

A dictionary of practical medicine: comprising general pathology, the nature and treatment of diseases, morbid structures, and the disorders especially incidental to climates, to the sex, and to the different forms of life : with numerous prescriptions for the medicines recommended, a classification of diseases according to pathological principles, a copious bibliography, with references, and an appendix of approved formulae : the whole forming a library of pathology and practical medicine and a digest of medical literature (Volume 9).

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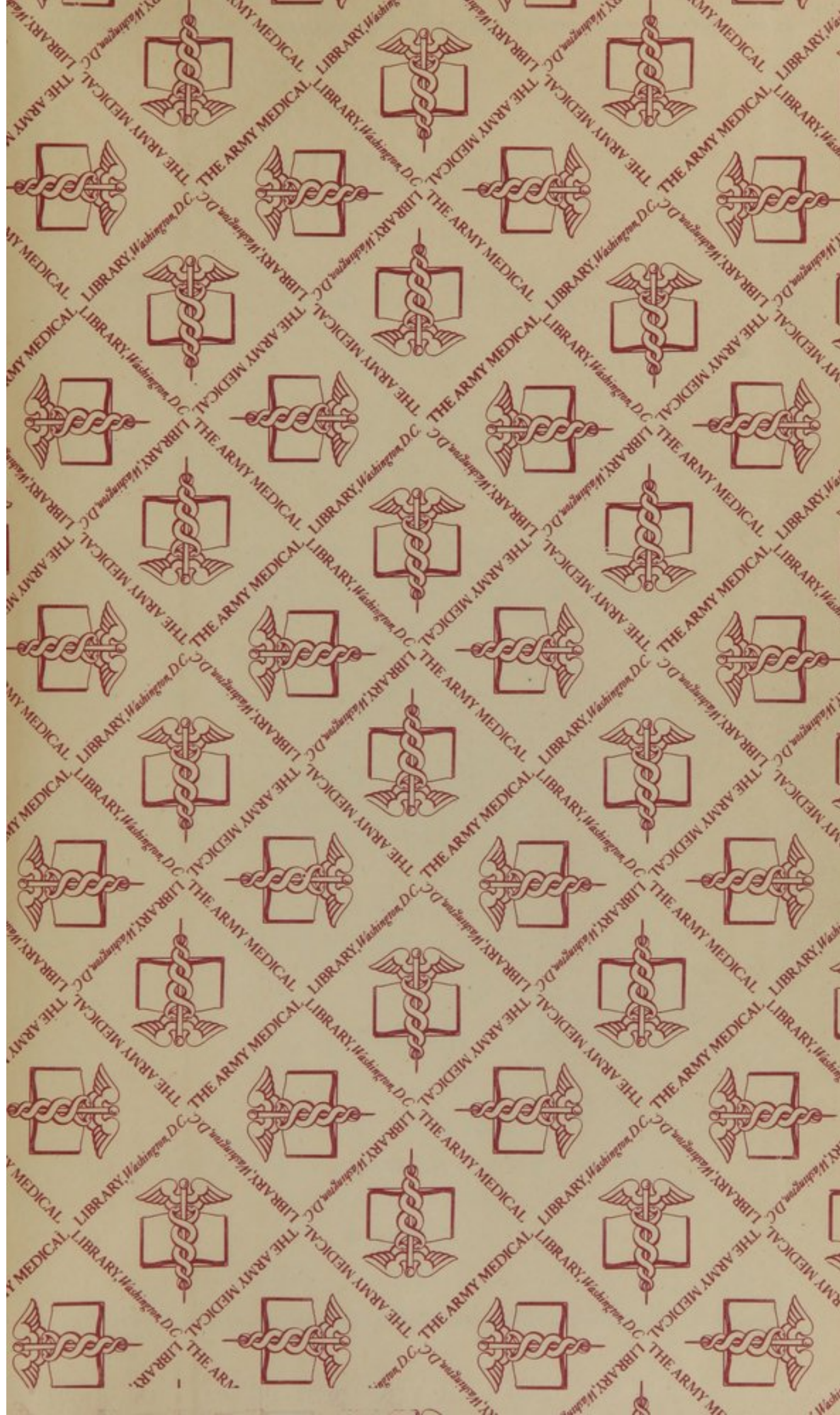
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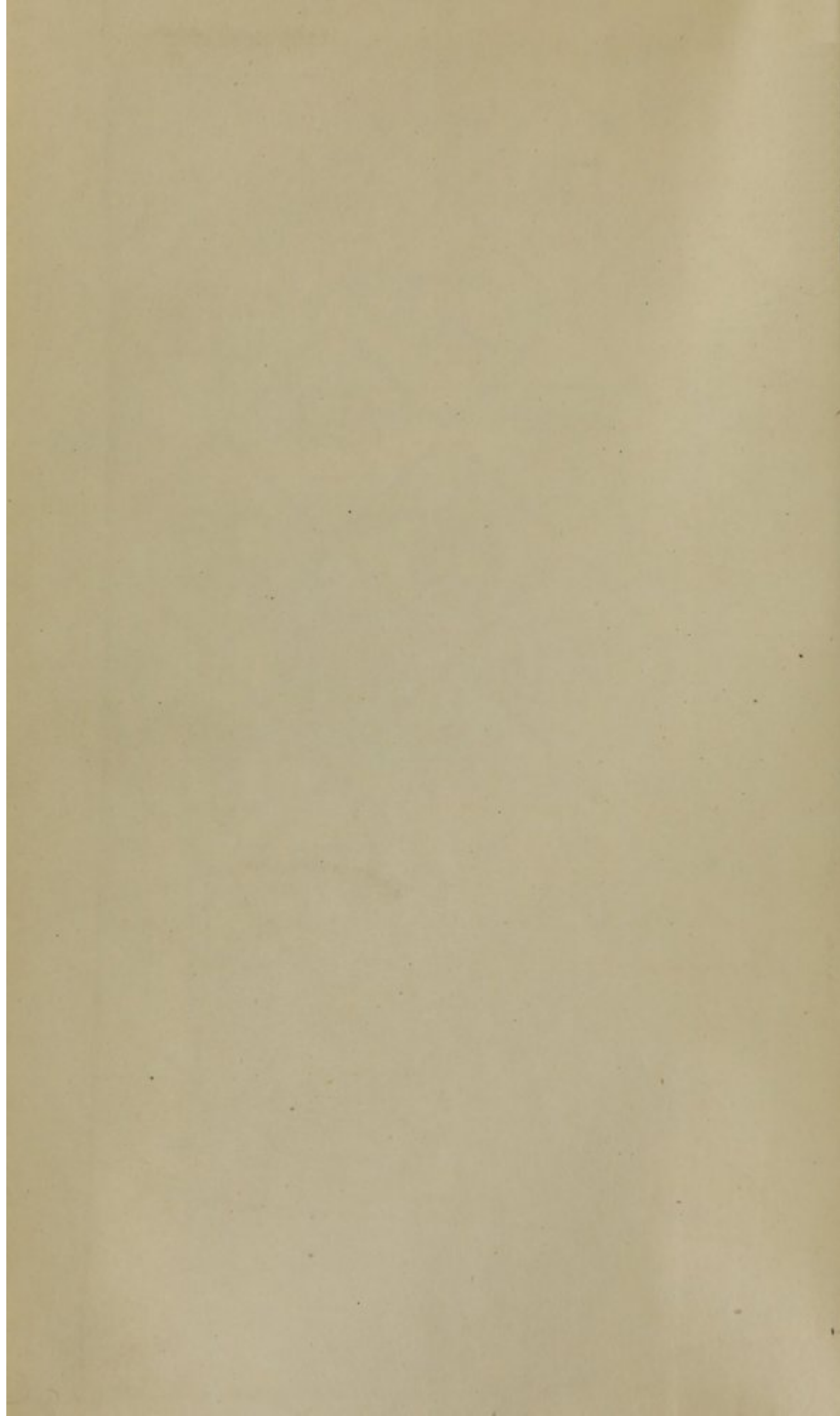


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A
DICTIONARY
OF
PRACTICAL MEDICINE:

COMPRISING

GENERAL PATHOLOGY,
THE NATURE AND TREATMENT OF DISEASES, MORBID STRUCTURES,
AND THE DISORDERS ESPECIALLY INCIDENTAL TO CLIMATES, TO THE SEX,
AND TO THE DIFFERENT EPOCHS OF LIFE;

WITH

NUMEROUS PRESCRIPTIONS FOR THE MEDICINES RECOMMENDED,
A CLASSIFICATION OF DISEASES ACCORDING TO PATHOLOGICAL PRIN-
CIPLES, A COPIOUS BIBLIOGRAPHY, WITH REFERENCES;

AND AN

Appendix of Approved Formulae:

THE WHOLE FORMING A LIBRARY OF PATHOLOGY AND PRACTICAL MEDICINE,
AND A DIGEST OF MEDICAL LITERATURE.

BY JAMES COPLAND, M.D.,

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EDITED, WITH ADDITIONS,

BY CHARLES A. LEE, M.D.

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few truths which are fully established with regard to it have been sufficiently demonstrated. "When, indeed, a fact is once well authenticated, no accumulation of authorities can be sufficient to invalidate its credibility; yet we cannot help placing a greater degree of confidence in opinions which we are, for other reasons, inclined to adopt, when we are informed that they are sanctioned by the observations of the most respectable authors of every age." It is necessary to premise that, until the commencement of the nineteenth century, the sub-acute and chronic forms of *bronchitis* were very generally described and treated as forms of *consumption*, and even as true *tubercular phthisis*; and that this want of precision in the diagnosis of these diseases led not only to a much greater diversity of opinion as to their treatment, but also to a marked difference in the reputed results of the means employed. The general misconception existing among writers respecting the precise nature and seats of *bronchitis*, and *tubercular formations* in the lungs, and their consequences, should be kept in recollection in reading the following sketch; for it will then become apparent that much of the benefit produced by many of the means recommended was actually not manifested in the cases of *tubercular consumption*, but in those of sub-acute, or asthenic, or chronic *bronchitis*. (See *art. BRONCHITIS*.)

242. HIPPOCRATES frequently mentions *tubercular consumption* by the name *phthisis*, *phthoe*, and *empyema*, and states that the age most liable to it is from 18 to 35. He notices many of its most prominent phenomena; as the taste and appearances of the expectoration, the pain between the back and sternum, the frequency of *hæmoptysis*, the quick, wheezing respiration, the cough, the condition of the hair and nails; the sweats, diarrhœa, emaciation, pleural adhesions, &c. His treatment is not always consistent with itself. He advises caustics externally, emetics, purgatives in moderation, oxymel, milk diet, especially asses', goats', and mares' milk, warm from the animal; walking exercise; avoiding the extremes of heat and cold. In addition to these, several other, and often opposite means, are advised in different parts of his writings, to which it is unnecessary to refer.

243. In the works of ARISTOTLE is to be found the earliest notice of the opinion that *phthisis* is infectious. He states that this disease makes the breath corrupt and offensive, and that those who approach the diseased person breathe air vitiated by him. PLAUTUS mentions resin and honey as being employed by the Romans for *hæmoptysis*; and DIOSCORIDES, the physician of Cleopatra, and the greatest writer on the *materia medica* in ancient times, recommends sulphur—a substance which has been employed in various forms, even down to the present time. ARETÆUS considers ulceration of the lungs as genuine *consumption*, called it *phthoe*, and gives a good description of the disease. Most of the chapter on the treatment is lost, but in what remains milk diet and sea-voyaging are strongly advised.

244. CELSUS states that, in genuine *consumption*, a long sea-voyage and change of climate are most advisable, if the strength will permit, and the climate of Alexandria is preferred by him. He remarks that the worst air for any disease is that in which it has originated. Among various other means he recommends milk diet, with garlic, leeks, &c., with vinegar; farinaceous articles,

occasionally some mild animal food; flour boiled with mutton suet, and some light and austere wines. He advises the cautery on various parts of the chest, and the ulcers not to be healed as long as the cough continues. He mentions several other remedies, as horehound with honey; the juice of plantain; garlic in wine, raw or soft; eggs with sulphur; hyssop; turpentine boiled with butter and honey; carriage exercise; sailing on a long sea-voyage. For *hæmoptysis* he advises bleeding, cupping, wool wet with vinegar to be placed where pain is felt; a cool apartment, and rest. The elder PLINY enumerates many substances as specifics for *consumption*, especially ammoniacum, a course of milk in the mountains, the juice of plantain, a linctus of betony with honey; goats' fat in gruel, or with honey and water, and a little rue, and various other means less rational.

245. The works of GALEN furnish many prolix and digressive discussions on *phthisis*. The expectoration of cretaceous concretions was first noticed by him. He believes in the infectious nature of the disease. He prescribes vinegar much diluted with water for the hectic; bleeding, an emetic, purgatives, frictions, baths, exercise, a mild opiate at night, and removal to *Stabia* for the advantages of the air and milk of that place. He remarks that the air of that place is dry, the pastures healthy, the hills of moderate height, three miles from the Bay of Naples, sloping gently to the west, and near to Vesuvius, which makes the air still drier by its volcanic heat, and defends it from the northwesterly winds. At *Stabia*, he says that the milk of cows is used; but he considers asses' and goats' milk preferable, the former being lightest, the latter of an intermediate nature. In order to allay the cough and improve the expectoration, he prescribes frankincense, myrrh, saffron, squills, liquorice, mastich, tragacanth, &c., with sirup of grapes and honey. When the discharge is excessive, he employs opium and castor, or aloes, mastich, and saffron; or the juice of hyoseyamus with pepper; or a lozenge of Scribonius Largus, containing liquorice, myrrh, turpentine, and tragacanth; or sulphur, with cardamoms and cinnamon. Most of GALEN's prescriptions were copied from those of the physicians who had preceded him. Various modes of preparing the *diacodium*, consisting chiefly of sirup of poppies and honey, are given; and for dry coughs, iris with honey is recommended; and for *hæmoptysis*, roses, gum, tragacanth, bole, linseed, and polygonum; and for the *consumption* consequent on it, iris with hyssop, bitter almonds, the juice of squills, with honey, southern-wood, and various other substances.

246. CÆLIUS AURELIANUS gives a tolerably correct account of the disease by the name of *phthisis* or *phthoe*. The medicines he prescribes are honeyed water, fenugreek, iris, aristolochia, arum, and horehound; also fir-cones, with honey and liquorice; and *diacodium*, with butter and honey. Sailing, especially to a distant climate, and reading aloud, are also advised. He censures the use of emetics, and considers the cold bath dangerous. For *hæmoptysis* he directs astringent electuaries, and pomegranate with aloe, as advised by THEMISON. If the hæmorrhage continue in moderation, he prescribes blood-letting on the third day, as inflammation will then take place; but if the symptoms are urgent with dyspnoea, bleeding should be practised at an earlier period. ORIBA-

sus gives merely an abstract of GALEN's practice, and remarks that a milk diet is of more importance than all other remedies. AETIUS makes a similar remark respecting asses' milk. He also recommends venison fat dissolved in soup, and caustics to the chest. ALEXANDER TRALLIAN gives ripe fruit for the hectic of phthisis, especially grapes. When concretions are expectorated he employs a cooling diet; and for the cough the juice of lettuce with liquorice; and the diacodium for relieving thirst and excessive perspiration. He also mentions the hermodactyls and their combinations. In the writings of PAULUS AEGINETA and ACTUARIUS, there is nothing beyond what is contained in the works of GALEN.

247. The *Arabian* writers exhibit no views of the nature and treatment of phthisis different from those which have been given by the Greeks. RHAZES, the most original of these, strongly recommends a milk diet, and fumigations from a mixture of orpiment, aristolochia, myrrh, styrax, and galbanum in equal parts, with a sufficient quantity of butter. AVICENNA prescribes camphor lozenges; in the early stages, bleeding; and generally a dry air, a milk diet, and sugar of roses. In all else he closely follows GALEN.

248. The medical writers of the fifteenth, and of the first half of the sixteenth century, follow the doctrines and practice of the ancients, with the exception of PARACELSUS. He recommends a powder for phthisis, containing crude antimony and crocus martis. He considers diet to be of the greatest consequence, and advises a bath to be tried containing a decoction of herbs with sulphur. FUCHSIUS was the first to notice digitalis, but in a very imperfect way. FERNELIUS, whose reputation was high in the sixteenth century, praises asses' milk, and small bleedings for hæmoptysis; in all things he principally followed HIPPOCRATES. LOMMIUS notices the infectious influence of the expectoration and breath in phthisis, and the hereditary character of the malady. The work of NICOLAS PISO is only a compilation from GALEN and other ancient writers. PROSPER ALPINUS merely states, in his work on the Diseases of Egypt, that phthisis is one of the endemic maladies of the country. FORESTUS was among the first to give cases in detail; but he professes merely to follow the doctrines and practice of GALEN. Among the means which appear to have been most beneficially used by him in consumptions are asses' and goats' milk, and sulphur with the white of egg. SCHENCK notices the use of turtle broth, and snails fattened on sugar and flour for hectic; but his materials are chiefly compiled from other writers. Most of the remedies he mentions have been already noticed; but we find that AVENZOAR prescribed olive oil, RUBÆUS sulphuric acid, and J. G. SCHENCK the balsam of sulphur, in phthisis. The voluminous writings of BALLONIUS or BAILLOU, a physician in large practice in Paris at the end of the fifteenth century, contain nothing more deserving notice respecting phthisis than a remark as to the frequent occurrence of the disease in those who have nursed others affected with it.

249. POTERIUS, a physician to the French court, struck out novel modes of practice in this disease, but kept the preparation of most of his chemical medicines secret. These, as far as they are known, seem to have been oxydations of tin, of mercury, of silver, of antimony, of gold, &c., with various other substances. He employed su-

gar of lead as a refrigerant; and a preparation which, under the name of the anti-hectic of POTERIUS, long enjoyed a great reputation. Dr. YOUNG states that this medicine appears to have consisted of two parts of tin and one of antimony, oxydated by means of nitre. He professes to have cured phthisis by giving five drachms of balsam of sulphur every morning with sirup, and the anti-hectic in the evening, sulphur lozenges and iris being held constantly in the mouth, with a diet of wine and animal food. The balsam of sulphur he recommends to be made with the oil of almonds, and given in milk; other oils make it too heating. SPIGELIUS states that consumptions are more common in England than elsewhere, owing to the habit of confining the chests of females by tight dress; and that in Venice, where this habit does not exist, females are more healthy.

250. SENNERTUS, whose works were very generally confided in at the commencement of the seventeenth century, closely follows GALEN. He considers the debility, diarrhœa, &c., to depend, in phthisis, upon an acrid or morbid secretion generated in the lungs. He prescribes many medicines, especially rhubarb, with infusion of roses and goats' whey; and he cautions against too copious evacuations of any kind. He advises an issue in one or both arms, if the debility and emaciation be not extreme. He remarks that sulphur was first recommended in phthisis by DIOSCORIDES; and he makes favourable mention of honey, roses, horehound, hyssop, &c. He quotes other authors in favour of guaiacum and ginseng. BONTIUS, in his *Medicine of the Indies*, gives a case in which he supposes that fragments of the bronchi were expectorated, but which are mere false membrane formed on the bronchial surface. For true consumption he praises his opiate extract of saffron, which, he says, stops bleeding, quiets the cough, and has alone cured many desperate cases. He also prescribes conserve of roses with poppy seeds and sulphur, and decoction of ginseng or of sarsaparilla. Verily there are much worse modes of treatment employed in recent times than those adopted by SENNERTUS and BONTIUS. TULPIUS furnishes nothing more deserving notice than the advantage obtained in a case of the disease by eating oysters daily. FABRICIUS HILDANUS describes several dissections of phthisical subjects, and notices the complication of pulmonary with mesenteric lesions, and the presence of calcareous concretions in the lungs. He relates several instances of successful recourse to setons.

251. Our countryman BENNET, as VAN SWIETEN and Dr. YOUNG very justly remark, has much surpassed his predecessors, and most of his successors also, as a writer on consumption, which he experienced in his own person. He pays marked attention to the breathing and the sputa, to the prognosis, and to the several contingent affections in the course of the disease. For hæmoptysis, leading to phthisis, he advises bleeding, warmth to the extremities, and bleeding from the feet in females, if the catamenia be scanty or suppressed. He recommends milk and milk diet, but prefers medicated whey, and reprobates the use of saccharine substances, as productive of an injurious fermentation. He considers the best expectorants to be those which contain resin and turpentine. BENNET also has recourse to frictions and fomentations, and to balsamic fumiga-

tions. These last should consist, in his opinion, of frankincense, turpentine, and styrax, with cinnamon, colt's-foot, and other articles, made into a powder or troche, and burned on coals. He prescribes also mixtures of herbs, on which boiling water is poured, and the vapour to be inhaled by holding the head over the vessel containing them. Issues are much praised, and, according to my experience, with very great justice. He directs them in various situations, according to the symptoms, and he considers that they may be kept sweet by using peas of orris root, and when the discharge should be promoted equal parts of hermodactyls and wax. He recommends Welsh flannel to be worn next to the skin, and not to be too frequently changed. Animal food, neither very fat nor lean, is allowed, and a gentle emetic is given when the stomach is loaded, and a decoction of sarsaparilla and other woods with ginseng is recommended for drink. If we except the recent employment of cod-liver oil in phthisis, in what, it may be asked, has the treatment of this disease been advanced since the appearance of the work of BENNET, by the voluminous writings of specialists and stethoscopists in recent times?

252. The continental writers of the middle of the seventeenth century afford very little information as to the treatment of phthisis beyond what was previously known. SILVATICUS confided chiefly in bleeding, issues, and sulphurated lozenges. RIVERIUS notices the infection of persons who had nursed phthisical patients. Among the many substances already mentioned he particularizes guaiacum, Peruvian balsam, and the stomachic, and the diaphoretic gold, of POTERIUS. BARTHOLIN furnishes nothing deserving notice farther than that sitting apartments may be made, by suitable vapours or medicated effluvia, useful substitutes for a voyage to Egypt or other warm countries. SYLVIVS attributed phthisis to the existence of glandular tubercles, which, when in a state of suppuration, constitute the vomica. For the cure of the disease he administers opiates, demulcents, and emulsions, fumigations, decoctions of the woods, hermodactyls, &c. He praises balsam of sulphur, prepared slowly with oil of anise seed, and says that it facilitates expectoration and relieves the breathing. He considers the milk of sulphur to be much inferior to it. To promote the appetite he prescribes the elixir proprietatis, which is made of myrrh, saffron, aloes, sulphurous acid, and spirit of wine, digested together. The diet he allows comprises wheaten bread, broths, milk, yolks of eggs, biscuits, with a little generous wine.

253. GIDEON HARVEY gives a tolerably good description of phthisis, notices bleeding, and remarks that great caution is required in practising it. He prefers whey to milk, gives it liberally with conserve of roses, and mentions the imperatoria as being recommended to him for this disease. WILLIS remarks that the atmosphere of towns is not always unfavourable to consumptive patients, for he has observed many have better health and less cough in London than in the country. He prescribes sulphur in all forms, several balsams, and tar-water. After bleeding, he advises narcotics, the muscus pyxidatus, warm bathing, frictions, blisters, &c. DIEMERBROECK mentions the case of a person who was cured by taking goats' milk thrice daily for three months, without any other medicine. BONETUS furnishes some information as to the lesions formed in

phthisical cases, but it is of a very loose and imperfect kind, chiefly furnished by former writers, many of them of little reputation.

254. Of the writings of SYDENHAM, which have been extravagantly praised, but which are now more justly estimated, Dr. YOUNG justly observes that, "among the practical writers on consumption he cannot be considered, even by his warmest admirers, as holding a distinguished rank." His pathology of the disease hardly deserves notice. For a confirmed consumption, medicines are, he remarks, of little use; but bleeding, mild purgatives, and pectoral remedies may be tried, with incassants or attenuants, according to circumstances. For the fever he gives refrigerents, asses' milk, emulsions, and opiates. For hæmoptysis he directs bleeding, cathartics, and the avoidance of animal food. Horse-exercise is very strongly recommended by him; and he states, with the truth that many cannot fail to appreciate, that riding cures consumption as certainly as bark cures intermittents. Carriage-exercise is also praised by him. For simple cough he prescribes abstinence from wine and meat for a few days; ten drops of anisated balsam of sulphur, taken occasionally on a lump of sugar; lozenges containing liquorice, alecampane, anise seed, angelica, iris, and sulphur; and a linctus of oil of almonds, with sirup of capillaire and violets. If the cough be obstinate or attended by fever, he orders bleeding and cathartics; and if the patient becomes consumptive, ten drops of Peruvian balsam three times a day, a decoction of bitter plants, riding being the chief remedy. G. HARVEY, after ridiculing the treatment of consumption proposed by his predecessors, concludes that there is a single cheap remedy which does wonders; but this remedy he conceals. The only remark made by him deserving notice is, that hectic is generated by the pus which enters the blood; for the disease is partly an affection of the fluids, and not, as has sometimes been supposed, of the solids alone.

255. The *Phthisiologia* of MORTON was for more than a century the basis of practice in consumption, although in all most important matters it was anticipated by the writings of BENNET. There remain, therefore, but few topics deserving notice. Chalybeate waters are considered by him as preferable to all other means for the prevention of the disease, especially in scrofulous constitutions; he directs them to be taken freely, either cold or warm. He considers catarrh to be the most frequent cause of phthisis; and infection sometimes to occur, for he believes that it may be communicated to a bed-fellow. When proceeding from this latter cause, he considers it to be most fatal. He recommends bleeding in the early stage, but views it as fatal in the advanced stages, and opiates for the cough with purgatives, as the aloetic tincture. After bleeding, emetics are viewed by him as of great benefit, in the first stage, but they ought to be followed by opiates. He frequently prescribes his stomachic pills, consisting of aloes, myrrh, mastich, saffron, cloves, wormwood, nutmeg, calamus, mace, rhubarb, musk, cardamoms, &c. In scrofulous and scorbutic consumption he recommends pills of gum ammoniac, with benzoin, balsam of Peru, and sulphur. But in all forms of phthisis, especially in the more advanced stages, he considers cinchona the great and general febrifuge. Several forms and complications of consumption

are particularized by him as requiring different or additional means of cure. He says that, in asthmatic phthisis, opium is injurious, by increasing the dyspnoea; but that ammonia and the citrate of potass are most useful remedies. In the melancholic and hysterical phthisis, emetics, he avers, act like magic, and opium is particularly requisite. For phthisis complicated with hæmoptysis, after venesection and other remedies, he gives the bark in doses of a drachm every four hours. He remarks that calculi may form in the lung, may lie there a long time inactive, or they act as foreign bodies. Consumption consequent on syphilis he considers to be of an asthmatic nature. Chlorosis often passes into phthisis, he justly observes, by imperceptible degrees, if not treated by chalybeates and purgatives. When he suspects internal ulceration, he gives from 20 to 30 grains of calomel every third or fourth morning, and the diaphoretic antimony at night. BRUNNER states that he "entertained strong doubts of the propriety of MORTON's practice of giving cinchona in hæmoptysis, till he found by experience that it succeeded, where every thing else had failed."—YOUNG, p. 203.

256. ETTMÜLLER recommends emetics early in phthisis, and a diet of milk and raw new eggs. BAGLIVI furnishes us with nothing novel, excepting that he supposes ipecacuanha to be the best remedy for this disease, and for all hæmorrhages and discharges. WEPFER furnishes some of the earliest information as to tubercles. In his observations on diseases of the head, he gives an account of an endemic consumption at Waldschut, on the Rhine, where there is a cavern in which mill-stones are dug and wrought. The air is there always hot—even in winter, and a very fine dust floats in it. All the workmen employed in it become consumptive, if they remain a year, or even a shorter time.

257. STAHL's opinions as to the treatment of phthisis are not worthy of his reputation. His remarks are chiefly directed to the non-efficacy of most of the means which had been advised up to his time, and many of his observations are just. He reprobates the use of balsams, opiates, expectorants, cinchona, myrrh, balsam of sulphur, &c., and confides chiefly in bleeding, and nitre in moderate doses; and asses' milk, he says, is fit only for asses. The too general or inappropriate use of these and other medicines—the universal employment of a medicine because it has been advised, or found useful in one or even a few cases, is mere empiricism. It is the appropriate exhibition of a medicine to inferred pathological conditions which constitutes rational practice. He remarks that females are more frequently consumptive than males; but they have a greater chance of escaping its fatal termination. He considers exercise on horseback or in a carriage to be the most beneficial remedy for phthisis. FULLER agrees with STAHL as to riding on horseback being most salutary in this disease, when "without fever or ulcer;" but he adds that "the patient must be a Tartar, and live on his horse."

258. F. HOFFMANN, the rival of STAHL in reputation, fully discusses the treatment of hectic fever and phthisis. He remarks that hectic attended by indigestion may often be relieved by an emetic of ipecacuanha, followed by a dose of aloes. If amenorrhœa be a concomitant, bleeding in the feet and deobstruents are prescribed by him. If mesenteric disease complicate phthi-

sis, as often observed in children, warm bathing, nitre, sulphate of potass, and sal-ammoniac are recommended. In all hectic he considers milk a principal remedy, especially woman's milk, asses' milk, goats' milk, or cows' milk, with manna or conserve of roses, or with Seltzer-water. He also ventures to give the tincture or infusion of roses, cascarilla, cinchona, and nitre. He gives the muriate of potass when the appetite is weak. Bleeding, he says, should be practised with much caution. He adverts to a patient who was kept alive thirty years by losing some blood twice a year, and drinking a decoction of ginseng and sassafras. The treatment which he more especially advises for phthisis is somewhat similar to the foregoing. He thinks justly that, where a predisposition to the disease exists, it may be called into action by attendance on a consumptive patient. When a milk diet occasions acidity, he substitutes whey; with which, or with milk, mineral waters, or lime-water, may also be mixed. He considers the best laxatives in phthisis to be manna, magnesia, rhubarb, or senna taken in milk; and milk or whey with parsley-seeds, or celery-seeds, to be the best diuretics. He is not favourable to the use of gum-resins or balsams, if they occasion, or if given during, febrile action. Myrrh, saffron, copaiba, opium, honey, wax, spermaceti, and oil are viewed more favourably. In the young and plethoric, small and frequent bleedings, air, exercise, and warm baths are, he believes, the best prophylactics. He considers half the cases of consumption to originate in hæmoptysis, and he advises that the bleeding should not be stopped too soon by astringents. In advanced cases, bleeding to the amount of an ounce only, often relieves the breathing. He says that emetics and strong cathartics are injurious. He makes favourable mention of issues, and of a stomachic elixir, composed of myrrh, saffron, nutmegs, and buck-bean, which is to be taken at meals, consisting chiefly of milk diet, broth, and ptisan. For the colliquative perspiration he gives nitre and opium in small doses. He often prescribes also sulphur and diaphoretic antimony; and the combination of milk with mineral waters is much praised by him. It will be seen that the treatment adopted by this great physician is, in most respects, of great excellence, and when employed appropriately to the circumstances, form, and stage of the malady, by no means inferior to any adopted at the present day.

259. MUSGRAVE was the first to point out the connexion of phthisis in some instances with irregular gout. The treatment he advises is not materially different from that recommended by BENNET, HOFFMANN, and others. BOERHAAVE furnishes no information as to the treatment of phthisis in any way worthy of his great reputation; his practical judgment appears to have been overlaid by his hypothetical doctrines. The respectable synopsis of ALLEN furnishes one very good suggestion, namely, the propriety of the liberal use of buttermilk in consumption. He also believes in the contagious nature of the disease in certain circumstances favourable to its operation. WHERLHOF comes to the defence of cinchona and MORTON against the attacks of STAHL. DOVER, in his ancient Physician's Legacy, appears in his heroic character of buccaneer in the treatment of phthisis. He advises a frequent repetition of bleeding in small quantities, horse-exercise, crude quicksilver in large quantities, a

substance much in fashion at the commencement of the eighteenth century; and anise seed and crocus martis made into pills with the balsam of Locatelli, in the morning, and elixir of vitriol in the afternoon. He gives also his powder, which originally contained nitre instead of the sulphate of potash of the modern powder. He advises the antiphlogistic regimen.

260. P. DESAULT deserves notice for his having been the first to contend that tubercles in the lungs constitute the essence of consumption; that they are generally antecedent to hæmoptysis; and that ulceration of the lungs is merely an effect, and not a cause. He adds nothing to what has already been stated as to the treatment. JUNCKER, the methodizer of the doctrines of STAHL, furnishes but little information respecting phthisis, and almost none deserving notice, excepting his approval of riding, and his disapproval of warm balsams and aloes. WAINEWRIGHT considers CHEYNE correct in concluding that the quantity of blood is much diminished in hectic, and thinks that pectorals and balsamics are injurious, unless they serve as stomachics and diuretics. He prescribes gentle emetics, mild stomachics, riding, pure air, frequent blisters, and a light, digestible diet. Dr. THOMSON is in favour of small doses of antimonial wine in consumptions.

261. Dr. HUXHAM's reputation induces a desire to know his practice in phthisis. He remarks, that catarrh occasions this disease only when tubercles had previously been formed in the lungs, and that the malady may be fatal before an ulcer is formed. Instead of sweet, oily, emollient, and other substances, which often disagree with the stomach, and occasion acidity and diarrhœa, he employs gentle diaphoretics, blisters between the shoulders, mild cathartics with anodynes interposed, the decoction of cinchona, with guaiacum and styrax, and inhalations of drying fumigations. He advises those of a consumptive tendency to remove into the country in the spring, and to lose a little blood as a precaution. RUSSEL's work on glandular decline is of some importance as recommending a remedy within the reach of most persons, and one of great efficacy when judiciously employed, namely, sea-water, especially when taken internally, warm or cold, according to the circumstances of the case. He employs it also externally, at different temperatures.

262. Dr. MEAD insists on the intimate connexion of phthisis with scrofula, and considers that the use of bark in the disease is indicated by the periodicity of the attendant fever; but he believes it to be injurious when the lungs have become ulcerated. Goats' milk and whey are recommended; and when milk disagrees with the bowels, it may be boiled with roses, pomegranates, and cinnamon, with the addition of water. The fumigations advised by BENNET, change of climate, a voyage to Naples or Lisbon, are severally noticed with approbation. Dr. BRYAN ROBINSON praises emetics, especially those with ipecacuanha, in hæmoptysis, and adduces evidence of their effects. Dr. HORSBURGH gives some cases showing the benefits produced by the aluminous chalybeate spring, the Hartfell Spa near Mofiat, at an advanced stage of consumption.

263. Dr. GILCHRIST adduces numerous cases showing the great advantage accruing from sea-voyages. He considers hæmoptysis a conse-

quence of tubercles previously existing, and remarks that there are still tubercles to be resolved, even after ulceration has taken place, and hence the difficulty to give appropriate remedies for every stage in which tubercles may be found. But sailing and sea-air appear the best calculated to fulfil all the indications. On a rocky coast, where the inhabitants live much on shell-fish, he observed consumption decidedly more rare than in the country inland. He considers that the practice in this disease should consist in a proper administration of bleeding, issues, mercurials, balsams, diet, sea-voyaging, and sea-air. The practice of Dr. MARRYAT has been very generally adopted, at least in many of its parts, until modern times. He strongly objects to bleeding in consumption, and recommends a nourishing diet, especially of pork broth, and exercise on horseback, but, above all, the "dry vomit," consisting of a grain of tartar emetic, with three of ipecacuanha, to be taken fasting twice or thrice a week, without drinking after it. If there be diarrhœa, he directs a grain of sulphate of copper with four of ipecacuanha. If ulceration exist, he gives twenty drops of copaiba in sugar night and morning. For hæmoptysis he gives his emetics in increased doses. Bark, nitre, sulphur, chermes mineral, and alum are also severally employed, according to circumstances. For scrofula he prescribes corrosive sublimate, with the addition of a few drops of the hydrochloric acid, &c.

264. There are few topics connected with the treatment of phthisis more important than that respecting the employment of opium, and to this TRAILLES has devoted much attention, in a prolix and discursive work, in which the general treatment of the disease also is fully discussed. He considers opium to be useful in the first stage, but to be injurious afterward. He thinks that it is not even a palliative. He, however, gives it in enemata with decoction of bark and milk, for the palliation of the colliquative diarrhœa, and admits that it is useful in small doses when the cough is violent, for which also he gives the sirup of poppies. He recommends PLUMMER's pill, ammoniacum, soap, squills, and honey, milk diet, milk with lime-water, emulsions, and farinaceous substances. The works of MORGAGNI furnish no precise information as to either the morbid anatomy or the treatment of pulmonary consumption, beyond what was previously known. Of the other contemporary writers on medicine there is none who gives any information respecting the treatment of consumption deserving notice, until we arrive at the works of Sir JOHN PRINGLE, DONALD MONRO, and others.

265. The observations of Sir JOHN PRINGLE deserve the high estimation in which they have always been held. In recent coughs he gives, after bleeding, mucilages, oils, and ammonia, in the form of an emulsion; and at night laudanum with oxymel of squills, or gum ammoniac. When the symptoms assume the form of hectic, he repeats the bleeding, recommends low diet, and the employment of setons or issues, which he justly considers still more beneficial than bleeding. If thirst or heat be great, acidulated drink, or buttermilk, without animal food, are advised. To check the sweats he uses sulphuric acid, or lime-water, conserve of roses, air, exercise, a milk and vegetable diet, and where there are debility and lowness of spirits, the bark is recommended. DONALD MONRO appears to have adopted the

practice of PRINGLE in phthisis. He has recourse to bleeding when there is pain, and to cinchona when neither pain nor difficulty of breathing is experienced. Setons and issues, he says, are always of use. A gentle emetic is advised for difficulty of breathing. For diarrhoea rhu-
barb and afterward opiates are given.

266. LIEUTAUD, in his *Synopsis of Medical Practice*, considers bleeding injurious, and advises chiefly a milk diet, with pectoral decoctions, balsams in small doses, sulphur, tar-water, or MORTON'S balsamic pills, the fumes of balsamic herbs, the waters of Bonnes or Seltzer, or lime-water mixed with milk, riding, issues between the shoulders. For the consumption produced by hard study, he prescribes camphor with HOFFMANN'S anodyne, baths, frictions, change of air, horse-exercise, and generous wine. LINNÆUS suggests the use of the lichen pulmonarius in phthisis. The Lichen Islandicus was known to earlier writers, according to Dr. YOUNG, although it is not mentioned by LINNÆUS. MR. READ lauds a residence in a cow-house in cases of consumption, and says that it is preferable to any fumigations. The recommendation of a medicine called the decoction of a thousand flowers, which was much used from two to three centuries ago for the different forms of consumption, is more rational than this singular residence. This decoction, or infusion, as sometimes prepared, was made from the recent dung of cows while feeding in open pastures, warm or cold water being mixed with it, and allowed to stand a considerable time, and the clear fluid being poured off for internal use. The bile existing in the dung was thus partially extracted, and employed as a stomachic.

267. The works of HEBERDEN, SAUVAGES, and FOTHERGILL furnish no additions to the method or means of treating phthisis already known. STORCK is extravagant in his praises of hemlock in this disease. VAN SWIETEN, in his commentaries on the aphorisms of BOERHAAVE, observes that persons exerting their voice in their professions are more liable to hæmoptysis than others; and that MOLIERE died of an attack of this disease immediately after performing his "Malade Imaginaire" for the fourth time. He believes in the communication of phthisis by infection, and considers that an hereditary disposition to the disease does not necessarily imply its actual existence. He approves of camphor as prescribed by AVICENNA (§ 247), and of the treatment adopted by PRINGLE. He praises the use of milk, small but frequent bleeding, horse-exercise, the cautious employment of cinchona, and of opiates. For relief of the diarrhoea, he directs an enema of a drachm of turpentine, rubbed down with yolk of egg, adding half an ounce of theriac and four ounces of new milk. The treatment recommended by MACBRIDE is, in most respects, the same as that already so frequently noticed, namely, gum ammoniac, soap, and ammoniacal iron, early in the disease; gentle emetics to promote expectoration and relieve dyspnoea; bark, in some cases, goats' whey, asses' milk, buttermilk, Seltzer, Bristol, or Malvern waters; riding, and especially sea-voyaging, setons, or issues, &c. For hæmoptysis, he directs bleeding, opiates, and demulcents. WINTERINGHAM disapproves of fumigations, as prescribed by BENNET and MEAD, but thinks that the steam of hot water containing vinegar of squills may be inhaled with advantage.

268. Dr. JAMES SIMS, the founder of the Medical Society of London, is favourable to emetics, to sulphur, and to cinchona, suitably employed. Tar-water is also useful, but he considers tar pills to be preferable. The following remarks are correct: Females not uncommonly have a respite from consumption when they marry, but sink under the disease after having had two or three children. The catamenia may remain natural till the last stage, but this, I may add, occurs only occasionally, and chiefly in the more chronic and protracted cases. SCHOENHEYDER employs the decoction of Iceland moss, especially in phthisis consequent on measles, or after the removal of inflammatory symptoms. TODE very judiciously gives the bichloride of mercury in the infusion of cinchona, with Iceland moss, and a milk diet, in syphilitic consumption. Dr. MOSES GRIFFITH is deserving of notice, chiefly for his recommendation of chalybeates in consumptions, and more particularly for his *Mixtura Ferri Composita*. This mixture is, however, varied by him according to the circumstances of the case; adding nitre in young subjects and recent cases, myrrh at a more advanced stage, and when there is more debility. He farther advises a diet of asses' milk, or skimmed milk, puddings, rice, potatoes, and a little light animal food, once a day, and, above all, snail-broth, or snails boiled in milk. LINNÉ reports favourably of the *Hypericum perforatum* in hæmorrhagic and ulcerous phthisis, a handful of the tops of the plant being made into a decoction with Spanish wine, boiled down to one third, and an eighth taken morning and evening.

269. The treatment adopted by CULLEN for phthisis was generally followed in this country until early in the present century. When expectoration of purulent matter, with hectic fever, is present, he believes that ulceration exists. He views catarrh as rarely a cause of phthisis in persons not predisposed to this disease, but it ought not to be neglected. Spasmodic asthma not unfrequently terminates in phthisis. In two cases of the expectoration of chalky concretions, the patients recovered by the aid of milk diet, &c. Consumption from hæmoptysis is less universally fatal than other forms. "Hæmoptysis is not always followed by ulceration, nor is ulceration always attended with hectic. Pregnancy retards the symptoms, but they generally recur and become fatal soon after child-birth." In the hæmorrhagic form of the disease he thinks the acetate of lead dangerous, and chalybeates and cinchona improper, as tending to increase the phlogistic diathesis, and as having been found injurious in his practice. He prefers evacuations of all kinds, a low regimen, and blisters to the breast or back, followed by issues. Sea-water and other mineral waters are wholly useless, and mercury is prejudicial. Milk is a chief remedy; and violent exercise, and the extremes of cold and heat, are to be avoided. He thinks that sea-air is desirable only for its moderate temperature; that the balsams, myrrh, &c., have sometimes done harm; that bark increases the phlogistic diathesis, and even when it relieves for a time, the symptoms speedily return; that acids are useful, especially vegetable acids; that opiates are necessary for allaying the cough, but they often increase the sweats; that demulcents frequently disagree with the stomach; that the diarrhoea requires astringents and mucilages, and that all purgatives are dangerous, but ripe fruits are often both agreea-

ble and beneficial. M. BRILLONET records cases illustrating the connexion of tubercular phthisis with scrofula, and the successful treatment of the former by small doses of corrosive sublimate, and by a diet of soup, eggs, and vegetables.

270. STOLL offers some judicious observations, although others are more open to objections. For tubercular hæmoptysis he advises small and repeated bleedings; gentle emetics; acid and nitrous drinks, and afterward lichen, polygala senega, or cinchona. For hectic diarrhœa he gives the powder of the root of arnica. He disapproves of balsams, bark, and astringents, where there is any inflammatory complication. BERGIUS strongly recommends the Iceland moss in phthisis. When its tonic qualities are not required, he directs the bitterness to be extracted by previous maceration. Dr. MUDGE employs the inhalation of medicated vapours for consumption. He believes hæmoptysis to result from the obstruction caused by tubercles; and for this state of the disease he advises nitre in solution, a moderate bleeding, and emetics; for cough, the inhalation of emollient vapours, the ammoniacum with laudanum, or half a drachm of the anisated balsam of sulphur, a very large scapulary issue, if these fail, and a milk diet and vegetables. He reprobates the use of small issues, and advises them to be large and efficient—a recommendation agreeable to my experience.

271. Dr. SIMMONS notices the form of consumption produced by dry-grinding, or by breathing the minute particles of sandstone and iron. He considers the practice of bleeding to have been carried too far by DOVER. He prescribes nitre and camphor, myrrh with spermaceti; and oranges and ripe fruit in preference to sulphuric acid. Setons and issues, he says, are useful, opiates mischievous, and ripe fruit and antiseptics are the best remedies for diarrhœa. A little animal food, plainly dressed, may be allowed if much desired. Change of air is advised; but he justly adds that migration to a warm climate, late in the disease, merely hastens death. Emetics of sulphate of copper, twice or thrice a week, in the early stage, preceded and followed by a draught of water, are also given with the vain hope of dispersing the tubercles. The observations of HOME, DUNCAN, and REID furnish little or no information. The last-named physician advised chiefly the exhibition of ipecacuanha emetics, morning and evening, and considered sea-voyaging beneficial, mainly by producing nausea and vomiting. Verily his treatment seems to have been as bad as the disease. BORSIERI again thinks emetics injurious, and balsamic remedies hazardous; but he approves of bark in incipient cases, of camphor, and of balsam of tolu and turpentine in advanced stages. POUTEAU advises, when pain is experienced, bleeding, and cupping, and blisters.

272. Dr. STARK's posthumous observations contain the earliest correct account of the anatomy of tubercles. He is favourable to bleeding in the early stages, to oleaginous and demulcent medicines, and to vinegar of squills, &c., when cough and dyspnœa are urgent. RAULIN's views as to the treatment of phthisis are in some respects heterodox. He is more correct in recommending ipecacuanha in the catarrhal complications of the disease. He considers gums to be preferable to emulsions; and the preparations of cascarrilla to be appropriate for the sweats and for diarrhœa. Sirup of tolu with ptisans; and myrrh, camphor, and

a little opium every night, are very generally prescribed. He praises opium in large doses for hæmoptysis; and the mineral waters of Cauterets and Bonnes for convalescents. Dr. WITHERING, in 1785, in his account of the foxglove, notices the recommendation of this medicine by Mr. SAUNDERS in consumption, and states that he found it of advantage in several cases when it was given in a decided manner. Dr. DARWIN, however, is doubtful of its good effects; and Sir G. BAKER is of opinion that its influence in phthisis is owing to the sickness it occasions.

273. Sir G. BLANE considers the best climate for the consumptive to be between 30° and 40° north latitude. VOGEL prescribes the vegetable acids with gum arabic; and, for phthisis after fevers, the taraxacum, bitter extracts, and horehound, or the cold infusion of cinchona with rhubarb, if inflammatory symptoms be absent. The cold infusion of bark he gives most frequently with acids or nitre, or made with whey, and preferably during the remissions of the hectic. He agrees with SIMS as to the use of oysters as an article of diet. QUARIN considers emetics unsafe in phthisis; he gives bark with sulphuric acid for the sweats; Spa water with milk in preference to Seltzer water; and the senega when the expectoration is difficult. Dr. MOSELEY believes that England furnishes change sufficient for an invalid; but that a voyage to Madeira early in the disease may be of advantage. For hæmorrhagic phthisis and pulmonary oppression he prescribes a vitriolic solution with the sulphates of zinc and alumina as an emetic, instead of bleeding, followed by a sea-voyage.

274. Dr. MAY states that, in a well-marked case of phthisis in a young person of a scrofulous constitution, the patient took laudanum night and morning, an ipecacuanha emetic when the stomach was loaded, and cinchona; and that the diet consisted of soup, meat, wine, porter, brandy and water, eggs, oysters, &c., with proper condiments. Swinging was employed twice daily, and horse-exercise completed the cure. A similar case was published by Dr. KENTISH. I recollect meeting Dr. MAY in 1820. He argued strongly in favour of his tonic and nourishing method of treating phthisis, which then appeared heterodox, but which is now more or less adopted. Dr. GRIEVE notices his employment of koumiss, a fermented liquor made from mare's milk, in the early stage of phthisis. The fermented whey of cow's milk is used as a popular beverage in this disease in Norway and the Shetland Isles. Dr. CRICHTON gives a favourable report of the Iceland moss in cases of phthisis uncomplicated with inflammation. BANG, of Copenhagen, recommends the oil of asphaltum, in doses of eight drops morning and evening in rye broth. The pneumatic treatment, first tried by FOURCROY, and more fully discussed and employed by BEDDOES, furnishes no satisfactory results. Dr. SENTER, of the United States, prescribes emetics of ipecacuanha and sulphate of copper, every second or third morning, without eating or drinking, and as much of GRIFFITHS's chalybeate mixture (p. 268) as the stomach will bear in the intermediate time. For children especially, the sulphate of zinc is a preferable emetic. A milk diet is also directed.

275. The first volume of the "Medical Inquiries" of Dr. RUSH, of Philadelphia, contains some of the most important observations on consumption which appeared towards the close of the last

century. He was himself subject to consumptive symptoms during a considerable portion of his life—a circumstance which imparts additional weight to his advice. He recommends, upon the first indication of the disease, or as soon as heat in the hands, weakness of the eyes on wakening, dryness of the feet, inactivity, and other slight febrile symptoms appear, the patient to have recourse to a more active life, with bathing, bark, and steel. When the pulse is hard, with pain or bloody expectoration, he directs frequent bleedings, and where bleeding cannot be employed, emetics and milk diet. In the last, or typhus stage, as he terms it, he considers that a temporary benefit is derived from balsams, horehound, vegetable tonics, bitters, cinchona, &c., the diet being now stimulating and nutritious. He believes damp situations injurious in all states of the disease, and a high, dry, and temperate residence in the country most beneficial. He advises also flannel always to be worn next to the skin, the dilute vapour of tar, or the smoke of resin to be inhaled, opiates to be given in small doses during the day, and more largely at night, and repeated blisters and small issues to be employed. He admits of a moderate exercise of the lungs in speaking, reading, and singing; and a gradually increased exercise of the body, especially of the limbs.

276. Dr. GREGORY, of Edinburgh, in his lectures considers mercury injurious; cinchona of little use, and myrrh of less. The mineral acids he views as palliatives only, and as inferior to the citric acid. Emetics are sometimes useful, even without operating powerfully; sulphur is liable to be too laxative, but beneficial nevertheless; and purgatives hazardous as either inducing or aggravating the diarrhoea. Dr. FERRIAR finds digitalis with change of air of service in the mucous consumption (chronic bronchitis), and in checking incipient phthisis, when the patient is too weak to bear evacuations. The pneumatic means, so much and so sillily vaunted at that time, and like other means puffed, with their authors, into undeserved notice much more recently, he justly considers quite undeserving adoption. Dr. GARNET introduced several chemical medicines into practice about the end of the last century. He prescribes the sulphuret of potass, and powdered charcoal, in the florid states of consumption, and gives a drachm of each of these, four or five times a day, in warm water, with the effect of promoting expectoration and improving the other symptoms. I question, however, the ultimate good arising from medicines which “promote expectoration,” as I have too frequently seen them promote other more unfavourable symptoms.

277. In the writings of DARWIN, in which there is a mingling of hypothesis, fancy, and poetical imaginings, with ill-assorted experience, I find nothing on the treatment of phthisis deserving notice, or at least nothing worth attention which had not been previously advised by many of his predecessors. J. FRANK professes himself an advocate for the tonic and nutritious treatment in phthisis proposed by SALVADORI, MAY, and others, though with much more moderation in the degree; palliating the urgent symptoms by opium, and endeavouring to relieve the debility by cinchona, lichen, milk, wine, exercise, and nutritious food—a treatment, however, by no means admitting of general adoption. Dr. BARTON men-

tions the *Arum triphyllum* boiled in milk as a remedy in phthisis, states that he has known only of one case of the disease cured by digitalis; and that he finds more benefit from emetics of sulphate of zinc than from other means.

278. Dr. FOWLER and Dr. FERRIAR relate cases of consumption cured by digitalis given as decoction or infusion; but it is not improbable that more benefit was imputed to the medicine than it really deserved, as most of the cases were characterized chiefly by hæmoptysis, and as those are often attended by prolonged periods of amendment. That it is, however, followed by some degree of benefit, especially early in the hæmoptysical form of the malady, appears from the testimony of BEDDOES, MOSSMAN, MACLEAN, SHERWEN, and others, although this position is denied by Dr. BREE. Dr. MAGENNIS's success with digitalis may be attributed chiefly to the very large doses, and to the early period of the disease in which he prescribed it. BUSCH in his researches employs chiefly aconite, hemlock, henbane, and dulcamara, combined with either ipecacuanha, chermes mineral, or honey of squills. He prefers the leaves of aconite to the extract, and gives two grains every two hours, increasing the dose to a drachm daily. Dr. BEDDOES insists upon the propriety of confining the phthisical patient to a temperature varying only from 60° to 65°, and believes that the muriate of lime is sometimes of service.

279. Dr. HEBERDEN considers asses' milk to be of use in allaying the fever; decoction of bark and sulphuric acid in relieving the sweats; opium in quieting the cough and favouring sleep; bleeding to the amount of five ounces only, when pain is urgent; and the application of a blister when the pain is obtuse. He advises a vegetable diet chiefly, and the purest water for drink. Dr. THOMAS recommends an emetic every second or third day, especially in the early stage, GRIFFITH's iron and myrrh mixture, and digitalis. Dr. TROTTER is favourable to cinchona and sulphur; and to digitalis with opium. Dr. WILSON considers sulphuric acid to be most efficacious in checking the sweats; and a demulcent mixture with spermaceti and a little laudanum most useful for the cough. He allows animal food in moderation; and the vapour of warm water, in which onions have been boiled, to be inhaled in order to facilitate expectoration. Dr. BOURNE furnishes experiments on the use of the *uva ursi* in consumption, from which he infers it to be of service early in the disease, in doses of ten or twelve grains, twice or thrice daily, sometimes taken with a small dose of opium. The end of the last century and the commencement of the present abound with writings on the treatment of phthisis, many of them most inconclusive, some of them trifling or puerile, and nearly all of them deficient in precision of description, and in logical inference. Most of these are filled with discussions and cases proving and disproving the efficacy of digitalis, and commenting upon the operation of this medicine.

280. Dr. BADHAM, in 1808, was the first to distinguish between asthenic and chronic bronchitis and tubercular phthisis, the former having been generally viewed as varieties of pulmonary consumption, and thus confounded with the tubercular disease. A large proportion of the recoveries of cases which had been considered tubercular, was evidently cases of bronchitis. Several writ-

ers at this period added nothing to our knowledge, or placed before us the "crambe bis coctum," or rather decies coctum, of their predecessors. RUSSELL expresses a favourable opinion of bark, calumba, chamomile, sulphuric acid, and iron, with hemlock. But these require discrimination as to the cases in which they may be individually prescribed. He considers the virtues of hemlock to be much overrated. Both he and THOMSON state the muriate of lime to be without any efficacy. In the more purely scrofulous phthisis, he considers issues to be decidedly beneficial, and sulphuric acid and salines as preferable to cinchona in the early stage. BARTON and others in America employ the super-acetate of lead with ipecacuanha and opium in the hæmoptysic form of phthisis.

281. The remarks of Dr. PARR are upon the whole judicious. He advises the pain in phthisis to be pursued by blisters as it changes its place; emetics to be given chiefly in hæmoptysis, and without informing the patient, ipecacuanha being preferred; and mild diaphoretics in an early period. He considers balsams of use only when expectoration is checked by debility; myrrh occasionally of service as a slight tonic and sedative; hemlock to be preferable to opium in palliating the cough without occasioning sweats; cicuta and the seeds of hyoscyamus to be often useful; and digitalis to do more harm than good. Asafœtida is recommended for flatulency and as an expectorant. In the last stage, emetics and other means are quite inefficacious, or palliatives merely. The work of PORTAL, although interesting at the time when it appeared, contains very little of importance in respect of treatment. He considers the mildest food the best, and particularly new-laid eggs; and issues, setons, and moxas, of service. Dr. BUXTON furnishes additional evidence to that adduced by BEDDOES in favour of a regulated temperature in phthisis, of from 60° to 65°. Dr. SHEARMAN notices the connexion of consumption with amenorrhœa, and observes that GRIFFITH'S chalybeate mixture has been more successful in females than in males, owing to this connexion. There is much truth in this: early in the disease this mixture is advantageously conjoined with the compound decoction of aloes and conium, and even in more advanced stages, if it do not increase the severity of the cough.

282. M. BAYLE very justly referred many of the cases of imputed recovery from phthisis to the circumstance of chronic bronchitis, or chronic pulmonary catarrh having been mistaken for phthisis; and he described, with greater precision than heretofore, the structure of the tubercular deposits, and the pulmonary and the associated lesions. The granulated form of this writer is merely the earlier stages of the disease, excavations not having taken place. In this state he advises, according to the features of individual cases, composing and emollient medicines, occasionally bleeding, blisters, and issues; aconite, hemlock, henbane, nightshade, and opium, and, where the expectoration is very copious, balsamic and resinous medicines. In the state of ulceration, he employs medicated vapours and external drains and revulsants of various kinds. In cases complicated with chronic bronchitis or catarrh, the lichen, with diaphoretics and balsams, is prescribed; or with bark, when there are well-marked rigours. Streaks of blood in the expectoration require lemonade or orangeade, and bleeding if the pulse be hard; blisters, if soft. As pro-

phylactics, he recommends travelling, voyaging, change of air and climate, nutritious diet, antiscorbutics, tonics, alkalies, muriate of ammonia, &c.; for incipient cases, repeated emetics, bitter and stomachic purgatives, a sea-voyage, exercise, the sulphuretted waters of Bonnes, Cauterets, Bagnères, or Mont d'Or; and later in the disease, mild tonics, as the lichen, sirup of cinchona, &c.

283. Dr. WELLS contends that phthisis is much less prevalent in marshy countries and districts where agues are endemic, and advises that consumptive patients should be removed, at least for some time, to these places. He quotes several authorities and statistics, by both which the subject is placed in exaggerated points of view. It is not yet satisfactorily proved that malarial situations are beneficial in either the early or the advanced stages of phthisis; at least the matter should be farther investigated, as well as the assertion that places wherein ague is endemic are free, or nearly free, from phthisis; inasmuch as the position is controverted by several more recent writers, although contended for by MARSHALL, WEEKES, HARRISON, and others, towards the close of the last century and at the commencement of the present.

284. Dr. ROBERTS has endeavoured to discover a more effectual remedy for consumption among the active mineral salts and other substances, than those hitherto employed. He has, however, only to record the failures of his experiments, with the nitrate of silver, superacetate of lead and opium, sulphate of zinc, oxyde of zinc, alone or with myrrh; white oxyde of manganese (10 grains); arsenite of potass; black oxyde of cobalt (one to four grains); ammoniated copper, muriate of baryta, nitric acid, phosphoric acid, aconite, henbane, stramonium, belladonna, and toxicodendron.

285. Dr. A. DUNCAN gives the results of his long experience in the treatment of phthisis. He considers hæmoptysis as often a salutary occurrence early in the disease; bleeding with low living to have hastened death in many cases; emetics to be of use in promoting expectoration, but to be useless as respects the cure of the disease; and blisters to be of service in most forms of the malady. He believes that vegetable acids are more beneficial than the mineral or acetous; that digitalis is of little use, and sea-voyages are counteracted by the inconveniences and risks attending them; that bark, myrrh, lichen, or these with hemlock, are sometimes of service in scrofulous cases, but that the pneumatic practice is altogether unsuccessful; that the diarrhœa may be moderated by mucilaginous fluids and broths, melted jellies, rice, catechu, opium, &c.; that the inspissated juice of the common lettuce is one of the best substitutes for opium, and that the patient should take asses' milk, wear flannel next to the skin, and have walking and riding exercise. Dr. SOUTHEY has remarked upon the frequency and infrequency of phthisis in different countries. He is in favour of the use of issues, of digitalis for hæmoptysis, of a regulated temperature, by means of a stove, from 60° to 65°, of riding, sailing, and swinging, and of change of air, at an early stage, to Valencia, Hières, &c.

286. Dr. THOMAS YOUNG, in his able and learned work on Consumptive diseases, has given an interesting account of the treatment of these diseases, and a full digest of the means employed for this purpose in this country during the first quarter of the present century; and until the di-

agnostic method of LAENNEC and the pathological and numerical disquisitions of French writers allured the minds of practitioners to the neglect of rational therapeutical doctrines. Dr. YOUNG considers *bleeding* an important remedy at an early period of the malady, for the removal of inflammatory and congestive symptoms, and for obviating the suppuration and debility consequent on them. From six to twelve ounces of blood, he remarks, may be taken away with safety in every incipient case, and the operation may generally be repeated with advantage three or four times, at proper intervals; but to do more than this might justly be called an experiment which, however laudable in proper circumstances, is not to be recommended in the ordinary routine of practice. Dr. YOUNG was himself bled twice, by the direction of his uncle Dr. BROCKLESBY, and was in favour of small bleedings, to the extent of three or four ounces—locally, when there is pain in any part of the chest. He advises *purgatives* at an early stage, and considers that fears of promoting the diarrhoea by them at this period should not be entertained. He justly views *sulphur* as an excellent aperient in the disease, and especially when complicated with hæmorrhoids. Dr. YOUNG also recommends *emetics*, and prefers *ipeacacuanha*, especially in cases of hæmoptysis, combining it with acetate of lead or other means, according to circumstances. On *sorbefacients*, especially *digitalis*, *mercurials*, and *alkalies*, he places very slight reliance, although they may be prescribed in some circumstances of the disease with advantage. *Epispastics* and *issues* are viewed by him much more favourably. He considers that the tendency to night sweats is not a just reason against the use of *sudorifics*, especially DOVER'S powder and antimonials. In *expectorants* he has little faith, although *ammoniacum*, *squills*, *senega*, *myrrh*, and *ipeacacuanha* may be employed with benefit in some cases, in conjunction with *hemlock* and other *palliatives*. *Demulcents* and *narcotics* are prescribed by him in circumstances indicating their use, sometimes with balsams, the benzoic acid, &c. Of *astringents*, when required to moderate the secretions of the skin and of the intestines, the sulphuric acid is considered the best, especially when conjoined with aromatics and opiates; but he is also in favour of *catechu*, *kino*, the extract of *logwood*, with chalk mixture, or the compound powder of chalk.

287. Dr. YOUNG believes *cinchona* to be the most important *tonic*, and both its advantages and inconveniences to have been exaggerated. He has known it decidedly beneficial at the commencement of the disease, and he has never observed that it increased the hectic symptoms at any period. Besides the powder, and the decoction, he has employed the cold infusion with Seltzer water, in his own case, as well as in others. He has had little experience of *chalybeates*; but he justly remarks that, when they can be taken alone, or with *myrrh*, as in GRIFFITH'S mixture, without increasing cough or pain—effects which may also proceed from *cinchona*—they are sometimes beneficial. The diet most favourably mentioned by Dr. YOUNG consists chiefly of milk and the farinacea, especially asses' milk twice daily, cow's milk boiled with soda-water or lime-water, butter-milk, new eggs, vegetable and farinaceous articles. He has found milk boiled with mutton suet of great service. *Exercise* in the

open air, riding, walking, &c., are also severally advised. *Change of climate* is recommended, and he considers that the remark of CELSUS, that the worst air for the patient is the air which has given rise to the disease, is founded on good sense.

288. I have now brought down the *Historical Sketch* of the treatment of phthisis to a sufficiently recent period. Notices of some more modern writers will appear in the sequel only in so far as they may furnish any thing deserving notice. Their works will, however, be mentioned in the *Bibliography* and *References*; so that the reader may be aided in satisfying himself as to the views of those who have written on this difficult subject, or on topics appertaining to it. I shall next endeavour to state those means of prevention which seem most efficacious against this malady, and afterward proceed to give the results of my experience as to the means which appear to me the most appropriate, or which have been advised for the several stages and states of this disease, conformably with the division above adopted (§ 17, 76, et seq.).

289. ii. OF THE PREVENTION OF PHTHISIS.—

The full exposition of the causes of phthisis which I have given above, and which many readers may consider tedious and unnecessary, will not be viewed in this light, when it is admitted that a knowledge of these causes, and of their modes of operation, is the most certain basis of rational means of prevention. By ascertaining the causes, and the ways in which they act, as far as they may be ascertained, we are enabled either to avoid or to counteract them. When we can neither avoid nor arrest the causes, we should endeavour to arrest or to palliate their effects, by means rationally selected and employed—guided by the lights of science, and by careful observation and induction. The great objects, therefore, of treatment are, in the first place, to avoid and to counteract the causes of the malady; and, secondly, when this end cannot be attained, to arrest or palliate their effects. The former constitutes the *prevention*, the latter the *cure*, of the disease. But in the procession of morbid conditions from the first impression of the causes, there is an intermediate state between the operation of the causes and the development of their effects in a manifest form, that requires the prompt recognition of the physician, and rational decision as to treatment. This state of incubation—of threatened or incipient phthisis—requires great acumen for its detection, and equal promptness for its arrest. For this state measures of prevention should be conjoined with means of cure, either predominating according to the circumstances of individual cases.

290. The prevention of phthisis is either radical and efficient, or conditional and uncertain. The avoidance or removal of the causes is required for the former; the counteraction or the arrest of their more immediate or early effects is all that can be expected from the latter; the one is *positive*, for the causes have not existed or acted; the other is *contingent*, for the causes have been present, have probably acted and produced their more immediate effects, the means of counteraction or of arresting these effects either succeeding or failing, as numerous circumstances may determine. Prevention thus may be divided into, first, that which consists of the avoidance of all the causes of the malady; and, second, that which attempts the counteraction, or the removal

of their more direct and immediate effects, before the malady is fully developed.

291. *A. The efficient prevention of phthisis* consists in the avoidance and removal of the causes which predispose to, and directly occasion, the malady. Those which affect one or both parents, or which operate during the earliest epochs of childhood, have generally produced their effects upon the constitution before professional advice is obtained. The transgressions of the parent have already injured the offspring, and the scrofulous taint has either been communicated to, or generated in, the child, before efficient measures of prevention could be instituted. The remarks which I have offered on the prevention of SCROFULA (*see* § 148, *et seq.*) apply with equal, if not greater, force to the prevention of phthisis. Consumptive persons who marry are even more culpable in this than those who are imbued with the scrofulous diathesis, or who have been affected with external tuberculosis. The offspring of the former may be scrofulous, but the taint is more likely to be manifested in the form of tubercular consumption, while the offspring of the latter are more liable to external tuberculosis, although they may be attacked with phthisis, especially when the external malady has not occurred. When the *predisposition*, whether it be hereditary or occasioned by the habits or the diseases of the parents, or by the management of infancy and childhood, has been produced, the radical and complete prevention of the malady can then rarely be effected, the best efforts to this end being merely conditional or uncertain. It is only by the avoidance of those causes which I have arranged under the head of *Causes appertaining to one or both parents*, aided by the removal of those which usually act during the early epochs of life, that the efficient or certain prevention of this disease can be expected.

292. *B. The conditional prevention of phthisis*, although uncertain, should not be neglected. Where the predisposition, arising from either the constitution or the health of the parents, already exists, prevention may be hoped for, but it cannot be insured.—*a. During infancy and childhood* the hygienic precautions which were offered when treating of SCROFULA (§ 148, *et seq.*) are even more urgently required when tubercular consumption has appeared in the family of either parent, or when the causes mentioned under the first class of the arrangement have injured the constitution of one or both parents. For children thus circumstanced, a dry, pure, and mild air, considerably elevated above the surface of the sea; frequent change of air; clothing suited to the temperature and season; exercise in the open air; light, digestible food, with strict attention to the digestive functions; a milk, farinaceous, and vegetable diet, with a moderate proportion of wholesome animal food, as childhood advances; but the milk of a healthy nurse, asses' milk, &c., during infancy, and the other means advised in the place just referred to, strictly avoiding the causes incidental to this period of life (§ 49, *et seq.*), are severally of great importance, especially when aided by such other means as the circumstances of individual cases will suggest.

293. *b. During puberty and adult age*, the causes of phthisis which have been noticed as most frequently operating in these epochs of life (§ 184, *et seq.*) should be carefully avoided, especially those which relate to schools, sleeping

apartments, &c. A strict surveillance ought to be instituted over youths of both sexes in order to prevent masturbation, and as soon as this vice is detected, its enormity should be represented to the delinquent, and measures taken to prevent the mental contamination from extending to others. The sleeping rooms should be well ventilated; but their temperature ought not to be much lower in winter than that of the sitting apartments, especially for the delicate and predisposed. For these a physical and mental regimen should be enforced, aided by proper food and clothing; by change of air, preferably to a warm, dry, and pure air; by chalybeates in forms suited to the peculiarities of the case; and, where the predisposition is manifest, by travelling to and in healthy, warm, or mild and dry countries, as Egypt, Syria, Upper Egypt, South of Spain, or north coast of Africa, &c.

294. These preventive measures are chiefly suited to the rich only; and to these especially hunting, riding, farming in a dry, elevated district, and field sports are remarkably beneficial. The selection of professions and trades for those who are hereditarily or otherwise predisposed to phthisis is attended by great difficulty. Agriculture and the out-door exercises which it involves are salutary to those who can adopt them. Gardening offers some advantages, but these are inferior to those furnished by other agricultural occupations. Poorer persons should become sailors and butchers; but the life of a soldier, even in the best circumstances, is very unfavourable to those in any way predisposed to phthisis. To such persons especially, and even to the most robust, several trades are most injurious. Sculptors, stone-masons, miners, millers, flax, wool, and cotton dressers and workers, weavers, tailors, bakers, milliners, dress-makers, and other needlewomen are severally more or less liable to phthisis in consequence of their occupations; and so liable are "dry-grinders," knife, fork, razor, scissor, and needle grinders to tubercular consumption and other pulmonary diseases, that it has been said by Dr. C. HOLLAND that about one fourth of those engaged in these occupations died every five years.* (*See ARTS AND EMPLOYMENTS in relation to disease.*)

* All nuisances, all dangerous and insalubrious establishments, especially in large towns, besides being productive of several other maladies, are liable to develop phthisis, especially in the predisposed. The government of this country has as yet paid little or no attention to the due regulation of these as regards the public health; but in France, as Dr. WALLER LEWIS has recently shown, these establishments are divided into three classes, and before they are permitted to be carried on, certain authorizations and formalities are indispensable. In the first class are placed those establishments that must be isolated from private habitations, but not necessarily from the outskirts of a town; in the second are included those factories which do not rigorously require their isolation from habitations, but which it is important not to allow until assurance has been obtained that the operations proposed to be carried on in them are executed so as not to be a nuisance to the neighbourhood, and not to cause damage. In the third class are such factories as may remain without inconvenience near dwellings, but which should be subject to the surveillance of the police.

As regards the effects on health of various professions and occupations, it is shown by M. LOMBARD that, in 1000 deaths, consumption had furnished the following proportions, viz.: Occupations with vegetable and mineral emanations, 176; with various dusts, 145; with sedentary life, 140; with work-shop life, 138; with hot and dry air, 127; with stooping posture, 122; with sudden movements of arms, 116; with muscular exercise and active life, 89; with exercise of the voice, 75; living in the

295. iii. TREATMENT WHEN PHTHISIS IS THREATENED.—When phthisis is imminent, the measures of prevention already noticed, conjoined with others of a more strictly medicinal kind, should be adopted, according to the predisposition, age, diathesis, and circumstances of the patient. The digestive and assimilating functions ought to be promoted by the usual means, and especially by change of air, by voyaging, by travelling in warm and dry countries, more particularly in those already mentioned (§ 293), by suitable clothing, and by attention to the temperature and ventilation of sleeping-places. The preventive and curative influences of districts where malaria and the diseases which proceed from this source abound have been insisted on by Dr. WELLS and several of his contemporaries. He states that it was common for the consumptive in Flanders to remove to the marshy parts of the country. In Minorca, where agues are endemic, consumption, according to Dr. CLEGHORN, is very rare. Dr. SEQUEIRA states, that in the marshy country of Alentejo phthisis is rarely seen. VOLNEY says that consumptive patients are frequently sent from Aleppo to the sea-coast, where intermittents prevail. Other instances are adduced by Dr. WELLS in favour of his opinion; and, although it has been controverted by several writers, yet I believe, from several facts with which I am acquainted, that it is not quite devoid of truth.

296. In this, as well as in other periods of the disease, the clothing, especially that worn nearest the skin, should be warm, and the best suited to the preservation of the functions of this part of the frame. With this object flannel ought to be worn during the night and day; and the dress in females should be sufficiently high to protect the upper regions of the chest and the neck. Close cinctures of the chest and steel supports in corsets are injurious. Due attention ought always to be paid to the digestive and excreting

open air, 73; with animal emanations, 60; and with watery vapour, 53. In manufactures the majority of workmen are affected with scrofula; this scourge marks the children and the youths with its scars, swellings, and deformities, and attacks more especially the weavers.

The women furnish more maladies and diseases than the men, partly owing to the comparative paucity of their earnings, from which it arises that the poor workwoman is ill-fed, ill-clothed, and ill-lodged. In one sense, indeed, not money, but the want of it, may be denounced as the root of all evil. So, in this case, "want is a bad adviser, and quickly triumphs over the weak resistance of a conscience without religious light to guide it." Debauchery, followed by excesses of all kinds, comes in to consummate the work of destruction commenced by distress. The worst occupations are those of needlewomen, or *couturières*, dress-makers, embroideresses, and *modistes*, from whose ranks the public women are largely recruited.

The separation of the sexes in work-shops is a measure imperiously demanded for the moralization of the working classes.

As to the healthfulness of employments much depends upon whether they are carried on in the open air or in confined air. Consumption is twice as frequent in the first as in the second case; the latter group comprising occupations carried on in vast spaces well aerated, and in others which confine the workmen in close localities. In the latter phthisis is far more prevalent. The action of dusts on the lungs is in the direct ratio of the volume, weight, and consistence of their molecules. The inhalation of coarse particles is less dangerous than that of dusts finely divided, which penetrate more easily into the last ramifications of the air-cells. Dusts from hard substances cause a far greater number of consumptive cases than dust from soft bodies, or of ordinary hardness. The specific gravity of the dusts does not affect in any marked manner the production of phthisis. The order of the respective fatality of dusts is as follows: viz., 1, mineral; 2, animal; and, 3, vegetable.—*Report, &c.*, by Dr. W. LEWIS.

functions, and to the state of the uterine discharges, which are often more or less disordered in the states of the disease now being considered. In many instances cod-liver oil may be of service; in others, as well as in these, sulphuretted or chalybeate springs, or a course of the one following that of the other. For females, the *mixtura ferri composita*, and the *decoctum aloes compositum*, in varying proportions, according to the state of the bowels, are often of service, especially when the pulse is languid, the catamenia scanty or difficult, and when the cough is not increased or rendered hard or dry by these medicines. In these cases flannel drawers, in addition to the other articles of flannel clothing, and woollen stockings should be worn. In other circumstances, or when the natural secretions and excretions are not suppressed, the infusion, or a weak decoction, of cinchona, with a mineral acid; or other tonic infusions, with aromatics, &c.; or the *tinctura muriatis ferri*, either with or without the preparations of calumba and an increased quantity of the acid, may be prescribed, and may even be made the vehicle on the surface of which the cod-liver oil may be taken. Confined positions of the body, the labours of the desk, and close application to either study or business, ought to be avoided, and a due restraint should be placed on the instinctive desires and passions. Mental and physical occupations ought to be pursued as much as possible in open and airy places and apartments, and in a temperature never lower than 60° nor higher than 70°; and should not be such as to fatigue, but such as moderately or pleasantly engage the mind and body.

297. In this state, as well as in the preceding, and more particularly when the predisposition is marked, or the tubercular cachexia manifest, warm or tepid salt-water bathing, or sponging the surface of the body daily with a warm, tepid, or cold solution of salt—the temperature and strength of the solution varying with the state of the patient and the effects produced—is often beneficial; but this practice should always be followed by rubbing the surface smartly with a rough towel, and by the constant use of flannel nearest the skin. Various medicated fluids or lotions have been advised as washes for the chest and neck, in the circumstances now being considered, as well as in the first stage of the disease. Of these, however, the most deserving notice are, a weak solution of the nitro-muriatic acid, a weak solution of the pyroligneous acid, and tar-water, varying in strength with the circumstances of the case. This last lotion has been employed only by myself, the temperature of it, as well as of the others, being varied according to the feelings of the patient and the state of the air. Friction of the surface also should always follow a recourse to either of these.

298. iv. TREATMENT OF THE USUAL FORM OF PHTHISIS.—*Treatment of the First Stage of this form.*—The imminence of tubercular consumption may be viewed almost in the same light as the commencement of this stage; and the treatment advised for the former is altogether applicable to the latter, with various additional means adapted or modified to the circumstances of individual cases. When this stage has commenced, as indicated by the symptoms (§ 187, *et seq.*), the question is no longer, Are tubercles already formed? This must be answered in the affirmative. But their development may be delayed or pre-

vented by judicious treatment; or their absorption may even be procured, although this is a doubtful or rare occurrence. The great principle of treatment in this stage, as well as when the disease is merely threatened (§ 295, *et seq.*), is to develop the powers of life, and increase the vital resistance to the farther advance of the malady, without producing or augmenting febrile symptoms: 1st. By diet and regimen—by hygienic means; 2d. By medical treatment. A selection of means belonging to each of these heads, appropriately to the peculiarities of the case, will frequently promote the assimilation of the chyle globules and of the colourless globules of the blood, by supporting or developing the powers of life.

299. *A. The food and regimen of the patient* are of the utmost importance in this stage.—*a.* The food has always been discussed, questioned, dogmatically prescribed, and often pertinaciously persisted in, according to the doctrines of the day and the views of prevailing authorities; and instead of accommodating it to the peculiarities of the case and to the effects produced by it, an indiscriminating mode of administering it has been too generally adopted. At different periods of medical history, and by different physicians, very opposite kinds of food have been recommended. Some have praised a milk diet; others farinaceous and vegetable food only; many a combination of both; some have allowed a large proportion of animal food; and even not a few have permitted the use of fat meats, and a rich, full, and nutritious diet. The praises of certain kinds of diet have often been accompanied by denunciations of all others. Thus the inexperienced, and those who treat a disease according to its name, and not according to the successive pathological conditions it presents, are bewildered, and an important part of the treatment is adopted and applied not more rationally than if it were drawn by lot, or were the turn-up of the die. Now each of those kinds of diet, modified and added to, according to circumstances, is appropriate and beneficial when appropriately employed, and when aided by a regimen judiciously prescribed. The diet in this stage should always have strict reference to the regimen which the situation and circumstances of the patient permit, and especially to the locality, temperature, and air in which he resides; and both diet and regimen ought to be directed according to his temperament and diathesis, to the states of vital power and vascular action, as indicated by the pulse and by the febrile symptoms, and to the indications of existing local lesions.

300. When the disease is not ushered in by hæmoptysis, or by indications of active congestion, and especially when it is traced to depressing or exhausting causes, then a nutritious diet, animal food in moderate proportion, the white kinds of fish, boiled, with a squeeze of lemon, with little or no other kind of sauce, and shell-fish, especially oysters, may generally be adopted. The fresh livers of the cod, torsk, ling, haddock, and coal-fish, and the fresh oil of their livers, may be very beneficially used as sauce for these kinds of fish; or the oil may be taken in a more strictly medicinal form soon after a meal. In these and in similar states of the disease even richer and more nutritious kinds of food than those may be tried, and the effects carefully observed. I have often advised a frequent use of fat venison

in some cases, and the fat of lambs or of mutton boiled in milk in others, with much benefit. In cases where this stage is characterized by little or no acceleration of the pulse, by despondency, by a poor state of the blood, and by absence of sub-inflammatory or congestive symptoms, a dry and nutritious diet, or a more full and restorative diet; animal food, consisting of mutton, game, &c., and even wine or malt liquors in moderation, may be allowed, if exercise in the open air, especially horse-exercise, short of fatigue, be regularly taken.

301. For persons of a fuller habit of body, or more sanguineous temperament than those just referred to, and especially when oppression, or constriction, or pain at the chest, or a dry, hard cough is complained of, the diet should consist chiefly of milk and of farinaceous and vegetable substances, ripe fruits, &c., and the antiphlogistic regimen should be adopted in every respect; but it should not be carried too far, especially in the scrofulous diathesis. In these cases, local depletions, issues, and other derivatives, as will be hereafter mentioned, should be employed according to the state of the pulse and other peculiarities of the case. For these, buttermilk, whey, and skimmed milk are excellent beverages and aids to diet. After the more inflammatory and congestive symptoms are removed, and when issues or setons have commenced to discharge, then a more liberal and nutritious diet may be allowed, and the cooling, antiphlogistic, and febrifuge medicines hitherto prescribed may be changed for those which are more restorative, and more calculated to support vital power and to promote a healthy assimilation. In these circumstances the fish diet, as advised above (§ 300), may be first employed, and the more nutritious articles of food be afterward given with caution.

302. *b.* In this stage, *change of air, voyaging*, more particularly in latitudes from 30° to 50°, or from 10° to 15° or 30° in winter, in vessels possessing comfortable accommodations; *travelling* in temperate and warm climates, with due regard to the temperature and climate, and to season; residence in a warm and dry air, the elevation above the surface of the sea, and the degree of atmospheric dryness being such as the patient finds to be most beneficial; regular exercise in the open air, preferably on horseback, and short of much fatigue; are severally of manifest advantage. Exercise on horseback is, however, rarely of benefit to females, and is generally too exciting, and consequently exhausting to them; walking or driving in an open carriage being more beneficial. In all cases, extremes of temperature, and sudden changes or vicissitudes of temperature, must be avoided, even by those who are able to take active exercise, as well as by those who are much less able.

303. *Travelling*, at proper seasons and hours of the day, is generally beneficial, especially when the patient is able to travel on horseback. Travelling on land by other conveyances is less serviceable; although an open carriage, when the weather will admit, is little inferior to riding, especially in the cases of females. But when a close carriage is used, the patient should sit with his back to the horses; and when he travels by railway, this seat should always be taken, a sufficient ventilation of the carriage being always preserved.

304. *Tepid and cold-sponging*, and washing the

surface of the body, or the surface of the chest merely, with variously medicated lotions, have been advised in this stage; but, excepting with those already mentioned, or with the lotions, liniments, and embrocations about to be noticed, this practice is seldom of much service when this period is far advanced, unless exercise can be regularly taken in the open air, and flannel be constantly worn nearest the skin. It is, however, beneficial when employed as a preventive measure for the predisposed, and for those of a tubercular cachexia (§ 170, 171); and when adopted at the commencement of this stage, and followed by very active frictions of the surface.

305. *c.* A winter residence is of the greatest importance in this stage to patients in cold or temperate climates, for that residence should be selected which will admit of regular and daily exercise in the open air. But this is not the only consideration by which we ought to be guided. Elevation above the surface of the sea, a situation near the level of or close to the ocean, or removed at a distance from it, and frequent or prolonged voyaging on it, are severally topics which require to be duly considered. As to the last of these—*voyaging*—very well-founded expectations of success from it may be formed, if it be commenced in this stage, or before the second be far advanced, more especially in cases which have been attended by hæmoptysis at their commencement or early course, and if it be continued for a sufficiently long period. Voyaging in the Mediterranean or in the Atlantic between the degrees of latitude named above (§ 302), and preferably in the Pacific Ocean, especially when prolonged, either in naval cruisers or by repeated voyages, so as to avoid the winter and spring of this and other countries unfavourable to consumptive patients, deserves to be more frequently recommended than it has hitherto been. Now that the passage across the isthmus of Panama is easy, voyages thence, in various directions in the Pacific Ocean, may be made, and a return to this country effected in May or June.

306. Elevation above the surface of the sea, especially in warm climates, and when dryness of air is attained by elevation, is generally beneficial. Even in temperate climates, where elevation is conjoined with dryness, the diminished temperature which results is not so injurious as generally believed. The cold of Canada is by no means injurious to the consumptive, owing to the dryness of the air being great in proportion to the lowness of temperature. If such a residence admits of regular exercise in the open air, it may be salutary, although a warmer air, and an exemption from sudden atmospherical vicissitudes, may be preferred.

307. The only question connected with residence that remains to be considered is, whether preference should be given to a sea-coast or to an inland locality. This is a difficult question to answer; and judging from the indisputable advantages derivable from sea-voyaging, and the very frequent recommendations of places on the sea-coast by modern physicians as winter-residences for the consumptive, it may be inferred that these places are actually the most healthy. But this inference is neither logical, nor practically correct as respects phthisical cases. The benefit derived from voyaging depends chiefly upon uniformity of temperature and the motions of the vessel, aided by the influence of a pure

sea-air on the digestive and assimilating functions. Residences on the sea-coast furnish only two of these elements of benefit, in an imperfect manner, but they are altogether deprived of the third and that which appears to be the most important. We must therefore refer to the results of observation for a decision; and, as far as my experience enables me, I may state, where two localities, one inland the other on the sea-coast, possess equal advantages as to dryness of the air; as to annual, monthly, and daily ranges of temperature; and as to vicissitudes of weather, and facilities for out-door exercise, that the inland situation should be preferred.

308. Whatever be the locality adopted for the consumptive, or however the patient may be limited in his choice, exercise should not be neglected, in air and sunshine, while he is able to enjoy it; and the temperature of his sleeping apartment should not fall below 60° or rise above 70°. The advantages derived from stoves, when properly regulated, are shown by their preservation of the warmth of apartments at all hours of the night; but a due ventilation ought always to be preserved where they are the only means of keeping the temperature at a proper elevation. Having insisted upon regulation of diet and regimen appropriately to the pathological states of the case in this stage, and upon the advantages of *change of air, of travelling, voyaging, and of suitable residence* during the winter and spring months, the means which are more strictly medicinal are next to be considered.

309. *B.* The strictly medical treatment of the first stage of phthisis must depend entirely upon the diathesis, temperament, and habit of body of the patient, and upon the states of vascular action, of local lesion, and of vital power. The predisposing and determining causes should also be kept in view; for these should influence or even almost change our indications and means of cure.—*a.* In cases where vascular action is excited, or the pulmonary circulation is oppressed or congested, or where pain is felt in the thorax, or where hæmoptysis occurs without being very copious, neither anæmia nor vital exhaustion being remarkable, *bleeding* ought not to be either neglected or delayed. The only consideration is, in what manner may it be most advantageously resorted to. Venesection, unless the patient be robust or plethoric, is rarely required. Scarification and cupping are most frequently to be preferred, as the circumstances are few in which this operation may not be efficiently performed, and a due quantity of blood withdrawn in a very short period, the operation itself generally proving a salutary derivative. When the quantity of blood to be taken is small, and in certain complications, the application of leeches may be preferred.*

310. The quantity of blood abstracted at one

* [We are obliged to dissent from the opinion here expressed, that bleeding is occasionally proper in this stage of the disease. When we bear in mind that weakness and defective nutrition are its essential characteristics, and that cases of uncomplicated pneumonia, where hepatization is well marked, will frequently recover sooner and better without blood-letting, we cannot but call in question the expediency of resorting to this heroic remedy in tuberculosis. Hence, as BENNETT well remarks, the great effort of the practitioner, so far from diminishing the strength, ought to be to support it, and favour cell-growth and disintegration; then, when the blood is loaded with the effete matter thus introduced into it, to assist its excretion by means of diaphoretics, diuretics, and purgatives, according to circumstances.—*Ed.*]

time should be small, or at most not great. In the majority of cases it may vary from four to twelve ounces; this last amount being allowed only where the habit of body and circumstances of the case appear the most to require depletion. Time should be allowed to observe the effects of the first bleeding; and after a due interval, if the symptoms still continue, or upon the return of the indications for having recourse to it, the operation may be repeated. The amount and the repetition of the depletions should be determined only by the peculiarities of the case and the judgment of the physician. It will often be observed that even when bleeding appears to be required, it is but ill endured, although the quantity withdrawn has been small. When this stage is developed by the suppression of an accustomed discharge, as of the catamenia, or of hæmorrhoids, then the necessity of having recourse to vascular depletion is obvious, and that method of performing it which is most likely to re-establish the interrupted discharge should be adopted. Leeches may be applied around the anus when the hæmorrhoidal discharge has been suppressed; and beneath the groins when the catamenia are interrupted, difficult, or scanty; and, for both causes of aggravation, calomel, the preparations of aloes, and warm fomentations or the hip-bath, may be prescribed. The older writers advised bleeding from the feet when immersed in hot water, in cases of catamenial obstruction, and this mode may be adopted by those who prefer it. I have sometimes prescribed it, and seen it employed, with benefit.

311. Vascular depletion has been advised in the first stage of phthisis by some authors, and reprobated by others. I have now stated many of the circumstances which require it; but there are others, more especially certain complications hereafter to be noticed, which also are benefited by it. But cases are common for which, even at an early period, bleeding cannot be ventured on with safety; or, if employed at all, it can be prescribed only to a small amount, and in the immediate vicinity of parts which appear to require it. The numerous class of cases caused by the depressing and exhausting causes mentioned above (§ 192), by want, by misery, by debilitating discharges, by confinement and etiolation in factories, close apartments, &c., and by sedentary and ill-rewarded occupations—those cases which present anæmied, cachectic, discoloured, and debilitated appearances, or in which the pulse is either slow and beneath the healthy condition, or very quick, small, or soft, or when the blood is inferred to be thin and poor in red globules—are severally injured even by the smallest local depletions, unless they be prescribed for the removal of the pains occasioned by pleuritic complications, for which the additional and often more successful means hereafter to be noticed should be employed.

312. The indications for and against vascular depletion in an early stage of phthisis are, however, not always to be depended upon. While many are manifest, others may be doubtful. Much, therefore, should be left to the close observation, the enlightened experience, and the acumen of the physician, in the interpretation of these indications and the discovery of others. The season, climate, peculiarities of race, modes of living, and prevailing constitution and character of disease, the prevalence of a sthenic or an asthenic condition of morbid action, are severally weighed in his

mind before bleeding in any way, its amount and its repetitions are decided upon, and before other important means are prescribed. The prevailing constitution of disease, so much insisted upon by SYDENHAM, differs most remarkably in different periods of time. The sthenic constitution, so general in the first quarter of the present century, was changed to the asthenic in the second quarter, and this latter still appears to continue. The vital energies of the residents in large cities and manufacturing towns, especially in low situations, are weaker than those possessed by the inhabitants of rural districts and elevated localities; and these differences, with others manifested by individual cases, require due consideration when devising our indications and means of cure.

313. The necessity of having recourse to vascular depletions, especially to local depletions, when congestion, sub-inflammatory action, pain, the state of respiration or of cough, or other symptoms, require them, does not necessarily prevent the exhibition of nutrient and even of restorative means, more particularly when vital power appears depressed and vascular action is not much increased. Indeed, in large cities and manufacturing towns, these latter medicines, or even more tonic remedies, are often required, although local depletions are equally necessary for the local lesions. For these milder tonics, conjoined with sedatives and narcotics, as the infusions of chey-reita or calumba, with hydrocyanic acid, or conium, or hyoscyamus, or the tinctura camphoræ comp., may be first prescribed, and be followed, according to the effects observed, by infusions or decoctions of a more tonic kind. When, with debility, a cachectic or an anæmied appearance is present, the preparations of iron may be given, commencing with the mildest. I have generally preferred the *mistura ferri composita*, with the extract or tincture of conium, or the powder or extract of liquorice; and, if the bowels be sluggish, and the catamenia be deficient, with a sufficient quantity of the *decoctum aloes compositum*, or *tinctura aloes*.

314. The effects of chalybeates of every kind require to be closely observed in this as in every other stage and state of the disease. This class of medicines are contra-indicated where any inflammatory complication exists, or where a tendency to hæmoptysis is observed, unless hæmorrhage has occurred to a large amount, when the *tinctura ferri hydrochlorici*, with additional acid and appropriate medicines, may be given in a suitable vehicle; but on all occasions the effects of chalybeates on the respiration and the cough should be strictly watched, and, if rendered more oppressed, difficult, or hard by them, they ought to be relinquished. I have often prescribed the iodide of iron, in sirup of sarzæ, or in other sirups, with conium, or some other anodyne; but I have not considered it more beneficial than GRIFFITH'S myrrh mixture, even in cases where the catamenia are deficient; and I have found it in some cases to aggravate the cough and tightness of the chest more than that mixture.

315. When the above medicines are either not indicated or prove inefficacious, the infusions of cinchona, prepared either with cold or with warm distilled water, may be prescribed with hydrocyanic acid, or with any of the preparations of conium or hyoscyamus; and it may be taken in milk in which a little of the bicarbonate of potash or of soda has been dissolved. When fe-

brile symptoms harass the patient, the liquor ammoniæ acetatis may be given with the infusion of cinchona, and the spirit of nitric ether and hydrocyanic acid added to them. In some instances the liquor ammoniæ acetatis may be prescribed with an excess of acetic acid, especially where hæmoptysis occurs; and in others, particularly where sinking or exhaustion is present, with an excess of the carbonate of ammonia, other substances which the symptoms will suggest being also added.

316. In this early period of phthisis the functions of digestion—of both stomach and liver, are often more or less impaired; and it is often beneficial to them, as well as to the state of circulation in the lungs, to commence the treatment with an *emetic*. The older writers recommended this practice, and experience has shown that, when the emetic has been judiciously selected, and the treatment otherwise appropriate, benefit has been produced by it. The Italian physicians, and after them LAENNEC and his pupils, prescribed tartarized antimony as an emetic in this disease, having, as they believed, derived great advantage from it in the more strictly inflammatory diseases of the lungs; and not only did they employ it as an emetic, but as a contra-stimulant, and in doses which were seldom efficacious in reducing the febrile symptoms, but which rarely failed in reducing the vital powers of the patient. I frequently saw the effects of this substance while it was in vogue, and sometimes prescribed it; but I considered it of inferior utility to ipecacuanha and to sulphate of zinc as an emetic in phthisis, their operation being facilitated and increased by a draught of a weak infusion, tepid, of chamomile flowers. Afterward demulcents or emollients, or stomachics, with the addition of a little hydrocyanic acid, if the retching or vomiting be more than we desire, may be prescribed, and subsequently the other internal remedies which the features of the case will suggest.

317. The effect of the emetic early in this stage, and the repetition of it when the functions of digestion are disordered, will generally be beneficial, as shown by the appetite and the state of the evacuations, especially when followed by the medicines just mentioned, or by small doses of the nitro-muriatic acids taken in the tonic infusions already noticed, or in others which the state of the case appears to require. If the bowels become irritable, the tinctura camphoræ comp., or the pilula saponis composita, will correct the disorder; the former being given in the mistura cretæ, or any other suitable vehicle or form of combination, the latter with small doses of ipecacuanha, and of an aromatic powder. If the biliary secretion be deficient, as not infrequently observed in this period, although the bowels are relaxed, PLUMMER'S pill or blue pill may be cautiously given, with soap and extract of taraxacum, instead of the nitro-muriatic acids; or these latter may be prescribed instead of the mercurial, an occasional dose of which should only be taken. In this stage of the disease the bowels are more frequently confined than much relaxed, and the intestinal secretions and excretions are very often more or less disordered. It thus becomes an important object to improve these secretions, and to regulate the function of defæcation. The medicines just named will often aid in attaining this end; but they require to be either conjoined with others, or followed by suitable laxatives or aper-

ents, conjoined with vegetable tonics, stomachics, &c. I have also observed great benefit result from the following, when appropriately administered or modified:

No. 350. R Pulv. Ipecacuanhæ, gr. viij.; Extracti Fel-lis Bovini, ℥ij.; Pilulæ Rhei comp. (vel Pil. Aloes cum Myrrhâ), ℥ijss.; Extr. Conii (vel Extr. Hyoscyami), ʒss.; Saponis Castil., gr. xij.; Olei Anisi, q. s. Contunde bene et divide massam in pilulas xxxvj. quarum capiat duas horâ somni.

No. 351. R Extr. Glycyrrh., ʒss.; Tinct. Aloes comp. ʒss.; Tinct. Conii, ʒj. (vel Tinct. Hyoscyami, ʒij.); Decocti Aloes comp. ʒvss. Aquæ Carui ad ʒviij. Misce. Fiat mist. cujus capiat cochl. ij. vel iij. ampla horâ somni vel primo mane.

No. 352. R Pilulæ Rhei comp., ℥ijss.; Pilulæ Scillæ comp. et Pilulæ Conii comp., āā, ℥j.; Saponis Castil. gr. x. Contunde bene et massam divide in pilulas xxiv. Sumantur binæ horâ somni.

318. These medicines are most suitable in cases devoid of any inflammatory complication, which, as occurring either in this or in subsequent stages, will be more particularly considered in the sequel. The objection of not being applicable to these and other complications cannot, however, be urged against equal proportions of magnesia and sulphur as an aperient in this stage, especially when rendered more agreeable by the addition of liquorice powder and a little ginger. Where this aperient proves too depressing, or where vital power and vascular action and assimilation are much impaired, a little powdered cascarrilla may be added to the former, the whole being taken in some water.

319. *b. External medication* is a very important part of the treatment of phthisis; and, as will be seen from the historical sketch given above (§ 242, *et seq.*), it has been considered such from a very early period of medical history. Probably external derivation by means of moxas was as early resorted to in eastern countries for this and other diseases, as by issues and setons among the Greeks and Romans; but there can be no doubt of the benefit to be derived from these and similar means in aid of judicious internal treatment and regimen. As it was in respect of internal, so it has been as regards external means, different kinds and various modes of prescribing them having been advised in successive ages, and those which had fallen into disuse having been revived from time to time, again to be neglected or forgotten. The moxas employed in far eastern countries from time immemorial came into vogue in Europe after the former were visited by voyagers and travellers from the latter; but failed in superseding issues and setons, which have always held their place, and deservedly, in the treatment of this disease, especially with the judicious sand experienced. Early in the present century moxas came again into use in some places on the continent of Europe, and pustulation by means of tartarized antimonial ointment, or of croton oil in this country; the latter means having so entirely superseded issues and setons as to have caused the complete disuse of them. I have seen much of these modes of derivation, and have had considerable experience of their effects, both in phthisis and in other diseases. Moxas are of more or less use according to the amount of discharge which may be procured subsequently to their incandescence; but their operation is uncertain. Both the tartarized antimonial ointment and the croton-oil liniment produce external irritation, but little discharge, their influence on the disease being seldom beneficial,

while they distress the patient and even augment the constitutional disturbance in some cases.

320. *Issues*, made sufficiently large, have proved most beneficial in my practice. I have always prescribed them when I have seen the patient in the first, or even in the second stage, and several persons are now alive who had recourse to them from twenty to thirty years ago, as I advised them. I have generally recommended them to be made near the margins of the ribs, when the patient is not much emaciated; or in any other situation which may be preferred. The chief objection to them is the preliminary measure of destroying the integuments for the lodgment of the peas. Where *setons* appear preferable, as respects the state of the patient, or the situation in which they may be inserted, so as least to incommode him, care should be taken, in respect of them as well as of issues, that they should be sufficiently large to be effective, and that a free purulent discharge be uniformly procured from them. When both issues and setons are objected to, especially the formation of an issue in the usual way, then the inner bark of the mezereon, previously moistened, may be placed on a part of the surface of the extent of a crown-piece, and confined there by means of a larger piece of adhesive plaster spread on paper or leather, the bark being renewed from time to time. This latter plan, however, is not preferable to a blistered place of this extent kept open and discharging by the usual means; but neither the one nor the other is so effective as an issue or a seton, the benefit being derived chiefly from a uniformly copious discharge. When this is procured, the internal treatment and regimen of the patient should be more restorative and generous than in other circumstances of the disease; tonics, chalybeates, animal food, restorative beverages, &c., being allowed, according to the peculiarities of the case, especially as respects the vital and vascular conditions.

321. I have, since 1819, never neglected to prescribe an embrocation to the chest, in phthisis and in some other diseases, which acts less as an external irritant and derivative than as a source from which a salutary agent is inhaled into the lungs in so mild a form as neither to irritate nor to stimulate, while it is slightly absorbed. This embrocation I have employed in many internal diseases, in various forms or modifications, as a liniment, or as an embrocation or epithem—sprinkled on folds of flannel, or on spongio-piline, and covered over by a napkin, or otherwise—and varied as respects the constituents, the principal one being always present.

No. 353. R Linimenti Terebinthinæ, Linimenti Camphoræ compositi, ʒi, ʒjss.; Olei Olivæ, ʒss. ad ʒvj.; Olei Cajuputi, ʒj. ad ʒjss. Misce et sit embrocatio.

No. 354. R Linimenti Terebinthinæ, Linim. Saponis cum Opio, ʒi, ʒij.; Linim. Camphoræ comp., ʒjss.; Olei Cajuputi, ʒjss. Misce.

322. When it is desired that external irritation should follow the first of these, the olive oil may be omitted. Either of these should be renewed every night, the vessel being previously shaken, and applied, by the means already mentioned, to a sufficiently large surface, either of the front, or of the back of the chest, or of the side, where pain or uneasiness is most felt. It should be kept applied all night, or the following day, and even be renewed again in the morning, the quantity sprinkled over the surface of the flannel or spongio-piline being sufficient to moisten, or more complete-

ly to wet these substances, according to the effect we wish it to produce, whether by inhalation of the fumes proceeding from it, or by the external derivation it may occasion, in addition to the former mode of action.

323. Blisters, mustard poultices, the cauteries, urtication, and dry-cupping have severally been resorted to as derivatives in this stage. Blisters are often of much service, especially when applied after local depletions; and when a discharge has been procured from them for some time. The others, excepting the cauteries, are seldom productive of much or permanent benefit. The tartarized antimonial ointment and liniments with croton oil have deservedly fallen into disuse. The actual and potential cauteries were not infrequently employed in former times for this disease, a discharge from either having always been promoted. They are now never resorted to in phthisis.

324. *c.* In this, as well as in more advanced stages of the disease, the *inhalation* of medicated vapours, and of certain fumes, effluvia, and odours, has been recommended and been adopted. I have, however, very rarely observed much benefit derived from it, especially as commonly employed by means of an inhaling apparatus. The substances, also, generally prescribed for inhalation have been used in so concentrated a form, or are so acrid or stimulating, as often to increase the existing irritation in the bronchi, or the morbid action in the substance of the lungs, and in the seats of vomica or of cavities. It is also very questionable whether or no the inhalation of vapours—whether watery, emollient, or anodyne, or narcotic, or possessed of all these properties—is actually beneficial in phthisis, more especially at an early period of the malady. The inhalation of these may be useful as palliatives at an advanced stage, especially when an irritable cough, a sense of constriction in the chest, difficult expectoration, &c., are much complained of; but, in other circumstances and stages of the disease, they only tend to obstruct or impair the functions of the lungs, by interrupting the progressive metamorphosis and oxygenation of the globules of the blood, and by favouring congestion or a partial collapse of the organ. The modes of inhalation, or of having recourse to the respiration of the effluvia of substances which are calculated to prove beneficial in this disease, will be considered in the sequel.*

325. *C. Treatment of the second stage of the common form of Phthisis.*—At the commencement of this period, or when the symptoms, especially the appearances of the expectoration, and the character of the febrile action, indicate the recent supervention of this stage on the first, then it

* [We unhesitatingly concur in the truth of these remarks, as will doubtless every practical physician who has had much experience in regard to inhalation in this disease. That it may palliate the cough, when harassing and of an irritative character, when proper substances are used, is a matter of common observation; but we cannot admit that it exerts any decided curative power. Forceful inspiration, which expands the air-vesicles, is far more efficient than the local contact of aerial or vapoury medical agents; for a more perfect oxygenation of the blood aids materially the nutritive function, primary and secondary assimilation. It is possible that certain substances, such as chlorine and iodine, which act as stimulating and tonic alteratives, when introduced into the circulation, may exert the same curative influence as when taken into the stomach. But these are few in number, and it is very possible that the local irritant effects exerted on the lungs may overbalance any good effects which they otherwise might produce. We reserve farther remarks on this and other allied topics to the APPENDIX.—Ed.]

will become a question how far the means which have been or still are in use may be continued, and in what they may be modified or changed, or what additions may be made to them. In this the physician will be guided by the peculiarities of each case; but in the circumstances of most the same principles and means as have been discussed should be continued, modified so as to meet prominent symptoms, and commencing or fully developed complications, or intercurrent affections. The softening of the tubercles in this stage is generally attended by an increase of cough and expectoration, of the hectic symptoms, and of the morning perspirations, with occasional attacks of diarrhoea or disorder of the bowels. One or more of these usually become more prominent as the disease advances; or other phenomena are superadded, requiring the treatment to be directed more especially to them.

326. *a.* The cough generally suggests palliatives, in connexion with the other means which the state of the patient demands. Thus hydrocyanic acid, or henbane,* or hemlock, or the compound tincture of camphor, may be added to mixtures containing the liquor ammoniæ acetatis, and any demulcent which may appear most appropriate to the nervous and vascular conditions of the case; or they may be conjoined with bitter or tonic infusions or decoctions, when the states of the pulse, of the fever, and of the vital powers require them: these latter are often rendered more beneficial by the addition of the solution of the acetate of ammonia, and of the sweet spirits of nitre. Where there is much pallor of the surface, the pulse being either weak or but little accelerated, any of the anodynes above mentioned may be added to the *mistura ferri composita*, and the effects upon the cough and upon the hectic and other symptoms carefully observed.

327. *b.* The perspirations during the night or early part of the morning are always productive of great exhaustion, and are the most difficult to restrain or prevent. They have been very differently treated by both ancient and modern physicians, but most frequently by mineral acids, and by various refrigerants, astringents, and tonics, as shown in the historical sketch given above (§ 241, *et seq.*). Either of these may be prescribed in combinations suited to the case, with emollients, stomachics, or tonics, and may be made the vehicle, on the surface of which the recent cod-liver oil may be taken shortly after a meal, twice or thrice daily, and in sufficient quantity; this being the substance most deserving of reliance for moderating this distressing symptom. Some of the medicines advised with this object have often disordered the bowels, or induced an attack of diarrhoea, and even augmented the suffering of the patient, without effectively diminishing the perspirations and their consequent exhaustion; but these results rarely follow from the use of

this oil. The *mistura ferri composita* is sometimes of service in allaying the severity of the hectic and the excessive perspirations, especially when there is no inflammatory complication present, and when it neither produces headache nor renders the cough harder or more severe. Dr. WATSON has found the *tinctura ferri muriatis* successful in allaying the perspirations after other means had failed.* The dose he prescribes of this medicine is twenty minims thrice daily. I have likewise given this preparation with advantage in the infusion of calumba, with an additional quantity of the acid, and have sometimes made this combination the vehicle on the surface of which the cod-liver oil was taken.

328. *c.* When diarrhoea occurs it is often induced by some purgative medicine, or by errors in diet, or by means employed to moderate the perspirations. The cause of it should be ascertained, and the medicines to restrain it be suggested or selected accordingly. It is, however, frequently independent of either of these causes, and the result of indigestion—of the acidity and the accumulation of sordes in the *prima via* consequent upon the imperfect performance of the functions of primary assimilation. In either of these circumstances antacids and absorbents, conjoined with mucilages, anodynes, or narcotics, or with mild tonics, will prove of service; as the cretaceous mixture with the compound tincture of camphor, or the tincture of hop, &c., and with the tincture of catechu, or with other vegetable astringents, if they be required. But the bowels should not be confined by these or other medicines; and when there is any risk of such an occurrence magnesia may be given with sulphur or rhubarb, or with cascarrilla; or the compound decoction of aloes may be prescribed with the tincture or with other suitable medicines.—[*Opium* is well suited to such cases, and may be used freely with the best effects.]

329. *d.* In this stage of the disease *emetics* and *bleeding* are seldom beneficial, unless the states of the digestive and respiratory functions require a recourse to the former, and the occurrence of pain or the appearance of an inflammatory or congestive complication demand the latter. *Ipecacuanha* is in most instances the best emetic, and local bleeding the most beneficial, especially when the embrocation prescribed above (§ 321) is afterward applied and duly persisted in. Although it may be necessary to have recourse to these means, others of a restorative or even tonic kind—both medicinal and regimenal—may be equally required; often, however, in different cases, but not infrequently in the same case, and sometimes even soon after the more antiphlogistic measures have been employed. Generally, when local depletions are required, febrifuge medicines, chiefly such as the solution of the acetate of ammonia,

* [Great caution is necessary in regard to the use of hydrocyanic acid, henbane, or any other powerful sedative in tubercular disease, inasmuch as the vital powers, already prostrated, may be still farther reduced by the influence of the remedies. When there is "great pallor of the surface with weak pulse," we have found the night sweats augmented by the use of the above-named drugs, as well as the *veratrum viride*, and the general prostration aggravated, under which circumstances the disease invariably makes more rapid progress. We have, however, used of late, with apparent advantage, TILDEN'S "Fluid Extract of Hyoscyamus," with paregoric, which serves to allay the pulmonic irritation without causing any increase of debility.]

* [The oxide of zinc will be found one of the most efficacious remedies for the night sweats of phthisis. It may be made into a pill with extract of hyoscyamus, two grs. of each to a pill, of which one, and in some cases two, may be taken at bed-time. Dr. BARLOW recommends one gr. sulph. zinc and four grs. ext. of hyoscyamus to be taken in one pill at bedtime, and generally finds it successful. As the oxide of zinc is insoluble, Professor WOOD advises the use of the sulphate; but though the former, like calomel and many other mineral substances, be insoluble in water, they find their appropriate solvent in the stomach or intestinal canal; so that, in fact, the oxide is just as efficient as the sulphate, and less irritating to the mucous membrane. We have found a combination of sulphate of quinine and morphia very useful for the night sweats of phthisis.]

camphor mixture, &c., are the most appropriate ; but they may be afterward conjoined with others of a more tonic nature, such as the infusion of hop or the infusion or decoction of cinchona, and to these anodynes may be added, the selection of which should depend upon the features of the case. Hydrocyanic acid, monkshood, hemlock, henbane, meadow-saffron, and digitalis, have been individually employed in combination with these or other medicines ; but they require caution in their use, and careful observation of their effects. Monkshood, or *aconite*, is most appropriate in the more inflammatory tendencies of this and the preceding stage, but it especially demands a most cautious observation of its effects ; a remark not less applicable to colchicum and digitalis, which are suited to the same states of the disease as those for which aconite may be given ; these being useful chiefly as antiphlogistic means, either in aid of vascular depletion, or when the condition of the blood and of vital power contra-indicate a recourse to depletion ; although the local morbid action requires to be restrained or even lowered.

330. *c.* The remarks offered above respecting *issues*, *setons*, and other derivatives (§ 319–323), apply to this as well as to the first stage. Instances are rare in which either the one or the other should not be resorted to. The great difficulty often is, owing to the emaciation of the patient, in which situation they may be placed, so as to produce the least amount of discomfort. When emaciation is not very remarkable, then the margins of the ribs may be selected ; but in different circumstances an issue of good size may be formed over the pectoral muscle, or between the shoulder-blades. When this stage in females is characterized by suppression or marked diminution of the catamenia, the issue may be made near the groin, in the anterior aspect of the thigh. When setons are preferred, the arm, near the axilla, may be selected. If neither of these nor moxas be adopted, *blisters*, kept open as long as possible, and renewed from time to time, are generally necessary. The *embrocations* advised above (§ 321) ought not to be overlooked, inasmuch as, in the more urgent cases, they may be applied while the foregoing means are also in operation, and as they are sources both of derivation and of inhalation. When the above produce a sufficient discharge, then GRIFFITH'S myrrh mixture, or other chalybeates or tonics, may be prescribed, with anodynes, narcotics, &c. ; and their effects upon the cough, the pulse, and the hectic should be carefully observed. If these symptoms become aggravated by them, they ought to be relinquished, and the salines, especially the solution of acetate of ammonia, or of citrate of potash, with hydrocyanic acid, conium, &c., as noticed above (§ 329), may be substituted. If these effects do not result, then the more generous regimen recommended for the first stage (§ 314, *et seq.*) is equally, if not even more, required for this.

331. *f.* Inhalation of dilute medicated vapours and fumes may be tried in this stage, as well as in the first. The opinion I have formed of them, and stated with reference to that period (§ 324), is not materially different as regards this. Cases may occur in which they will be more serviceable in the second than in the first stage, and still more so in the third than in either of the foregoing ; but the amount of benefit, or the want of it, will entirely depend upon the substances selected for this mode of administration, and upon the way

of effecting this intention (*see* § 412). But mild or weak *fumigations* of the patient's apartment are generally much more beneficial than inhalations, which often irritate and increase the local lesions (§ 413).

332. *g.* In females the state of the *catamenia*, as respects both the intervals and the duration and quantity of the discharge, is of the greatest importance, especially in the first and second stages of the malady. Excessive discharge, whether as to frequency of recurrence, the duration of its continuance, or the quantity, not infrequently predisposes to, or more directly occasions, phthisis ; and the same disorders of this function, if allowed to proceed, will also aggravate or hasten the progress of this malady, if they occur in either the first or second stages. The rapid or sudden disappearance of this discharge, on the other hand, is even more certainly and rapidly injurious, in whatever stage this may take place. A difficult or scanty catamenial discharge requires attention, although it is not so dangerous as either of the former states, especially the latter. Excessive states of the catamenia should be moderated with caution, and by such means as are not likely to be followed by suppression. The decoction or infusion of cinchona with either of the mineral acids, or the sulphate of quinine in the compound infusion of roses, and tincture of orange-peel may be prescribed, or the sulphate of quinine may be mixed in some water and taken without any addition. If anæmia have been produced by this discharge, the tincture of the sesquichloride of iron may be given, either alone or with the preparations of calumba or quassia. It should not be overlooked that the disorders of the catamenia in the early stages of phthisis are often caused by masturbation ; and when this is suspected, and when advice can be prudently given and precautions taken against this vice, it becomes the duty of the physician to act accordingly. In these, as well as in other circumstances of profuse catamenia, ipecacuanha, conjoined with extracts of gentian, catechu, and a narcotic, may be given in such quantity as to occasion some degree of nausea to even retchings.

333. Scanty or difficult menstruation requires means appropriate to the peculiarities of the case ; for either of these states may be attended in one patient with an anæmied or chlorotic appearance, and in another with little or no apparent deficiency or poorness of blood. In the former case, the compound mixture of iron, with as much of the compound decoction or the tincture of aloes as will act moderately on the bowels, or prevent constipation, with a little of the extract or tincture of conium, will generally be of service. In other cases, where there is no deficiency of blood, a few leeches may be applied below the groins shortly before the expected period of the catamenia ; and the hip-bath and pediluvia, at a sufficiently warm temperature and with the addition of salt or mustard, resorted to.

334. In cases attended by suppression of this discharge, strenuous efforts should be made to restore them. The hip-bath, pediluvia, &c., rendered stimulating by bay salt and mustard, leeches applied around the anus or beneath the groins, the preparations mentioned above (§ 333), walking exercise, or riding on horseback or in a carriage, and the several emmenagogues advised for suppression of the catamenia (*see* MENSTRUATION, § 64–95, *et seq.*), should be prescribed in combi-

nations or forms suited to the state and stage of the pulmonary disease.

335. In this stage various complications appear, either as temporary or intercurrent affections, or as morbid associations, which continue to the termination of the malady. These will be noticed in the sequel; but there is one which is rarely absent, and which renders the treatment difficult, namely, the bronchitic affection. This, in many cases, becomes the prominent disorder, and requires the treatment to be more especially directed to it; the most generally serviceable means being, according to the accompanying fever and the state of the patient, the solution of the acetate of ammonia with the spirit of nitrous ether, dilute hydrocyanic acid and camphor mixture; or in somewhat different states, with carbonate of ammonia, compound tincture of camphor, or henbane or conium. If there be a hæmorrhagic tendency, the acetic acid may be added; and in most cases the terebinthinate embrocation should be applied to the chest.

336. *h.* The diet and regimen in this stage may in a very large proportion, if not in the majority of cases, be altogether the same as I have advised for the prevention and for the treatment of the first stage of the disease (§ 292–308). In many cases a fish diet will agree well in this stage; the white kinds of fish, always boiled, but never fried, a squeeze of lemon, with little butter, but preferably with the liver of fish, being the chief or only sauce. The fish and their livers, which are most beneficially used as articles of diet, are the *Gadus brosmius*, or torsk; the *Gad. morrhua*, or cod; the *Gad. molua*, or ling; the *Gad. æglefinus*, or haddock; the *Gad. merlangus*; the *Gad. callarius*; the *Gad. carbonarius*, or coal-fish; the *skate*, *turbot*, *soles*, &c. The recent livers of all these species of the genus *Gadus*, boiled in such a manner as to preserve their oil, may be used either as sauce to the fish, or may be eat with it, or the oil may be taken after the meal, in the usual medicinal way. They are beneficial both as articles of diet and as medicine. When quite recent they have no fishy or unpleasant flavour, and are easily digested—the more easily the more oil they contain.

337. As to other articles of diet, regimen, change of air, exercise, travelling, voyaging, and choice of residence, the remarks which I have made above (§ 292–308), and in the sequel (§ 420, 421), and in the article CLIMATE (§ 42, *et seq.*), are applicable to this stage, according as the strength of the patient and the prominent symptoms will admit of their adoption, and as the presence or absence of any of the more important complications will suggest.

338. *D.* The treatment of the third stage of the common form of phthisis (§ 38, *et seq.*) is frequently but little different from that already advised. The state of the patient may not, in some instances, be materially different from that characterizing the second stage, although cavities—one or more—have already formed in one or even both lungs. The patient may not be materially worse in respect either of strength or degree of emaciation, or of cough and respiration, especially if the more aggravated symptoms and complications have not as yet been experienced. More commonly, however, he is much worse as regards all these; and colliquative perspirations, attacks of diarrhœa, severe paroxysms of cough and of oppressed breathing, and pains in various

parts of the chest or its vicinity from inflammatory congestion of portions of the lungs or from the extension of the morbid action to the pleura, are more or less experienced, and are generally relieved with greater difficulty than in the preceding stages. The treatment depends chiefly upon the complication, or rather complications, which characterize this stage.

339. *a.* In all cases there is more or less bronchitis, chiefly, however, of the bronchi communicating with the softened tubercles and cavities; but there may be in addition inflammatory or sub-inflammatory action in the surrounding portions of lungs, or even also in parts of the pleura in the vicinity. These may require, or at least suggest, a treatment which neither the strength nor vascular condition of the patient may well bear, especially when carried so far as to subdue the superinduced local mischief. But to leave these complications to their natural courses, when clearly manifested by symptoms, may be more injurious than the effects of judicious means prescribed for their removal; and, as far as my experience enables me to decide, the employment of such means is the safest alternative. For these states of this stage, therefore, local depletions, by leeches or by cupping, are required, according to the condition of the patient and symptoms of the case, the quantity of blood taken at first being small. When the indications for having recourse to this measure are doubtful, dry-cupping, afterward blisters, the terebinthinate embrocations already advised (§ 321), and the febrifuge medicines recommended above, are most appropriate. Of this class of medicines, the solution of acetate of ammonia, in forms and combinations already noticed (§ 315), is the most generally of service.

340. *b.* In this stage, especially in its advanced course, the colliquative perspirations and diarrhœa exhaust the patient, and more or less waste the red globules of the blood. While these symptoms should be restrained, the powers of life and the supply of duly assimilated blood-globules must be supported and promoted. The means which fulfil the one indication often also aid the other. This is more particularly demonstrated by the effects of cod-liver oil, and by medicines which improve the digestive and assimilating processes, and correct, counteract, or remove the contaminating matters which are carried into the circulation from the lesions seated in the lungs, whether softened tubercles or ulcerating cavities, and which thereby affect the cutaneous and mucous surfaces and follicles, so as to give rise to these exhausting and distressing symptoms of the malady. Numerous means, beside those already mentioned, have been proposed for these morbid conditions, especially the acetate of lead with pyroligneous acid and laudanum, the sulphate of zinc with sulphuric acid, the sulphate of copper with opium, the substances containing tannin, gallic acid, &c., and catechu, kino, krameria, hæmotoxylum, nux vomica, &c.; but very few of these, even while they restrain the diarrhœa, diminish the perspirations, or in any other respect alleviate the malady. Indeed, in some cases they aggravate the disease, and only accelerate its progress to a fatal issue by preventing the elimination by those emunctories of the effete, morbid, and contaminating materials conveyed into and circulating in the blood.

341. *c.* Much more rational and efficient indications for the abatement of the colliquative diar-

rhœa and perspirations in phthisis would be the improvement of the digestive and assimilating functions by such means, or combinations of means, as would at the same time, by their partial absorption into the circulation, correct, change, or counteract the contaminating matters which are imbibed from the seat of the disease; whether these matters be purulent or tubercular, or the sanious fluid formed in or on the surface of ulcerating parts, and whether they are actually present in the blood, or are more or less changed in the course of the circulation of the blood. That they actually contaminate more or less this fluid, however small may be the quantity which passes into it, and thereby give rise to the most distressing and dangerous symptoms of phthisis, cannot be doubted, the skin and the bowels being two of the chief channels through which they, and other injurious matters they may form, are eliminated from the circulation; but the selection of the means of fulfilling these indications is much more difficult than devising them, and depends entirely upon the peculiarities of individual cases, as respects especially the progress of the disease and the states of respiration and circulation. The bicarbonate and the nitrate of potass, prescribed in tonic infusions or decoctions, with aromatic or astringent or narcotic tinctures, according to the state of the case; magnesia and sulphur, with the powder of cascarrilla or of cinnamon or ginger and liquorice powder, or with other substances, as the state of the bowels will suggest; the compound iron mixture, or the aromatic mixture of iron (D. P.); the bitter or tonic infusions, with carbonate or citrate of potass or of soda and anodynes; balsams, the purified or inspissated ox-gall, with conium or with the compound soap pill and ipecacuanha, or with the purified extract of aloes, according to circumstances; and camphor, the terebinthines, tar or tar water, conjoined with such of the foregoing medicines as the features of the case require, may severally be employed. In some instances where the colliquative state of the bowels and other symptoms indicated a contaminated state of the blood, and consecutive alteration of the mucous surface and follicles of the bowels, I have prescribed the following pills at night, or night and morning, or with the meals; the bitter vegetable tonics, with alkalies, &c., having been taken in the intervals between meals:

No. 355. R Pilulæ Ferri comp.; Pilulæ Rhei comp.; Extracti Fellis bovini; Picis liquidæ, aa. ʒss. Misce et contunde bene, dein divide massam in pilulas xxx.; quarum capiat unam ad tres pro dose.

No. 356. R Extr. Fellis Bovini; Sulphuris præcipit.; Picis liquidæ; Confect. aromat. in pulv. aa. ʒss.; Olei anisi, q. s. Contunde bene et divide in pilulas xxxvj. Sumat j. ad iij. pro dose.

No. 357. R Magnesie carbon.; Sulphuris præcipit., aa. ʒij.; Confect. aromat. in pulv. ʒss.; Creasoti ℥viij. ad xij.; Olei anisi, et mucilag. q. s. Misce et fiant secundum artem pilulæ xxxvj. Capiat j. ad iij. bis terve in die.

342. It may be noticed that the above, both mixtures and pills, may be modified, or receive additions, so as to meet the peculiarities of the case. If irritation or pain in the bowels be experienced, small doses of the extract of opium or the soap pill with opium, may be added to either of the foregoing; and if diarrhœa, or tenesmus, or dysenteric symptoms be present, ipecacuanha in full doses may also be conjoined with these.

343. With the other distressing symptoms, to which I have directed notice, there are others for

which relief is required, and although we may be unable to impart it, we should at least attempt it. The dyspnœa, difficulty of breathing, the feelings of suffocation, &c., in this stage, are sometimes distressing. In many instances the terebinthinate embrocations already mentioned (§ 321), applied over the chest or between the shoulders, will afford some relief; and an opiate conjoined with either of the pills just prescribed, or with expectorants and antispasmodics, or the compound galbanum pill, or with stimulants and other means indicated by the state of the case, as already mentioned, will often be of service. When the dyspnœa is urgent or distressing, an emetic will be found to afford most relief. The aphthæ which, towards the close of this stage, often appear in the mouth, tongue, and throat, farther increase the distress of the patient, and require the treatment advised for this condition of the mouth and throat in the articles THROAT (§ 40, *et seq.*) and THRUSH (§ 11, *et seq.*).

344. *d. Delirium* rarely occurs in this form of phthisis until shortly before dissolution, unless in females, when this stage of the malady is accelerated by, or occurs in the puerperal state, or in cases where the nature of the medicines or the idiosyncrasy of the patient has given rise to this symptom. Most of the narcotics and anodynes, especially henbane, conium, aconite, opium, morphia, digitalis, &c., will have the effect of inducing delirium in the advanced progress of this stage, especially in nervous and exhausted states of the patient, and when either of these substances are given in too large doses, or continued too long; or when substances which are calculated to prevent or to correct their injurious effects have not been conjoined with them. The delirium, in most instances, is slight; but it is sometimes more severe or acute, and is attended with restlessness and sleeplessness, or it approaches the character of delirium tremens. For these modifications of mental disorder, lowering means only hasten a fatal issue. If they have been occasioned by either of the medicines just mentioned, they will frequently disappear after the cause has been removed, especially if judicious means be prescribed; but under every circumstance the state of vascular action, especially as respects the brain and membranes, should be observed. If it be increased in these, cold-sponging the head, mustard pediluvia, &c., are required; and even when such increase is present, it will be more readily relieved by restoratives, prescribed in small and moderate doses, and their effects watched, than by opposite means. The medicines from which most relief may be expected in the delirium occurring in this period, are camphor, ammonia, the solution of the acetate of ammonia, the carbonate of ammonia, the compound spirit of ether, the spirit of nitric ether, the hydrochloric ether, the preparations of serpentaria, of arnica, and of sumbul. These may be prescribed individually, or in combinations of two or more, or with the alkaline, saline, and restorative medicines I have mentioned as being useful when the blood is contaminated, the delirium often arising from that condition, as well as from exhausted organic, nervous, or vital influence.

345. *v. TREATMENT OF THE LATENT FORM OF PHTHISIS.*—This variety of the disease (§ 77, *et seq.*) generally eludes the notice of the friends and the fears of the patient until it has advanced

to a state hardly admitting of hope. If, however, the symptoms characterizing it should alarm either friends or patient, if depression of spirits, impaired digestion and assimilation, or other indication of disorder lead to the procuring of medical advice, and the detection of the malady in its silent and stealthy course, although no prominent or unmistakable sign be present, the treatment which will be found most beneficial is that which has been already advised for the *prevention* and for the *threatened appearance* of the malady (§ 292-298). It is obvious, however, that the best-devised means will have no beneficial effect if the causes which injured the constitution still continue to act. The physician should endeavour to ascertain what these are; and if they be such as may be removed, the necessity of making the attempt should be insisted upon, and the patient be made acquainted with the consequences of the neglect of this advice, especially when the removal of these causes depends upon himself. In most of the cases of this variety the causes are usually depressing and exhausting; and in many, as soon as the nature of the malady is suspected, the digestive and assimilating functions require restoratives, mild tonics, change of air, moderate exercise in the open air, travelling, and pleasurable occupation of the mind; the regimenal and medical treatment I have advised above (§ 299-324) for the first stage of the usual form of the disease being also necessary. In this latent or silent course of phthisis vascular depletions are not well sustained; and if they be at all attempted, they should be small, and their effects watched. In the great majority of cases of this form, and especially when depressing or exhausting causes have occasioned the malady, medicines of a decidedly restorative or tonic kind, attention to the digestive functions, cod-liver oil, and the other means recommended at the place referred to, should be adopted. These may arrest the disease; but if it should advance nevertheless, and become unmistakably developed, the treatment must necessarily be the same as I have advised for the more common form of the malady, modified as above, according to the manifestations of the advanced stages.

346. vi. PRIMARY ACUTE OR RAPID PHTHISIS.

—A. The symptoms of the *first variety* of this form (§ 82-84) have been described by me as intermediate between those of congestive bronchitis on the one hand, and of congestive or nervous pneumonia on the other (§ 83), both lungs being more or less affected. The cases which I have observed have been consecutive of measles in a scrofulous diathesis, or of delayed, suppressed, or excessive catamenia. In these bleeding seemed injurious, or was of no avail. Emetics, the solution of the acetate of ammonia, with ether or ammonia, small doses of camphor, the terebinthinate embrocation applied over the chest or between the shoulders, and blisters, were the means which appeared to be of most service. Cod-liver oil was either not retained, or was nauseated and not taken, or failed of producing any benefit. The infusion or decoction of cinchona, with nitrate of potash and bicarbonates of the alkalis, or with the solution of acetate of ammonia and various ethereal preparations, and small doses of camphor with aconite, &c., were also prescribed in different cases, or in the same cases at different periods of the disease, but with no marked advantage.

347. B. The *second variety*, or more strictly febrile form of acute phthisis described above (§ 85, 86), is often mistaken for low nervous or typhoid fever, which it closely resembles, especially in its advanced progress. In the few cases which have fallen under my observation I prescribed the remedies I have just mentioned (§ 346); and of these, the last-mentioned, or those consisting of the preparations of cinchona with the substances stated to have been conjoined with them, the chlorate of potash, camphor, the terebinthinate embrocations, &c., appeared to be of service only in prolonging the life of the patient for a few days. The nature of these cases precludes any hope of farther advantage than this from any treatment whatever.

348. vii. CONSECUTIVELY ACUTE PHTHISIS (§ 87) is merely the supervention of either of the acute varieties of the disease described above (§ 81-86) upon the latent form (§ 77-80), of the development of this latter form owing to an attack of hæmoptysis in its course, or to some determining or aggravating cause or occurrence. Although an attack of hæmoptysis often relieves the pulmonary symptoms when they have been unequivocally manifested previously, at least for a time; yet it is sometimes followed by an acute state of the disease, most frequently by the more common form, when it occurs in the course of the latent variety. In the consecutive manifestation of acute symptoms the treatment should depend upon the character of these symptoms and upon the associations they present. If hæmoptysis take place, the treatment I have advised for it (§ 353-5) may be adopted as far as it may be appropriate to the peculiarities of the case. If the local symptoms and signs indicate congestion or inflammatory action in one or both lungs, local vascular depletions, or even a repetition of them, emetic, antiphlogistic, and saline medicines, especially the solution of the acetate of ammonia, terebinthinate embrocations, blisters, and other means already noticed, will be of service; and if the disease assume the acute or febrile states, the medicines noticed above (§ 346, 347) may be prescribed, although with little or no hope of benefit from them. In some instances the malady assumes a less acute or febrile form, the treatment having temporarily mitigated the severity of the symptoms. This is probably owing to the congestive and inflammatory states of the bronchi and substance of the lungs, which had supervened upon an extensive but latent formation of tubercles in both lungs, having been partially subdued by the means employed. In these cases the development of the tubercles by the morbid action in the bronchi and substance of the lungs afterward prevents this action in these parts to subside; and thus both these morbid conditions act and react on each other, so as to occasion an acute state of disease. The extension of these lesions in a more or less marked degree through both lungs generally terminate fatally before large cavities, or even any cavities, are formed;*

* Of 750 cases of acute pneumonitis treated in the great hospital of Vienna from 1847 to 1850, pulmonary abscess was observed in but a single instance, and with regard to the physical signs of excavations thus formed, Skoda remarks as follows: "I have frequently examined patients suffering from pneumonia, in whose lungs newly-formed abscesses were found after death; but I have never, in any single instance, recognised the presence of abscess by the aid of auscultation or percussion. In every case, the abscess, though communicating with the bronchial tubes, was filled with pus or sanies."—SKODA

whereas, in the common form of the disease, the greatest part of the lungs remains free from change, although other portions are ulcerated, excavated, or otherwise disorganized. In these circumstances the principles of treatment already developed should be adapted to the peculiarities of individual cases.

349. viii. PROTRACTED PHTHISIS (§ 89-91), especially when early recognised or manifested, and judiciously treated, furnishes many chances either of recovery or of prolonged existence. For this variety, particularly when the pulse and respiration are not much disturbed, the several Hygienic means advised for the *prevention* of the disease and for the treatment of the first stage (§ 292-323) are generally of great service, more especially change of climate, voyaging, exercise and agreeable occupations in the open air, and in a dry and temperate situation, attention to the digestive and assimilating functions, aided by digestible and nutritious food; by sulphur, balsams, a farinaceous and milk diet, &c.; by tonics, stomachics, and chalybeates when the disease appears to have proceeded from depressing or exhausting causes; and by emetics and other antiphlogistic means, or by small bleedings, issues, setons, terebinthinate embrocations, blisters, &c., according as vascular excitement or congestive or inflammatory complications may occur. In the simpler states of this form, when the pulse is weak or slow, and no congestive or inflammatory complication is present, and especially if the blood be deficient or thin, the *mistura ferri composita*, or the *tinctura ferri muriatis*, will be given with benefit; and with either of these other medicines may be conjoined, especially cod-liver oil, anodynes, &c.

350. ix. PHTHISIS IN INFANTS AND CHILDREN (§ 92-95) requires more particularly the Hygienic measures I have recommended under the head SCROFULA AND TUBERCLES (§ 148-153); and in the sections above on the *prevention* and *early treatment* of the usual form of phthisis (§ 292-308). Asses' milk, a milk and farinaceous diet, moderate exercise in the open air, change of climate, strict attention to the promotion of the digestive and assimilating functions by means of diet, regimen, and suitable medicine, the cod-liver oil in as large quantity as the stomach will bear, and taken in the modes hereafter to be noticed, are the chief means in which confidence can be placed, although others should be added which the circumstances of particular cases will suggest. When the disease advances to the second or third stage in children, then the treatment advised above for these stages, in the usual form of the disease, will, with due reference to the ages and states of the patients, be equally appropriate for them.

351. x. PHTHISIS IN THE DARK RACES (§ 96, and *note*)—The forms and states of the disease may reasonably be considered as varying with race and climate (§ 200-222), and also with the habitual food and clothing, or amount of clothing, of these races (§ 219-222, 420, 1. and CLIMATE, § 42, *et seq.*). From what I have seen or gathered from writers respecting the disease in these races, I conclude that for them a tonic and restorative treatment, with attention to the digestive organs and to the functions of the skin, is espe-

cially and generally required. In other respects the means of cure advised above for the several forms of the disease in the white races are also suited to these forms when they appear in the dark races. In these latter the causes are commonly depressing and exhausting. Confinement to close situations, where the air is rendered impure by frequent respiration or by numbers, removal to colder and more humid climates than those from which they have been taken, venereal excesses, and insufficient food, are the most frequent causes of phthisis in these races, and hæmoptysis is a common occurrence at the accession or early stage of the disease. For these the more astringent tonics, the preparations of cinchona or of cascarilla, conjoined with laxatives or aperients, or with diaphoretics, according to the states of the bowels and skin; ipecacuanha combined with the balsams and restoratives, chalybeates with stomachics, and terebinthinate embrocations externally, are most frequently indicated. If febrile action be present, the warm and restorative febrifuges and diaphoretics are required; especially the solution of acetate of ammonia, the carbonate of ammonia, camphor, and the infusion or decoction of cinchona. If the bowels become disordered, ipecacuanha in large doses, with opiates, the bitter extracts, and such of the medicines already mentioned as the circumstances of the case will suggest, will be found most appropriate. Dr. ARCHIBALD SMITH states that the several dark races, and the crosses between these races, on the coast of Peru especially, when attacked by the hæmoptysic form of phthisis, were most benefited by a residence for several months in the mountains at an elevation of 5000 to 10,000 feet above the level of the sea.

352. xi. TREATMENT OF COMPLICATED PHTHISIS.—The complications which severally appear from the accession to the close of this disease require a few remarks. These complications are not confined to any one form or stage of the malady, but occur in all; although more frequently perhaps in some cases than in others, owing to the constitution and predisposition of the patient, to the exciting and determining causes, and to the exposures and other influences in operation during the progress of the malady. Some of these complications may appear in the character rather of prominent or more urgent symptoms than of actual superinduced or intercurrent affections; but as phthisis may, and actually often does, run its whole course without the appearance of any of them, or of one only in some cases, and of another in others, while two or more may occur even in the same case, although not at the same time, they may be more correctly considered as contingent symptomatic affections, complicating, and often rendering the tubercular or original malady more severe and more rapidly fatal. With a few exceptions, these affections have already been considered with reference to treatment when discussing the successive stages.

353. A. *Hæmoptysis* is a frequent occurrence in phthisis. The treatment of it should depend upon the state of the pulse, the age and habit of body of the patient, the stage of the disease, and the amount of blood lost. I have, however, so fully treated of hæmoptysis under the head HÆMORRHAGE FROM THE RESPIRATORY ORGANS (§ 123-141), that it is quite unnecessary to entertain this subject farther than to remark that hæmoptysis is generally the result, at the accession

On Auscultation, Am. ed., p. 311. Professor FLINT remarks that his "own observations do not supply facts bearing on this question" (*loc. cit.*, p. 425).]

or at an early stage of phthisis, of capillary congestion arising from the obstruction or irritation caused by tubercular deposits, and at an advanced stage either of the same cause or of exudation from an ulcerated cavity, or of discharge from an eroded vessel or vessels. The older writers, observing the relief following a free discharge of blood at an early stage of the disease, advised that the hæmorrhage should be allowed to proceed for some time. But to do this would often greatly alarm the patient, and be running the risk of the blood passing into and obstructing or irritating many of the bronchi which had remained free from disorder. It is, therefore, safer to arrest the hæmorrhage by suitable means, such as those which I have detailed under the article HÆMORRHAGE (§ 123-141), or by general or local bleeding, or by the internal exhibition of the spirits of turpentine in doses of twenty or thirty drops every half hour or hour, and by the turpentine embrocation or epithem applied over the chest. There are numerous other means which may be employed, and which are mentioned in the article just referred to; but these are most generally of service. The bleeding should be rather repeated than large, and be regulated by the circumstances already stated. Large doses of ipecacuanha, or one or two grains given every quarter or half hour, are also of great service; but if the bowels be confined, half an ounce each of spirits of turpentine and castor-oil may be taken in a suitable vehicle, and the same substances in larger doses administered in gruel as an enema. Dr. CHEYNE advises, especially in cases of hæmoptysis with inflammatory symptoms, a quarter, or even an eighth of a grain of tartarized antimony with five to ten grains of nitre every hour. The chief advantage from ipecacuanha and from antimony is produced by the nausea they occasion. Much, also, of the benefit experienced from sea voyages, especially in this form or complication of phthisis, is produced by the nausea thereby occasioned.*

354. When called to these and other forms of hæmorrhage I have often found the practitioner assiduously applying cold or ice to the chest. The instantaneous shock or impression of cold sometimes does good; but if this effect does not immediately follow, to persist in these applications, especially in hæmoptysis, always does mischief, by increasing or perpetuating congestion of, and vascular determination to, the lungs.

355. When hæmoptysis has not sufficiently relieved the congestion or the inflammatory symptoms attending it, then bleeding, general or local, should be repeated, according to the effect or to the circumstances at the time or subsequently. When, on the other hand, the quantity of the discharge, the existing symptoms, the stage of the disease, and state of the patient, require an immediate arrest of hæmoptysis, without having recourse to vascular depletion, then the other means advised are the most efficient, the spirit of turpen-

tine or ipecacuanha acting more promptly than the acetate of lead or other astringents. The secale cornutum I have also found to act very promptly in hæmoptysis, five grains of it being given every five, ten, fifteen, or twenty minutes, until it produces the effect, or causes vomiting or much nausea. The repetition of small bleedings, or of other means subsequently, should depend upon the state of the pulse, the existence of pain in any part, or of dyspnœa and the state and stage of the disease; but in most cases the terebinthinate embrocations already advised should be continued to those regions of the chest where most uneasiness is felt.

356. *B. Inflammation of portions of the lungs or of the bronchi, or of the trachea or larynx*, followed by more or less of the consequences of these, as stated above (§ 109-112), often complicates phthisis, and requires means of an antiphlogistic kind in some respects the same as those just advised. It should, however, be recollected that the inflammatory action affecting one or more of these parts, owing to its asthenic or congestive character, to impaired constitutional power, to previous disease, and to the associated morbid conditions, admits not of the same treatment as that which is found most beneficial in idiopathic or some other states of this action. Vascular depletions, generally local, as in hæmoptysis and pleuritic attacks, are required, and sometimes should be repeated. When the state of the case admits of venæsection, to however small an extent, this should be preferred to the application of leeches, to which also cupping ought to be preferred.

357. *a. Pain in the chest*, independently of hæmoptysis, is often relieved by small bleedings, by cupping or leeches, by blisters, and by the continued application of the terebinthinate embrocation. The usual cause of this pain—its connexion with *partial pleuritis* (§ 112)—should not be overlooked; and the advantage generally following a recourse to mercurial and antimonial preparations in combination, and sometimes also to anodynes, demulcents, &c., in the intervals between the exhibition of the former, ought to be kept in view.

358. *b. Cough* is often a most distressing symptom, especially in the advanced stages of phthisis, and more particularly when it is associated with *dyspnœa*. In the less urgent states of cough, compound tincture of camphor, or hydrocyanic acid, will often give relief. The preparations of anise seed have long been highly esteemed for their effects in ameliorating the cough and even the dyspnœa. To the preparations in common use Dr. WATSON states that Dr. PROUT preferred an infusion of three drachms or half an ounce of the bruised seeds of anise seed in half a pint of distilled water, at a temperature not exceeding 120°, allowing it to stand until it is cold. This may be made an excellent vehicle for the compound tincture of camphor, hydrocyanic acid, or conium, &c. But the severer attacks of cough, in the advanced stages, require more energetic means, especially the preparations of opium or of morphia. These, however, often are followed by unpleasant symptoms, particularly morphia, if they be not conjoined with aromatics and gentle stimulants—with small doses of camphor, of spirits, or oil of caraway, or of lavender, or of anise seed, &c. Opium may be given in the form of the *confectio opii*, or conjoined with a little of the *confectio aromatica*;

[* We have rarely known the *Gallic acid* fail in checking hæmoptysis. Dr. JAMES FOUNTAIN strongly recommends an infusion of the common *Witch Hazel* (*Hamelis Virginica*). As the flowers of this singular shrub appear after it has shed its leaves, in autumn, and the fruit is not perfected till the following season, all manner of magical properties have been ascribed to it. It possesses astringent properties, and perhaps slightly anodyne. An empirical preparation is kept in the shops, prepared from this shrub, which goes under the name of "Coryle Extract," the proprietor mistaking it for the "*Corylus Americanus*" or *Hazel-nut*.]

or the pilula galbani composita, or the pilula saponis composita, or the pilula styracis composita may be prescribed with either of the foregoing. I have frequently preferred the following solution of the acetate of morphia, conjoined with aromatics, in order to counteract the depressing effects often produced by it.

No. 358. R Morphine acetatis, gr. vj.; Liq. Ammonia acetatis, ʒj.; Acidi acetici diluti, ʒij.; Spirit. Anisi, ʒss.; Spirit. Carui et Spirit. Lavand. Comp., aa ʒij.; Mist. Camphoræ (vel Syrupi Tolutani) ad ʒijj. misce. Fiat mist. cujus capiat ʒj. pro dose, vel ʒij. hora decubitus, et ʒj. primo mane, in aquæ hordei cyatho vinario.

359. *C. Laryngeal and tracheal affections* are often the most distressing of those which occur in the course of phthisis (§ 109, 110), and in some of the usual or more protracted forms of the disease present more or less of the characters noticed above (§ 109, 110), or of the sub-acute or chronic states described in the article on Diseases of the LARYNX AND TRACHEA (§ 105, et seq.). Since this article was written, the diseases of these parts have been ably investigated by Dr. HORACE GREEN. He contends that inflammatory affections of the larynx, trachea, and throat are seated in the mucous follicles. It is, however, chiefly in the sub-acute and chronic affections of these parts that the follicles are either primarily or consecutively implicated, and especially when these affections are complications of phthisis, and are produced either by the protracted irritation of the trachea, larynx, epiglottis, and even of the pharynx and fauces, by cough, and by morbid secretions passing through them, or by the existence of tuberculous matter in their follicles or muciparous glands. At first these sources of irritation and contamination enlarge these follicles, increase their discharge, thicken and somewhat soften the mucous and sub-mucous tissues, and ultimately occasion an ulceration of the mucous follicles, and an atrophy, with increased softening, of the mucous and sub-mucous membranes. That the affection of the muciparous glands, in the advanced course of phthisis, is occasioned not only by the morbid secretions passing over them, but also by the deposit of tuberculous matter in them, is extremely probable. Dr. H. GREEN insists upon this latter change, although it is denied by several eminent pathologists. In either case, the treatment cannot materially differ. Dr. H. G. found this complication of phthisis most frequent between the ages of 25 and 38 years. He also often observed this affection of the throat and larynx after influenza, eruptive fevers, and more particularly in persons habitually using tobacco. Dr. GELLERSTEDT considers the ulcerations so commonly found in the larynx, in phthisis, to be of tubercular origin; while those of the trachea he regards, with LOUIS, as of an aphthous nature, arising from the constant irritation of the cough and expectoration.

360. The treatment of this complication of phthisis has been by inhalation, insufflation, lotions, and the application of the solid nitrate of silver to the tonsils, uvula, and pharynx. Dr. LAYCOCK remarks, in an able article in the *British and Foreign Medical Review* (vol. xxiv., p. 497), that the application of the nitrate of silver to the cavity of the larynx is not, however, to be classed among these ordinary methods; and the practice of it by Dr. GREEN seems to have been received with so much incredulity in the United States, that he has thought it necessary to multiply evi-

dence as to the fact that he has introduced a strong solution of nitrate of silver within that cavity. "TROUSSEAU and BELLOC are supposed, by Dr. GREEN, to have been the first to prescribe and employ topical medication in chronic laryngeal disease. They found a solution of the nitrate of silver, in the proportion of two drachms, or sometimes four drachms, to an ounce of distilled water, to be the most efficacious and harmless application. Two methods were adopted by them: the one was to saturate a small sponge attached to a bent rod of whalebone, and to manipulate so that the solution be expressed into the larynx: the other was to use a small silver syringe, with a tube suitably adapted for effecting the same object. Dr. GREEN, however, several years before the appearance of Messrs. TROUSSEAU and BELLOC's book, had instituted experiments, and come to a similar conclusion." Dr. LAYCOCK farther remarks that, without wishing to disparage the labours of our Gallic or American brethren, Sir CHARLES BELL successfully adopted the method of treatment so fully illustrated by Dr. GREEN; and Dr. L. refers to cases published by Sir C. BELL (*Surgical Observations, &c.*, Lond., 1816, p. 34), for which this practice was employed. Dr. WATSON states that Sir C. BELL had recourse to this local application of the strong caustic solution in a case under his care; and remarks in his Lectures as follows on the practice: "It is said that a little practice will enable a person to pass his finger into a patient's throat, and to familiarize his sense of touch with the ordinary condition of the upper part of the respiratory apparatus, so as to be able to detect swelling, or irregularity, or thickening about the chink of the glottis. And great advantage is said to have been obtained from applying remedies directly to the diseased or irritable part. This practice was much followed by the late Mr. VANCE, who had been for many years a naval surgeon; and he called it, in naval phrase, *swabbing* the affected organ."*

* As the question of priority in regard to local applications to the larynx has given rise to some discussion, and is alluded to by Dr. LAYCOCK and our author, it is proper to state the principal facts relating to the subject. There can be no doubt that Sir CHARLES BELL and Mr. VANCE were in the habit of making local applications to the inner surface of the larynx with the sponge and probang, much after the manner of Dr. GREEN. The statement that "Dr. GREEN, several years before the appearance of Messrs. TROUSSEAU and BELLOC's book, had instituted experiments, and come to a similar conclusion," is quite erroneous. The work above mentioned was published in Paris in the summer of 1837, and was reviewed by Dr. JOHNSON in the October number of his *Review* for 1837, and the January number of 1838. In the summer of 1838, Dr. GREEN had a conversation in London with Dr. JOHNSON on the subject of the treatment of laryngitis, "and the suggestion was made," says Dr. G., "that if proper applications could be applied below the glottis, no difficulty would occur in successfully treating the disease. Acting upon this suggestion, after my return home, I made the attempt, and was successful in entering the larynx, and thereby succeeded in curing a well-marked and severe case of laryngeal disease. With the like success other cases were treated in the same year, and the appearance of the TROUSSEAU and BELLOC soon after, confirmed my confidence in a method of treatment which I have since pursued," &c. (*Preface to Treatise on Diseases of the Air-Passages, &c.*, New York, 1846.) Dr. G. probably refers to the *American Translation of Trousseau and Belloc*, which appeared in 1841; the original work, however, we have seen, was published four years, and reviewed more than three years before this period. It is to be remembered, moreover, that these authors do not claim to have entered the larynx with the probang and sponge, and TROUSSEAU has expressly disclaimed it in a published letter to Dr. GREEN. The similarity of their modes of procedure will appear, however, from the fol-

361. Where the laryngeal complication occurs in the advanced course of phthisis, this practice can prove only of temporary benefit. I have been consulted in many cases of this description where it had been said to have been resorted to, but apparently either with no advantage, or with very temporary relief. However, in idiopathic or primary cases, or when the complication occurs in an early stage of phthisis, for which a rational and an appropriate treatment is prescribed, this local medication of the laryngeal complication may be employed, by one capable of performing it, safely and satisfactorily. I do not, however, believe that the appliances here advised enter the larynx and trachea once in twenty times; whatever benefit results arises from the applications to the under surface of the epiglottis and adjoining parts. I have, since the commencement of my practice, trusted much in those cases to the inhalation of the weak vapour of turpentine arising from the application of the embrocation so often mentioned, either around the throat and neck, or to the chest, or between the scapulæ.

[In this connexion, we should bear in mind that diseases entirely located in the larynx or pharynx are often mistaken for pulmonary tuberculosis; that even when tubercles exist, the more prominent symptoms may be owing to the pharyngeal and laryngeal complications; and that these complications may be greatly alleviated, or even removed, by local treatment, and in this way, as suggested by Professor BENNET, thus tend to arrest the pulmonary disease. Dr. HORACE GREEN has extended topical medication in pulmonary diseases to the injection of a solution of nitrate of silver into the bronchial divisions by means of a gum-elastic tube or catheter passed down the trachea. In the volume of *Transactions of the American Medical Association* for 1856, he has reported over one hundred cases of pulmonary and bronchial disease treated in this manner. Of these, 71 were stated to be cases of *tuberculosis*, and 32 cases of *advanced phthisis*, in which cavities were recognised in one or both lungs; 39 were reported cases of *incipient phthisis*. Of the first division, *advanced phthisis*, 14 died, 25 were said to be more or less benefited, and 7 not benefited by the injection. Of the 39 cases *incipient tuberculosis*, 12 apparently recovered, and 5 convalescent at the time of making the report (May, 1856). Of the remain-

ing 22 cases, 17 "have been greatly improved, 3 moderately benefited," and 3 only failed to find relief. Of the 28 cases of *bronchitis*, 16 were reported as cured; all the others had been greatly benefited, though some were still under treatment.]

362. *D. The Abdominal Complications* of phthisis have been already partly considered, when remarking upon the treatment of the diarrhoea (§ 328), and of the impaired digestion and assimilation (§ 234) so generally observed previously to, and in the course of the malady. But the functions of the liver are also not sufficiently discharged in the course of the disease; and due attention has not hitherto been directed to them. That this organ has been long disordered in cases of phthisis is shown by the nature of the organic lesions it generally presents after death (§ 118). It has been insisted upon by an able and close observer of the causes and nature of disease (Dr. McCORMAC, of Belfast), that phthisis is not only caused, but is also perpetuated, by an imperfect supply, and an insufficient digestion and assimilation of pure air in and by the lungs; consequently, the red globules of the blood are not oxygenated and assimilated to such an extent or amount as to supply the requisite materials by their waste for the elaboration of healthy bile: owing also to this cause, the carbonaceous and hydrogenous elements are not sufficiently combined with the oxygen of the respired air, so as to contribute to healthy assimilation and nutrition; and they consequently, under the influence of life, form morbid or adventitious products, and give rise to the fatty enlargement of the liver so generally found after death (§ 118).

363. The great importance of promoting the digestive and assimilating processes from the very commencement of phthisis, whatever other means of treatment be adopted, will appear from what has been advanced above; and I know of no surer means of attaining this end, than by improving the secretions and excretions by suitable medicines and food, and by removing the patient to a high, dry, and temperate air, where he may enjoy the advantages of sunshine and exercise, and avoid those causes which reduce organic nervous or vital power. In general physicians have been, during the last half century, in which such wonderful advances have been made in the practical sciences, so much occupied in listening to sounds which they often could neither interpret nor refer to their proper sources—in splitting the diagnostic hairs floating before their troubled, if not always dazzled vision, and in hearing what they believed even when not believing what they heard—as to be carried along by the pathology in fashion, neglecting those great views of physiological pathology which alone furnish the true basis of rational and successful practice. While a murmur, a bruit, a râle, a ronchus, and every sound for which a term could be coined, and their various grades, cadences, &c., were observed, or were feigned to be observed, and were noted, and paraded and admired, on all occasions, the conditions of the vital powers and functions, upon which both disease and recovery from disease mainly depend, were entirely neglected. But attention to these latter, to the states of the secretions and excretions, to the manifestations of impaired vital power, to the causes of this impairment, to the removal of those causes, and to the true means of restoring lost energy, as regarded

following quotation from Messrs. T. and B.'s work (*Am. Trans.*, p. 125):

"When we wish to cauterize the pharynx, the base of the tongue, and the top of the larynx at the same time, we take a whalebone at least a line and a half thick, that it may not bend readily; this is heated an inch or more from one end, and, when sufficiently softened, we curve it at an angle of 45°. To this end we fasten a spherical piece of sponge six lines in diameter; the sponge is to be moistened with a solution of nitrate of silver, the mouth opened, and the tongue depressed. When the isthmus of the gullet is passed, there occurs an effort of deglutition which elevates the larynx, and we seize this opportunity to draw forward the sponge, which had been at the entrance of the œsophagus. By this manœuvre we get at the glottis, and then it is easy to express the solution into the larynx; the cough which now occurs favours the introduction of the caustic," &c. Dr. GREEN, instead of a spoon, uses a broad spatula, bent at right angles, and instead of "expressing the solution into the larynx," passes the sponge directly into the cavity. To him, therefore, undoubtedly belongs the credit of establishing the possibility and utility of the direct introduction of nitrate of silver into the laryngeal cavity; just as Dr. MORRIS proved the safety and advantage of the inhalation of ether as an anæsthetic, although it had been suggested and used occasionally by others for similar purposes.]

a malady the most fatal, the most prevalent, and the most constant in its prevalence, was practically discarded; and fussy manipulations, striking examinations—where such examinations and manipulations were often unnecessary—were paraded in the place of these, and of other more profound, more physiological, and more practical investigations.

364. *E.* Several other complications, of less frequent occurrence than the above, have been mentioned (§ 119–123), but the means appropriate to each will readily suggest themselves to the physician. *Œdema* of the lower extremities (§ 120) not unfrequently occurs in the advanced stages of phthisis, and is sometimes diminished by prescribing small doses of biborate of soda, or of potash, with the tonic infusions or the diuretics, or with the means employed for the disease. Pressure on the course of the veins of the lower extremities, by the sitting or other posture of the body, sometimes favours the *œdema*, and even occasions a permanent obstruction of these vessels.

365. xii. BRIEF REMARKS ON SOME OF THE MEANS ADVISED FOR TUBERCULAR PHTHISIS.—Having considered the treatment which appears the most suited to the several forms and stages of phthisis, I am next desirous to notice the medicines which have been recommended by writers for this disease, and to mention the circumstances or states of the malady in which they may be prescribed, and in which they are contra-indicated. Most of these medicines have been prescribed empirically in phthisis; for, although the treatment of the disease had assumed a rational aspect in the works of our countrymen BENNET and MORTON, there were few besides, even among the most eminent of medical writers, who presented us with a plan of cure which was even tolerably appropriate to the stages and states of the disease; and, even among those who had cultivated the most the diagnosis and pathology of this malady, there were very few who recommended their favourite remedies with due reference to the states and complications of the disease, and to the pathological conditions which they had themselves described or admitted. I shall, therefore, attempt to inquire, in my brief notices of the substances recommended, into the circumstances in which either experience or the operation of these substances warrants their use.

366. *Acids*.—Most of the *mineral and vegetable acids* have been employed in phthisis, but seldom with any definite object, or to fulfil a rational indication. The chief intention with which they have been prescribed in recent times is to repress or prevent hæmoptysis, or to act as a refrigerant when the febrile action is considerable, and the night-sweats exhausting. They are merely palliatives—and in this they often fail, and sometimes they even render the cough harder and more severe; and, with the exceptions of the hydrocyanic and boracic, they are injurious to the sub-inflammatory states, and in the inflammatory complications of the disease. The *acetic acid* has long been employed in phthisis, and when the contra-indications just mentioned do not prevent recourse to it, either simply or in the form of raspberry-vinegar, or oxymel more or less diluted, it is a grateful and cooling medicine, especially after hæmoptysis has been considerable or excessive. In states of great exhaustion or colliquation, when it is desirable to produce an antiseptic as well as an astringent effect, the pyroligneous

acetic acid may be given, or even a drop of the aromatic.

367. *Sulphuric acid*, much diluted, has been commonly prescribed in phthisis, and generally with the same object as the acetic. BANG gave it with mucilages; JOERDENS with the *Phelandrium aquaticum*, a medicine much employed in Germany for this disease, and PORTAL in states of weak dilution, as a cooling drink; ROLLO and HUFELAND considered it useless; but COLLEBATCH, GRANT, DE HAEN, HOME, FOTHERGILL, SIMMONS, SIMS, and MARX, entertained a more favourable opinion of it, especially in the form of *acidum sulphuricum aromaticum*, or *vitriolic elixir*. QUARRIN very justly cautions against its use in the more inflammatory states and complications of the disease. Weak dilutions of the *nitric* and the *hydrochloric acids* may be prescribed, in the same states as those which admit of the use of the foregoing; and the combination of the two—one part of the former to two of the latter—when the contra-indications mentioned above are not present; and when exhaustion, colliquation, and other symptoms of vital depression are urgent, these two may be added to the infusion of cinchona, or other restoratives, especially when the functions of the liver are much impaired. I have prescribed them with benefit in such cases, and sometimes given the cod-liver oil on the surface of a mixture of these or of similar substances.

368. *Hydrocyanic acid* is one of the most useful medicines in this disease. It was introduced into practice by MAGENDIE, GRANVILLE, and ELLIOTSON, who took a just view of its effects both in phthisis and in dyspepsia—complaints so intimately allied in their origins and in their pathology, as already shown. Its influence in the latter benefits the former, while it exerts a soothing effect on the cough, without aggravating, but rather ameliorating, any complication which may appear in the course of the malady. It may, moreover, be advantageously conjoined with other acids, with the neutral salines, most of which it is incapable of decomposing, and with the great majority of other medicines usually prescribed for phthisis. Of the other acids, the most important are the *citric*, the *benzoic*, and the *boracic*. The *citric* is serviceable in the states of the disease for which the acetic is given; but, either in the pure form or as it exists in lemon-juice, it is most useful as an adjunct to beverages, or in combination with the alkalies. In these latter states it aids, with other means, in preventing, counteracting, or removing the morbid conditions of the circulating fluids in the advanced stages of phthisis. *Benzoic acid* has been frequently advised in various combinations for this disease, but has rarely been confided in alone. It is chiefly in the more asthenic and colliquative conditions that it is at all of service. I have seen more benefit from the *boracic* than from benzoic acid. Either of these acids may be given conjoined with mucilaginous, balsamic, and expectorant medicines, when these are indicated. The boracic acid and its alkaline salts—the biborate of soda and B. of potash—are not contra-indicated by the inflammatory diathesis, and may be given in those states in which the mineral acids are inappropriate. I have found the *dilute phosphoric acid* of much service in the few cases in which I have tried it. It may be prescribed in doses of 20 to 40 minims in cases of phthisis characterized by vital depression or exhaustion, especially when

the disease appeared to result from depressing causes, or from masturbation. For such it may be given in the infusion of absinthium, or of ginseng root, with or without the addition of the tincture of sumbul.

369. *Aconite* was first prescribed for phthisis by PORTAL, who afterward relinquished the use of it. BUSCH gave the powder of the dried leaves in doses of two grains every two or three hours, and increased the dose until a drachm was taken in the twenty-four hours. I have prescribed the powder in smaller doses in a few cases, and the extract in doses of a quarter of a grain in others, cautiously increasing the dose; but I have ventured upon it only in the more inflammatory states as a substitute for bleeding. I cannot say that it was so beneficial as BUSCH and HAREL DU TANEL have stated it to have been. It had, however, the effect of lowering the pulse, of causing perspiration, of diminishing pain, and of affording ease; and although I cannot view it, with the writers just mentioned, as a cure for phthisis, yet I consider it as an excellent medicine in the more inflammatory states and complications of the disease, when prudently exhibited, or when its doses are increased, or its use interrupted and resumed from time to time, as circumstances require.

370. *Alkalies and alkaline salts* are serviceable in several states of phthisis. The former, and their sub-carbonates, were much praised by BARKER and SPALDING. I have often prescribed the liquor potassæ and BRANDISH's alkaline solution in the scrofulous forms of the disease, with sarsaparilla, demulcents, and narcotics, and, in the protracted form, with tonics or bitters and anodynes, with temporary, and sometimes with permanent benefit. In certain states, and more particularly when the blood is probably more or less contaminated by the passage into it of morbid matters from the lungs, the alkalies are often advantageously combined with the solutions of the neutral salts, as the bicarbonate of potass with the nitrate, or the solution of the acetate with the carbonate of ammonia, and with the other substances now mentioned.

371. *Ammoniacum* was frequently prescribed in phthisis, and often injudiciously, especially in combination with squills or other heating gum-resins. It should be given only in the more chronic states of the disease, and even in these with caution, and rarely with the medicines now mentioned. I have prescribed it with benefit when an expectorant was required, and when no inflammatory complication existed; but if the cough became severe or hard during its use, it was always relinquished. I generally gave it as follows:

No. 359. R Ammoniaci, ʒjss. tere cum Aq. Destill. ʒivss.; dein adde Vini Antimonialis, ʒij.; Liq. Ammoniacæ acetatis, ʒij.; Tinct. Conii (vel Tinct. Hyoscyami), ʒij.; Syrupi Althææ officinalis ad ʒviij. misce. Sit mistura, cujus capiat cochl. j. vel ij. larga, 4tis vel 6tis horis.

No. 360. R Ammoniaci, ʒjss.; Tinct. Benzoini Comp., ʒij.; Tinct. Camphoræ Comp., ʒss.; Aquæ Flor. Aurantii, Aq. Sambuci, aa, ʒij. Tere bene, et adde Tinct. Conii, ʒjss.; Acidi Hydrocyanici diluti, ʒss.; Syrupi Tolutani, ʒij.; Syrupi Althææ officinalis ad ʒviij. Misce. Capiat cochl. j. amplum, 3tis vel 4tis horis.

No. 361. R Ammoniaci, Balsami Sulphuris Anisati (vide § 400), aa, ʒj.; Extr. Hyoscyami (vel Conii), ʒij.; Saponis Castil., ʒss.; Extr. Glycyrr., ʒss. Misce. Fiant, secundum artem, Pilulæ L. quarum capiat unam vel duas, omni 4ta vel 6ta horâ.

No. 362. R Ammoniaci, Galbani, Extr. Conii, Saponis Castil., aa, ʒss.; Fol. Belladonnæ, gr. xv.; Antimonii Potassio-tart., gr. v. Contunde bene, et fiant secundum

artem Pilulæ xxxvj. Sumantur binæ vel tres ter in die. (The Pills prescribed by RICHTER (*op. cit.*) for tubercular phthisis.)

372. *Balsams* have been long in use in chronic pectoral diseases, and especially in phthisis; and although they are sometimes of service, they are as often injurious, unless they be given with great discrimination. Under this denomination the *Copaiba*, the *Peruvian*, and the *tolu balsam* fall more strictly; the others more correctly belong to the terebinthines and to the gum-resins, and to these likewise the older writers often extended the term. The circumstances and the combinations in which the balsams, and even the other substances often ranked in the same category, may be prescribed in phthisis, are the same as those which I have stated in respect of the exhibition of ammoniacum (§ 371). When it is considered that these medicines, and those closely allied to them, are appropriate only in certain states of the malady, that an empirical use of them may be as often injurious as beneficial, we should not be surprised at finding them recommended by DE HAEN, GODBOLD, SIMMONS, RUSH, &c.; and denounced by FOTHERGILL, FRIZE, and others. The *Copaiba balsam* was preferred by FULLER, HOFFMANN, MONRO, and GESSNER; but it is now seldom prescribed for phthisis. A substance becomes a remedy only by its appropriate use.—*Barytes, the hydrochlorate*, has been recommended in phthisis by HUFELAND, HERZ, and CRAWFORD; but although it has been prescribed by many, yet no satisfactory result has been adduced respecting it.

373. *Bitters and tonic infusions*, as those of absinthium, Gentian, Calumba, Chereita, &c., have been advised for phthisis by CÆLIUS AURELIANUS, CHALMERS, SALVATORI, RUSH, MAY, and PEARS, generally also with a nourishing and digestible diet. Although too generally and empirically prescribed by these and other writers, yet these medicines are often required in the usual and more chronic states of the disease, especially with the view of removing the symptoms of indigestion so frequently attending phthisis from its commencement, and of supporting the vital powers. These infusions, moreover, may be made the vehicles in which other medicines, whether saline, anodyne, or alterative, or narcotic, may be prescribed.

374. *Camphor* was given in phthisis by BURSERIUS; by MARX, with nitre and hydro-chlorate of ammonia; and by KORTUM with this latter salt. It is useful chiefly as an adjunct to other more appropriate medicines, or when it is given with the object of abating urgent symptoms. In small doses it is beneficial, especially when conjoined with nitre, the spirits of nitric ether, and a solution of the acetate of ammonia, in allaying febrile action and inflammatory complications. In larger doses, and combined with the sesquicarbonate of ammonia, it is of service in the advanced stage of phthisis, in rallying the vital power and in counteracting morbid conditions of the blood, while it promotes expectoration; and with the extract of conium or of henbane, or with a preparation of opium, it allays irritation, both locally and generally.

375. *Carbon or charcoal* was formerly much employed in the colliquative states of phthisis, in dysentery, and in putro-adyne fevers. I have given it at an early period of my practice in several cases, but generally with camphor, chalk, cascarrilla, and aromatics, in doses varying from a

scruple to a drachm, and chiefly with the intention of correcting the fetor of the excretions. SOBERNHEIM states that SCHÖNLEIN gave it in phthisis with digitalis; and GARRETT prescribed it with sulphur and the extract of the smaller centaury. I suspect, however, that whatever benefit resulted from these combinations cannot be imputed to the carbon. M. JOURDAN justly remarks, "Lorsque les théories chimiques régnaient en Médecine, on attribuait au Charbon végétal puissantes vertus dans la phthisie pulmonaire, la dysenterie, et surtout les maladies putrides. Le temps n'a justifié aucune des espérances qu'on avait conçues à cet égard."

376. *Cascarilla* was often prescribed with the same intention as cinchona and the medicines last noticed. I have given it only in the form of infusion in the more colliquative states and non-febrile forms of phthisis, and have generally made this preparation the vehicle for such other medicines as the peculiarities of the case suggested. *Cascarilla* has received the approbation of THULENIUS, WENDT, KRUGELSTEIN, and HECKER, in the usual and more chronic forms of the disease, indeed, in the states for which I have prescribed it. The historical sketch I have given above will sufficiently show the diversity of opinions as to the propriety of employing the tonic and astringent barks in phthisis, and more particularly as to the use of cinchona, &c.

377. *Chalybeates* have been already mentioned in connexion with the states of the disease in which they may be prescribed. They have been recommended by GRIFFITH, GÜNTHER, STANGER, SCHULLER, VELSEN, and many others. The compound mixture of iron, the ammonio-citrate of iron, the ammonio-chloride of iron, the solution of the pernitrate of iron, the potassio-tartrate of iron, the tinctures of the acetate and of the muriate of iron, and the compound pills of iron, are severally of use in certain states of phthisis; but there are few medicines which require greater discrimination and caution in their use in this disease than they. Cases which proceed from depressing and exhausting causes, in which the blood is poor in red globules, or which are free from inflammatory or hæmoptysic complications, are often benefited by chalybeates, as well as by other tonics, especially if dyspeptic symptoms are prominent; but their effects upon the cough, expectoration, breathing, pulse, and the accompanying hectic, should be carefully watched; and any aggravation of these should cause the discontinuance of the medicines and the adoption of other means. The good effects of chalybeates may be aided by other medicines, with which they may be conjoined according to the stage and complications and other peculiarities of the case.

378. *Cinchona*.—While DESAULT, DE MEZA, and ROMANS considered it injurious, and FOTHERGILL said that it was rarely of use, QUARIN, VOGEL, RAULIN, MARX, JAEGER, HORN, SCHMIDTMANN, and others, recommended it. HALLER, HOME, and CHAPMAN prescribed cinchona with a milk and vegetable diet. CALLISEN gave it with a powerful stimulant, the oil of asphaltum, of which notice will be taken hereafter; THOMANN with opiates; and RYAN and MAY with animal food. STOLL advised cinchona, when inflammatory symptoms were absent, and SIMMONS when the expectoration was abundant and puriform. METTERNICH preferred the extract, and gave it in large doses. In more recent times, the sulphate

of quina has been substituted for the preparations of cinchona, in phthisis as well as in other diseases; but I doubt the advantage of the substitution as respects this malady, for the infusion, the decoction, the extract, and the compound tincture of cinchona, furnished the physician with the means of selection according to the features of the case for which he was prescribing. However, the sulphate of quina is an excellent medicine, when it is desirable to have recourse at the same time to an acid and to an astringent; and then it may be given in the compound infusion of roses, and at the same time also, as advised by GUENTHER, AMELUNG, DROSTE, and some other German writers, with the tincture of digitalis, or with the powder of digitalis in the form of pill. I have prescribed it with small doses of camphor and conium, with benefit in some states of the disease.

379. *Conium* has, from the days of STOERCK down to the present time, been more generally employed in phthisis and scrofula than perhaps any other medicine. It has been praised by QUARIN, ZEVIANI, FOTHERGILL, ADAIR, BUTTER, BUSCH, HUFELAND, and many others; and yet there are few medicines whose effects in phthisis are more equivocal, and, as usually employed, are more uncertain. At the present day it is seldom confided in alone; and when given as an adjunct to other means it is often in insufficient doses, or in imperfect states of preparation, and not persisted in for the time required to evince its effects.

380. *Creasote* has been recommended for phthisis by SCHROEN, REICHENBACH, CARTONI, RAMPOLD, and others. I have employed it, since its introduction to medical practice, chiefly as an adjuvant of other means in the last stage of the disease, and for the mitigation of the disorders of the stomach and bowels—of nausea, vomiting, diarrhoea, &c. It is also of great benefit when used to slightly impregnate the air of the apartment in which the patient chiefly resides (§ 413). *Creasote*, however, should not be prescribed in the circumstances contra-indicating chalybeates and tonics—when the cough is dry, hard, or constrictive—when a state of erythema or of active congestion is inferred, and when an inflammatory complication or active hæmoptysis is present. It is chiefly in the colliquative or asthenic conditions of phthisis that it is a valuable adjunct of other means, and especially when the excretions are more or less fetid, and the circulation is contaminated by the passage of morbid matters into it from the primary seat of disease.

381. *Digitalis* has been recommended by some, and praised by others, for phthisis. Indeed there is, perhaps, no other medicine which has been more generally employed in this disease, and whose operation has been less understood, than digitalis—has, in short, been more empirically prescribed. It has been sanctioned by BEDDOES, WITHERING, DARWIN, FERRIAR, SPENCE, FOWLER, KINGLAKE, MAGENNIS, MEYER, and THOMAS. Dr. DRAKE says that citric acid counteracts its unpleasant or cumulative effects, when given in too frequent or too large doses. While the above, and many continental writers, are favourable to the use of digitalis in phthisis, BREE and BAILEY contend that it is injurious in some cases and useless in others. I have, however, seen some benefit derived from the infusion, prescribed at first in very large, and afterward in rapidly

diminished doses; especially in the hæmoptysic and febrile states, and in the congestive and inflammatory complications of the disease.—*Dulcamara* was advised for phthisis by BURSERIUS, and afterward by STARK, RICHTER, and HUFELAND, who generally gave it in conjunction with the Iceland moss.

382. *Emetics* have been recommended for phthisis since the days of HIPPOCRATES to the present time. MORTON, BRYAN-ROBINSON, MARRYAT, SIMMONS, SIMS, KENTISH, MARET, REID, METTERNICH, SWEDIAUR, PARR, RICHTER, DUMAS, &c., advise emetics at an early stage of the disease; some, as REID, BAYLE, and others, with a frequency which appears to be excessive or even injurious; others, as YOUNG, CLARK, WITT, &c., in a more moderate and rational manner. Many physicians in Italy, early in the present century, pretended to have cured phthisis by the exhibition of a solution of tartar emetic, in the infusion of the flowers of the *sambucus nigra*, or in other emollient infusions—generally three grains of the former in six ounces of the latter. A quantity sufficient to produce vomiting was directed night and morning, and milk and water were drunk freely. If diarrhœa supervened, digitalis and ipecacuanha were prescribed in small and frequent doses, with other means calculated to moderate or arrest the diarrhœa, and the emetic tartar was relinquished.

383. *Emetics* are often of service, especially in the early stage of the malady, and when advised as above (§ 306, 317); but they should be prescribed with caution, and with strict reference to the functions of the stomach and liver, and to the assimilative and vital powers. I have already mentioned those which may be preferred; but even they ought not to be given so as to impair digestion and assimilation; and if these functions be weakened by them, or in cases where this risk appears great, mild tonics and a restorative and digestible diet, aided by external derivation, should be prescribed. In the advanced stages of phthisis, emetics are of more doubtful advantage, but even in these they may be of service. BLUMENBACH recommended them even in the third stage; but either in this or in an earlier period, they sometimes constitute an important part of rational practice, especially if appropriately selected, when the digestive mucous surface appears to be loaded by sordes, when the expectoration is difficult or scanty, the breathing suffocative or oppressed, and the biliary secretion interrupted, or deficient in the evacuations. But even in these circumstances, vital power should not be exhausted by a too frequent recourse to them, and the digestive functions ought to be restored soon afterward by suitable tonics and anodynes, as the infusion and tincture of calumba, or of chereita, or of other bitter tonics, with hydrocyanic acid, conium, &c.; or with one of the vegetable extracts, the purified ox-gall, &c., in the form of pill. *Ipecacuanha* is useful in phthisis not merely as an emetic, but as a nauseant, expectorant, and promoter of digestion, and as a corrector of morbid actions in the bowels, according to its dose and mode of administration. As a nauseant it was praised by PIDERIT, BARBARI, and others; and it certainly is a valuable medicine in the more inflammatory and hæmoptysic states of the disease; and in the form of pill with bitter tonics and anodynes, or astringents when the bowels are much relaxed.

384. *The iodides*, especially the iodide of potass,

have been employed in phthisis, but are appropriate only in the more chronic states of the disease. Since the discovery of iodine, the use of its preparations in scrofula had extended to tubercular consumption. The earlier prescribers of this substance, and of iodides generally, erred in giving them in too large doses, in scrofulous and other diseases, and in neglecting to conjoin them with a sufficient quantity of alkalies, whereby the irritating effects of the iodine, or the decomposition of the iodide, by the acids of the stomach, might be prevented. Thus, even when a very small dose of the iodide of potass is prescribed in a vehicle suited to the features of the case, the solution of potass or the bicarbonate should be given in sufficient quantity to prevent the decomposition of the iodide. Whatever form or combination of iodine is given in phthisis, the effect upon the digestive functions, the pulse and the cough should be watched, and if it induce dyspeptic symptoms, or aggravate those already present, it should either be relinquished, or the dose of it much reduced. *The Karageen Moss*, or *Fucus crispus*, has been long employed as a popular remedy in consumption, and it has been favourably noticed by M. BÉRAL, myself, and others. It, as well as others among the fuci, may be used as a demulcent in this disease, with some benefit, probably arising in part from the minute quantity of iodine this class of sea-weed contains.

385. *The Lichen Islandicus* has been very commonly used in consumptive cases by QUARIN, BERGIUS, THILENIUS, MARX, RÉGNAULT, RICHTER, SCHMIDTMANN, CHRICHTON, and others. It is one of the most generally useful medicines in this disease; its bitter, demulcent, and tonic properties, divested of exciting action, rarely proving injurious, even in the most febrile cases. WENDT, myself, and others, prescribed it with milk, adding to these such other medicines as the circumstances of the case required. SACHTLEBEN recommended a decoction of three ounces each of the lichen, and of the *polygala amara*, of six drachms of liquorice-root, and of three drachms of *dulcamara*, to be made with milk, as a preferable mode of prescribing the lichen in consumption. The decoction of these substances is best made with water to which a small quantity of the carbonate or solution of potash is added, boiled milk being added to the strained decoction, and such anodynes or other remedies as the peculiarities of the case suggest.

386. *Lactucarium* was much employed by DUNCAN, ROTHAMMEL, and FRANÇOIS to allay the cough in phthisis and bronchitis, and was considered appropriate in the inflammatory state of the disease. It may be given under almost any circumstances with this intention, and may be conjoined with the ipecacuanha, digitalis, demulcents, mild tonics or bitters, or other medicines suited to the case.

387. *Lead, the acetate of*, has been often prescribed in phthisis, but chiefly with the view of arresting hæmoptysis, and it has then been given either with opium and ipecacuanha, in the form of pill, or in solution, with the addition of acetic acid. These combinations of acetate have been advised by KOPP, STARK, ETTMÜLLER, AMELUNG, HILDENBRAND, HORN, and others. WEBER prescribed the acetate with digitalis, myrrh, balsam of Peru, extract of hellenium, and mucilage, in the form of pills. HOFFMANN preferred the

phosphate of lead, in the dose of a grain, to the acetate, and conjoined it with the extract of henbane.

388. *Lime water* and the *muriate of lime* were advised by QUARIN, MARX, BEDDOES, and HUFELAND. Effervescing lime water (*Carara water*) is very advantageously given with milk, especially when the bowels are much relaxed. For this state of the malady not only may catechu, kino, and other means already recommended for it, be employed, but the nitrate of silver, the extract of nux vomica, tar made into pills with liquorice powder, &c., also be individually tried.

389. *Mercurials* are occasionally of service in phthisis, especially in certain states of the disease, and when judiciously combined with other medicines. Mercury with chalk, the blue pill, or Plummer's pill, will be of service, when the biliary functions are torpid, either alone or with soap and taraxacum, or with the compound rhubarb pill, or with the aloes and myrrh pill, when the digestive functions require to be assisted. In the more inflammatory states or complications of the disease calomel may be prescribed, as advised by BEDDOES; although it should not be pushed so far as to produce salivation, as recommended by RUSH, unless the disease be consequent upon syphilis; when the very unfavourable state of the malady may require this decided treatment. When partial pneumonitis, or pleuritis, or pneumo-pleuritis complicate phthisis, then calomel may be employed, and be beneficially conjoined with antimonials, or with ipecacuanha, or with opium, or with other narcotics. The beneficial effects of the bichloride of mercury, prescribed in the decoction, or in either of the tinctures of cinchona, in scrofulous cases, have induced me, as well as other physicians, to employ the same combination in the more manifestly scrofulous states of phthisis, and in some instances with much benefit; but in my own cases, as other means were also employed, especially the external treatment about to be noticed, the amount of benefit derived from the former could hardly be determined. SCHAEFFER and VALENTIN have also given the bichloride with tonics and opium in phthisis, and, as they conceived, with advantage.

390. *Myrrh* and various gum-resins, especially *asafetida*, *galbanum*, &c., are most appropriate in the more chronic or protracted forms of phthisis, when they are attended by dyspnoea or difficult expectoration, and in females when the catamenia are difficult or scanty, or when the disease has been caused by depressing or exhausting causes. They are contra-indicated during inflammatory states and complications, and in the febrile forms of the malady; and are best suited to the circumstances of the disease which admit of chalybeates, tonics, balsams, cinchona, &c. In the form of GRIFFITH'S mixture (§ 314, 377), or when conjoined, as in the compound galbanum, or compound iron pill, or when farther combined as with soap, extract of conium, or extract of henbane, they are sometimes of service.

391. *The oils*, especially *fish oils*, have only recently been employed in consumptive diseases, although they have been long previously used in other disorders. HANKEL appears to have been the first to prescribe the *cod-liver oil* in phthisis in Germany, and Professor BENNETT in Edinburgh, to whom the credit of having first recom-

mended it is clearly due. Contemporary with the earliest employment of it in this country, it was prescribed for a lady, whom I frequently saw in consultation with my friend Dr. BAIRD; and at that time it was not to be had in London, Mr. MORSON having procured it, at our request, from the continent. Since then I have employed it in this and several other diseases, and have always seen more or less benefit derived from it, especially in the more usual, and in the protracted states of phthisis. It may be given in various ways; but generally with greatest benefit, from an hour to two hours after a meal, in the dose of half an ounce or even more for an adult, on the surface of any agreeable vehicle, as of an infusion of orange peel, or of any bitter tonic or aromatic infusion, with either a little acid or carbonate or citrate of an alkali, and any anodyne, &c.; or on the surface of milk, or of ginger or orange wine, &c. This oil may be taken twice or thrice daily, and in all stages of the disease. After continuing it for some days or weeks, it may be intermitted for a few days, and medical treatment may then be directed more especially to the digestive functions, and to the promotion of the biliary and intestinal secretions and excretions; and after such intermission, its use should be resumed and continued for a time which the state of the case and its effects will indicate.

392. All the *fish oils*, especially the oils from the livers of the *Torsk*, *Cod*, and other fish which I have enumerated above (§ 336), are beneficial in phthisis, especially when they are recent or fresh, and then they may be taken in larger quantity. The common use of fish oils in the most northerly countries of Europe probably is partly the cause of the infrequency of phthisis in those countries. The use of vegetable oils, especially *olive oil*, in countries near the Mediterranean, and in the north of Africa, may have the effect of diminishing the number of phthisical cases in those countries; and the adoption of the *palm-oil nut*, as an article of food, in Western Africa, and of the oil for daily inunction of the surface of the body, may have a similar effect on the natives of that part of the world. It is not unlikely that other mild vegetable oils, as *linseed*, *almond*, &c., may also prove of service when taken in sufficient quantity, and when judiciously conjoined with other medicines. Formerly the *oil of asphaltum* or of bitumen was often prescribed for phthisis, especially by CALLISEN, BANG, THILENIUS, HEALDE, and others. QUARIN said that it was only slightly palliative, while FRIZE considered it injurious. It was probably employed then, as other things have been used recently, or are praised now, merely with the object of being, with their abettors, talked of.

393. *Opium* and *Opiates*, in various forms, have been advised in phthisis by many writers, and condemned by others. There are, however, states of the disease which indicate the propriety of having recourse to them, and circumstances which contra-indicate their use. They are more frequently injurious than beneficial in the first stage of the disease, although TRALLES has given a different opinion. Sometimes in the second stage, but most frequently in the third stage, opiates, or even the preparations of morphia, are of great service; but much of the benefit produced by them will depend upon the combinations in which they are prescribed. MARCUS gave them with myrrh and Peruvian balsam.

and, in the advanced and more chronic states of phthisis, this combination, or that with the compound galbanum pill and the compound soap pill, will be appropriate. PEART advised opiates to be given with the carbonate of ammonia, ether, and aloes; and J. FRANK laudanum, with the aromatic sulphuric acid. In the third stage of the disease, preparations containing more or less opium, especially the compound tincture of camphor, the compound styrax pill, pills of ipecacuanha and opium, &c.; and, when diarrhoea is present, the opiated cretaceous powder, the compound cretaceous powder with opium, the compound ipecacuanha powder, the compound kino powder, or the combination of opium with the extract of nux vomica, or with the nitrate of silver, or with the sulphate of copper, or with the sulphate of zinc, will be found individually of service, when judiciously prescribed. When there is much debility, opiates should not be given in full doses, unless they be combined with aromatics, tonics, or stimulants, or with balsams or gum resins; and when the preparations of morphia are preferred to other opiates, then this recommendation should be especially kept in recollection, because I have seen much distress result from its neglect.

394. *The Phyllanthium aquaticum*, or water hemlock, especially the seeds and herb, has been much recommended for phthisis by STERN, OSWALD, FISCHER, J. FRANK, RICAMIER, ROSEN-MÜLLER, HENNING, MICHAELIS, &c., who have employed chiefly the powder of the seeds, in doses of ten to twenty grains, the decoction and tincture. Its action is stimulant, narcotic, and diuretic. Some of the authorities now adduced have given this medicine with sulphur. LANGE prescribed it after bleeding, in robust or plethoric cases, in goats' milk twice or thrice daily; HERZ, with nitrate of potass, sugar of milk, and gum Arabic, thrice daily; and HUFELAND, MÜLLER, CHIAPPA, REMER, BERKUN, and HEINE, in various forms and combinations—in powder, decoction, and tincture.

395. *The Polygala amara* has been much praised in phthisis by THILENIUS, PLENCIZ, COLLIN, BAUME, FRIZE, &c., and is certainly to be preferred to the *Polygala senega* in this disease, as it is more tonic and pectoral than this latter. It was formerly much employed in consumptive diseases, but has now fallen into undeserved neglect. The root is chiefly used; and either in powder (from fifteen to thirty grains), or in extract or infusion, or decoction, in which forms it is directed in several of the Continental pharmacopœias. The *Polygala Senega* is much more stimulating than the *P. amara*, and is not appropriate in the more inflammatory and complicated states of phthisis, unless it be given with ipecacuanha, or with antimonials, so as to occasion nausea or vomiting. The decoction is, however, sometimes of use, not only when prescribed with this intention, but also in the less febrile and more chronic forms, or in the advanced stages, when it is desirable to promote expectoration or to relieve dyspnoea; and in these circumstances it may be conjoined with orange-flower water, or with hydrocyanic acid, or conium, or the compound tincture of camphor, or with other anodynes, as the peculiarities of the case will suggest.

396. *Salix*, &c.—Besides the barks already mentioned (§ 376, 378), others, especially the

willow, the *cedar*, the *larch*, and *fir-barks*, have also been employed in phthisis, but they are useful chiefly as tonics and astringents, and have few other virtues to recommend them. GOURAUD and SCHNEIDER prescribed an extract of the middle bark of the *willow* in this disease; and the *cedar* and *pomegranate* barks were prescribed not merely as tonic in phthisis, but also with the object of destroying intestinal worms, with which this disease was sometimes complicated, especially in low, cold, and damp localities.

397. *Sage* is an old and popular remedy for coughs and colds; it was also much used in pulmonary consumption. It is by no means a bad adjunct to other medicines, and may be advantageously combined with the decoction of *marsh mallows*, in which form it was prescribed by QUARIN and others.

398. *Salts and saline solutions* of various kinds have been prescribed for phthisis, with the intention of moderating the hectic and other symptoms rather than with hopes of curing the disease, although several of them may be as rationally considered capable of effecting this latter object as many other medicines which have been employed with this expectation. Of this class of substances none are more generally useful than the solution of the acetate of ammonia, and of the citrates of the fixed alkalies, of ammonia, and of magnesia. The solution of *acetate of ammonia* is of service chiefly in the early stage of phthisis, and may be prescribed, according to the state of the case, with the nitrate of potash, sweet spirits of nitre, and camphor mixture, with hydrocyanic acid, or with compound camphor mixture, or with conium, henbane, &c. In more advanced or chronic states the ammonia of the acetate may be given in excess, and other medicines substituted for some of those now mentioned. The *citrates of potass*, of *soda*, and of *magnesia* are of service, either individually or with the nitrate of potass and the other substances enumerated, chiefly in advanced stages of the disease, when the blood becomes contaminated by the absorption of morbid materials. In similar states of phthisis the *carbonates of the alkalies* are also of service, especially when given with the *nitrate of potash* or with the *chlorate of potash*, in solution or in vehicles—bitter, tonic, or demulcent—suitable to the requirements of particular cases. The *hydrochlorate of ammonia* was much employed by THILENIUS and MARX in phthisis, as well as in all forms of hectic and in some other fevers, periodic and continued; and was a favourite remedy in these diseases among German physicians early in the present century.

399. The *secale cornutum* has been found very efficacious in arresting the hæmorrhage, in the hæmoptysic states of phthisis. Dr. T——, who had been for many years subject to attacks of hæmoptysis, had recourse, and generally with success, to the *secale*, in doses of five grains, at intervals of a few minutes, until the discharge began to cease. It was not until at an advanced period of life, and when travelling on the railway, that he was disappointed in the effects of this remedy, for he always carried it on his person. I saw him on his arrival in town, and prescribed oil of turpentine. The hæmorrhage returned some time afterward, and produced suffocation. I had an opportunity of examining the lungs. The appearances are noticed in another place

(§ 91). The hæmorrhage proceeded from ulcerated vessels.

400. *Sulphur* was formerly much employed in phthisis, and was prescribed either in combination with myrrh and various balsams, gum resins, or powders, or in the form of a balsam or electuary, prepared with an essential oil, as the oil of anise seed, or with honey or sirup, and given with such other medicines—demulcent, emollient, anodyne, absorbent, or narcotic—as the state of the case suggested. The anisated balsam of sulphur especially, and other combinations of this substance, were strongly recommended by ETTMÜLLER, BUSCH, SIMS, AGRICOLA, ROLLO, and others. HUNOLD prescribed it with charcoal in the advanced stage of the disease. The *anisated balsam of sulphur*, the preparation most frequently used, consisted of one part of the flower of sulphur and four parts of the oil of anise seed, which were digested in a sand-bath. If diarrhœa was present, the sulphur was given with preparations of chalk, or with astringents and tonics. Sulphur has long since fallen into disuse in phthisis; but I have seen much benefit from it in several states of the disease, when judiciously combined and prescribed.

401. *Tartar emetic* was prescribed by SCHLEGEL in small and frequent doses, and was probably employed by him and others on account of the apparent benefit derived from it and other antimonials in the inflammatory complications of the disease. The contra-stimulant doctrine in vogue in Italy at the end of the last century, and in France at the commencement of this, carried the use of tartar emetic in diseases of excited action to an extravagant height; and very probably more injury than advantage was derived from it, owing to its improper use. However, in the more inflammatory, and in the more active hæmorrhagic states of the malady, it is often of service when given either as an emetic, or in frequent small doses, as a contra-stimulant.

402. *Tussilago farfara* has been for ages a popular remedy for chronic coughs and consumptions; and the several parts of the plant have been used in the form of infusion, decoction, electuaries, sirups, &c., for these complaints. It was recommended for phthisis by PERCIVAL, REUSNER, KRAMER, and others; and the mucilaginous, bitter, and mildly tonic virtues of the plant appear to warrant their recommendation.

[The *Black Snake-root* (*Cimicifuga racemosa*) has long been a very popular remedy in consumption in this country, and has been highly recommended by several able practitioners, as Dr. GARDEN, of Virginia (Am. Medical Record, Oct., 1823), and Dr. HILDRETH, of Ohio (Am. Jour. Med. Sci., N. S., iv., 281). It is believed to allay pulmonic irritation like the wild cherry bark, and to exert a sedative influence over the circulation. Dr. HILDRETH recommends employing it in the early stages of the disease, in connexion with iodine.]

403. *Turpentine*, in the various modes of its existence, from the essential oil through the terebinthinate balsams to the pine-tops, tar, and tar-water, have been for ages found of benefit in various states of phthisis, some in certain states, and others in other states. These substances, in their several modes of employment, are often of service, not only when exhibited internally, but also when employed externally, and when the much diluted vapour, or even the odour from

them, is inhaled into the lungs. In the hæmoptysic states of phthisis, when it is proper to arrest the hæmorrhage, there is no remedy that is more certainly efficacious than turpentine, when exhibited in small and frequently repeated doses, epithems of the same substance being applied over the chest. It may be taken in doses varying from twenty minims to a drachm every hour, or two or three hours, according to the urgency of the case; or even oftener, either mixed in honey and liquorice powder, as prescribed by GASSER and myself, and as advised in a memoir on the use of this medicine, published in 1820, in the London Medical and Physical Journal; or as directed in a case lately attended by Mr. W. BARNWELL and myself.

No. 363. R Olei Terebinthinæ, ʒiiss.; Spirit. Ætheris Sulphurici Comp., ʒij. Pulv. Tragacanth. Comp., ʒijss.; Mist. Camphoræ, ʒij.; Syrupi Rosæ et Syrupi Tolutani, aa, ʒjss.; Aquæ destillatæ ad ʒvj. Misce. Fiat mistura, cujus sumatur pars quarta, quartâ quaque hora.

404. The quantity of the oil may be diminished or increased, or the frequency of the dose increased or otherwise, according to the circumstances of the case. There are almost no complications of phthisis which contra-indicate the use of this remedy, when judiciously prescribed, as respects the dose and mode of exhibition; and especially when employed externally also, as hereafter recommended. The terebinthinate substances, in which the essential oil exists in different forms and combinations, are also beneficial when suitably prescribed. The infusion of *pine tops* was praised by CÆLIUS AURELIANUS for phthisis; *tar-water* was recommended by Bishop BERKELEY for this and other diseases; and *tar* was given by SIMS for this malady. I have had recourse to these, especially to tar and tar-water. Tar, in the form of pill, with liquorice powder, is often of great service in the colliquative states of diarrhœa, and when there is reason to fear incipient ulceration of the mucous follicles of the bowels. Tar-water, when sufficiently weak not to be unpleasant to the patient, is also of service in this state of the disease, and in its hæmorrhagic and congestive complications. Indeed there are several states of this malady, and several other diseases, in which both tar and tar-water may be very usefully employed. The injudicious or rather extravagant praises of some writers at the commencement of the last century have caused the complete disuse of an excellent remedy.

405. *Uva ursi*, in powder, decoction, and extract, was recommended for phthisis by Dr. BOURNE, and subsequently by Drs. HAMILTON and DAVY. The tannic and gallic acids it contains, and its astringent and tonic qualities, would justify its use in several states of this disease, especially in the hæmoptysic, and in the colliquative sweats and diarrhœa which occur in the advanced stages. It may, moreover, be combined with other remedies—demulcent, tonic, and anodyne—with opiates, bitters, &c., according to the peculiarities of the case.

[*Alcohol* has recently come into extensive use, not only as a prophylactic, but also as a curative agent in the treatment of tuberculosis. Dr. MARSHALL HALL a few years since extolled very highly the efficacy of alcoholic inhalation, as calculated to check both the deposition and softening of tubercular deposits; one part alcohol to three water is applied, at first tepid, afterward

of the temperature of the air, by means of a few folds of soft linen across the upper part of the chest, the compress to be fastened to the shoulder-straps or other part of the dress, and moistened every few minutes by means of a small sponge. Dr. H. recommends that it be applied every five minutes during the day, so as to secure a constant effect, and he states that it possesses a power in checking the progress of the deposition and softening of tubercle in the lungs beyond any other which he has ever tried. He speaks also of "numbers of patients who have recovered under its use. When taken in this way, as well as through the medium of the stomach, alcohol promotes digestion, retards the metamorphosis of tissue, and sustains the animal heat." As the process of tuberculization, as we have seen, is due to defective hæmotosis and imperfect nutrition, we might, *a priori*, expect that alcohol would prove beneficial. Its prophylactic power, however, we believe to be overrated. The alleged facts on this point need revision. The whole treatment of this disease may be summed up in the aphorism of Dr. RUSH: "The remedies for consumption must be sought for in those exercises and employments which give the greatest vigour to the constitution."]

406. *Venæsection* and other modes of vascular depletion, as by cupping or leeches, or by the application of these last to the anus, as insisted on by PLENCIZ and LÄKEREN, with antiphlogistics, emollients, and demulcents, have been advised by many in the early stage of the malady. At this stage venæsection, hardly amounting to more than eight or ten ounces at a time, and repeated according to circumstances and to its effects, has been recommended by MORTON, MEAD, PRINGLE, MONRO, FOTHERGILL, SALVADORI, STOLL, HOSACK, FARR, CHEYNE, and others. I have stated above (§ 309-313) the circumstances in which the practice may be adopted; and that it should not always be accompanied with other antiphlogistic remedies, either in an early stage, or when prescribed for inflammatory or hæmorrhagic complications; for depletion, although manifestly indicated, may be followed, in many cases, by suitable tonics and nutrients, provided that exercise be taken with due care in the open air, and that the external derivation about to be noticed (§ 415, 416), such as issues or setons, be kept discharging. RUSH advised, for cases requiring venæsection, recourse to it in preference, in spring and autumn. But this recommendation is in conformity rather with an old custom than with correct pathological inference. RHODIUS, TRACY, and RUSH considered an attack of hæmorrhage from the nares, rectum, or even from the lungs, beneficial, and the larger the better, and that it should not be too soon arrested, unless manifestly injurious. The opinion is certainly often correct, but the numerous exceptions should not be overlooked.

407. *Various other substances* have been prescribed for phthisis by eminent writers; and, although they may be of little use, farther than as adjuncts to other more beneficial remedies, they may be very briefly enumerated at this place. The *arum triphyllum* was recommended by BURTON, in the form of decoction with milk, the *carduus benedictus*, either in decoction, infusion, or extract with senega, by THILENIUS; the *cryngium campestre*, by HOFFMANN; the *geum urbanum*, by BUCKHAVE, in doses of a scruple and

upward of the powder of the root, as a tonic and astringent; the tops and flowers of *hypericum*, for its balsamic, bitter, and tonic qualities, by LINNÆUS; the *nasturtium aquaticum*, by POUTEAU and BRILLONET; *myrrh*, conjoined with sulphur, or various other substances, by numerous writers; the *rhys radicans*, by GIBSON; the *raphanus*, or horse-radish, by SCHENCK and OSIANDER; the *marubium vulgare*, by ALIBERT, a popular remedy, in various forms of preparation, for pectoral complaints in most European countries; the conserve and other preparations of *roses*, by MOSELEY and very many other writers; the *phosphoric acid*, by GOEDIN; the *sulphate of iron*, by STRANGER; and *taraxacum*, by SCHMIDTMANN. These hardly require any remark. They may be employed under circumstances which prevent the use of other more beneficial remedies; or in conjunction with such means as have already been advised, as with the Iceland moss, digitalis, conium, &c., or with bitters, as absinthium, calumba, cascarilla, arnica, &c., when a restorative diet is required, or when indigestion, flatulence, or sinking are experienced. In certain states or complications, as in those just named, the preparations of ammonia, as the carbonate, &c., or the ethers, may be conjoined with other means with benefit. Of the ethereal preparations, the compound spirit of sulphuric ether, the spirits of nitric ether, and the hydrochloric ether are the most useful. In cases where I have prescribed the hydrochloric or nitro hydrochloric acids, with or without the hydrocyanic acid, I have often added the hydrochloric or other ethers when the state of the case required such an addition.

[In this connexion the *wild-cherry bark* deserves favourable mention, for its admirable combination of sedative and tonic properties. The cold infusion of the inner bark of *Cerasus Scrota* has long had a high reputation in this country, in cases of general debility, with feeble digestion, and frequent pulse, and especially in pulmonary tuberculosis. It rarely fails to lessen the frequency and increase the force of the pulse, while it invigorates all the functions. "Few remedies," says Prof. WOOD, "are better adapted to hectic fever, from whatever source it may proceed." The best preparation is the cold infusion, made with half an ounce of the bark to a pint of water, prepared by percolation, and given in doses of two ounces three or four times a day. It may be used to great advantage in connexion with cod-liver oil.]

408. xiii. MINERAL WATERS have been recommended by several authors; but they require much caution and consideration before entering upon the use of any of them, when the disease has fully declared itself. In the scrofulous diathesis, and when the disease is threatened, or when its prevention should be attempted, these mineral waters are often of great benefit, when taken in proper quantity, and in suitable dilution, in certain cases. The quantity of these waters usually recommended is often not duly regulated, or suited to the nature of the case and to the effects produced; and hence they are either inefficacious or injurious. There are three kinds of mineral waters, which, when used in proper quantity and combination, and their effects watched, are sometimes beneficial both in the prevention and in the treatment of the early stages of phthisis; these are the *chalybeate*, the *sulphureous*, and the *alkaline*; each, however,

being suited only to certain states or forms of the disease. It should not, however, be overlooked that all these waters contain various proportions of different saline ingredients—the oxides or salts of iron, or sulphureted hydrogen, or alkaline carbonates, being present in certain of these waters also in various proportions.

409. *a.* The *chalybeate mineral waters* are chiefly indicated in those states of the disease for which the compound iron mixture has been recommended above (§ 378), more especially in lymphatic and phlegmatic temperaments, and when the pulse is weak, small, or slow, and the blood poor in red globules. Generally the weaker chalybeates, or the stronger more or less diluted, are most beneficial, and should be preferred for cases where their use is of doubtful propriety. The mineral waters of *Aix-la-Chapelle*, especially the sulphureted chalybeate, have been recommended for this class of cases; but the mineral waters of this country, of a similar composition, are equally appropriate with those, especially the chalybeate and saline spring at *Harrowgate*, which may be taken alternately with the sulphureous waters of that place. The mineral waters of *Kissingen* are also of service early in the disease, or when phthisis is threatened, especially when the several springs are employed under judicious medical direction.

410. *b.* *Sulphureous mineral waters* are often beneficial in phthisis, especially if the composition of the several springs containing sulphureted hydrogen gas be such as may be appropriately employed for individual cases. The several springs at *Harrowgate* supply a sufficient variety of composition to suit the various states of different cases. The waters of *Moffat* and *Strathpeffer* are stronger in sulphur than those of *Harrowgate*, but they present a less variety of composition. The waters of *Enghien* and *Barèges* may also be tried, but they offer even fewer advantages than those already mentioned.

[There are several mineral springs in the United States whose waters are reputed beneficial in phthisis pulmonalis, especially the chalybeate waters of *Saratoga*, and the sulphur and saline springs of *Virginia*, particularly the *Red Sulphur*. The latter, containing *carb. acid*, *nitrogen*, *oxygen*, *hydro-sulphuric acid*, *sulphate soda*, *carb. lime*, *carb. magnesia*, *sulphur compound*, &c., have the property of reducing the frequency of pulse and tranquillizing pulmonic irritation in a very remarkable degree. It is not uncommon for a hectic pulse of 120 to be reduced to the natural standard in the course of a few days under the use of the waters, while at the same time the appetite is increased, the night-sweats checked, and the general system invigorated. The medicinal virtues of these waters, together with the delicious climate in summer and autumn, the romantic scenery, and the accommodations and comforts afforded to the guests, render the *Virginia Springs* a pleasant and profitable resort to the invalid. The sulphur springs of *Richfield*, *Sharon*, and *Avon* also deserve favourable mention in this connexion.]

411. *c.* The mineral springs abounding in the carbonates of the alkalis, as well as holding various other substances in solution, have likewise been recommended for threatened and incipient phthisis. The chief of these are the waters of *Ems*, *Seltzer*, and *Vichi*. These are usually most beneficial when taken with milk or with whey.

The *Ems* waters are much praised by *BRUCHMAN* and others, and the *Seltzer* by *BANG* and *KRAMER*, in this disease, especially when diluted with milk or whey. The waters of *Cauterets* have also been recommended by many; and those of *Bonnes* and *St. Sauveur* of the *Pyrenees* have proved most beneficial in several instances which have come before me. Whatever mineral water be adopted, other means, medicinal, regimenal, and dietetic, are generally also required. Some advantage, moreover, is derived by consumptive invalids from change of scene and of modes of living, and from dryness of the air and elevation above the level of the sea, when they visit some of the inland or continental watering-places. Increased exercise in the open air, and in open day and sunshine, is also not devoid of some benefit.

412. *xiv.* *INHALATION* of various fumes and vapours, chiefly medicated in various ways, and by diverse means, has been advised by many.—*a.* I have seen several modes of inhalation employed, and have prescribed certain of them, but without any very manifest benefit. The great disadvantage of most of these means is occasioned either by the amount of aqueous vapour thus passed into the lungs, or by the irritating or other effects produced in the air-passages by the ingredients employed. I have already noticed the subject of inhalation above (§ 324), and when treating of *bronchitis* (see *art. BRONCHI*, § 98, *et seq.*); and the opinion I have stated under this latter head a farther experience has fully confirmed. I may mention, however, that the inhalation of sulphuric ether, with the vapour from preparations of conium, was advised by *DR PEARSON*; of vapour containing the fumes of *Burgundy pitch*, by *HOME*; of aqueous exhalations from *henbane*, *myrrh*, and “*naphtha vitrioli*” (sulphuric ether), by *JOERDENS*; of the fumes from *pine-tops*, and various balsams, by a number of writers; and of tar-vapour, by *CRICHTON* and *PAGENSTECKER*. But the usual modes of inhalation, especially those in which inhalers are employed, are most objectionable, and much more injurious than beneficial.

[After much experience in the use of inhalation in phthisis, we fully agree with our author that, in general, it is, as practised, more injurious than beneficial. We have tried a great variety of substances, as *iodine*, *chlorine*, *creasote*, *tar*, *bals. Tolu* and *Peru*, *styrax*, *benzoin*, *copaiba*, *turpentine*, &c., and we cannot say that we have ever seen any essential, permanent benefit from their use in tubercular phthisis. In bronchial disease they often prove useful by their local alterative action, and doubtless in many such instances exert a curative influence. As consumption is generally connected with bronchial irritation and inflammation, medicated inhalation often proves a useful palliative, allaying irritation, and affording some relief to the cough. Hence the popular belief in its efficacy in such cases. But in a constitutional affection like tuberculosis, the local application of medicines to the bronchial tubes, whether by inhalation or any other method, can only be expected to palliate, never to cure, the disease. Patients are often flattered into a belief that they are rapidly improving under this process, while all that is effected is a slight diminution of the most harassing symptom, viz., the cough. This mode of practice is now chiefly resigned to the hands of noted quacks and empirics, where it properly belongs.

The late *Dr. MORRIS*, of *Philadelphia*, em-

ployed inhalations to a considerable extent in every stage of phthisis, and, as he believed, with beneficial effects. In some cases he combined conium with iodine, after the manner of Sir CHARLES SCUDAMORE, as follows:

R Iodini puri, Iodidi Potassii, aa, gr. vj.; Aquæ distillatæ, ℥v.-℥vj.; Alcoholis, ℥j. Fiat mistura.

From ℥ss. to ℥j. of the saturated tincture of conium is added, with the same quantity of the iodine mixture, to the water in the inhaler of 120°, at each inhalation of 8 to 10 minutes' duration, increasing the quantity of each according to circumstances. We have tried this combination in several cases of phthisis with apparent temporary benefit. Instead of the above, Dr. MORTON came at last to prefer the following preparation:

R Iodini puri, gr. iv.; Foliorum Conii, gr. viij.; Etheris Sulphurici, ℥j.

Digest for 48 hours; add a teaspoonful to a wine-glass of warm or tepid water; hold in the hand, and inhale the vapour as it rises. In 10 to 15 minutes the evaporation is complete. If it causes cough or dizziness, use a smaller quantity, or hold it farther from the nostrils. Dr. MORTON preferred this method to the inhaler. The most that inhalation, however, can do, in any case, is to palliate some of the symptoms.]

413. *b. Weak fumigations* diffused through the apartment occupied by the patient are much more beneficial than any mode of inhalation; and the vapour, or the weak fumes, or rather the odours, exhaled from the substances employed for the purpose of impregnating the air of the apartment, are sufficiently strong to be respired by the patient in most cases. The greatly-diluted fumes or vapours proceeding from creasote, from tar, from turpentine or the several terebinthines, from pine-tops, from various balsams, from the ethers, especially pyroligneous ether or pyroxylic spirit, from cedar, and from resins, gums, &c., independently of any combination with aqueous or narcotic vapours, are generally much more beneficial and pleasant to the patient than the inhalations commonly employed. The embrocations so frequently recommended for this (§ 321, 322, 403) and several other diseases act beneficially, chiefly in consequence of the inhalation by the patient of the ingredients as they are evaporated, or as their dilute fumes are exhaled and diffused in the air surrounding him. A young man, who had repeatedly come under my observation in an advanced stage of phthisis, completely recovered his health after he had been for a considerable period employed in the manufacture of creasote. When the cough is distressing, the fumes of ether, arising from the sprinkling of one or other of these, especially of the spiritus ætheris sulph. comp., the pyroligneous ether or pyroxylic spirit, or the hydrochloric ether, or of chloroform, on the bed-clothes of the patient or on any article more or less removed from him, will often have a very palliative effect.

414. *xv. THE EXTERNAL MEANS* of treating phthisis have been already partly noticed (§ 319, 323).—*A.* Among these, *medicated and mineral baths* have been advised by several writers, more especially the warm mineral springs of the continent. Sulphureted chalybeate baths were recommended by LENTIN; the baths of *Baden* were praised by SCHENCK, and those of *Weisbaden* by RITTER, especially for the early stages of phthisis; but they are more likely to be of service for the pre-

vention of the disease, aided by more beneficial means; for very little dependence can be placed upon thermal springs or baths, either in the prevention or cure of this malady. Whatever benefit is derived in some cases is to be imputed as much to change of air, exercise, and regimen as to the effects of the baths.

415. *B. External derivatives and exutories* have been advised for phthisis from the earliest periods of medical history. I have stated above (§ 319-323) the modes in which these may be employed, and the general results of my experience of them. I shall only notice the opinions of a few writers respecting them: the views of many eminent authorities on this important department of medical practice may be gathered from the historical sketch I have given above (§ 242-287). During the course of my medical experience I have not observed this practice employed in the manner in which it is most efficacious. Tartar-emetic ointments, croton-oil liniments, &c., have been frequently resorted to in recent times; but issues and setons have been rarely employed, although the experience of numerous writers, as well as my own experience in several cases, has demonstrated their great utility. The selection of a situation in which an issue may be made or a seton inserted is often the chief difficulty in the way of either. BARTHOLIN directed an issue to be made in the back, below the scapulæ; DUPLAN and RIVERIUS between the scapulæ; GEBEL, DREYSIG, and BILLARD, in the upper arm; SIMMONS recommended a seton to be inserted in the pape of the neck; MONRO, PORTAL, and HILDENBRAND, in the arm; ZACUTUS LUSITANUS, at the edge of the pectoral muscle, near the axilla; WHYT and RUSH preferred the same situation for a seton, or near the sternum for an issue, LENTIN also selecting these places in preference to others. While these and many other authors have thus resorted to these means in phthisis, they have not considered them suitable to all states or stages of the malady. QUARIN, WINTINGHAM, and SOUVILLE, who have been less in favour of these means than the writers just referred to, consider them worse than useless in the far-advanced course of the disease, and when there is much exhaustion. Having often employed them with advantage—in some instances in the families of medical men of my acquaintance—I am enabled to state that I have generally preferred issues, kept discharging by means of a number of peas, to setons; that, when the patient is not much emaciated, some part of the breast, or over the margins of the false ribs, has been preferred; that this practice is of service chiefly in early stages, before cavities are formed, and in the more usual and chronic forms of the disease; that it is more especially beneficial in the hæmoptysic and congestive complications; and that it should not be resorted to in the more febrile, debilitated, and emaciated cases, and when the signs of cavities are manifest. It ought to be farther recollected that time is a necessary element in the development of the effects of this treatment; that the other means of cure, the diet and the regimen adopted, should be restorative and nutritive, without being heating or stimulating, especially as the discharge from the issue or seton becomes copious; and that air and exercise in the open day, avoiding injurious exposure, should not be neglected.

416. *C. Blisters, rubefacients, and embrocations*

(§ 319-323) have been sufficiently noticed. The first of these, when kept discharging for some time or frequently renewed, is often of service, and may be substituted for issues or setons when these latter will not be adopted by the patient. The *embrocations* which I have so often mentioned are of service, both as irritants or rubefacients, and as furnishing the best means of inhalation. *Cauteries*, actual or potential, formerly employed and recommended by HIPPOCRATES, GALEN, and others of the ancients, and by PORTAL, AULAGNIER, GARDOUIN, &c., among the moderns, are rarely prescribed; and even *moxas*, although much praised by LARREY and other recent writers, are seldom resorted to. *Urtication*, which was recommended by LANGE, is also superseded by other means. That pustular eruptions and purulent discharges artificially produced have more or less influence in delaying or arresting the progress of phthisis, when the disease is not far advanced, is among the most important facts in medical practice; but much more is required than an empirical recourse to such means. A knowledge of the cases, states, and stages of the malady in which they are likely to be of service, or at least not to be detrimental, and of the other means, constitutional, local, external, and regiminal, which may be brought to their aid, is essential to success in the employment of them. That the production of a purulent discharge or the formation of a purulent eruption has sometimes cured phthisis, appears to have been known from the earliest periods of medical history. After the appearance of small-pox, it was observed that a copious eruption in that malady often cured pulmonary consumption in an early stage, and as often accelerated the progress of this latter disease in an advanced stage. This was remarked by MUYNIK, BRACHET, and others; and it has been stated by writers that phthisis is rarely observed in persons much marked with small-pox (§ 231)—a statement which has appeared to be confirmed by my own observation.

417. xvi. STATES OF THE AIR were much discussed by writers from the middle of the last century until early in this, in respect of consumption, and all sorts of air were considered with reference to the cure of this disease. The air of cow-houses was advocated by some, of marshes by others (§ 295). Even the mephitic air produced by bilge-water (arising chiefly from the action of salt-water upon the ship's timbers) was considered by BEDDOES and HARRISON as the cause of the benefit derived from voyaging. The use of fixed air, soon after its discovery, in the treatment of phthisis, was most unprofitably discussed by writers from 1780 to the commencement of this century; and although the influence of the carbureted and sulphureted hydrogen, and other gases given off from bilge-water, may be considered by some as disposed of, yet it is still viewed as not without some favourable influence by those who believe in the good effects of marshy exhalations in threatened phthisis.

[Dr. S. G. MORTON, in his "Illustrations of Pulmonary Consumption," first published in 1833, suggested (p. 261) that, as the only equable climate of the United States is that of the Mammoth Cave of Kentucky (its temperature differing but little the year round from 56°, and perfectly dry), it might at some future period become a place of hybernation for invalids, "where they will be shielded alike from the cold, the wet, and the

noise of the world above them." This hint was taken advantage of by its proprietor soon after, and several huts were erected a mile or more from the entrance of the cavern, which were inhabited throughout the winter months by consumptives from different parts of the United States. The first effect of the under-ground residence in a few cases appeared decidedly favourable; the cough was arrested in a great degree, and a quiet, placid feeling pervaded the system. The absence, however, of light, the want of exercise, the monotony of life, the smoke from fires and lights, &c., rendered existence under such circumstances intolerable, and, on emerging again to the light of day, the disease progressed with astonishing rapidity to a fatal termination. Altogether, twelve different patients tried the experiment of living within the cave from one to six months each, but in no instance with any permanent benefit.—See 31st vol. *Boston Medical and Surgical Journal*, June, 1844.]

418. That fixed air contained in fluids is a useful palliative in this disease, and for the dyspeptic symptoms which accompany, cannot be doubted; and that the sulphureted hydrogen contained in some mineral waters is often beneficial, as most preparations of sulphur are also more or less so, in tubercular states of the lungs, must be admitted, as far as medical observation and experience warrant the belief. But this refers only to the gases impregnating fluids taken into the stomach.*

419. Of much greater importance is the determination of the questions, whether or no the air in very elevated situations, or in low places, and whether that near the sea, or at a distance from it, is the most beneficial to phthisical cases? Or, in other words—1st. What is the state or states of the air which the phthisical patient may breathe with greatest benefit? 2d. Should the states of the air, found beneficial in certain seasons, be continued in other seasons? and, 3d. If change of such an air be found requisite, how should it be most appropriately and beneficially changed with the procession of the seasons?

420. 1st. *Sea voyages* were praised by CELSUS, ARETÆUS, and others among the ancients; and by GRANT, SAVARY (*Lettres sur l'Égypte*, t. iii., p. 8), and many among the moderns. But it is very doubtful what share of the benefit observed proceeds from the sea air itself, or from the motions and other circumstances connected with the voyage. It is not improbable that the sea air may contain certain elements beneficial to morbid states of the lungs, and sufficient to counteract any injurious influence which humidity alone might produce. But persons living on the seacoast are not much more exempt from phthisis than those living inland, where equally humid states of air, within the same ranges of temperature, usually exist. A greater exemption may be experienced, but the amount has not yet been ascertained, or even an approximation to it. The ancients inferred benefit from sea air, because the

[* If we bear in mind that the principal indication in phthisis is to improve the faulty nutrition, which is the cause of the tubercular exudation, and invigorate the general system, we shall avoid the use of such drugs as tend to impair the tone of the digestive organs, and we shall find, moreover, that as the digestive powers and the general health are strengthened by suitable hygienic means, the local as well as general symptoms will yield, and there will be little occasion for those special remedies for sweats, cough, diarrhoea, &c., which have hitherto been in such general use.]

voyages for the cure of pulmonary diseases were generally made to Egypt, and very probably the relief manifested soon after the arrival of patients in that country was partly at least attributed to the voyage. Although Dr. SMYTH is not in favour of sea air for consumptive cases, yet I know that voyaging in the Mediterranean and in the Atlantic has been most beneficial in several cases in which I have advised it. But I agree with CÆLIUS AURELIANUS, GILCHRIST, BLANE, REID, and many others, in saying that, in order to be of service, it should be adopted early in the disease; if it be resorted to at a far-advanced period, and if a very warm latitude be entered into, the disease will most probably be accelerated to a fatal issue. The doubt expressed by me above (§ 307) of the superiority of the sea-coast to inland situations, other circumstances being equal, appears to be confirmed by the observations of Dr. RICHARDSON respecting the climate of Nubia, of Dr. BARCLAY on the climate of Egypt, and of Dr. ARCHIBALD SMITH on the influence of high elevation in warm climates on consumption. In *Nubia, Egypt*, the South of *Spain*, and at a considerable elevation on the *Andes*, cases of this disease, whether attended by hæmoptysis or not, were remarkably benefited soon after their arrival; and a removal from the last-named place to the sea-coast was often followed by a return of the malady. From the testimony and experience of these eminent writers, and from what other sources of information have furnished, I infer that dry states of the atmosphere, in moderate grades and ranges of temperature, and at considerable or even moderate elevations above the sea-level, are most favourable to consumptive patients; that the places just named, and Malaga, and various other places in Syria and the East, are most to be preferred; and that, before the commencement of the hot season, Nubia, Egypt, and other places, where the temperature rises very high, should be relinquished for others which are more temperate.

[*Climate in Tubercular Phthisis.*—With regard to the influence of the climate of different regions of the United States in the causation of tubercular phthisis, the positive facts bearing on the subject are not yet sufficiently numerous to enable us to draw any very positive conclusions. The late Dr. SAMUEL FORRY, in his able work on "The Climate of the United States and its Endemic Influences" (based chiefly on the records of the Medical Department and Adjutant-general's Office, United States Army), having first established the *isothermal* and *isochermal* lines, representing the mean temperature of summer and winter (from which it appears that the same parallels of latitude present systems of climate very diverse in character, as, 1st. The regions bordering on the ocean; 2d. Those under the influence of inland seas; and, 3d. Those remote from such controlling powers), demonstrates very clearly that these laws of climate maintain an intimate relation with the etiology of pulmonic diseases, and that the prevalence of *catarrh* and *influenza* in each system of climate increases and decreases in proportion as the seasons are contrasted, thus maintaining an unvarying relation with the extreme range of the thermometer as connected with the seasons.

The following table from his work, exhibiting the ratio of cases per 1000 of mean strength, will show the comparative prevalence of pulmonary diseases in each system of climate:

NORTHERN REGION OF THE UNITED STATES.	Mean Strength.	Catarrh and Influenza.	Pneumonia.	Pleuritis.	Phthisis Pulmonalis.	Total.
Atlantic Ports	3,130	533	52	26	9	290
Ports on the Lakes	5,973	500	19	30	9	558
Ports remote from the ocean and the Lakes. }	12,604	552	17	28	5	602
Total	21,707	439	18	28	7	490
SOUTHERN REGION.						
Coast from Delaware to Savannah	3,199	271	25	32	13	341
Southwestern Stations ...	11,140	290	39	52	11	392
Ports on the Lower Mississippi	3,381	218	22	28	9	277
East Florida	4,607	143	15	24	9	191
Total	22,327	246	29	40	11	236

If these statistics are reliable, the annual ratio of pulmonary diseases, with the exception of catarrh and influenza, is lower in the northern than in the southern regions of the United States; pneumonia, pleuritis, and phthisis pulmonalis are most prevalent, however, in the middle regions of the United States, and Florida has a lower average than any other. The ratio of deaths per 1000 of mean strength is, in the northern region, 2.1, southern 4.4, from phthisis; and in the former 0.5, the latter 1.8, from pneumonia, pleuritis, and catarrh. This corresponds with the conclusions deduced from the "Statistical Reports on the Sickness, Mortality, and Invaliding" among the British troops stationed in every part of the globe. The reporter shows by numerical results that phthisis pulmonalis is more prevalent in southern than northern latitudes, and infers "that it is by no means likely that any beneficial influence can be exerted by climate itself in pulmonary affections."

These facts also correspond with what has been observed in Europe. Phthisis is far more prevalent in the middle and southern regions of Europe than it is farther to the north; while in Sweden the ratio of deaths from this disease is only 63 in 1000, in London it is 236. The northern parts of Russia are comparatively exempt from the disease, while from the 35th to the 45th parallel of latitude it is very common.

The popular notion that a changeable climate favours the production of phthisis is undoubtedly erroneous. Those who are most exposed to the vicissitudes of climate are least exposed to pulmonary disease of every kind. Statistics have fully proved that the maximum of liability to phthisis is found among those who suffer the least exposure to climatic variations; and it will even be found true that the most variable climates are best calculated to develop the physical and mental powers. Doubtless, it is owing to this cause that the Indians, our frontier inhabitants, and the hardy backwoodsmen of the West, are so little liable to attacks of phthisis. The above holds true also, according to Dr. FORRY, in regard to pleuritis, pneumonia, and catarrhal affections, which, he says, are far less prevalent in the moist and changeable climate peculiar to the Atlantic coast and the borders of our great lakes than in the dry atmosphere of the interior parts of the continent. The above facts are also corroborated by the recent "Statistical Report on the Sickness and Mortality in the Army of the United States, compiled from the Records in the Surgeon-General's Office," for sixteen years (Washington, 1856, 4to). For example, Surgeon WOTHERSPOON, in giving an account of the "Medical Topography and Diseases of Fort Kent" (lat. 47° 15' N., long.

68° 38' W.), remarks that "the climate of Fort Kent does not seem favourable for the production of pulmonary phthisis. During my sojourn at the post, I have neither seen nor heard of a case of this disease among the French or American settlers. Assistant-Surgeon ISAACS, who, during the two years he was resident at the fort, had a much better opportunity than myself of becoming acquainted with the diseases of the country, informs me; not only that he never saw a case of consumption in the country, but that some of the inmates of the garrison, who were affected with suspicious symptoms, recovered from them entirely" (p. 27).

From this recent "Report" we copy the following "Consolidated Table," exhibiting the amount and ratio of sickness and mortality in the several regions from phthisis pulmonalis:*

Regions.	Mean strength.	Number treated.	Deaths.	Ratio of Cases per 1000 of mean strength.
Coast of New England ..	3,963	19	5	4.8
Harbour of New York ..	9,387	56	35	5.9
West Point	6,901	6	8	0.8
North Interior, east....	3,553	17	10	4.7
The Great Lakes.....	10,346	47	53	4.5
North Interior, west....	7,130	30	15	4.1
Middle Atlantic.....	6,249	16	19	2.5
Middle Interior, east ...	2,456	6	3	2.4
Newport Barracks, } Kentucky.....	1,454	5	4	3.4
Jefferson Barracks and } St. Louis Arsenal....	5,580	23	21	4.1
Middle Interior, west....	5,319	28	13	5.2
South Atlantic.....	2,800	26	5	9.2
South Interior, east....	5,919	43	28	7.2
South Interior, west....	10,013	20	25	2.
Atlantic Coast of Florida	835	2	1	2.3
Gulf Coast of Florida ..	2,299	16	3	6.9
Texas, southern frontier	4,450	18	11	4.
Texas, western frontier.	6,324	25	12	3.9
New Mexico.....	5,873	8	3	1.3
California, Southern....	1,707	9	5	5.2
California, Northern....	1,599	9	4	5.6
Oregon and Washington	1,831	6	2	3.2

From this table we gather that the lowest ratio of cases of consumption occurs in New Mexico, being only 1.3 per 1000, and the highest in the South Atlantic region, where it is 9.2 per 1000. Assistant-Surgeon HAMMOND observes that he had never seen but two cases of the disease in the country (New Mexico), and those came from the United States. The south interior, east, and Gulf coast of Florida give the next highest proportions, being respectively 7.2 and 6.9 per 1000 of mean strength. The ratio for these three regions, and also for California, are higher than for any of the regions in the United States. The compiler of this work, Dr. COOLIDGE, arrives at the following conclusions in regard to climatic influences in the production of this disease:

"1st. That temperature, considered by itself, does not exert that marked controlling influence upon the development or progress of phthisis which has been attributed to it.

"2d. That the most important atmospherical condition for a consumptive is *dryness*.

"3d. That next to *dryness* in importance is an *equable* temperature—a temperature uniform for long periods, and not disturbed by sudden or frequent changes. A uniformly *low* temperature is

* The northern division includes that portion of the United States north of the 40th degree of latitude and east of Rocky Mountains; middle division lying between 35th and 40th parallels of latitude; southern division between 30th and 35th degrees of latitude. Besides these are the divisions of Florida, Texas, New Mexico, California, Oregon, and Washington Territories.]

much to be preferred to a uniformly *high* temperature. The former exerts a tonic and stimulating effect upon the general system, while the latter produces general debility and nervous exhaustion. The worst possible climate for a consumptive is one with long-continued high temperature, and a high dew-point." The British Army Statistical Reports confirm the truth of these statements, the ratio of cases of phthisis among the troops in Canada being 5.7 per 1000 of mean strength, while in Bermuda it is as high as 8.9.

Such being the facts in regard to climatic influences in the production of tuberculosis, the important question recurs, are consumptive patients to be sent away from home; and if so, whither shall they be sent? English physicians have from time immemorial been in the habit of sending their pulmonic cases to Rome, Naples, Nice, Florence, and other parts of Southern Italy, Montpellier, Lisbon, &c., places particularly subject to bronchial and tubercular affections, and where a greater proportion of the native inhabitants perish from this class of diseases than in any part of Great Britain. Even in Madeira, so vaunted as salubrious in tuberculous cases, consumption and scrofula are very common diseases, and the average duration of life is inferior to that of our own country. Indeed, all known facts seem to prove that the notions which have hitherto prevailed in regard to the beneficial effects of change of climate in this disease are utterly unsound and fallacious. As Dr. BURGESS* has well remarked, "We may seek in vain along the entire range of organized existence for an example of diseased animals being benefited by removal from a warm to a cold, or from a cold to a warm country. There appears nothing in the Book of Nature so violently inconsistent. The fishes which inhabit the waters of the British islands will not thrive in the Arctic seas, nor those of the latter in the ocean of the tropics; our birds generally die when carried to Europe, and the wild animals of Africa and Asia perish when translated to our own continent. Man, it is true, is a cosmopolite, and can bear sudden changes and unnatural transitions better than any other animal; still, his constitution and health are endangered by such opposite conditions, as we see among the blacks removed from the South to Canada, and among the inhabitants of northern latitudes who remove to the tropics, and *vice versa*. Well may it be asked, if such extreme changes of climate prove obnoxious to the health of individuals having naturally a sound constitution, how are we to expect persons in a state of organic disease to be thereby benefited? Nature has, in fact, adapted the constitution of man to the climate of his ancestors, and that is the natural climate of man in which not only he himself was born, but also his blood relations for several generations. This is his natural climate, as well in health as when his constitution is broken down by positive disease, or unhinged by long-continued neglect of the common rules of hygiene." We believe, therefore, with BURGESS, that *change of air in his own climate*, or removal to one nearly approaching to it, is the natural indication, and will effect whatever good climate can effect in consumption.

When tubercular disease, then, is fully established, a residence at home, if in a favourable sit-

* "Climate of Italy, in Relation to Pulmonary Consumption." London, 1852.]

uation, with all the comforts and consolations of home, is far preferable to any of the remote resorts recommended in such cases. We have seen that more cases of phthisis originate in warm than in cold climates, and are also more speedily fatal; and it would be easy to show that while cold retards the progress of the disease, heat accelerates it. Tubercular softening, as we have had many opportunities of observing, is much hastened by warmth and moisture, as in removing from New England to Cuba, or any of the West India islands. We admit, however, that there are exceptional cases, where consumptive persons seem relieved as soon as they reach a warmer and more uniform climate. But these are either cases of pure bronchial disease, or *broncho-tubercular*, where a warm, moist air allays the irritability of the bronchial mucous membrane, and affords great relief to the cough and the general sensations of the patient. It is a mistake, however, to suppose that rapid variations and an extensive range of temperature are unknown to warm climates. Such variations are very great and frequent in Southern Italy, and along the Atlantic coast of Florida and our Southern States.

If, however, it is thought desirable, for the patient or physician, that a change of climate should be made, there is no necessity that he should be sent abroad while we have every possible variety of climate in our own country. *Change of air in the same climate* is what should be sought, and not a climate greatly foreign to that of his own. An *equable* temperature is what is required, and every consumptive patient who has tried a change of climate will testify that a low degree of temperature, with a limited range, gives more permanent ease than a high degree subject to frequent alternations. Such a winter climate is found in many parts of the United States. We have little doubt the time is not remote when, instead of sending tuberculous cases to spend the winter at the South, southern invalids will seek the bracing atmosphere of the North, and return home in the spring greatly invigorated. The above remarks, I am aware, are in opposition to the maxim of CELSUS, that "the air in which a man grows sick is the very worst air for him;" and also in opposition to the opinions of many enlightened physicians, like Professor DICKSON, who thinks a change of climate in such cases "is always desirable;"* and that "a northern winter should be avoided by migrating to a southern latitude; and that a southern summer is almost equally dangerous in its ultimate effects," &c. Dr. RUSH advised American patients to pass the winter and a part of the spring in South Carolina and Georgia; in summer to go northwardly into Canada as far as Quebec, and to return in autumn to Pennsylvania and New Jersey.† He inculcates strongly the necessity of keeping far from the sea-coast, believing a mixture of sea and land air highly prejudicial. Dr. DICKSON remarks that "the atmosphere of islands, of many points on the coast, Madeira, the West Indies, St. Augus-

tine, and Savannah, is found to be generally salubrious to pulmonary patients."—*Loc. cit.* Of the numerous patients we have sent to these different places with confirmed phthisis, we can scarcely call to mind a single case which was essentially benefited, while in numerous instances the patients became suddenly worse. Great relaxation and debility ensued, with an increase of the night sweats, hæmoptysis, and diarrhœa, if present; the high temperature rendered exercise in the open air next to impossible, while there was a general absence of those comforts and appliances procurable at home. The appetite usually fails on transference to a tropical clime, and tubercular softening makes rapid progress.

Admitting that the ratio of pulmonary diseases is as high, or higher, in southern than in northern latitudes, we grant it does not necessarily follow that benefit may not be derived from change of climate in the way of a *winter* residence. This must be decided by actual experience only, and experience we hold to be generally adverse to the doctrine. The late Dr. FERRY, who was personally acquainted with the climate of Cuba, Florida, and our Southern States, was in the habit of recommending a residence in those localities during the winter months, in cases of bronchial disease and incipient or threatened phthisis, or "when mostly limited and merely nascent," but never after the latter disease was unequivocally established. Sir JAMES CLARK also remarks that "the climate of the West Indies is an improper one for patients with tuberculous disease of the lungs."—"On Climate."

The idea is a prevalent one in the profession, that residence in a malarious district acts as a prophylactic against tubercular phthisis; but the evidence on this point is very conflicting. It is

The Mean Temperature at Brunswick, Maine, for the Winter Months, December, January, and February, from the Year 1807-8 to 1856-7 inclusive.

Year.	Mean Temperature.	Year.	Mean Temperature.	Year.	Mean Temperature.
1807-8	25.29	1824-25	23.60	1841-42	23.52
1808-9	19.83	1825-26	24.33	1842-43	24.86
1809-10	24.75	1826-27	22.25	1843-44	24.87
1810-11	23.54	1827-28	27.69	1844-45	22.37
1811-12	21.57	1828-29	22.08	1845-46	27.81
1812-13	21.79	1829-30	22.18	1846-47	21.37
1813-14	24.89	1830-31	27.66	1847-48	28.13
1814-15	20.97	1831-32	23.14	1848-49	22.75
1815-16	22.09	1832-33	22.05	1849-50	22.06
1816-17	21.29	1833-34	26.54	1850-51	23.07
1817-18	21.52	1834-35	22.95	1851-52	20.39
1818-19	26.99	1835-36	29.31	1852-53	24.52
1819-20	23.74	1836-37	25.64	1853-54	21.52
1820-21	23.23	1837-38	31.06	1854-55	17.95
1821-22	19.73	1838-39	28.85	1855-56	20.07
1822-23	17.47	1839-40	32.39	1856-57	20.14
1823-24	22.73	1840-41	27.25		

The Mean Temperature at Brunswick, Maine, North Latitude, 43° 53', for the Summer Months, June, July, and August, from the Year 1808 to 1856 inclusive.

Year.	Mean Temperature.	Year.	Mean Temperature.	Year.	Mean Temperature.	Year.	Mean Temperature.
1808	64.80	1821	68.57	1833	62.16	1845	61.72
1809	65.70	1822	65.70	1834	64.20	1846	62.37
1810	65.24	1823	67.69	1835	63.18	1847	61.22
1811	66.59	1824	65.97	1836	61.99	1848	61.03
1812	63.58	1825	69.87	1837	65.08	1849	62.72
1813	66.08	1826	71.70	1838	69.76	1850	61.79
1814	64.90	1827	67.56	1839	67.24	1851	60.23
1815	67.13	1828	66.87	1840	69.76	1852	61.70
1816	63.39	1829	64.54	1841	64.90	1853	61.84
1817	64.88	1830	61.64	1842	63.57	1854	62.87
1818	70.03	1831	66.17	1843	62.29	1855	60.66
1819	69.31	1832	55.77	1844	61.21	1856	61.71
1820	67.40						

* Essays on Pathology and Therapeutics, p. 317, vol. II. (1845.)

† It is a common belief that there has been a gradual change in the temperature of our summer and winter months during the last 50 years, our summers growing hotter and our winters colder during that period. An examination of the following tables, for which we are indebted to the kindness of Professor PARKER CLEVELAND, LL.D., will show that there has been no essential change in these respects during that period:

doubted whether malaria exerts any antidotal or curative power in regard to tuberculous affections. On the contrary, it is stated on good authority that malaria powerfully predisposes to such attacks, and that a malarial fever frequently lays the foundation for tubercular disease. Nothing, indeed, is more common than to witness the supervention of rapid pulmonary consumption in constitutions deteriorated by malarial diseases. "An attack of ague," says Sir JAMES CLARK, "is much more likely to favour the occurrence of consumption than to prevent it."—"On Climate." "Whenever any cause," says Dr. FORRY, "depresses the vital energy, and lowers the power of assimilation beyond a certain point, the tubercular diathesis will be produced. Moreover, the connexion of pulmonary phthisis with congestion and derangement of the abdominal viscera has been long since noticed; and as abdominal plethora is the predominant character of the prevailing diseases of tropical latitudes, we have a ready explanation of the high ratio of tubercular consumption in the West Indies. Hence malaria has a tendency to develop this disease, for it tends to destroy the balance of the functions and diminish the tone of the system, thus robbing the blood of that rich, fibrinous, and vital condition, by which proper nutrition and the organic functions are sustained. Malaria holds a prominent place among the causes productive of the cachectic condition of the system which precedes the formation of tubercle."—*Loc. cit.*, p. 266.

The opinion generally prevails that a mixture of sea and land air, such as exists on all our maritime situations, is unfavourable to delicate lungs, especially where there is phthisis, or a strong predisposition to it. Such was the opinion of the late Dr. S. G. MORTON, Sir JAMES CLARK, and perhaps a majority of writers on this disease. Such also is the result of our own observation. But it conflicts with the statements of Dr. FORRY, and other statistical writers, that pulmonary diseases are scarcely half as prevalent on the moist and variable coast of New England, as well as the Lakes, as in the dry and less changeable regions of the same latitude. We regard this question, however, as far from being settled. The laws and conditions regarding the causation of tubercular disease are probably far from being the same as those connected with inflammatory affections of the lungs. LAENNEC has remarked that few consumptive cases occur near the sea; the comparative ratio, however, may vary in different countries in the same latitude, and also at different latitudes. In Georgia and Florida the opinion prevails that the dry air of the interior, in conjunction with the aroma of pine forests, is more congenial to delicate lungs than the moist air on the coast. The ancients sent their consumptives to the pine-forests of Egypt. CLOT BEY, in his recent work, states that Egypt enjoys an exemption from lung diseases, especially from phthisis, and he therefore recommends it as a residence for persons predisposed to or labouring under this disease. Such pulmonary invalids as seek a milder winter climate may be safely recommended to the pine regions of the interior of South Carolina, Georgia, or Florida, where all the advantages of a change of climate may be found which are to be expected in such cases.

Mr. A. KEITH JOHNSTON ("The Physical Atlas of Natural Phenomena," ed. 1856) observes, as regards consumption, as follows: "It originates

in all latitudes—from the equator, where the mean temperature is 80°, with slight variations, to the higher portion of the temperate zone, where the mean temperature is 40°, with sudden and violent changes. The opinion long entertained that it is peculiar to cold and humid climates is founded in error. Far from this being the case, the tables of mortality of the army and navy of this and other countries, as well as those of the civil population, warrant the conclusion that consumption is more prevalent in tropical than in temperate countries. Consumption is rare in the Arctic regions, in Siberia, Iceland, the Faroe Islands, the Orkneys, Shetlands, and Hebrides. And, in confirmation of the opinion that it decreases with the decrease of temperature, FUCHS shows, from extensive data, that in Northern Europe it is most prevalent at the level of the sea, and that it decreases with increase of elevation to a certain point. At Marseilles, on the sea-board, the mortality from this cause is 25 per cent.; at Oldenburg, 80 feet above the sea, it is 30 per cent.; at Hamburg, 48 feet above the sea, it is 23 per cent.; while at Eschwege, 496 feet above the sea, it is only 12 per cent.; and at Brotterode, 1800 feet above the sea, it is 0.9 per cent."]

421. The second and third questions are partly answered by what I have now stated; for although a continued residence in these climates may not be injurious to many consumptive patients, yet it may give rise to diseases of a different nature, or may occasion complications of phthisis which otherwise might not have occurred; or it may prove too exhausting, or otherwise injurious to the patient: in many cases, if not in the majority, a change to a more temperate climate is therefore beneficial before the hot season commences; and if the change can be made to a climate both dry and temperate, it will generally prove of the greatest advantage. Patients who are subject to hæmoptysis, or other states of the more usual or the chronic forms of phthisis, will derive very great benefit from a voyage to Alexandria, and a journey thence to Cairo and Upper Egypt, and, having resided there or in Nubia some time, proceeding thence to Syria, they may return by Malaga, Granada, or other places in Andalusia, in April or May, to England; or, if it be preferred, a voyage may be made across the Atlantic early in September with great benefit; and having crossed the isthmus of Panama, the Pacific may be traversed; and having visited Lima, a residence in the mountains of Peru may be tried at the elevation and in the season found most beneficial for phthisical patients. After a satisfactory residence in this locality, the patient may return to Europe by the same route as that by which he went out, or by one more direct, taking care, however, to return to England about May or June.* If this

* There are many places in the south of Spain that may be chosen for winter residences by persons either threatened by or in the first stage of tubercular consumption, especially in Andalusia; and if the vicinity of Malaga, or of Granada, or of Seville be not selected, other places in the above extensive province may be tried. During the warmer months the more elevated situations on the southern side, or the southern ridges of the Sierra Morena, furnish many situations which cannot fail of possessing most of the advantages required by phthisical invalids.

Dr. MITCHELL (*Brit. and For. Medico-Chirurg. Rev.*, No. xxxiii., p. 226) states that "the climate of Algiers, during winter and spring, vies with that of Madeira, being as warm and steady in temperature, but drier and more bracing."

It has been a generally received opinion among medi-

plan be followed out for two, or three, or four seasons, at an early stage, with due precautions

cal and scientific men that very high elevations above the level of the sea are injurious to tubercular consumption, especially when it is either ushered in, or attended by, or even threatened with hæmoptysis. Dr. ARCHIBALD SMITH's very interesting account of the very remarkable benefit he saw, in numerous cases (see above, § 420), derived from residing at an elevation above the sea-level of 5000 to 10,000 feet, completely upsets this opinion. This very able and experienced physician has farther remarked upon this subject, in a communication he has kindly favoured me with since the earlier pages of this article were published; and he has stated, respecting a diminished or increased frequency of phthisis in the aborigines of a country by change to a colder or to a warmer climate, or to a higher or lower elevation, "that, as regards Lima and the coast of Peru generally, the change to the maritime climates of Chili and Ecuador—the first colder, the second warmer—has a decidedly bad effect on the Peruvian phthisical invalid; but the higher elevation on his own mountains of 5000 to 10,000 feet has a decidedly curative influence. In these regions the climate is moderately dry and temperate, favourable to exercise in the open air, and the patient is also removed from a luxurious and sensuous society, as well as from a warm, humid, and relaxing atmosphere. Very possibly the decided benefit received by the natives of Peru from the change from coast to mountain may not be equally shared in by strangers. I hope, however, that this may be a fair trial, and, as you recommend navigating by Panama to the Pacific, that you will find room to recommend, on fair trial, to Europeans, the migration to elevated spots on the Andes, from time immemorial known of paramount importance to the native races affected with pulmonary consumption." Dr. ARCHIBALD SMITH's very long and extensive experience of the diseases in this part of the New World renders his opinion of the greatest value on this subject. He farther remarks: "I observe at § 218 what you say with respect to the effect of migration on the Chinese; and I can say that, among the thousands of this race lately introduced into Lima, I never met with an instance of phthisis. It is likely, however, that this disease will show itself in their offspring born in Peru of Indian or dark women. When the Chinese crop their hair and take on the Peruvian dress, it is not easy to distinguish them from native Peruvian Indians." Is not this last remark in favour of the opinion that the Indian races are offshoots from the Mongolian, or Chinese?

Dr. RICHARDSON, in his account of his travels in Egypt and Nubia, published more than thirty years ago, has strongly recommended these countries, and especially the latter, as winter and spring residences for phthisical invalids. The more recent evidence of my eminent friend, the Rev. Dr. BARCLAY, fully confirms this recommendation. The very interesting account given by Dr. BARCLAY of the climate of *Middle and Upper Egypt, Malaga, &c.*, is so very important to our profession and to phthisical patients, coming as it does from one whose great talents and acquisitions I have long known and admired, that I quote it at this place without abridgment, of which, indeed, it does not admit:

"The object of this communication is to draw attention to those characteristics of the Egyptian climate by which an opinion may be formed of its curative influence in cases for which a removal to a milder and warmer atmosphere is usually recommended. The result of my own observation and experience, during five months spent in that country, is a thorough conviction that there is no accessible part of the world so well adapted for the relief of most of that formidable class of diseases to which the respiratory organs are subject. In venturing to express this opinion, however, I am far from affirming that all Egypt, or any part of Egypt at all seasons, fulfils the conditions required in a climate suitable for such cases. On the contrary, it will be readily perceived that no part of the Delta is at any season adapted to patients who are subject to these affections, nor, it may be added, to those who are either dyspeptic or rheumatic; and from the beginning of May to the end of September the heat in every part of Egypt is too great for a European constitution weakened by disease. But in Middle and Upper Egypt, from the beginning of October to the end of April, the invalid may breathe, under a bright and cloudless sky, an atmosphere at once of a warm and equable temperature, of perfect purity, and free from all excess of humidity. The climate of other regions may be equally distinguished by one or more of these properties (though even that is doubtful), but assuredly there is no other habitable part of the globe in which they are all combined in so great perfection.

"The malady for which I sought relief in a southern

against injurious exposure, the disease will either be arrested for some years, or altogether over-

climate was chronic bronchitis in its most aggravated form. All the usual remedies, both external and internal, had been resorted to and steadily persevered in, under the ablest medical advice, but with little temporary and no permanent benefit. I had tried with the same unfavourable result those places on the south coast of England which are usually recommended to invalids. The symptoms obstinately resisted every medical measure. The chronic character of the disease was frequently exchanged for attacks of a sub-acute form. These always commenced with inflammation of the pharynx, creeping insidiously down the glottis and trachea to the bronchial tubes, which became gorged with mucus throughout their whole extent, and on every spot on which the stethoscope could be planted over the lungs the mucous rale was to be heard. Dyspnoea, accompanied with loud wheezing, was at all times distressing; but its nocturnal exacerbations, which invariably occurred after a short sleep, like fits of spasmodic asthma, were often so fearfully violent as to threaten suffocation. The digestive organs were deranged, I had no appetite for food, my frame was emaciated, and my strength prostrated.

"I was so enfeebled as to be unable to encounter the voyage till the month of November, and thus I lost two months of the season suitable for the residence of an invalid in that country. Yet the benefit which, by the blessing of Providence, I reaped from that delicious climate was most signal, and far exceeded all that my most sanguine hopes had ventured to anticipate.

"On the passage onward I stopped five days at Malta, but found the heat so oppressive in the daytime, and the chills in the evening so severe, that I was glad to make my escape. The extreme humidity of the atmosphere in that island, notwithstanding its high temperature, must always render it, I apprehend, an unfit resort for a bronchitic patient; and the greatness of the diurnal range of the thermometer, at least in winter, makes it questionable how far it is an eligible residence for consumptive patients. It is believed that an inquiry into results will not tend to give a favourable idea of its sanative influence on that class of complaints. Of the climate of Alexandria also I have reason, as I shall show afterward, to speak unfavourably. In Cairo, however, a very different climate was found; and I had not been many days there when I began to experience its effects in allaying the irritability of the respiratory mucous membrane. The coldest season there is the latter part of December and the early part of January; and though the temperature even then is equal to that of our best summer weather, yet the evenings are somewhat chill. The following observations, made with the register thermometer and Dollond's hygrometer, show the temperature and the dryness of the atmosphere at Cairo during the coldest fortnight of the year:

Date.	Lowest temp. by night.	Highest temp. by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
Dec. 25.	59	64	5	7	..	Bright sunshine.
" 26.	58	63	5	7	..	Do.
" 27.	58	62	4	5	..	Do.
" 28.	57	60	3	..	5	Rain and blowing.
" 29.	57	60	3	1	..	Showery.
" 30.	58	60	2	..	4	Wind and rain.
" 31.	59	64	5	5	..	Bright sunshine.
Jan. 1.	60	64	4	8	..	Do.
" 2.	57	62	5	4	..	Cloudy.
" 3.	58	63	5	0	0*	Do. and blowing.
" 4.	58	64	6	5	..	Bright sunshine.
" 5.	57	64	7	4	..	Cloudy.
" 6.	58	61	3	..	4	Drizzling.
" 7.	57	60	3	..	1	Cloudy and windy.

"From these observations it will appear that, warm and equable as the winter temperature is at Cairo, the weather at that season is not free from frequent and sudden changes. It is in Upper Egypt that the invalid must seek entire exemption from these, and there he will not be disappointed.

"While I was there my register was kept on the Nile, and consequently it shows a lower temperature, at least in the night time, than would be denoted at a little distance from the river, while the dryness indicated by the hygrometer in the latter case was many degrees greater than that registered on the river.

* The zero of the hygrometer corresponds to summer drought in Britain.

come, in a great many cases—indeed in most, if it be not delayed to a too far advanced stage.

[The following table shows the mean temperature for each season, each month, and the whole

year, at St. Augustine, Fort Brooke (Florida), Nice, Rome, Naples, and Madeira, for the years 1825, 1828, 1830, rejecting decimals:

Place.	Lat.	Mean Ann'l Temperature.	Mean Temperature of the Seasons.				Mean Temperature for each Month.											
			Winter.	Spring.	Summer.	Autumn.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
St. August- tine . . .	29 48	72.24	62.83	70.55	82.05	73.56	62.15	64.97	66.53	68.68	76.44	81.12	82.36	82.68	79.56	73.61	67.47	61.38
Ft. Brooke.	27 57	73.19	65.02	71.71	81.04	74.59	63.75	66.56	66.48	71.27	77.39	80.90	81.43	80.79	79.01	75.04	69.71	64.76
Nice	43 41	59.48	47.82	56.23	72.26	61.63	45.85	49.00	51.45	57.00	63.00	69.00	73.50	74.30	63.35	61.85	53.70	48.60
Rome	41 54	60.79	48.90	57.65	72.16	63.96	47.65	47.45	52.05	56.40	64.50	69.17	73.30	74.02	69.50	63.60	58.80	49.62
Naples . . .	40 50	61.40	48.50	58.50	70.83	64.50	46.50	48.50	52.00	57.00	66.50	71.00	75.00	76.50	72.50	65.00	54.50	50.50
Madeira . .	32 37	64.56	59.50	62.20	69.33	67.23	59.50	58.50	61.06	62.50	63.00	65.00	70.00	73.00	71.50	67.50	62.70	60.50

The above table shows very conclusively the superiority of the climate of Florida during the

winter and spring months to that of the most celebrated places of resort abroad.]

"The following table contains the result of the observations noted between Thebes and Asouan, the uppermost town in Egypt, and from these an idea may be formed of the winter climate in that region:

Date.	Lowest temp. by night.	Highest temp. by day.	Diurnal range.	Degrees dry.	State of weather.
Jan. 17.	64	70	6	7	Cloudless sky and bright sunshine every day; the firmament blazing with stars every night; no evening chills.
" 18.	63	68	5	7	
" 19.	66	70	4	5	
" 20.	64	63	5	12	
" 21.	64	71	7	7	
" 22.	63	72	3	6	
" 23.	68	72	4	10	

"The benefit I derived from breathing the genial air of the Thebaid was very decided. The periodical night attacks, though still occurring, were less violent and of shorter duration; my breathing was greatly relieved; and my strength was so far recruited that I was able, without fatigue, to make daily excursions, sometimes of many miles, to the monuments with which this part of the valley of the Nile is studded.

"At Thebes, which for several reasons should be made head-quarters in Upper Egypt, the day temperature, from the middle of January to the middle of February, ranges from 68° to 78°, and after the latter date the heat becomes rather too great to be borne with comfort. The invalid should then commence his downward voyage, and by the time he reaches the latitude of Cairo he will find the climate there nearly as delightful as that which he left at Thebes. My register during the first week of March at Cairo was as follows:

Date.	Lowest temp. by night.	Highest temp. by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
Mar. 1.	66	72	6	9	..	Gentle breeze, sunny.
" 2.	69	74	5	4	..	Do. do. do.
" 3.	68	75	7	0	0	Fog.
" 4.	68	76	8	0	..	Calm and sunny.
" 5.	71	74	2	Haze.
" 6.	69	72	3	6	..	Cloudy and sunny.
" 7.	65	69	4	6	..	Drops of rain.

"In a city like Cairo, with a dense population of more than two hundred thousand people, and with narrow streets walled in by lofty houses, and constantly watered to lay the dust, the air can neither be so pure nor so dry as in the desert. Accordingly, the medical gentlemen of Cairo are in the habit of sending almost all their convalescent patients to reside for some time in the adjoining desert, to enjoy the benefit of its invigorating air. In it there is no water, either running or stagnant, to produce humidity by evaporation, nor is there any decaying matter, either vegetable or animal, to taint the air with noxious exhalations. It is in the desert, therefore, that the qualities of warmth, equability, dryness, and purity, which are characteristic of the Egyptian climate in general, are to be found in the most perfect union. The

soothing influence of the desert air on delicate organs of respiration, and its invigorating influence on a debilitated frame, can be appreciated by those only who, like myself, have experienced its marvelous effects. It is at once balmy and bracing; and the invalid, while breathing it, feels as if he were drinking in health at every pore. I quitted Cairo for the desert of Ghezeel on the 12th of March, and took up my abode in the neighbourhood of the Pyramids; and there a sudden change came over me, as if by magic. The second night I passed in the desert was marked by sound and uninterrupted sleep, and the absence of the periodical fit of dyspnoea, the first occasion on which I had enjoyed the one or had been exempted from the other for more than two years. My appetite soon became excessive; both the flesh and the strength I had lost during my illness were restored; every symptom of my complaint disappeared, and at the end of a month I returned to Cairo in perfect health. The following table contains the meteorological register kept by me while I lived in the desert:

Date.	Lowest temp. by night.	Highest temp. by day.	Diurnal range.	Degrees dry.	State of weather.
Mar. 13.	63	69	6	10	High wind.
" 14.	63	70	7	12	Bright sunshine.
" 15.	63	68	5	12	Do.
" 16.	63	68	5	13	Do.
" 17.	63	67	4	13	Do.
" 18.	63	70	7	12	Do.
" 19.	63	73	10	14	Do.
" 20.	67	72	5	17	Do.
" 21.	63	70	7	18	Do.
" 22.	63	71	8	18	Do.
" 23.	66	76	10	19	Do.
" 24.	71	76	5	16	Cloudy.
" 25.	67	71	4	10	Do.
" 26.	63	71	8	13	Bright sunshine.
" 27.	63	71	8	12	Do.
" 28.	64	73	9	11	Do.
" 29.	63	74	11	15	Do.
" 30.	63	71	8	12	Do.
" 31.	66	71	5	12	Cloudy.
April 1.	67	81	14	23	Khamséen.
" 2.	67	72	5	10	Cloudy and blowing.
" 3.	65	72	7	11	Bright sunshine.
" 4.	68	71	3	12	Do.
" 5.	65	71	6	16	Do.
" 6.	65	75	10	18	Do.
" 7.	64	70	6	3	Rain.
" 8.	65	71	6	10	Bright sunshine.

"The only other place in Egypt whose meteorology it seems necessary to notice is Alexandria. When it is borne in mind that this city is surrounded on three sides by the Mediterranean Sea, and that on the land side it is enveloped by the Lake Marcotis, a moist atmosphere may be expected, and accordingly the degree of humidity indicated in the following extract from my register is excessive. In this respect the state of the atmosphere in Alexandria, during the early part of May, will be found to contrast remarkably with that of Cairo and its vicinity during the latter part of April; while the greater equability of temperature in the former city, both from day to day and during the twenty-four hours, is no less observable:

422. THE DIET in phthisis has been already discussed in general terms, and chiefly with respect to my own experience (§ 299-301), but a few authorities and particulars may be farther adduced at this place.—*a*. HIPPOCRATES advised, for phthisis, animal food to be taken in small quantity, and often, when fever is absent; and the opinion has been followed by SALVADORI, MAY, RUSH, VOGEL, ROLLO, and KINGLAKE. Animal fats, marrow, and fat meats were recommended by LANGE and BERTIN. The circumstances in which these may be adopted have been stated above (§ 299-301).

[Many physicians of the present day make but little if any discrimination in prescribing the diet and regimen of phthisical patients. The directions are to eat beef-steak, mutton, fat ham, butter, cream, and drink porter, ale, brandy, using

all the exercise possible in the open air; forgetting that the diet of consumptives must, as in other diseases, be regulated by the stage of disease and the circumstances of each particular case; in the early stages enjoining usually a milder diet, especially in cases complicated, as it often is, with inflammation. If the patient is able to take active out-door exercise, the food may be of a more nourishing quality, and in larger quantity, than if confined to the house; but we have almost invariably found that if the patient was chiefly confined in-doors, a rich diet of animal food excited fever, and aggravated the cough and other symptoms. Carbonaceous matters, however, must be supplied in sufficient quantity to combine with the oxygen taken in, otherwise the waste and loss of weight will be rapid. Sir JAMES

Place and Date.	Lowest temp. by night.	Highest temp. by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
<i>Cairo.</i>						
April 19.	63	70	7	6	..	A gentle breath of wind and bright sunshine by day. Always calm towards evening and during the night.
" 20.	67	70	3	5	..	
" 21.	66	72	6	5	..	
" 22.	67	72	5	4	..	
" 23.	69	74	5	9	..	
" 24.	70	77	7	9	..	
" 25.	75	79	4	5	..	
" 26.	72	75	3	4	..	
<i>Alexandria.</i>						
April 28.	70	73	3	..	10	Sunshine and calm.
" 29.	70	73	3	..	13	Do.
" 30.	71	73	2	..	12	Do.
May 1.	72	74	2	..	15	Do.
" 2.	72	74	2	..	14	Do.
" 3.	73	75	2	..	15	Do.
" 4.	72	74	2	..	14	Do.
" 5.	73	76	3	..	15	Do.

"How far Alexandria, during the months of March and April, may be a more suitable residence than Madeira or Italy for those whose complaints require a climate at once warm, equable, and moist, I leave it to gentlemen of the medical profession to judge; but I do think myself fully warranted to denounce it as a most unsuitable place for a bronchitic patient. During all the time I was there I felt as if inhaling steam; my breathing was excessively affected, and my whole system was languid and relaxed. These effects, however, by the time I had been twenty-four hours at sea, were completely dispelled, leaving no doubt whatever as to their cause.

"I may add that dyspepsia is very prevalent among the European residents in Alexandria; and I was informed that cases of pulmonary consumption, though not common, do occasionally occur among the natives of the whole northern sea-board of Egypt; but the inhabitants of Middle and Upper Egypt, as far as I could learn, are entirely exempted from that fatal disease. The prevailing maladies throughout all Egypt are dysentery and ophthalmia, both induced, it is believed, by exposure of the heated frame to currents of cold air.

"These observations on the subject of Egyptian climate would be very incomplete if I failed to notice its influence in arresting hæmoptysis. Several instances of its efficacy in that respect were mentioned to me, and one very decided case fell under my own observation. A. B., a middle-aged gentleman, of a clear and florid complexion, had been for years afflicted with this complaint to an alarming extent. He had spent a winter in Italy without experiencing the smallest mitigation of his ailment. He had next been sent to Madeira, and there the malady was very greatly aggravated. He was at Malta when I went to Egypt; but finding no relief there, he came to Cairo in the end of December, and took up his abode at the hotel at which I lodged. The effect of the change of climate was immediate. The spitting of blood ceased at once, nor did it ever recur during his stay at Cairo, which was prolonged till the end of April. He then went to the south of Spain, and remained there till the month of June, when he returned to England, apparently in perfect health, and fully resolved to spend the whole of the following winter in Egypt with the view of confirming his cure.

"The transition from the climate of Egypt to that of

Britain is too violent to be hazarded by one whose respiratory organs are in a delicate or dubious condition, especially as the season at which it is necessary to quit the one country is far from being genial in the other. I therefore stopped in Spain on my homeward passage, and spent the latter part of May and the greater part of June in that country and in Portugal. Having heard that the air of Malaga was remarkable for its mildness, I repaired thither, and was both delighted and surprised to find in Europe a climate scarcely inferior in any respect to that of the latitude of Cairo. The register I kept while there, and from which I subjoin an extract, shows a temperature which was probably only a few degrees lower than that of Cairo at the same date, while its equability was greater than I had noted any where except at Alexandria; and, what is still more remarkable, the dryness of its atmosphere exceeds that of Cairo, and contrasts surprisingly with the humidity with which the air of Alexandria is loaded.

"The atmospheric conditions indicated by the following table are doubtless to be referred, partly to the geological structure and the physical conformation of the country around Malaga, and partly to the latitude in which it is situated. I am persuaded that, in a therapeutic point of view, the climate in this part of Andalusia is deserving of more attention than it seems hitherto to have received. Those who take it for granted that the climate of Italy must be the mildest and warmest in Europe seem to forget that Malaga is 248 miles farther south than Naples, 318 miles farther south than Rome, and 518 miles farther south than Venice; and those who have not adverted to the fact will probably be surprised to find that it is 5 miles farther south than Algiers. Both Gibraltar and Cadiz are somewhat south of Malaga, but both have a great diurnal range of temperature, and are nearly equal to Alexandria in the humidity of their atmosphere, the one standing on an almost insulated rock in the Mediterranean Sea, and the other on a narrow spur of land projecting into the Atlantic Ocean.

Date.	Lowest temp. by night.	Highest temp. by day.	Diurnal range.	Degrees dry.	State of weather.
May 20.	70	72	2	9	Bright sunshine.
" 21.	70	73	3	12	Do.
" 22.	71	73	2	12	Do.
" 23.	69	72	3	11	Rain.
" 24.	67	70	3	10	Do.
" 25.	66	69	3	10	Do.
" 26.	68	70	2	14	Bright sunshine.
" 27.	69	72	3	16	Do.
" 28.	69	73	4	15	Do.
" 29.	69	73	4	15	Do.
" 30.	69	72	3	16	Do.

"In the beginning of June I moved northward to Lisbon, but on its climate and that of delightful Cintra no information is needed. In the end of June, 1853, I returned to Scotland; and though I was threatened soon after I reached home with a recurrence of bronchitic symptoms, these now yielded readily to medical treatment. I am most thankful to be able to add that during the last twelvemonth I have enjoyed excellent health, nor have I been affected during that time by any of the changes of weather to which our variable climate is subject."—*The Climate of Egypt*, by the Rev. THOMAS BARCLAY, D.D. Svo. Edinburgh, 1854.

CLARK is of opinion that "the cases likely to be cured by the stimulating plan of treatment—by beef-steaks and porter—bear a very small proportion to those who are injured by it."—Art. "Tubercular Phthisis," *Cyclop. Pract. Med., Am. ed.*, p. 570. This statement will hardly hold good, perhaps, when applied to the disease among us, although we are satisfied that more discrimination should be used in regard to the diet prescribed, and that injury is often done from neglect of due caution on this subject.]

b. A fish diet is often of service, especially in the more chronic and hæmorrhagic states, or when the biliary organs are congested; but on all occasions the white kinds of fish should be selected, and always be boiled. Oysters were praised by TULPIUS and SIMS, but they ought to be taken immediately upon being opened, and a small number only at one time.

c. Vegetable food has been advised by many writers in preference to any other, while as many recommend a due proportion of animal and vegetable diet. Of the more unusual articles, at least in this climate, new figs, dates, the nuts yielding the palm oil, olives, &c., are the most likely to be of service. Grapes, both recent and dried, were praised by RIVERIUS; pickled red-cabbage by LANGE; and cucumbers, with vinegar and sugar, by SCHMALZ, FRIZE, QUARIN, MARX; but these last should be thus dressed without having had their outer rinds removed. Of oranges, lemons, limes, &c., the utility is manifest.

423. d. Milk has always received great commendation in phthisis, but writers have differed respecting that which is most beneficial. Thus ZACUTUS LUSITANUS and BLEGNY prefer human milk; ARETÆUS, BURSERIUS, and STOLL, asses' milk; DIEMERBROECK and VELSCHIUS, goats' milk; SCHENCK, either asses' or goats' milk; HIPPOCRATES, either mares' or asses' milk; and HEISTER, the whey of cows' milk. STOLL considered that asses' and human milk should be diluted, and that they are injurious in the inflammatory complications and in the last stage of the malady. Whatever may be the diet and regimen adopted, milk of various kinds, in suitable forms and states of dilution, constitutes an important part of the treatment of phthisis.

424. e. The beverages allowed the patient should depend on the form and stage of phthisis. In an early stage whey is one of the best that can be taken. At a far-advanced stage, or if diarrhœa be present, it is apt to run off by the bowels. Fermented whey, or serum of milk, or the whey of butter-milk, or recent butter-milk, may be given according to circumstances. In northern or Scandinavian countries, and also among the Tartars, the fermented serum of milk is very commonly employed, and it has been recommended by SIEVERS and others. Spruce-beer is one of the best beverages that can be used; weak tar-water is also sometimes beneficial. Seltzer-water, with milk, and lime-water or Carara-water, with milk, when the bowels are much relaxed, are also of service.

425. f. In recommendation of exercise in the open day, according to the strength and state of the patient, it is unnecessary to add any thing to what has already been stated. Of all kinds of exercise, walking and horse-exercise are the best. Although the latter was considered of little use by QUARIN, yet by SYDENHAM, HALLER, MARX, DARWIN, and others mentioned in the historical

sketch (§ 214, *et seq.*), it was strongly recommended. STOLL advised it in the non-inflammatory states, and when the abdominal viscera were torpid or congested. In the inflammatory complications, active exercise, either on horseback or otherwise, can rarely be taken.

426. In concluding the above imperfect view of the treatment of phthisis, it will be manifest that no one plan of cure, class of medicines, kind of diet, or regimen—no single method, whether medicinal or regimenal, or both, is appropriate to all cases, or even to the great majority of cases, of phthisis. The rational physician, after having endeavoured to ascertain the existing morbid conditions, will merely select and combine, from the stores above indicated, such means as he believes to be most energetic in arresting, counteracting, or removing these conditions, as far as circumstances may warrant the attempt or may promise success.

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[AM. BIBLIOG. AND REFER.—*Samuel G. Morton*, Illustrations of Pulm. Consumption, its Anatomical Characters, Causes, Symptoms, and Treatment, to which are added some Remarks on the Climate of the United States, the West Indies, &c., with 13 col'd plates, 8vo. Philad., 1837 (one of the best works on this subject). — *Benjamin Rush*, Medical Inquiries and Observations, 4 vols. in 2, 5th ed. Phil., 1819. Dr. Rush recommends particularly long journeys on horseback for the cure of this disease; also, in particular cases, stimulants and tonics, as *copaiba*, *bals. Peru*, *oil amber*, *turpentine*, *tar*, *garlic*, *elix. vitriol*, *dandelion*, *horehound*, *wild cherry bark*, *cinchona bark*, *cold bath*, &c.; also a cordial and stimulating diet, dry air in elevated situations, remote from the sea in all cases; appropriate clothing, blisters, and issues in the inflammatory stage, moderate use of the lungs, salivation, and in some cases bleeding. For cough, *demulcent teas*, *syrups* and *lozenges*, *opiates*, *tar vapour*, &c.; for night sweats, *elix. vit.* and *lime-water*; for diarrhoea, *chalk julap*, with *tinct. opii* and *tinct. cinnamon*, and astringent injections. The above are called palliatives. The radical remedy is long-continued horseback exercise. — *Wm. Sweetser*, a Treatise on Consumption, embracing an Inquiry into the Influence exerted upon it by Journeys, Voyages, and Change of Climate, with Directions for the Consumptive visiting the South of Europe, and Remarks upon its Climate, 8vo. Bost., 1836, p. 254. This work, adapted for general reading, is written in a pure classical style, and is one of the most instructive on this subject in our language. The remarks on the best modes of prevention and the climate of different places in Southern Europe, the result of the author's personal observations, are worthy of the particular attention of the American reader. — *John Bell* and *W. Stokes*, Lectures on the Theory and Practice of Physic, 2 vols., 8vo. Phil., 1848, 4th edition. Dr. Bell has embodied a vast amount of facts and personal observations in regard to this disease in seven lectures devoted to it, which may be found in the 2d vol. The treatment recommended is judicious, and in accordance with the present prevailing doctrines on this subject. — *Parish*, North Am. Med. and Surg. Journ., vol. viii. Dr. P., following in the footsteps of Dr. Rush, recommends the tubercular invalid "to rough it" on horseback, on long journeys and in all kinds of weather, as the principal mode of cure. — *Samuel Forry*, The Climate of the United States and its Endemic Influences, 8vo. New York, 1842. — *Horace Green*, a Treat. on Diseases of the Air Passages, 8vo. N. Y., 1846; also Report on the Use and Effect of Applications of Nitrate of Silver to the Throat, either in local or general disease, Trans. of Am. Med. Assoc., 1856; also Am. Med. Month. for Jan., 1855, and March, 1856, and Trans. of N. Y. State Med. Soc., 1855, &c. — *Lemuel Shattuck*, Report of the Sanitary Commission of Massachusetts, 1850, 8vo. Mr. S. has embodied in his report some very interesting facts in regard to the prevalence of consumption in Massachusetts. He shows from the statistical reports that the seasons do not exert much influence upon the disease, especially its terminating period. In four years, from 1845-8, there were 3443 males and 5384 females died of this disease in Massachusetts, of whom 533 females were under 15, and 464 males; over 60, 916 females, 753 males; from 20 to 30 the number of females who perish from it is nearly double that of the males. In the country towns the proportion of the sexes is as 39.01 males to 60.99 females; in New York city, as 42.08 to 57.92. What are the peculiar causes affecting females in the country predisposing them to the disease? The proportion of deaths from phthisis in the western counties does not vary much from that on the sea-coast, being 1 in 3.92 in Barnstable county, to 1 in 5.43 in Berkshire. As 5.935, one tenth of the whole, are returned without a specified cause, the proportion of deaths from consumption in Massachusetts must be somewhat greater than the above (*loc. cit.*). — *H. Hunt*,

- Observ. on a Change of Climate in Pulm. Consumption, North American Med. and Surg. Journ., vol. i., p. 282.—*Thomas Henderson*, Cases of Pulm. Consumption, Am. Journ. of Med. Science, vol. viii.—*N. S. Davis*, in Trans. of Illinois Med. Soc., 1855, on Alcoholic Liquors in Tub. Consumption.—*Wm. M. Fahnestock*, in Am. Journ. of Med. Sci., vol. v., p. 366.—*John Spence*, Case of Pulm. Consumption, showing the Influence of a Sea Voyage on that Disease, in *Ibid.*, vol. ii.—*G. W. Steadman*, Case of Tub. Consumption, in which milky urine was voided, in *Ibid.*, vol. ii., p. 295.—*James Stewart*, on the Lungs and their Diseases. New York, 1849. In this small work Dr. Stewart shows that in all classes of animals there is found a certain relation between the composition of the body and the development of the apparatus of respiration, which explains very clearly the production of scrofula and tubercle by breathing too little or too foul air. He shows that in the lowest form of organization albumen predominates greatly over all other animalized substances, the proportion being diminished as animals rise in the scale of being. In those of the lowest organization respiration is least active, and as they rise in the scale respiration becomes more and more elaborate; so that the greater the proportion of albumen in the animal, the less important is the function of respiration, and the less the proportion, the more complicated, more developed, and more important is this function. Now, as tubercle and scrofula consist almost wholly of albumen, Dr. S. supposes that from a want of sufficient oxygen, where too little air is respired, or from inhaling an impure air, the albumen is not converted into healthy animal tissue, but deposited in the lungs, glands, &c., in its nearly pure form, constituting tubercular or scrofulous disease. Hence the deleterious influence of certain occupations which restrict the movements of the chest, as tailoring, engraving, shoemaking, &c., as well as tight lacing.—*John H. Griscom*, The Use and Abuses of Air, 12mo. N. Y., 1850, p. 249. In this work Dr. G. has most ably pointed out the influence of air in sustaining life and producing disease, with remarks on the ventilation of houses, and the best methods of securing a pure and wholesome atmosphere inside of dwellings, churches, court-rooms, workshops, and buildings of all kinds.—*Samuel Henry Dickson*, Essays on Pathology and Therapeutics, 2 vols., 8vo. Charleston, 1845.—*Austin Flint*, Physical Exploration and Diagnosis of Diseases affecting the Respiratory Organs, 8vo, p. 636. Philad., 1856. The ablest work on the subject yet published; also Prize Essay "on Variations of Pitch," Trans. Am. Med. Asso., 1854.—*George B. Wood*, a Treatise on the Practice of Medicine, 2 vols., 8vo. 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Journal, 1850.—*Jules Rochard*, on the Influence of Sea Life and Warm Countries on the Progress of Pulmonary Phthisis, Am. Med. Monthly. N. Y., 1856. Dr. R., from much experience in the French Navy in various parts of the world, concludes that sea voyages accelerate the progress of pulmonary tubercularization much more frequently than they retard it; that it is a very common disease among sailors, much more so, indeed, than in the army; that phthisis progresses aboard ship much more rapidly than on land. He advises that young men threatened with phthisis should be interdicted the naval profession, and expresses the opinion that warm countries, especially within the tropics, are very prejudicial to consumptives, though there may be a few places on the confines of that region, and concentrated in a narrow space, which may be exceptions; and that if change of climate ever does good in phthisis, it is in the first stage.—*W. W. Gerhard*, Remarks on Tuberculous Affections, &c., Am. Journ. 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TYMPANITES.—(From *τυμπανον*, a drum.) *Τυμπανιτης*, *τυμπανιας*, Hippocrates, Celsus, Galen. *Tympanites*, *Tympanitis*, Auct. Latin. *Tympanites*, Sauvages, Vogel, Sayar, Cullen, &c. *Affectio Tympanitica*, Hoffmann. *Tympanita*, Sennert. *Meteorismus*, Sagar, et auct. var. *Emphysema Tympanites*, Parr. *Tympania*, Ploucquet. *Emph. Tympaniticum*, Young. *Emph. Abdominis*, Good. *Hydrops siccus*, Auct. *Windsucht*, *Trommelsucht*, Germ. *Tympanite*, Fr. *Tympanitide*, Ital. *Tympany*, wind dropsy, dry dropsy, inflation of the abdomen.

1. CLASSIF.—4th Class, 6th Order (Cullen).
6th Class, 2d Order (Good). I. CLASS,
I. ORDER (Author in Preface).

2. DEFINIT.—An inordinate generation and accumulation of a gaseous fluid within the digestive canal, generally with retention of it, occurring chiefly symptomatically, either terminating acute disease, or complicating chronic affections, and occasioning great abdominal distention, and a drum-like sound on percussion.

3. I. PATHOLOGY.—*Tympany* is generally the result of greatly impaired vital power, as manifested chiefly through the organic or ganglial nervous system upon the digestive canal, whereby not only is the tonicity of the coats of the canal remarkably impaired, but also gaseous fluids are exhaled from the digestive mucous surface. That the air is generally contained in the canal, where it is retained either by spasm in parts of the canal near to its outlets, or by the inability of the muscular structure of the canal to expel it, cannot be doubted. It has been supposed by some writers that the air may be on some occasions exhaled into the peritoneal cavity. If this occurrence take place at all, it must result from the decomposition of matters effused into the cavity, as in cases of chronic peritonitis, or of puerperal peritonitis, or of perforation of the intestines, when some of the intestinal contents have passed into this cavity. The occurrence of tym-

pany from these changes is however, rare, but less rare when the intestines are perforated by any of the causes of this lesion of the intestines. (See art. **INTESTINES**, § 29.)

4. Several varieties of tympany have been enumerated by writers of the seventeenth and eighteenth centuries, according as the gaseous accumulation has occurred in the advanced course of acute maladies, or has complicated chronic diseases, the primary affections, with which tympany is associated, furnishing the basis of arrangement. Of these it is quite unnecessary to take any notice, as such occurrences of tympany are merely contingencies of advanced and dangerous diseases, and are merely symptoms of these or of hysterical or uterine disorders; often, however, assuming very prominent and distressing characters, especially in the last stages of peritonitis, of puerperal and malignant fevers, &c. That the air which accumulates in the digestive tube in these and various other circumstances of disease cannot arise, to any great amount, from the decomposition or retention of alimentary materials, or of morbid secretions accumulated or retained in the canal, is demonstrated by the absence of these sources of the gaseous collection in the more extreme cases. We are compelled, therefore, to view the accumulation of air as the result of a morbidly increased exhalation of it from the digestive mucous surface, resulting from depressed vital or organic nervous power, in connexion with lost or impaired tone of the muscular coats of the canal; this last condition, equally with the augmented exhalation, proceeding from the loss of vital power. According to this view *tympany* is merely an extreme state of *flatulence* (see that article), the gaseous exhalation having accumulated in the former, so as to produce extreme distention, but being discharged in the latter at intervals or absorbed.

5. That this exhalation must necessarily proceed from the blood, in great measure, or, in as far as it does not arise from the decomposition of alimentary matters, or of the secretions, must necessarily be inferred, particularly in the more extreme and sudden accumulation of the gaseous fluid. JOHN HUNTER and CULLEN believed that the fluid was thus generated, and MAGENDIE and GERARDIN endeavoured to prove the occurrence by experiment. They included a portion of intestine between ligatures, returned it into the abdomen, yet air, nevertheless, was found in it, although it contained no materials for the generation of air. That the air was exhaled from the digestive mucous surface had long been believed in, and supported by observation and analogy. FABRICIUS HILDANUS, HOFFMANN, PORTAL, VIDAL, GASPARD, NYSTEN, MERAT, and many others, have contended for this doctrine, and have adduced facts in support of it. BICHAT has shown that friction with sulphur communicates the odour of sulphureted hydrogen to the gas which collects in the bowels. The swimming-bladders of fishes are known to be supplied with air from the blood only; and BLAINVILLE, DUMAS, MAGENDIE, and others, have shown that a division of the pneumo-gastric nerves is followed by gaseous distention of the stomach.

6. Tympanitic distention of the abdomen may therefore be referred, firstly and chiefly, to the extrication of air from the digestive mucous surface, owing to the states of organic nervous en-

dowment, or to the irritation or morbid action of matters received into the alimentary canal, as in various kinds of poisoning, or to changes in the blood itself; secondly, in a small degree, from the deglutition of air with the food or with the saliva; and thirdly, and in a very variable degree, from the decomposition or fermentation of alimentary matters, or of secretions and excretions. In cases of weak digestion, or when the organic nervous influence is much depressed, the quantity of air which may be formed, as shown by Dr. HALES, from the fermentation of fruit or raw vegetables in the stomach is often very great.

7. According as either of these sources of gaseous collections in the digestive canal predominates or is increased, so may the nature of the gaseous fluid be supposed to vary. The states of the blood, the nature of the ingesta, whether alimentary, medicinal, or poisonous, the seat of the collection, will severally modify the composition of the gaseous fluid. MM. JURINE and CHEVREUL have shown that generally the proportions of oxygen and carbonic acid decrease, while that of nitrogen increases, in descending from the stomach to the rectum.* Although there does not appear to have been any analysis of the air collected in tympany, yet there is every reason to infer that it does not materially differ from that usually formed in the digestive canal, unless under the influence of acute or malignant diseases, when, with an admixture of carbonic and nitrogenous gases, and a little hydrogen, sulphureted, carbureted, and even phosphoreted hydrogen, may severally exist in varying proportions.

8. II. THE CAUSES OF TYMPANY—*whether predisposing, exciting, concurring or determining*—are in some respects the same as those which are noticed under the head FLATULENCY; but they exist in the former, or are rather associated, with one or more of the following pathological states: 1st, with mechanical or other obstruction to the discharge of the gaseous exhalation from the alimentary canal; 2d, with impaired or lost contractile power of the muscular coats of the canal; 3d, with alterations of the blood from absorbed matters or from vital changes, affecting the absorption of gases from the air, or the generation or extrication of them from the blood; 4th, with changes in the circulation in the lungs, and in the respiratory functions. Where one or more of these conditions are present, and in proportion

* In the Stomach.	Oxygen.....	11		
	Carbonic acid.....	14		
	Hydrogen.....	3.55		
	Nitrogen.....	71.45		
		100		
In small Intestines.	Carbonic acid.....	24.39	40.6	25.0
	Hydrogen.....	55.53	51.15	8.4
	Nitrogen.....	20.08	8.85	66.6
In three cases.				In one.
In large Intestines.	Carbonic acid.....		43.5	70.0
	Carbureted hydrogen with trace of sul- phureted hydrogen.		5.47	11.6
	Nitrogen.....		51.03	18.4
	Carbonic acid.....		12.5	
In the Cæcum.	Hydrogen.....		7.5	
	Carbureted hydrogen		12.5	
	Nitrogen.....		67.5	
			100	
In the Rectum.	Carbonic acid.....		42.86	
	Carbureted hydrogen		11.18	
	Nitrogen.....		45.96	
			100	

as they are increased by depression or exhaustion of the vital manifestations or endowments of the digestive canal, in so far will the tympany become remarkable or extreme, and the possibility of its removal be diminished.

[There are two principal sources of flatulence; the first, chemical changes in the ingesta; second, secretion, or exhalation from the mucous membrane of the gastro-intestinal surface. There is also a third cause, not usually recognised, but of the reality of which we are fully satisfied from careful observation, and that is inefficient action of the liver, and a want of bile in the intestines. In a considerable proportion of the cases of flatulence which have come under our notice, we have found it relieved by medicines which promoted the hepatic secretion, as small doses of blue-pill or calomel. These cases are often associated with constipation, a furred tongue, foul breath, &c., all pointing to hepatic torpor, and the flatulence as well as the other symptoms are very certainly relieved by mercurials. In retrocedent gout, where the disease is transferred to the stomach and intestinal canal, attended, as it usually is, with very painful cramp of the stomach, colicky pains, constipation, and great flatulence, we have found large doses of calomel very successful in affording relief. In a case of this kind which recently came under our care, where the disease suddenly left the extremities and fastened on the digestive organs, and where the pain, flatulence, gastric sensibility, and cramp were so severe as to threaten the life of the patient, perfect and permanent relief was afforded by the administration of calomel, at first in large, and afterward alterative doses, which resulted in bringing away large quantities of thick, black bile. It is very probable there may be here, as in gastro duodenitis, a complete temporary occlusion of the mouth of the ductus communis choledochus, from vascular congestion of the duodenal mucous membrane, thus causing an obstruction to the flow of bile, and leading to flatulence, flatulent eructations, &c. In the flatulence accompanying ordinary dyspepsia, an alterative pill of blue mass, aloes, rhubarb, and gentian, will generally afford relief. The flatulence of low fevers may be due to exhalation, or to the play of the ordinary chemical affinities in the aliment or excretions in the stomach or intestines, from the low condition or suspension of organic nervous power. On the same principle we may perhaps account for the eructation of air in gastritis, hepatitis, &c., although it is more probable that in such cases it is the result of exhalation or secretion.]

9. The causes of tympanites, or rather the circumstances in which flatulent distention of the abdomen chiefly occur, are pathological, or consist of antecedent disorders or most dangerous organic changes. While such disorders are productive of the less severe and dangerous states, or those which more nearly approach the conditions described under the head Flatulence, the most dangerous organic changes and malignant maladies give rise to the extreme instances of meteorismus or tympany. The slighter cases of flatulent distention are produced by the nature of the food, especially by saccharine and acescent matters and vegetables, by indigestible and otherwise injurious articles of food, by constipation or the retention, by mechanical or vital obstruction, of the intestinal excretions, as in cases of

colic and ileus, and by hysteria or uterine and spinal irritation.

10. The *extreme* instances of tympany occur chiefly after poisonous ingesta, more particularly after poisonous meats, poisonous fish and shell-fish, and indeed during the last and most dangerous stage of poisoning by other deleterious agents (see *art. Poisons generally*, and especially § 427-528); in the advanced stages of puerperal fevers and puerperal peritonitis; in gastritis and enteritis, particularly when perforation of the intestinal canal has taken place, and then air may escape into, or be developed in, the peritoneal cavity; in misplaced gout of the stomach or bowels; and in the last stage of adynamic and typhoid fevers, and of malignant continued and eruptive fevers. They also occur as terminations of fatal ileus, of hernia, of intersusceptions and strictures of the bowels, of lead colic, &c. Even a moderate degree of tympanitis in adynamic or typhoid fevers should be viewed with alarm, inasmuch as it is an indication of ulceration of PEYER'S glands.*

11 III. The signs and symptoms of gaseous distention of the abdomen are very manifest, and even the seat of distention may be correctly inferred, especially when it is not extreme.—A. Palpation and percussion, in some cases even simple inspection, of the abdomen, are sufficient to show the seat and nature of the morbid condition. When the distention is chiefly of the stomach, the region of this organ is elevated above the margin of the false ribs, and the ensiform cartilage is protruded, the lower abdominal regions being less prominent. A similar elevation of the upper regions of the abdomen exists when the colon is the chief seat of distention, but the course of the colon, from the distended cæcum to the termination of the bowel, may be observed on inspection; and it is farther evinced by the hollow sound on percussion, especially when the cause of obstruction to the escape of flatus exists in or near to the sigmoid flexure or rectum. In the extreme instances of tympany, arising from any of the causes stated above (§ 8-10), the inflation is generally greatest in the small intestines, although it may be more or less in other portions of the digestive tube. In cases of hysteria, the distention is more limited, varies in its seat, and in the sympathetic sensations and pain it occasions; and owing to the spasm and contractions, successively affecting different portions of the tube, occasions borborygmi, and the propulsion of flatus into the stomach and œsophagus. The

[* AUSTIN FLINT, in an analysis of 56 cases of continued fever, reports tympanites present in 16 out of 28 hospital cases of *typhoid*, and in 8 out of 13 cases of *typhus* fever (*Clin. Rep. on Contin. Fever*, p. 84), being about an equal ratio in both, or as 4 to 6. In private practice it was less frequently observed. In *typhoid* fever it was accompanied in a majority of cases with diarrhœa; in *typhus* the diarrhœa was uniformly absent. In no case was this symptom considered to be present, except where there was obvious distention of the abdomen, as well as resonance on percussion.

In a second analysis of cases of continued fever, Dr. F. found tympanitis present in 22 out of 39 cases of *typhoid* fever, or in both collections 34 in 47 cases. In 5 cases the tympanitic distention was slight or moderate in 13, and considerable in 4. Of 10 cases of *typhus*, tympanitis was present in 8, being slight in every case but one. It was less marked in *typhus* than *typhoid*. Of 7 fatal cases of *typhoid*, it was present in 6; in one fatal case it was slight, in 3 moderate, in 2 considerable. Of 4 fatal cases of *typhus*, it was present in 3, but slight in each. The results show that this symptom occurs in a much larger proportion of cases ending fatally than of those in which recovery takes place.]

mechanical effects of abdominal inflation are chiefly the pressure of the diaphragm on the heart, lungs, and large veins, and the arrest of the peristaltic motions of the intestine and of the propulsive efforts by which the intestinal contents are excreted. To these various subordinate effects others may be added, consisting of disturbance and arrest of the several secreting and excreting functions, of congestion of the lungs and large vessels, and of imperfect oxygenation of the blood, &c.

12. B. The source and nature of the abdominal inflation are to be inferred chiefly from the history of the case; from the antecedent disorder; from the seat, nature, and duration of pain; from the indications furnished by percussion of the several abdominal regions, and from the states of the excretions and of the pulse and tongue, with the various constitutional symptoms.

13. The flatulent distention is generally that of the intestinal canal, and not of the peritoneal cavity, although I would not say that this latter may not in rare cases be its seat, especially if the fluids effused into this cavity undergo more or less of decomposition previously to dissolution; but it is not improbable that the instances of gas thus evolved in this cavity, as observed by HEISTER, DUSSEAU, LIEUTAND, MORGAGNI, PORTAL, and others, are merely those in which the gas had escaped into the cavity owing to a perforation of the digestive canal. Tympanites has been occasionally observed in most of the organic lesions affecting the biliary organs, the digestive tube, and the abdominal and pelvic viscera. It is often an attendant on gout of the stomach or intestines.

14. C. The appearances observed in fatal cases are a very large proportion of those lesions which have been very fully described under the heads DIGESTIVE CANAL and INTESTINES. In some cases the distention of the tube has been remarkably great throughout the greater part; and in others it has been more limited; as to the CÆCUM and COLON (see those articles). It has rarely been such as to rupture the bowel, sphacelation of the more distended portions being more common. The small intestines, especially the ileum, are always remarkably distended by flatus, and the glands, more particularly PEYER'S, are often more or less ulcerated, &c.

15. IV. THE TREATMENT of tympany is generally difficult, often hopeless, and always dependent upon the pathological conditions of which it is merely a symptom or contingent effect. In many cases it is productive of so much and so urgent distress that it becomes requisite to attempt the removal, or the amelioration of it, before the morbid states, from which it results, should occupy our attention with the view of directing the means of cure to them more especially. The indications are, therefore, 1st, to remove the tympanitic distention by such means as we possess, when it is distressing and most urgent; and, 2d, to subdue the pathological states upon which the distention depends, by appropriate treatment, either when this urgency is removed or does not yet exist.

16. i. The removal of the flatulent distention of the intestines by mechanical means was first recommended by Dr. DARWIN to be attempted by the introduction of an enema-pipe into the rectum, in order to remove the resistance of the sphincter ani to the passage of flatus. TRENKA

proposed that the gas should be removed by the air-pump; and Dr. OSBORNE, of Dublin, adopted this means, in the mode most likely to render the recommendation successful. After other means had failed, he introduced a gum-elastic tube of nearly three feet in length, with a button and hole at its extremity, and, having applied to it a stomach-pump, he proceeded to withdraw the gas, and "was enabled to do so with few interruptions, which were speedily overcome either by shifting the place of the tube in the intestine, or by injecting warm water to clear the holes by accidental stoppage. In about an hour the abdomen was reduced to nearly the natural size."—(*Lond. Med. Gaz.*, vol. vii., p. 825.) Dr. GRAVES employed similar means with success in two cases.—(*Lond. Med. and Surg. Journ.*, vol. ii., p. 781.) I had recourse to it in one case with temporary benefit, and have advised it in consultation in two or three instances, but in neither with permanent advantage. It should not, however, be neglected, as more or less relief is produced by it. In many of the more severe cases I have prescribed enemata containing the extract or confection of *rue*, or *asafoetida*, or both *rue* and *asafoetida*, and enemata with *oleum olivæ* and *oleum terebinthinæ*, or the other carminative injections recommended for the removal of obstinate constipation.

17. While the operation of these and similar means is expected, *frictions* over the abdomen with either of the *liniments* referred to in the APPENDIX (F. 311) may be resorted to, and medicines may be exhibited by the month. When the tympany is not attended or caused by mechanical obstruction, and is to be imputed rather to a paralyzed state of the muscular coats of the canal than to either constriction or strangulation, then the extract of *nux vomica* in small doses, or the usual carminatives, especially *rue*, *asafoetida*, *capsicum*, *turpentine*, &c., are often of service. *Turpentine*, either as a confection or as a draught, with the *oleum olivæ*, or *ol. ricini*, on the surface of an aromatic water, or of common gin, in cases of hysterical tympany, or of spirit-drinkers, if prescribed with discrimination, is the most efficacious, especially if enemata or liniments with this substance be employed also.

18. When the tympanitic distention has arisen from obstruction in the vicinity of the cæcum or in the large bowels, then the injections into the latter should consist chiefly of warm, oleaginous, and saponaceous substances. Olive oil in large quantity may be thus employed, and this oil may be taken in small and frequent doses, oleaginous frictions being also resorted to. In several instances where tympany was caused by the obstruction arising from hysterical pica—by chewing paper in two cases, by sealing-wax in one case, and by bleached wax and spermaceti in another, the obstruction was removed, in all, by these means, the causes of the disorder having been made apparent, by the numerous balls of these substances, agglutinated by the mucus of the bowels, and moulded in the cells of the colon, which were voided.

19. ii. Having removed the more urgent symptoms, the *Pathological conditions* producing the tympany requires close attention and appropriate treatment. These conditions are so numerous and so different that it is impossible to state all that may be required to fulfil this intention. This is, however, the less necessary, as the circum-

stances under which tympanites occurs, and the pathological causes producing it, are duly considered, with the treatment required for each, in the articles on *Adynamic Fevers*, inflammations of the *intestines* and of other portions of the intestinal tube, *hysterical affections*, *colic*, *ileus*, and on other disorders upon which tympania is often contingent. The diverse sources of this affection, and the very opposite pathological states which may occasion it, sufficiently explain the success which has sometimes followed very different or even opposite indications and means of cure. Thus, when depending upon inflammatory action, the antiphlogistic treatment and regimen, as advised by J. P. FRANK and others, are then required; but when depending upon a paralyzed state of the intestines, consequent upon either organic lesion in some part of the digestive tube, or upon a morbid condition of the blood, as in the advanced stage of low or malignant fevers, then stimulants, tonics, carminatives, and restoratives, as *turpentine*, *camphor*, *musk*, *ammoniacum*, *asafoetida*, *galbanum*, *capsicum*, *myrrh*, *rue*, &c., are equally necessary. In these latter circumstances, and especially when the bowels are loaded by offensive sordes or morbid excretions, then powdered *charcoal*, as advised by FRANK, and employed by myself in such cases, in conjunction with antiseptics or other means, or with one or more of those just named, may be employed. The carbon may be administered in doses of half a drachm to a drachm, twice or thrice daily, in the state of powder, in any suitable vehicle. In the case of a very celebrated general, attended some years ago by Dr. F. HAWKINS and myself, this substance was administered in that quantity and even in more frequent doses, and was conjoined with active medicines; it having been adopted chiefly for the removal of the fetor characterizing the evacuations and tympania in the advanced stage of low fever. For inflation of the bowels in the last stage of fevers, in dysentery, in chronic diarrhoea, in misplaced gout, &c., the treatment already advised (§ 17) is often beneficial; and in many of these, especially in aged subjects, *charcoal* is often of use, and seldom fails of removing the fetor characterizing these cases.

[When chronic, or owing to atony of the muscular coat, *electricity* by the electro-magnetic apparatus has often been found useful. We have known also the *galvanic belt* worn round the body to afford much relief, and exert a curative action. Cold applications to the abdomen, the various preparations of iron, sea-bathing, horse-back exercise, a firm band about the abdomen, all may prove advantageous in cases where these remedies are indicated. *Articles of food* prone to fermentation, or the extrication of large quantities of air, must be avoided, such as *peas*, *beans*, *turnips*, *greens*; also fermented liquors, sweet wines, pastry, &c. The bulk of a meal should be small, and condiments used, as pepper, mustard, &c.]

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[See various Am. works of Prac. of Med. already referred to; also *Flin's "Reports on Continued Fever,"* and *Bartlett on Fever.*]

URINARY BLADDER.—**SYNON.**—*Vesica Urinaria*; *Vesica urinialis*; *κυστις*, *Cystis*; *Urocystis*;—*Vesica*;—*Vessie*, Fr. *Harnblase*, Germ.

1. *The urinary bladder is a musculo-membranous reservoir for the reception of the urine, until the accumulation of a certain quantity solicits the discharge of this secretion. This reservoir is situated in the hypogastric region, between the pubes and rectum in man, and between the pubes and vagina in the female. Its several connexions with the urinary and sexual passages, in both sexes, and its other anatomical relations, need not be noticed at this place. It is sufficient that we bear in recollection that, in addition to the disorders and lesions which are seated in it solely or chiefly, it is liable, in consequence of these connexions, and of the nervous and vascular communications existing between it and other parts, to several sympathetic affections, the most important of which are those depending upon lesions of the kidneys and ureters, and upon those of the prostate gland and urethra. In all cases, therefore, when the urinary bladder appears to be the seat of disease, our attention should be directed also to the states of these organs and passages; and not be limited to these, but be extended even farther, and more especially to the composition and condition of the urine and of its deposits, with the several relations of digestion and assimilation.*

2. I. IRRITABILITY OF THE BLADDER.—CLASSIF.
—II. CLASS, III. Order. (*See Preface.*)

3. DEFINIT.—*A frequent and urgent desire to micturate, independently of febrile symptoms and of inflammation, and of organic lesion of the urinary bladder and prostate gland.*

4. i. SYMPTOMS.—A person otherwise in good health feels an urgent desire to void his urine after very short intervals, and if the desire be not gratified, either he is incapable of retaining it, or he retains it with great difficulty, and with more or less pain. The effort at micturition is sometimes attended by pain in the glans or under the frænum, and by straining; and although the

calls are frequent, the quantity passed at each call is very small. These latter symptoms are most frequent in old or aged persons, and in those who have been addicted to masturbation or sexual excesses, in whom the prostate is more or less tumid or enlarged. Hysterical persons are often liable to this disorder; but in these the urine is more copious and pale, and contains less than the usual proportion of solid ingredients, the nature of which are not altered. When irritability of the bladder has continued long—the organ having for a long period ceased to be distended by the accumulation of urine—the capacity of it becomes permanently accommodated to the paucity of its contents, and incapable of containing more than two or three ounces.

5. Mr. COULSON, in his admirable work on Diseases of the Bladder and Prostate Gland, remarks that, notwithstanding this contracted state, if there be no stricture or disease of the prostate, the parietes of the bladder are often thinner than natural; and that it would seem that protracted irritation produces absorption of part of the substance of the organ. Opportunities of examining after death the bladder of persons who laboured under this affection in its idiopathic form are very rare. Mr. COULSON examined the body of a gentleman of a very nervous temperament, long a sufferer from this disorder, who was carried off by disease of the lungs; but he could not detect the least alteration in the appearance or structure of the bladder, or of any of the urinary organs.

6. ii. THE CAUSES of this disorder require recognition in each case which comes under treatment. Old persons, or the aged, and next the very young, are more liable to irritability of the bladder than youths or the middle-aged; but the causes producing it in the aged are generally very different from those occasioning it in children. The nervous temperament, weak, irritable and anxious dispositions, and gouty and rheumatic persons are most predisposed to it. Those subject to chronic dyspepsia, to nervous giddiness, tremors, or to scaly eruptions, are often also afflicted with this complaint.

When it occurs in females it is sometimes referable to injury from pressure, either during pregnancy or in parturition, or to disorders or lesions of the uterus, ovaria, or vagina. It may be occasioned in both sexes by hæmorrhoids or irritation of the rectum by ascarides, or by chronic states of dysentery. It may occur, in a slight form, even independently of hysteria, in males as well as in females, from self-pollution, or from irritation of the spinal nerves increasing the organic sensibility of the bladder.

7. a. The most frequent causes are probably those which are referable to the states of the urine, arising either from the nature of the ingesta, or from the changes consequent upon primary or secondary assimilation. It has been well remarked by Dr. PROUT, in his celebrated work, that cases of irritable bladder, depending on functional derangement of the kidneys, usually result from the unnatural properties of the urine. All deviations from the normal condition of the urine, whether in deficiency, or in excess, or in kind, are recognised by the containing organs, and may prove a source of irritation in the bladder. "Hence, whenever the urine is very dilute or very concentrated, or is preternaturally acid or alkaline, or contains any unnatural ingredient, the urinary organs in general, and the bladder in particular,

though perfectly healthy, are liable to become excited and irritable, and the individual has no peace until the unnatural secretion is discharged. In such cases the fault lies, not in the bladder, but remotely in the kidneys and assimilating organs."—(*Op. cit.*, p. 366.)

8. The use of various fruits, ripe or unripe, especially by children, and even by adults, and disorders of digestion and of assimilation, occasioned by these or by other causes; the elimination from the blood of unwholesome substances, conveyed into it from the organs of digestion, whether subsequently altered or unaltered by the kidneys; the excessive use of alkalis, or of these combined with the vegetable acids, and alkaline states of the urine from these or other causes; and the prolonged use of acids, or of the nitrate of potass, or of the oxide of potassium, or of other diuretics, may severally occasion this complaint.

9. *b.* The irritation of ascarides in the rectum, and morbid states of the urine, caused either by unwholesome food, by unripe fruit, or by impaired assimilation, or by spinal affections, or by rickets, are the most common causes of this affection in children. Mr. COULSON met with cases in children which were caused by so great a contraction of the orifice of the prepuce as hardly to admit the point of a probe; circumcision cured the complaint. When irritability of the bladder occurs in this class of patients about the periods of dentition, it may generally be imputed to disorder of the digestive organs, and to consecutive alterations of the urine. The connexion of irritability with paralysis of the bladder is not unfrequently met with in children (§ 36).

10. *c.* *Symptomatic irritability* of the bladder is much more common than the idiopathic disease. Granular and other organic lesions of the kidneys are generally attended, especially during the night, with frequent and urgent desire to evacuate urine, this excretion being always more or less morbid even from an early period. Diseases of the prostate gland and of its vicinity, organic, inflammatory, or malignant very generally, and strictures of the urethra not unfrequently, are accompanied with this complaint. Indeed, strictly speaking, irritability of the bladder is merely symptomatic, either of disease of some adjoining or some closely related organ, or of morbid conditions of the urine; and this may be the case even in those considered purely nervous, or most devoid of manifest structural change.

[*Gonorrhœa* and *masturbation* are among the most frequent causes of irritability of the bladder, the irritation being transferred from the urethra to the neck of the bladder; causing frequent micturition, with tenesmus, pain, bloody urine, &c. All the stimulating class of diuretics may cause the same difficulty; also those resinous cathartics, like *aloes*, which act on the lower portion of the intestinal canal. Turpentine, cantharides, and nitrate of potass are the most likely, perhaps, of the diuretics, to irritate the bladder.]

11. *iii.* THE DIAGNOSIS of this complaint is often of importance; and nothing tends more to determine this than a careful examination of the urine. Irritability of the bladder will not be mistaken for *diabetes*, if the quantity and quality of the urine be ascertained. Although irritability is a symptom of inflammation of this viscus, yet it is necessary to ascertain its independence of inflammatory action; and this is to be inferred chiefly from the absence of those local and con-

stitutional symptoms characterizing cystitis, either in an acute or chronic form. The absence of pain in the region of the bladder, and of frequency of pulse or of other febrile symptoms, especially towards evening, will indicate the independence of the recent state of the complaint of acute inflammation; while the more chronic state of irritability will not be imputed to chronic inflammation of the bladder, if the constitutional powers of the patient be not very sensibly impaired by it. The dependence of the complaint upon disease of the prostate gland may readily be ascertained by an examination *per rectum*. Not only, however, may there be irritability, but also pain of the bladder, without any manifest disease of this viscus; the mischief being confined to the kidneys, chiefly in the form of calculi of these organs. Instances of this kind are adduced by MORGAGNI, PROUT, COULSON, H. J. JOHNSON, and others, and have come under my own observation. Dr. PROUT remarks that, in certain renal affections in particular habits, even where the urine is not very unnatural, the pain is confined chiefly to the neck of the bladder; but where the urine is actually diseased, and especially when it is alkaline, we may be certain that the kidney is functionally, and if the patient be of a scrofulous habit, and the case of long standing, very probably organically affected.*

12. *iv.* TREATMENT.—*a.* In recent cases, the states of the general health and of the urine will frequently indicate a successful treatment. When the urine is very acid, or scanty, or furnishes a red sandy deposit, and when the complaint appears in connexion with either gout or rheumatism, then bicarbonate of potash may be given, with or without the nitrate of potash, in tonic or bitter infusions or decoctions; the carbonates of soda and of ammonia being inappropriate, the former owing to its favouring the formation of urate of soda, the latter to its influence in generating urea and uric acid. Mr. COULSON states that great relief will sometimes be obtained from cupping on the perineum. This will be more especially the case if any congestion of, or vascular determination to, the prostate gland be present. Liquor potassæ, prescribed in bitter infusions, with henbane or conium, or with small doses of colchicum, in the gouty or rheumatic diathesis, is also of great service. Where the potash, in either of the states now mentioned, is not productive of relief, magnesia may be given so as to preserve the bowels in an open state, an occasional dose of equal parts of the compound infusions of gentian and senna being also taken.

13. *b.* In cases which manifest a nervous character, or which seem to be results of abuse of the sexual organs, tonics are especially required, either in combinations already mentioned, or with the mineral acids; as the infusion or decoction of cinchona with the nitro-muriatic acids, and with henbane or conium, or with a few drops of tincture of opium, or with the compound tincture

[* This disease has sometimes been mistaken for stone in the bladder. We have known two instances where the operation of lithotomy has been performed without finding any calculus in the bladder. Dr. GROSS relates a case of a boy four years of age, who had a constant desire to micturate, complained of severe pain in the urethra and neck of the bladder, pulled constantly at the prepuce, and strained violently whenever he voided his urine, which was occasionally tinged with blood. On sounding, no stone could be found, and he was cured with alterative doses of calomel and rhubarb, with carb. soda, and in the intervals quinine and Fowler's solution.]

of camphor. The mineral acids may also be given with the decoction of pareira brava, or of uva ursi, or with the infusion of buchu, and with the additions just mentioned. I have prescribed the tincture of the muriate of iron in calumba or quassia, and anodynes, with benefit, for cases of this kind. Mr. COULSON remarks that the decoction of uva ursi and the infusion of wild carrot seeds will occasionally give great relief; but that no medicine is so generally successful in irritability of the bladder as the infusion of diosma; and he adds that, from time immemorial, the buchu leaves have been held in great esteem by the natives of the Cape of Good Hope as a remedy for irritative and inflammatory affections of the urethra, bladder, prostate gland, and rectum, and also for rheumatism, indigestion, and gravel. The natives of the Cape and the Dutch are partial to the spirit of buchu, made by distilling the leaves in the dregs of wine, and call this spirit buchu brandy; and they use it for all chronic diseases of the stomach and bladder, especially colic, spasms, &c.* A tincture of buchu is ordered by the Edinburgh and Dublin Colleges; and half a drachm to a drachm of it may be given for a dose. In these and similar cases of irritability an opiate suppository, or a starch enema containing from one to two drachms of sirup of poppies, or about thirty drops of tincture of opium, may be administered at night; or a pill with opium, or henbane, and extract of colchicum, shortly before bed-time.

[Dr. GROSS (*loc. cit.*) speaks favourably of the *tinct. of cantharides* in this disorder, and states that he has used it with marked advantage in several cases during the last few years, especially in the irritation of the bladder in young children and hysterical girls, when carried to the extent of producing slight strangury. *Haerlem oil* has sometimes succeeded when every thing else has failed, in doses of from 10 to 20 drops. The saturated tinct. of the *Phytolacca decandra* was often prescribed in this disease by the late Dr. PHYSIC, in doses of two drachms every 7 or 8 hours. The decoction of *soot*, $\frac{3}{4}$ ij. to one lb water, and filtered, is highly recommended by Dr. GIBBIN (*Bull. l'Acad. de Méd.*, March, 1837).]

14. *c.* When this complaint is *symptomatic* of granular or other organic disease of the KIDNEYS, or of enlargement or other lesions of the PROSTATE GLAND (see those articles), then the treatment must be based on the primary and chief malady. When it is connected with the gouty or rheumatic diathesis, or with either of the scaly eruptions, then the bicarbonate of potash, or the solution of potash, and small doses of the iodide of potassium, in equal parts of the compound tincture of cinchona and of the fluid extract of sarsaparilla, with one of the narcotics already mentioned, are often beneficial. If the urine becomes alkaline, or if the iodide appear to perpetuate the irritability, the alkali and the iodide should be relinquished. In this state of the disease, colchicum may be conjoined with the above, or even a small quantity of opium may be added to them. In most cases, especially when the nightly rest of the patient is much disturbed, an opiate in some suitable form should be given in the evening or at bed-time.

15. *d.* When the complaint occurs in *hysterical females*, or in connexion with the accession, or with disorder of the catamenia, the prepara-

tions of iron, or of valerian, or of asafœtida, or of aloes, the bowels being acted upon by preparations of the latter, are generally beneficial. In these cases also, the tincture of sumbul, in doses of twenty to forty drops, with five or six of the tincture of opium, is often of service.

16. *e.* The incontinence of urine often afflicting children, and generally during sleep, seems to proceed from an association of irritability with partial paralysis of the bladder, or at least with impaired tonicity of the sphincter vesicæ. In most of these cases the general health, the digestive functions, and the state of the urine are more or less disordered; and to these especially medical treatment ought to be prescribed. In many instances, while due means are employed for these, stimulating liniments rubbed along the spine, or sponging the back and sacrum with a strong solution of salt night and morning, will prove of service. (*See also* § 39.)

17. *f.* In all cases of irritable bladder the *diet* and *regimen* of the patient should be duly regulated, and with especial regard to the states of the digestive functions, of the urine, and of the organs most intimately related to the offices of the bladder. Fruit and vegetables are often injurious. Much animal food is even more hurtful, especially in the gouty, rheumatic, and uric acid diathesis. Malt liquors and spirits are still more injurious, and wine is very rarely of service. Sexual excesses ought also to be avoided, and sexual intercourse seldom indulged in. The calls to micturate should be deferred as long as possible, and the mind be diverted from it; for a constant response to each early call ultimately gives rise to a habit which increases and becomes confirmed from the want of opposition to it.

[*Neuralgia of the bladder* may be noticed with propriety under this head. This is a painful affection of the organ, generally referred to the neck of the bladder, occurring in paroxysms daily, or every other day, at about the same period of time. It is met with most frequently in miasmatic districts, and in hysterical subjects, though by no means confined to females. For the most part it occurs in the old or middle-aged. The attack is generally preceded by a sense of uneasiness in the perineal region, with occasional numbness, aching, or a sharp, tingling pain; and these symptoms, with remissions, may last several days, the attacks becoming more distinctly paroxysmal; the paroxysms lasting from two to six hours, and the pain resembling that produced by a fit of the stone. Dr. GROSS represents the pain as extending to the neighbouring organs, as the rectum and anus, the urethra and inside of the thighs. In the female the *uterus* is sometimes involved, and the spermatic cords in the male. The pain is generally very severe in the sacral and lumbar regions in both sexes. The desire to micturate frequently is strongly marked, although attended with difficulty; and a sensation of heat and burning is felt along the urethra, but especially at the extremity of the penis, from whence it frequently extends to the neighbouring parts. "The paroxysm," says Dr. GROSS, to whom we are indebted for this description, "generally goes off gradually, leaving no other inconvenience than a sense of soreness, or aching in the neck of the bladder, perineum, and posterior part of the urethra. During the intermissions the urine is voided without difficulty, and the patient feels comparatively comfortable, almost as

[* The fluid extract is far preferable to the tincture. Tilden's preparations are altogether reliable.]

well, indeed, as if he had not suffered any pain. When the attacks assume the quotidian type, they usually occur in the evening, during the night, or early in the morning. Occasionally they make their appearance soon after eating, and in a few instances they occur twice in the 24 hours; thus leaving the poor sufferer scarcely a moment free from pain.*

This affection is rarely accompanied with fever. There is usually much derangement of the digestive organs, with torpidity of the bowels; the sleep is disturbed, the pulse quick and irritable, the extremities cold, and the general health greatly impaired. In severe and obstinate cases there is a gleet discharge from the bladder, with soreness in the perineum and hypogastric region, and a sense of coldness, with numbness, in the neighbouring parts. The urine is generally normal in quantity and quality, except in gouty or rheumatic subjects, in whom it is generally acid, scanty, and mixed with red sand.

The diagnosis of this affection is not always easy, as its paroxysms closely resemble those produced by calculus in the bladder. Dr. Gross advises sounding the bladder. The most important signs are the sharp and darting pains, the paroxysmal character of the disease, the itching and scalding in micturition, the attempts at which are frequent, urgent, and difficult, and the numbness in the perineum, scrotum, groins, and thighs.

The causes are obscure, though they are probably the same as excite neuralgia in other parts. No doubt, masturbation, venereal excesses, stricture of the urethra, stone in the bladder, piles, uterine diseases, may excite it in nervous, irritable subjects; and malaria, indigestion, the depressing passions, and a morbid state of the urine, may act as predisposing, if not exciting causes. Its seat is supposed to be, as in other cases of neuralgia, in the nerves of the part, though dissection has thrown no light on this point. The prognosis of vesical neuralgia must be guarded. Though it seldom, perhaps, terminates fatally, yet it is apt to prove obstinate in spite of the most judicious management. Sometimes it disappears suddenly, like other neuralgias, but more frequently it persists for years, undermining the health, and terminating in serious organic mischief. The treatment of this affection must be regulated by the predisposing and exciting causes, if ascertainable. In miasmatic regions, the usual antiperiodics, quinine, Fowler's solution, &c., promise best. If inflammatory symptoms be present, they are to be combated by the usual antiphlogistics. Dr. Gross recommends early, copious, general blood-letting, repeating it every day or two till the force of the attack is abated, and this to be followed by leeches to the perineum, or over the seat of the pain. Purgatives are also advised, especially if the affection is of miasmatic origin, trusting to those which produce free evacuations, but avoiding drastics. Mercurials are useful adjuncts, but salivation is to be avoided. "I am convinced," says Dr. Gross, "that a systematic course of purgation is not only unequivocally beneficial, but absolutely indispensable to a speedy and permanent cure."

The preparations of iron will sometimes prove useful, but they are inferior to quinine and arsenic in this affection. These, as well as strychnine and aconite, with opium, are recommended by

Dr. Gross in pill, according to the following formula:

R Acid. Arseniosi, gr. ij.; Strychninae, gr. j.; Ext. Aconiti, gr. viij.; Pulv. Opil, gr. v. M. ft. 16 pills. One pill to be taken every 6 hours.

If opium disagrees, *lupuline* or *hyoscyamus* may be substituted for it. If nausea results, the dose is to be diminished, or the pills taken less frequently. It is also advised not to continue the pills longer than a week or ten days at a time, resuming them in the course of two or three days. Under this course the disease is often cured; and the same combination will prove useful in other forms of neuralgia. To relieve the violent pain of the paroxysms, *narcotics*, in full doses, are necessary; of which the salts of *morphia* will prove among the best. We have found *stramonium*, in the form of Tilden's fluid extract, very efficacious in every form of neuralgia. It is to be given in large doses, and the system kept under its influence for some time. *Belladonna suppositories* are also worthy of a trial, if other means fail. When the disease occurs in a malarious district, and is associated with hepatic or gastric derangement, an emetic will often arrest or cut short the paroxysm. The wine of *colchicum*, with *morphia*, at bed-time, will be beneficial, especially in rheumatic or gouty subjects, alternated with mercurial purgatives. If there be acidity of stomach or flatulence, a combination of bicarbonates of soda and potash may be advantageously given, or an occasional dose of calcined magnesia.

Dr. Gross condemns the use of *bougies* in vesical neuralgia, as advised by M. CIVIALE (*Gazette Medicale*, July, 1836), after considerable experience in their use. He thinks more favourably of injections of acetate of lead and opium, or of a watery solution of opium and *hyoscyamus*, employed tepid, cool, or cold, as is most agreeable to the patient. If the disease prove very intractable, then counter-irritation to the perineum, the supra-pubic region, the sacrum, the upper and inner parts of the thighs, by the moxa or Vienna paste, will be advisable. When the disease depends on piles, stricture of the urethra, foreign bodies in the bladder, &c., the treatment must be directed to the removal of the original cause, which is always to be assiduously sought for, else it may be overlooked by the practitioner. The warm bath is an important remedy in every form of the disease. But, as in all other diseases, although our remedies be carefully selected and judiciously applied, yet without strict attention to diet a cure can not be expected. All kinds of alcoholic liquor must be sedulously avoided, as well as acescent fruits and vegetables, new bread, strong coffee, cheese, &c. The digestive organs must be strengthened, and all the usual hygienic appliances faithfully carried out. If the patient reside in a malarious region, a change to a more healthy district will be useful.]

18. II. SPASM OF THE BLADDER.—CLASSIF.— II. CLASS, III. ORDER. (See Preface.)

19. DEFINIT.—A sudden and violent attack of pain in the region of the bladder, extending along the urethra to the glans, with either involuntary expulsion or retention of the urine.

20. A. This disorder is most commonly symptomatic either of stone in the bladder or of gonorrhœa, especially when this latter is treated by injections; or of organic disease of the kidneys, or of parts adjoining the bladder. Dr. PROUT remarks that it may be caused by acid urine, by

* "On Diseases of the Urinary Bladder," &c. Phil., 1855, p. 264.

abscess of the kidney, by ulceration or other disease of the prostate gland, bladder, &c., or by retention of urine, or by gout, or by venereal excesses. Irritating diuretics, cantharides taken internally, the application of blisters, hysteria, masturbation, the irritation of ascarides in the rectum, dysentery, or tenesmus, may severally excite an attack. When it is connected with gonorrhœa or the treatment of it, then the sphincter vesicæ is thereby either irritated or inflamed, and spasm supervenes as soon as urine passes into the bladder.

21. *B.* The sudden and violent attack of pain in this viscus, *characterizing* this complaint, is attended by a constant desire to void urine, without the ability to do so, and the agony felt during these attacks is excessive. The contraction of the bladder excites the muscular coats of the rectum, and occasions also a desire to evacuate the bowels, or more or less tenesmus. Mr. COULSON remarks that the closure of the ureters at their vesical extremities has given rise to dilatation of these ducts and of the pelices of the kidneys, and to serious changes in the kidneys; and that, after an attack of spasm, from which the patient has apparently recovered, it sometimes happens that a new train of symptoms appears, indicating the injury which the tubular and secreting structure of the kidneys has received. Frequent attacks of spasm also sometimes injure the tone and contractility of the bladder so much as ultimately to induce a partial or more complete paralysis of the organ (§ 27).

22. *C.* The *diagnosis* of spasm of the bladder is not difficult; it may, however, be confounded with inflammation; but in this latter the pain is constant, commences with uneasiness, and gradually becomes more and more severe. Spasm occurs suddenly; the pain is violent and constrictive; whereas in inflammation the pain, when greatest, is either lancinating or throbbing, and is attended by more or less febrile action, of which the former is generally exempt. In both the urine is usually retained, or passed in the latter in very small quantities, and after remarkably short intervals. Spasm may, however, be associated with inflammation of the mucous coat of the bladder, as spasm of the coats of the colon is associated with inflammation of the mucous coat of the intestine. In such cases the spasm is only a symptom aggravating the character of the inflammation, febrile symptoms more or less manifestly attending this latter.

23. *D.* The *treatment* of spasm of the bladder will appear from the above to depend chiefly upon the pathological state occasioning it. If it be consequent upon inflammatory action, either of the sphincter vesicæ, upon suppressed gonorrhœal discharge, upon the use of irritating injections, or upon inflammation of the bladder, *bleeding*, according to the grade of morbid action and habit of body of the patient, should be prescribed, either by venæsection, cupping, or by leeches, and be repeated if required. The warm bath, fomentations, cooling aperients, and diaphoretics should follow vascular depletion; and demulcents with anodynes, emollient enemata with anodynes or narcotics, &c., should also be prescribed. If the complaint supervene on gonorrhœa or the use of injections, the above treatment is appropriate; local bleeding, however, generally proving sufficient.

24. If spasm of the bladder occur in the gouty diathesis, or upon the suppression of a paroxysm of gout, or as misplaced gout, the regular form of the disease should be solicited by means of mustard pediluvia, and mustard poultices to the feet, while the soothing and anodyne remedies above mentioned are exhibited. In cases of this kind, as well as in many others, magnesia and sulphur may be taken, with small doses of colchicum, of camphor, and of opium; and if the former be given in decided doses, so as to act upon the bowels, a more rapid effect will be produced upon the spasm than by any other means. If the state of the urine occasion or aggravate the spasm, appropriate means should be used to correct this state.

25. When the disease is symptomatic of a calculus in the bladder, or in the kidney, or passing the ureter, the warm bath, fomentations, demulcents, emollients, and narcotics, or anodynes, taken by the mouth and administered in enemata, are generally of service; but when the calculus is in the bladder, these means are only of temporary benefit—permanent relief must be looked for only from the surgeon. Cases of spasm affecting chiefly the sphincter vesicæ, and causing retention of urine, are generally symptomatic of irritation or of disease of adjoining parts, and are relieved by the tinctura ferri sesquichloridi taken in doses of ten to twenty drops in water every quarter of an hour, or by a suppository containing the extract of belladonna, or by a belladonna plaster applied over the perineum, while the emollients and anodynes already advised are taken internally. Mr. COULSON recommends a poultice containing powdered camphor to be applied over the perineum, or a liniment composed of camphor and opium; and states that emollient clysters containing some of the watery extract of opium often afford instant relief.

26. III. PARALYSIS OF THE BLADDER.—CLASSIFICATION.—I. CLASS, II. ORDER. (See Preface.)

27. DEFINITION.—*Partial or complete loss of the contractile power, and of the organic sensibility, of the bladder; often also with loss of power of the abdominal muscles, whereby the urine is partially or completely retained.*

28. i. HISTORY.—Paralysis of the bladder, whether partial or complete, whether temporary or permanent, depends on loss of power, either originating in the organ itself, or affecting it consecutively upon injury or disease of the spinal chord, or of the brain, or of their membranes.—*a.* A partial form of paralysis sometimes occurs as a symptom of extreme debility or exhaustion in the course of acute or chronic maladies, as of typhoid or adynamic fevers, of hectic, and of the last stage of organic diseases. In these circumstances, the contractility and organic sensibility of the bladder is more or less impaired, and the power of the abdominal muscles to aid by their contraction the expulsive efforts of the detrusor urinæ, is equally lost.

29. *b.* In some cases the loss of power in both is *general and complete*, and this state of the disease, especially in its advanced or protracted form, may be attended by a constant dribbling of the urine, owing to the over-distention of the bladder having overcome the resistance of the neck or sphincter vesicæ. Thus incontinence of urine is superadded to retention, and the latter is sometimes mistaken for the former. In such cases examination of the abdomen and region of

the bladder, or the introduction of a catheter, will disclose the state of matters; and strict attention should be paid to the excreting functions of the urinary organs in all fevers and constitutional maladies.

30. *c.* Paralysis of the bladder, giving rise to retention, may come on gradually, especially in advanced age; either in consequence of disease of the kidneys, or of the prostate or urethra, or after a prolonged neglect of evacuating the bladder or the suppression of the desire to evacuate. In these circumstances, however, the paralysis and the retention may be at once complete. Although this form of the affection is most frequent in aged persons suffering from disease of some other parts of the urinary apparatus, yet it may also affect the middle-aged, especially when the desire of evacuation has been long suppressed; the consequent over-distention having overcome the power of contraction, the abdominal muscles either failing to expel the urine, or expelling it only partially. In these and similar circumstances a frequent desire to micturate occurs, and after expulsive efforts made by the abdominal muscles a small quantity only is expelled; and this state may be mistaken for a form of irritability of the bladder; but upon a strict examination of the abdomen, or upon the introduction of a catheter, a large accumulation of urine is found in the viscus.

31. In some persons even of middle age, a more or less manifest state of paralysis is consequent upon impaired health caused by anxiety, fatigue, excessive application to business, and neglect of calls to micturate, or by venereal excesses or masturbation. When these latter causes have existed, a state of complete or incomplete *tabes dorsalis* supervenes, with manifest weakness of the loins and lower limbs; and if relief be not obtained, paraplegia, with complete paralysis of the bladder, ultimately results. In both this and the immediately preceding cases, as well as in some others, the over-distention of the bladder, or the distention of it to a certain extent, occasions a frequent desire or effort to evacuate the urine, and a small quantity only is passed, the power of contracting farther being lost, or the contractions of the abdominal muscles being sufficient only to expel that small quantity. In such cases the catheter is often required.

32. *d.* Injuries and diseases of the spinal cord and brain, and their membranes, occasion the most complete and severe instances of paralysis of the bladder; more especially lesions seated in the spinal cord or its membranes, and whether in the cervical, dorsal, or lumbar regions. In this class of cases the effects produced upon the bladder and upon the state of the urine are different, or vary more or less with the amount of injury or disease, or with the rapidity of progress of the latter in the nervous centres; but they are generally remarkable according to the severity or danger of either. At first, or immediately after the occurrence of these, the urine may be more or less acid and free from mucus; but especially after injury of the spinal cord it soon becomes alkaline, turbid, and ammoniacal, evincing this state at its discharge; and when it cools it deposits much adhesive mucus. After a short time phosphate of lime is found in the mucus, which afterward is sometimes blended with blood. The urine collected in the bladder is altered, either during the process of secretion or during its re-

tention in the bladder, and is generally changed in the following manner: The urea is converted into carbonate of ammonia, which irritates the mucous surface of the bladder, and causes the exudation of much viscid mucus. The neutral triple phosphate of magnesia and ammonia contained in the secretion forms prismatic crystals, and presents different degrees of transparency. The inflammation of the bladder consequent upon paralysis of the bladder, caused either by injuries or disease of the nervous centres, extends from the mucous to the other coats of the organ, if the patient live for some time; and the parietes become thickened and incapable of contraction; the urine requiring to be drawn off, and always presenting a fetid and alkaline character. The question in these cases is whether the change in the urine is owing to the altered nervous power of the kidneys, or is it the result of retention in the bladder? From some attention which I have paid to this question, I conclude that the change in the urine takes place primarily and chiefly in the kidneys, owing to the loss of that portion of nervous power which the spinal nerves convey to the renal ganglia; and that it is increased during the retention of the urine in the bladder, the paralyzed state rendering this viscus more prone to inflammation, and to the more rapid supervision and progress of the changes consequent upon inflammation.

33. As this state of disease proceeds, the pain or uneasiness of the neck of the bladder and glans penis at first experienced subside and ultimately disappear, although distention may continue or increase. The desire to pass urine is not expressed; and while the local symptoms subside the constitutional become aggravated. The pulse is much accelerated, thirst is increased, and restlessness and anxiety of mind are augmented. The fur on the tongue is thicker, deeper, and darker-coloured. Delirium supervenes, with a urinous odour of the perspiration, and stupor or profound coma supervenes, and the patient dies in this state; the complaint being, perhaps, mistaken for typhus fever, if due attention have not been directed to the states of the urinary functions and bladder. Patients, especially those advanced in life, when attacked by fever, owing to the congested states of the nervous centres, may experience similar changes in the urine, and a similar paralysis of the bladder; and if this unfavourable complication of fever be overlooked, it rarely fails of being the chief cause of a fatal issue.

34. Paralysis of the bladder occurs chiefly in the aged; and although in them, as well as in some younger persons, it may be favoured or caused by the states of the spinal cord or of its membranes, it is most frequently consequent upon disease of the prostate gland or neck of the bladder, or of the urethra, causing over-distention of the organ. When this complaint affects females, especially from puberty to the decline of life, it is generally connected with *hysteria*, or with the advanced stage of spinal congestion (*hysterical paraplegia*) caused by uterine irritation. I have seen several cases of *hysterical paraplegia* where a surgeon was required to draw off the urine, the complaint having been imputed to masturbation. When it occurs in married females, it may be either a symptom of pregnancy, or of injury experienced during labour or delivery. In the fourth month of pregnancy, or about that time, or near the period of confine-

ment, retention of urine may occur, and if it be neglected, a paralyzed state of the bladder may supervene from distention. Similar results may follow retroversion or anteversion, or prolapsus of the uterus. Imperforate hymen, and obstructed catamenia from this cause have even occasioned this complaint.

35. *c. Hysterical paralysis* of the bladder is believed by Sir B. C. BRODIE, and very justly, in many cases, to be owing to defective efforts of volition. He remarks that, in the first instance, it is not that the nerves are rendered incapable of conveying the stimulus of volition, but that the effort of volition is itself wanting; and this corresponds with what is observed in other affections connected with hysteria. "As the distention increases the patient begins to be uneasy, and at last suffers actual pain; and as soon as this happens volition is exercised as usual, and the bladder begins to expel its contents." If not relieved by means of the catheter, the hysterical retention of urine is thus of short duration; but if the catheter be had recourse to, the natural cure is prevented, and the disease may be indefinitely prolonged. "The general rule," Sir B. BRODIE adds, "in the treatment of these cases, is to interfere but little;" but this rule is not without exceptions, for, in a few cases where the bladder has been very much distended, it loses its power of contraction, and even though the patient endeavours to micturate, no water flows. Under these circumstances artificial aid should be obtained.

36. *f.* The affection which sometimes occurs in children, especially in delicate boys, and which is characterized by the discharge of urine during sleep, has been variously explained; by some it has been imputed to irritability of the bladder, by others to a morbid state of the urine, causing irritation of this viscus, and by some to paralysis of the neck of the bladder, occurring during sleep. That this last condition may obtain is not unlikely, as the affection is not unfrequently associated with prolapsus of the rectum after a motion, and with deficient tonic contraction of the sphincter ani. It may, however, depend, in different cases, upon the association of all these morbid conditions in different degrees, the share that a morbid state of the urine may have in its production being ascertained by the examination of this excretion.

37. *ii.* THE TREATMENT of paralysis of the bladder is, 1st, *constitutional*, and, 2d, *local*; but in many cases the latter should precede the former, especially as respects the urgent necessity of obtaining immediate relief. As to the best means of attaining this end I must refer to surgical writers, and especially to the able and precise instructions of Mr COULSON, in his work on the "*Diseases of the Bladder*," &c.—*A.* The constitutional treatment must chiefly depend upon the nature of individual cases, upon the pathological conditions occasioning this disease; but in most cases, and particularly in old cases, medical treatment is of little avail; surgical appliances, especially frequent introductions of the catheter, being required during the life of the patient. Trial, however, may be made of strychnine, gradually increasing the dose, and carefully observing its effects on the nervous and muscular systems. I have generally preferred the extract of *nux vomica*, in doses of a quarter of a grain, gradually increased to one grain, given twice or thrice daily, and combined with the aloes and myrrh pill, and

purified extract of ox-gall, or with the compound galbanum pill. I have also prescribed terebinthinate embrocations or epithems, to be applied over the loins and sacrum. In the great majority of cases, and especially in aged persons, serious lesions supervene in the kidneys and in the pelvis of these organs, and thus complicate and farther aggravate the disease, and render recovery altogether hopeless.

38. *B. Hysterical paralysis* of the bladder is not unfrequently caused by masturbation, and a moral discipline is required, although it may not prudently be either suggested or enforced, unless with the utmost discretion. Indulgence and sympathy, on the part either of friends or of the physician, should be withheld, and the most nauseous anti-hysterical medicines should be exhibited, especially asafœtida, turpentine, &c., both by the mouth and in enemata. In a case where this affection was rather simulated or feigned than actually present, I recommended, in the hearing of the patient, the actual cautery to be applied to the sacrum; but the complaint vanished soon after mention was made of the remedy, and directions given as to its employment.

39. *C.* The *paralyzed or relaxed state* of the neck of the bladder in children, noticed above (§ 36), generally disappears as the constitutional powers of the patient improve. I have found tonics, stomachic aperients, chalybeates, and stimulating embrocations applied over the loins, the spine and sacrum being sponged every morning with a strong solution of salt, of great service. The patient should sleep on a hair mattress, covered with a water-proof cloth. Change of air, sea bathing, or sponging with sea or salt water, where the plunge-bath causes alarm, and exercise in the open air, are also beneficial, indeed are almost essential in these cases.

[The treatment of palsy of the bladder must of course, as in all cases, be regulated by its pathological cause, and the attending circumstances. The urine must first be drawn off, and care taken to keep the bladder emptied by using the catheter at stated intervals, as every four or six hours. This alone will often be all that is required to effect a cure. If the continued use of the instrument be required, the patient may be taught to introduce it for himself. In exceptional cases, the catheter may be allowed to remain in the bladder, removing it, however, sufficiently often to prevent any accumulations upon it. Dr. GROSS (*loc. cit.*) advises not to remove all the water at once, in cases of over-distention, for fear of severe depression on the removal of the stimulus of distention, as a fatal result may in this way be induced. This is good advice, and so is that of swathing the abdomen by a bandage, as after tapping in ascites.]

The use of the catheter should always be discontinued at the earliest possible period, and the patient should be urged, from time to time, to make propulsive efforts, so that the use of the instrument may be dispensed with; otherwise the bladder, becoming accustomed to its use, may lose entirely its contractile power.

The tone of the bladder must, in the next place, be restored, if possible; and this may be done by cathartics, where the paralysis is associated with paraplegia or great intestinal torpor. For this purpose calomel, with jalap or rhubarb, will be preferable. The cathartic may be repeated every other day, or, at first, every day, with

decided benefit. Dr. Gross states, also, that *emetics* are sometimes of signal benefit in this disease, especially when associated with derangement of the digestive organs and general torpor. Afterward, *strychnia*, *cantharides*, and *arnica* may be used with advantage, unless the affection be of an inflammatory form. These may be given in combination, one-sixteenth of a grain of *strychnia*, one-eighth of *cantharides*, and three to five grains *arnica*, in a pill, every six hours, watching closely the effects. We have used with great satisfaction the *extract of Ignatia Amara*, in this and other forms of palsy, in doses of one half to two thirds of a grain, three or four times a day. Dr. Gross recommends the *arnica* (forty to sixty drops of tincture), especially, in palsy of the bladder consequent on typhoid and other fevers, masturbation, and general exhaustion. The *ergot of rye* has been strongly recommended in this disease by Dr. ALLIER of France (*Jour. des Connaissances, Med. Chir.*, 1838), and Dr. DAY of London (*Treatise on the Diseases of advanced Age*), by whom it is preferred to *cantharides* and *arnica*. There can be no doubt that *ergot* exerts a specific action on the bladder as well as uterus, exciting the muscular contractility of both organs, and probably in an equal degree.

The *inflammatory* form of this affection must be treated strictly on antiphlogistic principles, viz., general and local bleeding, fomentations, warm baths, anodyne enemata, &c. When the disease occurs in the aged, or those debilitated by other diseases, *tonics* of the chalybeate class will prove beneficial. *Hysterical vesical palsy* is to be treated on the same general principles as other forms of hysteria. There can be no doubt that the disease is sometimes feigned, as many other diseases are, by hysterical subjects, for what object, often, it would be difficult to say, unless to gratify a morbid taste for notoriety, or to excite the sympathy of friends and relatives. *Asafœtida*, *valerian*, *musk*, *castor*, *iron*, and *morphia* may all be brought into play, and the patience of the practitioner well-nigh exhausted, before an acknowledged cure will be effected. Dr. GROSS (*loc. cit.*) speaks highly, also, of a succession of *blisters* over the dorso-lumbar region, followed by an emollient poultice, and the surface sprinkled with one fourth of a grain of *strychnia*, after removal of the cuticle and adherent lymph, and repeated every twelve hours; and he remarks that "there is hardly any form of vesical paralysis, excepting, perhaps, the inflammatory, in which this mode of counter-irritation will not prove more or less advantageous." For farther details in regard to the treatment of this and other affections of the bladder, we refer to the above-quoted and most able work, *passim*.]

IV. INFLAMMATION OF THE URINARY BLADDER.

—SYNON.—*Cystitis* (from *Cystis*, a cyst or bladder), Sauvages, Vogel, Cullen, &c. *Inflammatio vesicæ*, Sennert, Hoffmann. *Cauma Cystitis*, Young. *Empresma Cystitis*, Good. *Uro-cystitis*, *Cystiphlogosis*; *Inflammation de la Vessie*, Fr. *Entzündung der harnblase, blasenentzündung*, Germ.

CLASSIF.—1. Class, 2. Order (Cullen). 3. Class, 2. Order (Good). III CLASS, I. ORDER (Author in Preface).

DEFINIT.—A sense of pain in the region of the urinary bladder, increased on pressure, with a frequent desire to micturate, generally preceded by chills or rigors, and attended by inflammatory fever.

40. i. STRUCTURES AND PARTS PRIMARILY OR CHIEFLY AFFECTED.—Inflammation of the bladder most frequently commences in the mucous coat, to which it may be limited, or it may extend to the external coats. When it thus commences it may be circumscribed, or it may affect all this coat. When the former obtains, the part covering the neck of the bladder and the cystic triangle is most commonly affected; but inflammation, whether limited to the mucous surface or affecting the other coats also, or even the whole parietes of the organ, generally commences in this situation, owing to the irritation of sabulous matter, of calculi, &c. The imperfect emptying of the bladder, especially in connexion with engorgement of the prostate, the contiguity of this part to the prostate and urethra, the liability of the extension of inflammation to it from these parts, and the participation in irritation of the rectum and vagina, also account for the more frequent commencement of cystitis in this part. From the extension of disease, cystitis may be consecutive upon inflammation of the rectum or vagina, upon metritis, and upon hæmorrhoids; and it is often consequent upon and complicated with inflammation of the prostate. In addition to these modes of commencement, cystitis may primarily attack the peritoneal covering of the fundus. This is comparatively a rare occurrence. The fundus of the organ is much less frequently the seat of the disease, particularly at an early stage, than the neck of the bladder and the parts situated posteriorly between the sphincter and entrance of the ducts. When inflammation commences in the peritoneal coat of the organ it usually arises from the extension of the morbid action from adjoining parts, as the rectum, cæcum, colon, or omentum. Uro-cystitis has thus been observed in the course of colonitis or inflammatory dysentery, of peritonitis, and of inflammation of the generative organs in females; and the connexion of these maladies has often been rendered manifest by examinations after death. Inflammation may also attack all the coats of the bladder either primarily or consecutively. The former is of rare occurrence, the latter is much more frequent, owing to its extension from the mucous or serous surface of the organ, and to injuries and operations.

41. Uro-cystitis, with reference to its seat, may be viewed, 1st. As to its limitation to the mucous surface of the organ; 2d. As to its extension to the coats forming the parietes; 3d. As to the part of the viscus most frequently affected either primarily or secondarily; 4th. As to the nature of the morbid action; 5th. As to its consequences; and, 6th. As to its complications. Each of these heads will be considered in detail.

ii. INFLAMMATION OF THE MUCOUS SURFACE OF THE BLADDER.—SYNON.—*Blennorrhagia vesicalis*, Swediaur. *Dysuria mucosa*, Cullen. *Catarrhus vesicæ*, Lieutaud. *Rheuma vesicæ*, Stoll. *Pyuria mucosa*, Sauvages. *Catarrhe de la vessie*, Fr. *Muco-cystitis* (Author). [*Cystorrhœa*]

42. Inflammation of the mucous coat of the bladder generally proceeds from the common causes of inflammation, and from those which are usually productive of cystitis (§ 84, *et seq.*), especially the extension of inflammation of the urethra to the neck and internal surface of the organ, the use of irritating injections, of irritating diuretics and aphrodisiacs, the irritation of calculi, &c. This form of cystitis is of frequent oc-

currence, and presents every degree of activity, from the most acute to the most chronic, owing to the diathesis and habit of body, age, and mode of living of the patient, and to its causes.

43. *A.* The acute form of the disease is characterized by severe pain, increased by pressure, sense of heat or tension in the hypogastric region, and uneasiness in the perineum, and by frequent urgent calls to discharge the urine, attended by difficulty and increased pain. These symptoms are often preceded by chills, horripilations, or rigors, and are followed and attended by febrile reaction and its usual concomitants. Sometimes neither chills nor horripilations are felt, especially when the disease has extended from the prostate gland or the urethra, the pain in the region of the bladder, and the frequent desire to urinate being the invading symptoms. The urine is passed often and in small quantities, with much smarting heat and repeated efforts. It is generally acid, of a deep lemon or orange colour; at first clear, but in a day or two numerous small shreds of lymph or mucus are seen floating in it. Sometimes the urine is reddened and turbid, and deposits a thick sediment, consisting chiefly of a muco-puriform matter. In a few days the irritation and febrile disturbance are diminished; the severity of the pain in the region of the bladder is abated; but often, even when this abatement is well marked, the quantity of mucus or of muco-puriform matter in the urine is increased. The local and symptomatic irritation, and the frequency and the difficulty of urinating, generally more or less subside about the same time.

44. *B.* The consequences and terminations of acute muco-cystitis vary with the severity, the causes, and the nature of the attack, and the constitution and other circumstances of the patient. If the inflammation proceed no farther than the mucous surface of the neck of the bladder and of the parts in the immediate vicinity, the above symptoms diminish gradually, and the disease terminates in resolution. But very different consequences occasionally ensue. If the inflammation be very acute, it may rapidly extend to all the tissues of the organ, and even partially to others in the vicinity, the disease becoming extremely dangerous or even fatal. In this case it passes into a state of uro-cystitis, to be noticed hereafter. More frequently, however, the acute inflammatory symptoms gradually subside, especially the febrile action, but the local ailment subsists for some time, or continues with greater obstinacy, the disease becoming chronic.

45. *C.* Chronic inflammation of the mucous surface of the bladder sometimes supervenes on the acute, as just stated; but it often occurs in a primary form. — In this latter case its invasion is slow, and it is not accompanied with any or much febrile disturbance, unless the inflammation assume an intermediate grade between the acute and chronic. Sometimes the febrile action is very slight or remittent, and the local symptoms are chiefly remarkable, especially irritability of the bladder, pains in its region, or at the extremity of the urethra, previous to and at the time of passing the urine. This excretion furnishes, especially as it cools, a mucous or muco-fibrinous deposit, of various shades of colour in different cases, and often an ammoniacal odour. A sense of weight in the perineum, or of heat in the bladder and along the urethra, frequent calls to mic-

turate, and shooting pains to the anus, are also often experienced. The discharge of mucus in the urine is more or less considerable—hence the term *catarrhus vesicæ*—but varies much in different cases and at different times.

46. *a.* Sometimes the disease is slight; but in old cachectic subjects, and when complicated with disease of the kidneys or of the prostate, or with both, it is often dangerous, or even proves fatal. In this latter state, or when the disease has gone on to ulceration, the heat in the bladder and urethra amounts to scalding, the desire to pass the urine becomes more frequent and urgent, and the efforts more violent or straining. The expulsion of the last portion of urine is more or less painful; and retention of urine is not infrequent, owing to the obstruction caused by clots of mucus or fibrinous exudation lodged in the passage. Pain is felt at the extremity of the penis, in the perineum and anus, sometimes in the loins and thighs. There are thirst, costiveness, or irregularity of the bowels, uneasiness or restlessness, wasting of flesh, and loss of strength.

47. *b.* The mucus discharged in the urine varies much in quantity and appearance. It is sometimes small, at other times or cases it is so great as to amount to pounds in the twenty-four hours. In small quantity the urine is rendered turbid or flaky by it, and it settles to the bottom of the vessel. It is occasionally stringy, ropy, or of a lumpy or viscid consistence. The urine is generally acid early in the disease, but it becomes neutral or alkaline as the mucous secretion is increased. When acute muco-cystitis passes into the chronic the quantity of mucus is often considerable, in some cases extremely great, forming glairy or ropy streaks in the urine, which are afterward deposited. When the disease has not been of long duration, the mucus in the urine is generally whitish-gray or yellowish-gray, tenacious or stringy, inodorous, and presenting no distinct appearance of pus. But in the more chronic or obstinate cases a purulent matter is evidently present, mixed with and often more or less predominating over the mucus. In these cases the morbid matter is less abundant, less tenacious, of a yellowish colour, more readily miscible with the urine, and is sometimes streaked with thin bloody filaments. It is also sometimes fetid, is not so readily deposited at the bottom of the vessel as the mucous secretion, nor is it so tenacious. It does not form albuminous flocculi when boiling water is poured upon it, nor does it coagulate, or but imperfectly, when boiled. When these appearances are seen in cases of considerable duration, ulceration of the mucous surface, affecting chiefly the follicles, and the extension of inflammation to the connecting cellular tissue, may be inferred. This inference will be still more fully borne out if there be slight fever assuming a remittent, or intermittent, or hectic form, constant pain in the organ, emaciation, restless at night, and the undoubted presence of pus in the urine, with more or less alkalence.

48. *c.* Pus may be distinguished from mucus not only by the above appearances, but by its being miscible with the urine, which it renders opaque. If the urine contain pus as well as mucus, the former is deposited upon the latter, and is yellower in tint, and opaque, the mucus being translucent. The microscope aids the diagnosis in these cases by showing the presence of pus-globules of the diameter of 1-2500th part of an

inch. If the urine be acid, the nucleus of the pus-globule may be seen without the aid of reagents; but, as it is more frequently alkaline, the addition of a drop of acetic acid will bring the nucleus into view by rendering the corpuscle more transparent. A copious sediment resembling pus is sometimes produced by a large quantity of triple phosphate in the urine. But the nature of this is shown by its solution in nitric acid, and by the shape of the crystals under the microscope. When the urine containing pus presents an acid reaction, pyelitis may generally be inferred; when it is alkaline, cystitis may be considered to exist. Purulent urine becomes clear on standing, a more or less abundant sediment is formed, the supernatant fluid is often of a greenish-yellow tint, and contains albumen.

49. Dr. PROUT states that, in the advanced stage of the disease, the mucus in the urine is diminished, it becomes opalescent and of a greenish tint, and can in part be easily diffused through the urine, rendering it glairy or opaque, or milky like pus, the morbid matter being in fact mucopuriform. The urine is now generally deep-coloured, or serous, or alkalescent, having an ammoniacal odour, and effervescing with an acid. In this latter case there is an excess of carbonate of potash or of soda in the urine, derived from the serum of the blood. "When these symptoms have continued for a longer or shorter period, the urine becomes scanty, still more high coloured, and occasionally even acid; the mucus, and even the pus, gradually diminish, and almost disappear; and after a short period of comparative ease the patient expires."

50. *d. Intermediate grades* of muco-cystitis, between the acute and chronic states of the disease, are occasionally met with in practice. These have often been termed *sub-acute*. They are to be distinguished by more or less of the symptoms already adduced, generally all of them, but in different degrees of severity, and attended by remittent or hectic febrile action. They may occur primarily or follow the acute, which may subside into the sub-acute, and ultimately into the chronic state, terminating at last in ulceration and thickening of the organ or some other structural lesion. The chronic form of the disease may even pass into the acute, although not so often as the converse, either having presented an intermediate grade of morbid action, or having, owing to some exciting cause, suddenly assumed the acute form. In this latter case the extension of inflammation still farther should be dreaded and guarded against.

51. *e. The duration* of muco-cystitis is extremely various: it may be from one month—it being seldom much less in the acute—to two or three months in the sub-acute, to several months to two or three years in the chronic. It depends entirely on the cause, the age, and constitution of the patient, on the degree to which the inflammation may have extended to the other coats of the viscus and to adjoining parts, and on the complications the disease may have presented. The same circumstances also influence the prognosis and treatment (§ 83, 89).

iii. INFLAMMATION OF ALL THE COATS OF THE BLADDER.—*Cystite profonde*, CLOQUET; *Cystitis vera*—*true Cystitis*.

52. This form of cystitis is not often met with as a primary disease. It much more frequently supervenes on one or other of the forms of muco-

cystitis, and it occasionally occurs from the extension of inflammation from contiguous viscera; as from inflammation of the uterus and ovaria or Fallopian tubes, or of the rectum, colon, cæcum, peritoneum, omentum, &c.; from extensive hæmorrhoids, and from diseases of the prostate. It will be seen that true cystitis, in some of these consecutive states of occurrence, commences in the peritoneal surface of the fundus, and that it extends to all the coats. It is, indeed, extremely rare for true cystitis to commence in this part of the structure of the bladder, unless when it supervenes in the manner now alluded to.

53. *True Cystitis* is thus more frequently secondary or consecutive, and but rarely primary. But whether originating in the one way or in the other, it is a severe and dangerous disease; and, owing to its consequences, is often speedily followed by the most serious effects. While the mucous coat only is the seat of inflammation, the function of the muscular coat is seldom affected in such a manner as to allow inordinate accumulations of urine within the viscus, unless the disease is attended by an obstruction to the discharge of the urine by associated disease of the prostate or urethra, or by the impaction of a calculus or fibrinous clot in the neck of the bladder. When, however, these obstructions occur, the inflammation of the mucous coat soon extends to the other coats; the previous irritability of the muscular coat is overcome by the distention consequent on obstruction, and rapidly passes into almost total paralysis or incapability of contraction, one of the most dangerous states of the organ in cystitis.

54. When true cystitis follows muco-cystitis or catarrhus vesicæ, the abundant mucous or muco-purulent secretion which characterized the latter is either much diminished or ceases altogether. This arises from the transfer of the inflammatory action chiefly to the more external coats of the bladder, and the diminution of it in the surface, which was formerly its only seat. The occurrence of this change has led Dr. PROUT to think that the inflammation of all the coats of the viscus is of a different kind from that of the mucous coat; but I infer that the difference consists merely in the different functions of the parts affected in both these forms of cystitis.

55. *True Cystitis* presents various grades of activity, from the most acute to the chronic. The pathological states through which the disease passes, and the consequences to which they lead, are also diverse, and not always referable to the violence of the attack, but are dependent upon a number of circumstances connected with the causes, complication, and other peculiarities of the case. Thickening of the coats of the bladder, owing to an infiltration of an albuminous serum into the connecting cellular tissue, is very frequent, especially when the inflammation is sub-acute or chronic, or has extended from the mucous coat and is dependent upon obstruction to the discharge of urine or the presence of calculi. In these cases the distention of the bladder is a frequent occurrence; and even when this form of the disease is primary, and is not accompanied with obstruction to the discharge of urine, a loss of the power of the muscular coat, and consequent retention of urine, is a frequent attendant upon it. Although true cystitis affects all the coats of the bladder, a part of the organ may be more particularly affected by it than the

rest, especially the parts near the neck, and extending thence to the ureters. This is especially the case when the disease has followed inflammation or other morbid states of the prostate gland, urethra, rectum; or has proceeded from hæmorrhoids, or from injuries caused by the use of the catheter, by lithotomy, lithotripsy, or other operations.

56. *A. Acute Cystitis.*—*a.* The symptoms of this state of the disease are, generally after chills or rigors, severe pain, at first behind, afterward above the pubes, a sense of uneasiness in the perineum, heat and tenesmus, and heat and smarting in the course of the urethra. The patient has frequent calls to pass urine, which are always attended by more or less difficulty, often amounting to dysuria. The urine at last escapes only by drops, with more or less scalding and pain, and ultimately with unavailing efforts to discharge it. When the symptoms arrive at this pitch much anxiety and tension of the abdomen are experienced. The distended bladder rises above the pubes, and the hypogastric region is very tender. The frequent calls to pass the urine and the dysuria may mislead the physician, a large quantity of water accumulating and causing injurious distention of the bladder before the circumstance is suspected. This accumulation may be explained by the irritable state of the sphincter vesicæ, the tumefaction of the inflamed parts having diminished the outlet of the bladder, and by the want of due action in the muscular coat, owing to the inflammation in which it and the other coats are involved. Hence it is thrown into frequent and inefficient action, a portion of urine is often passed; but as soon as it reaches the irritable and inflamed parts immediately below the sphincter, spasm of these parts, and of the sphincter itself, takes place, which the contractions of the fundus are unable to overcome. The secretion of urine proceeding, distention so great as to destroy the powers of reaction results, and complete paralysis of the muscular coat supervenes. If in this state a portion of the urine passes off, it is owing to partial relaxation of the sphincter for a moment, and to the position admitting of the discharge by gravitation. This difficulty of voiding the urine and the consequent accumulation are not owing to the muscular coat of the bladder only; for in many cases the parts near the neck of the bladder are chiefly affected, the tumefaction of these being so great as nearly to obliterate the canal, and mechanically to obstruct the flow of urine and the introduction of the catheter. In complications of the disease, with enlarged or inflamed prostate, this is obviously the case, a circumstance tending materially to influence the prognosis. Independently of this complication, there is every reason to infer, from the nature of the morbid secretion and structure of the parts, that this swelling contributes its share with the other lesions to the production of this very unfavourable symptom. In cases of cystitis produced by injuries of the spine, the paralytic state of the muscular parts of the bladder is the cause of the accumulation of urine and of the consecutive inflammation; but in other cases the inflammation is the cause of the retention and of the loss of muscular power, as above stated.

57. When the disease has reached this stage, and the accumulation in the bladder is manifest, the symptoms soon run on to a dangerous height, if relief be not soon afforded by medical or surgi-

cal treatment. The patient is anxious, distressed, and fevered, the pulse is frequent and hard, the tongue white and loaded, the appetite is lost, thirst is great, costiveness with frequent calls to stool, painful tenesmus, and difficulty of passing a motion, especially when the disease is seated chiefly about the neck of the bladder, or is complicated with disease of the bladder, as frequently is the case, especially in old men, are also experienced. In these cases, and in others proceeding from some irritation acting in a special manner on the bladder, as when the cystitis has arisen from the improper use of cantharides, the presence of calculi, &c., the urine which is passed is often sanguineous, or contains a considerable quantity of blood.

58. The disease, having reached the state now described, will often evince signs of diminution, or rapidly present those of a still more dangerous character. If accumulation of urine and over-distention of the bladder have been prevented, and the treatment otherwise judicious, the former will generally be the result. But when the bladder still continues over-distended, great prostration of strength, with extreme restlessness, takes place; the pulse becomes small, frequent, intermittent, constricted, and at last weak and scarcely perceptible; the skin is hot and dry, afterward moistened with a urinous or fetid perspiration; the tongue is dry, the thirst extreme; and to these sometimes supervene cardialgia, vomiting, hiccough, stupor or low delirium, cold extremities, sometimes convulsions, coma, and death.

59. *b.* Cases of true cystitis occasionally occur wherein little or no urine accumulates in the bladder, owing to the inflammation and consequent tumefaction of that part of the viscus surrounding or in the vicinity of the opening of the ureters into it, or to the effusion of coagulable lymph having entirely shut up their outlets. In these cases inordinate distention of the ducts and pelvis of the kidneys must occur, and, in addition to the above symptoms, those of dangerous disease of the kidneys and suppression of urine supervene, especially fulness, pain, and tenderness in the loins, numbness of the limbs, vomiting, constant hiccough, cold or urinous perspirations, rigors, subsultus tendinum, coma, &c.

60. *c.* When cystitis has followed the healing of old eruptions or ulcers, or the sudden stoppage of accustomed discharges, as the hæmorrhoids, the catamenia, or fluor albus, or if it have arisen from the misplacement or metastasis of rheumatism or gout, or if it have attacked persons of these diatheses, the several tissues of the bladder are liable to be affected nearly at the same time; but the symptoms are generally less severe than in the strictly primary and phlogistic form of the disease, and more frequently assume a sub-acute form, or some grade intermediate between this and the chronic form next to be described.

61. *d.* The duration of the disease in persons of the phlogistic diathesis, and at an early age, often is extremely short. True cystitis may reach its height as early as the third or fourth day, and its termination in the course of the first or second week. But in more delicate or less inflammatory constitutions, or in those weakened by previous disease, if it assume the acute form, it is more inclined to lapse into a sub-acute or chronic state, and to continue an indefinite time. It may, moreover, assume from the commencement a sub-acute or intermediate character between the acute

and chronic. But in all cases of this form of cystitis very much depends upon the nature of the exciting and concurring causes, the complications which certain cases present, and the attention paid to the unloading the bladder of its contents, and to other indications and means of cure.

62. *c. Terminations of Acute Cystitis.*—True cystitis terminates—1st. In resolution, with a gradual amelioration of all the symptoms; 2d. In the chronic state, with relief of the most urgent symptoms, and continuance of a dull pain, uneasiness, and tenderness in the region of the bladder, dysuria, &c. (§ 65, *et seq.*); 3d. In suppuration, when the disease is very acute, this issue generally occurring within twenty-four hours after the disease has reached its acme; 4th, and very rarely, in gangrene; 5th, and still more rarely, in rupture of the viscus.

63. (a) *Suppuration* is preceded and attended by pain and throbbing in the region of the bladder, or behind and above the pubes, and occasionally referred to the seat of the rectum, by horripilations, chills, or rigors, followed by flushes of heat, and sometimes by perspiration. There are often also painful tenesmus, costiveness, and fever. The urine afterward has a turbid, purulent appearance, or contains a whitish-yellow matter, sometimes streaked with blood, and has the odour characteristic of pus. In many of these cases the purulent secretion proceeds from the internal surface of the bladder, but small abscesses formed in the parietes of the viscus have opened internally and furnished this secretion. This latter is more frequently the case when the parts near the neck of the organ are more especially affected. CHOPART has recorded several instances of this occurrence, as well as of another, more unfavourable, when the abscess is formed more exteriorly, and makes its way, externally to the bladder, into the loose adipose cellular tissue at the bottom of the pelvis. If in such cases the patient survives, the abscess ultimately points in the perineum, or near the margin of the anus. Abscess of the bladder is seldom so situated as to break into the peritoneal cavity. In all cases of abscess of this viscus the danger is great, particularly in the latter cases.

64. (b) *Gangrene* may supervene in the most acute cases, or in cachectic constitutions; but it is a very rare occurrence, and is never met with unless the disease be attended by retention of urine of two or three days' duration. In these circumstances an eschar or small sphacelated spot is formed at one or more situations in the organ. This advances, and at last the bladder bursts, and the urine is effused, generally into the abdominal cavity. M. CLOQUET thinks that the rupture may occur without the previous sphacelation, from the distention, the greater tenuity of the bladder, and the deficient support of its parietes at this situation. Admitting that ruptures of the bladder are generally in the fundus, yet they are less to be imputed to want of support in this situation, and to greater tenuity, than to previous ulceration and deficiency of vital cohesion characterizing the advanced stages of acute inflammation, although these circumstances may contribute to the event. But very few of the cases of rupture that occur depend upon previous sphacelation, which is an extremely rare occurrence in this disease.

65. *B. Chronic Cystitis.*—When the acute form of true cystitis has not terminated completely in

resolution, it frequently passes into a chronic state of the disease. But this form may exist from the commencement, and, appearing in a mild state, it is often neglected, and hence becomes an enduring disease. As in other inflammations, cystitis is observed of every intermediate grade of severity and of duration, from the most acute to the most chronic, according to the nature of the exciting and concurring causes and the peculiarities of the individual. The consequences resulting from the sub-acute or chronic forms of cystitis also vary with the severity of the attack. When the chronic is merely a continuation of the acute in a less severe degree, the nature of the disease is manifested by the persistence of the local symptoms especially, which are of a nature readily to be recognised and understood, and are chiefly those already adduced, but in a milder form.

66. When chronic cystitis occurs primarily, its accession is sometimes slow, and scarcely so severe at first as to excite the anxiety of the patient. In other cases it is of a much more marked character, and more nearly approaches a sub-acute or an acute form. But in general it is characterized by permanent pain referred to some part of the viscus, by frequent calls to void the urine, attended by difficulty, as if occasioned by stricture of the urethra; by the presence of mucus or purulent matter in the urine; by tenesmus at stool and costiveness; by slight fever, especially in the evening, and sometimes by fever of a remittent or intermittent form; by a loaded tongue; by inability to retain much urine at a time; and by an exacerbation of some or of all the symptoms after fatigue, exposure to cold, or errors of regimen, especially after drinking spirituous, vinous, or malt liquors. These symptoms vary in degree, and one, more, or even all of them, are more severe the more nearly the disease approaches a sub-acute or acute form.

67. The *duration* of this form of cystitis varies, according to the severity of the symptoms, from two or three months to as many years, or even longer. An acute or sub-acute state may supervene upon the chronic and shorten its duration, or the same result may follow the extension of disease to adjoining parts and the presence of serious complications. When it arises from calculi in the bladder, or from disease of the prostate or urethra, thickening of the walls of the viscus is a common consequence. It may, when it approaches the acute or sub-acute forms, terminate in abscess, in ulcerations, or perforation, or give rise to other lesions by extension of the inflammation to adjoining parts, as noticed in respect of the acute disease (§ 63).

68. *C. Ulceration of the urinary bladder* may result from any one of the forms of inflammation of the mucous coat of the organ already noticed, but most frequently from the sub-acute, chronic, and most protracted states. It may, however, also follow the acute form and the more chronic states of true cystitis. It is often difficult to decide as to the existence of ulceration; but when disease of the bladder has been of long duration, the pain severe and continued, with a frequently recurring desire to micturate, and an increasing difficulty and pain in passing the urine, then the existence of this lesion should be suspected, and, if the urine presents the appearances stated above (§ 48), especially if it contains pus streaked with blood, it need not be doubted. *Ulceration of the*

bladder may take place differently: it may commence in the mucous follicles, especially in the more chronic cases; or it may follow the acute form, lymph being first exuded from the inflamed surface, and subsequently detached, leaving this surface tender and susceptible of irritation from the urine, and liable to experience ulceration from the continuance of the irritating cause. In acute cases the mucous surface may thus be nearly all destroyed by the softening and ulcerating processes produced and perpetuated by the urine on the inflamed surface, the walls of the viscus becoming thickened, even although the muscular coat may be laid bare in parts.

69. When the ulceration is seated or commences in the follicles, perforation of the bladder may result, the disease having assumed most frequently a chronic form. When ulceration or destruction of the mucous coat follows acute cystitis, all the coats forming the parietes of the organ rapidly become implicated, and the disease soon terminates fatally. The more limited states of ulceration, especially when commencing in the follicles, may perforate the coats of the viscus, and, having reached the peritoneal surface, occasion the exudation of lymph, by which the bladder becomes united to adjoining parts, thereby preventing the escape of urine, or forming a fistulous opening into some other viscus. In this manner a fistulous communication may be formed between the fundus of the bladder, the sigmoid flexure of the colon, or the cæcum, or the ileum, &c. When a fistulous opening is thus formed between the bladder and any portion of the bowels, feces may pass into the bladder, unless the opening be formed between the under surface of the bladder and the rectum, and then the urine is usually voided with the feces. Fistulous communications between the bladder and the rectum are more frequent, especially in females, than between the former and other portions of the intestinal canal. When communications are formed in this situation, either by ulceration commencing in the bladder or in the rectum, an abscess below the reflected portion of the peritoneum often forms, owing to the inflammation of the connecting cellular tissue caused by the urine or by the feces. Mr. COULSON (*op. cit.*, p. 140) has recorded some interesting cases of fistulous openings between the bladder and intestines, to which I may refer the reader. Ulceration and perforation are always attended by hypertrophy or thickening of the coats of the bladder, whether they be consequent upon muco-cystitis or the more chronic or sub-acute states of true cystitis. When the ulcer is seated in the posterior and inferior part of the bladder, it may penetrate the coats so that the urine will pass into the cellular tissue between the bladder and rectum, producing the most destructive effects.

70. iv. COMPLICATIONS OF CYSTITIS.—One or other of the forms of cystitis may be associated with some other disease or structural lesion. These diseases may be the causes of the inflammation of the mucous coat of the bladder, as well as its complication. This is especially the case with gonorrhœa, gleet, stricture of the urethra, syphilis, calculus in the bladder, rheumatism, gout, &c. *Gonorrhœa* often induces a severe and obstinate form of muco-cystitis, the discharge from the urethra being diminished as that from the bladder becomes more copious and the other symptoms more distressing. On the other hand, the chron-

ic forms of muco-cystitis, especially when they go on to ulceration, perforation, &c., induce disease of the kidneys, most frequently of the left kidney (RAYER, RICHTER, P. FRANK, COULSON, &c.). In these latter cases a dull pain is felt in the loins, is increased by pressure, and is ushered in by chills, rigors, sickness at stomach, and an albuminous urine, which also contains large quantities of puriform matter, often tinged with blood.

71. With ulceration of the mucous coat, hypertrophy of the muscular coat, contraction and thickening of the parietes of the organ generally result. The bladder, owing to its irritability, is constantly contracting upon the urine poured into it; and spasm of the sphincter often causes a regurgitation into, or an obstruction of the ureters; which thus become distended and tortuous, and still farther changes are thereby induced. "The mucous membrane, extending upward along the ureters to the pelvis and the infundibula of the kidneys, becomes inflamed and rough, and pours out a quantity of pus. The glandular structure of the kidney undergoes from pressure slow absorption. The capsule adheres with preternatural firmness to the exterior of the gland. Upon making a section of a kidney so diseased, we find that, although apparently of large size, it consists in great part of dilated tubes, and that the true vascular or secreting part is in smaller proportion than usual."—(*Op. cit.*, p. 144.)

72. The complications either of muco-cystitis or true cystitis are chiefly with diseases of adjoining parts, and arise from the extension of inflammatory action, either to these parts from the bladder, or from the latter to the former. Inflammation of the urethra, prostate gland, strictures of the urethra, calculus vesicæ, hæmorrhoids, colonitis or inflammatory dysentery, inflammations of the rectum and of the uterine organs, and kidneys, &c., may severally extend to, or excite inflammation of the bladder. On the other hand, this latter may involve the adjoining parts: it may extend from the fundus to the omentum, or to some of the convolutions of the intestines, or it may occasion peritonitis. This is not a frequent occurrence; but firm adhesions of one or other of these parts to the fundus of the bladder have been found on rare occasions, where, from the history of the cases, the bladder was the original seat of disease.

73. Inflammation may extend from the mucous coat of the bladder to the ureters, and along their course even to the kidneys; but this very frequent and important complication of uro-cystitis is most probably not often produced in this manner, but much more frequently by the occlusion of the ureters where they pass through the coats of the bladder, owing to the tumefied state of the inflamed parts at this situation. In this case the urine is secreted for a while, but cannot pass into the bladder, owing to this condition of parts. Inordinate distention of the ureters, pelvis, and tubular structures is the consequence, and serious disease and disorganization, not only of these parts, but also of the constitution, result.

74. The extension of inflammation of the bladder to the uterine organs is not infrequent; occasioning not merely adhesions between the serous surfaces, but also, particularly when cystitis is consequent upon, or is attended by retention of urine, retroversion or obliquities of the uterus, leucorrhœa, &c. The most frequent complication

of cystitis is stone in the bladder, the inflammation being consequent upon, and generally occasioned by the solid concretion. The frequent connexion also of the several forms of uro-cystitis with gout and rheumatism, either as consequences of the misplacement or metastasis of these, or as occurring from other causes, owing to the predisposition to urinary disease occasioned by them, should not be overlooked when ascertaining the causes and the relations of cystitis, or when determining the indications and means of cure.

75. V. APPEARANCES AFTER DEATH.—These vary much in different cases, and are more generally the consequences than the states forming the early, or even the advanced, states of the disease.—*A. After acute muco-cystitis*, the inner surface of the bladder is thick, rough, of a reddish-pink hue, from capillary distention, with small ecchymoses, owing to exudation from the congested capillaries. The inflammation in most fatal cases is found to extend over the whole inner surface, although greatest in some parts, especially near the neck of the organ. Coagulable lymph is sometimes found covering or attached to the mucous coat. This tunic, in the most acute cases, may be detached from the muscular in parts, or even throughout, forming a grayish layer resembling a false membrane. In many instances the mucous coat has been destroyed by ulceration; “sometimes, however, round ulcerated spots, the size of a sixpence, are found in different parts, with elevated edges and a red surface.” Ulceration generally commences at or near to the neck of the bladder, and extends more or less to the fundus; but it sometimes begins in the latter, and advances to the former. In the most severe cases the muscular coat is involved in the inflammation, presenting gangrenous or disorganized spots. One or other of the kidneys is also generally diseased, the pelvis being dilated or ulcerated, containing pus, and the ureters also being dilated and ulcerated at their vesical extremities.

76. *B. In the slighter or early states of chronic muco-cystitis* the mucous coat is found, in cases of death from other diseases consequent on the former, injected, discoloured, thickened, and softened, and its follicles enlarged and inflamed. It separates readily from the adjacent coat, is abraded in parts, and is even detached in spots by extravasations underneath. The parietes of the viscus are thickened and contracted, the muscular coat is greatly hypertrophied, and ulceration of the mucous coat penetrates to the muscular, or even farther (§ 68, 69). When the ulceration is extensive, the hypertrophied muscular fibres appear, and resemble the columnæ carneæ of the heart, presenting a purplish-red colour; the mucous coat between the columns thus formed being pale, soft, and swollen. Pouches, or sacs, generally coexist, with dilated ureters, between these muscular columns, and are formed by the contractions of the bladder and of the abdominal muscles, in expelling the urine, forcing the mucous coat in places between the muscular fibres. These pouches are lined with a diseased mucous coat, which secretes an alkaline mucus, and are “sometimes the receptacles of a mortar-like matter, and finally of calculi, consisting generally of phosphate of lime.” As the disease proceeds in the mucous coat it extends to the ureters, to the pelvis, and to the tubular structure of the kidneys;

and pyelitis supervenes. Ultimately the ureter leading to the kidney affected becomes dilated, tortuous, its lining membrane inflamed, granulated, or ulcerated, or sometimes covered with lymph. The pelvis and infundibula are much dilated, while the secreting structure of the kidney is reduced to a thin layer.

77. *C. In the more chronic states* and other cases of *muco-cystitis*, patches of a red colour, more or less deep, or from a bright red to a violet shade, are found in the mucous coat; and small ulcerated specks or points, apparently affecting the mucous follicles, are seen in these patches. In the more chronic cases the ulcers are of considerable size. When numerous they are generally small. Sometimes an albumino-puriform matter, adhering at points of the mucous surface, gives it an ulcerated aspect on a superficial view; and occasionally this surface appears elevated at numerous points, owing to an albuminous exudation in the subjacent cellular tissue. The whole internal surface is but rarely affected, although the greater part generally is, in the form of large irregular patches. In protracted cases the mucous surface is thickened, and this change often extends to the connecting cellular tissue; while the blood-vessels are more numerous and more engorged than natural. With these appearances the bladder is generally contracted, and the mucous coat forms a number of large wrinkles or folds, is often softened, and is occasionally incrustated, or covered in parts with a calcareous deposit. The prostate gland is often enlarged in these cases, is somewhat diminished in consistency, and readily admits of being divided.

78. *D. In true cystitis*, especially when chronic, in addition to increased vascularity, more marked in some places than in others, the parietes of the bladder are much thickened, and more or less contracted; but the extent of these changes varies greatly, being generally greatest in cases of chronic cystitis arising from the presence of stone. In some cases the thickening is moderate, yet attended by a varicose state of some of the veins of the viscus. Adhesions to adjoining parts of the fundus of the bladder, ulcerations, &c., are also seen in the circumstances and complications of the disease described above (§ 63–69).

79. VI. DIAGNOSIS.—*A. Muco-cystitis*, when acute, may be mistaken for inflammation of all the coats of the bladder; but in the latter the desire to void the urine is much less frequent than in the former, and sometimes is not experienced until a large accumulation has taken place, and then it occurs in most severe paroxysms. The sense of scalding along the urethra felt in muco-cystitis is either slight, or absent when all the coats are inflamed. Occasionally the power to pass the urine is lost in this latter form of the disease, even when the desire is most urgent, and the act can be accomplished only after repeated efforts, or by surgical aid.

80. Many of the symptoms of acute muco-cystitis are experienced when stone is present in the bladder. But in cases of stone the pain is chiefly felt after the bladder has been emptied; whereas in acute muco-cystitis the pain is most intense when the bladder contains urine, and it subsides when the viscus is empty: in cases of stone, also, larger quantities of blood are passed than in muco-cystitis, and the urethra is seldom so irritable. (COULSON.)

81. *B. Irritability* of the bladder is to be dis-

tinguished from muco-cystitis and true cystitis by the symptoms noticed above (§ 11), and by the severity of the local affection, and of the constitutional disturbance. When, however, the irritability depends upon organic disease of the kidney, the diagnosis is more difficult. Mr. Coulson remarks that the intense pain which attends inflammation and ulceration of the mucous coat of the bladder soon exhausts the patient, while in irritable bladder from diseased kidney there is sometimes, but not always, pain in voiding the urine; that the frequency of micturition is the most distressing symptom; and that, even when pain exists, it is never so severe as to wear the patient out, but may be, and often is, endured for years.

82. *C. The chronic states* of muco-cystitis are readily recognised. When mucus is passed in the urine in small or moderate quantity it may be mistaken for the involuntary discharge of semen, or of the prostatic fluid, which accompanies the evacuation of the fæces or of the urine in some persons; but semen differs from mucus in its color, in its property of liquefying on cooling, in its insolubility in water when recent and thick, and its solubility when liquid, and in the radiating crystals which it produces after evaporation. The prostatic fluid may be distinguished by its remarkable transparency, by its stringy and slimy properties, and by its retention of these conditions until it is dried. The prostatic secretion is often mistaken for the seminal in cases where it is discharged, both being passed immediately after the bowels and the bladder are evacuated; but the prostatic fluid is passed much more frequently than the seminal, which is thus voided much more rarely than is often believed to be the case. Chylous urine is different from the urine voided in muco-cystitis, in being of a uniformly whitish hue, and the sediment formed by standing readily mixes with the urine on shaking; whereas the urine in this form of cystitis is at first turbid, and on standing the sediment becomes viscid, ropy, flocculent, or muco-puriform, or even purulent, and it has the appearances already noticed (§ 47-49).

83. vii. *THE PROGNOSIS* depends much upon the age, constitution, diathesis, and habits of the patient, and on the exact seat, severity, and duration of the disease. It may even still more depend upon the consecutive lesions already produced, and upon the presence or absence of complications. If the disease be primary and uncomplicated, and the patient young or middle-aged, and of a sound constitution, or has not previously been subject to disease of the urinary organs, the prognosis is *favourable*; but, on the contrary, if he be aged, cachectic, has been subject to previous disease of the urinary organs, to stricture, or to any of the complications mentioned above (§ 70, *et seq.*), especially to disease of the kidneys, and still more particularly to this latter, occurring consecutively upon chronic muco-cystitis, the prognosis is *unfavourable*. In the more acute cases, as well as in the subacute and chronic, if the pain continue, notwithstanding a judicious practice; if the micturition be still frequent; if the urine be loaded with a muco-puriform matter, epithelium, and a little blood; if a dull, heavy, and continued pain be felt extending from above the pubes to the sacrum or sacro-iliac symphyses, and especially if it be experienced in the loins and extend to the thighs; if emaciation and hectic

be marked; and if vital exhaustion be rapid or extreme—ulceration of the bladder, and consequent disorganization of the kidney, may be inferred, and a fatal issue be expected. If the states of true cystitis be followed by retention of urine, or if either form be followed by suppression, renal symptoms supervening, and no urine being found in the bladder, the danger is generally extreme. Whenever any of the severe symptoms mentioned above (§ 56, *et seq.*) occur, whatever may be the stage, form, or progress of the disease, a most cautious prognosis should be formed.

84. viii. *CAUSES OF CYSTITIS.*—A. The several forms of cystitis are most frequently met with in persons advanced in age, and in adults—particularly in the former. MM. LESAIVE and BOISSEAU have, however, seen them in children between two or three years of age, and I have met with them as early as four and five years; but instances at this age are very rare, unless when accompanied with calculus in the bladder, or after injuries and operations. Cystitis frequently occurs in cold and humid climates, especially that form of it which is limited to the mucous coat; and it is common in persons addicted to fermented or spirituous liquors. Sedentary habits and occupations also *predispose* to it, especially in aged persons who are either confined to a sitting posture or to bed. An habitual neglect of immediately attending to the first desire of voiding the urine is a usual predisposing as well as exciting cause; the retention of this excretion occasioning irritation of the mucous surface and over-distention and diminution of contractility of the muscular coat. Females are less subject than males to muco-cystitis; but they appear quite as liable to the acute form of true cystitis, while they are less frequently affected with its chronic state, and to the complication of the disease with calculus and with disease of the kidneys. This partial immunity is owing to calculous concretions being less frequent and more easily removed in females; while diseases of the prostate and of the urethra are very frequent causes of the forms of cystitis in the male sex.

85. There are, perhaps, few causes which more frequently predispose to inflammations of the bladder than long-neglected disorder of the digestive organs, and especially to those states of cystitis which are complicated with calculous formations. There also seems to be a predisposition constitutionally inherent in some persons to diseases of the urinary organs, and consequently of the bladder, and especially in those of a gouty diathesis. Indeed, both the gouty and calculous diatheses often originate in the same sources, namely, in deficient vital energy, and long-continued disorder of the digestive functions connected with an excessive use of animal food relatively to the amount of exercise in the open air. The connexion of the former state of the system with disease of the bladder is very evident, and the intimate relation which both diatheses hold to each other in respect both of their common sources and of their exciting causes, are satisfactory proofs of predisposition independently of the evidence furnished by experience of the frequency of cystitis in gouty habits. Persons of a scrofulous diathesis, or who have been addicted to venereal excesses or to the habitual use of highly seasoned dishes, to much animal food, and to sedentary occupations, are generally disposed to cystitis.

86. *B.* The most frequent *exciting causes* are, too long retention of the urine, exposure to cold and moisture, sitting on damp couches, sofas, or seats, or on cold stones, or on the ground; damp clothes on the lower extremities; damp feet; cold drinks while the body is perspiring; the abuse of diuretic and lithotriptic medicines; the excessive use of common gin; the incautious exhibition of emmenagogues; the internal use of cantharides or turpentine in too large or too frequent doses; the abuse of aphrodisiacs; the introduction of a catheter or sound, especially by unskilled hands; irritating or improper injections thrown into the bladder; the irritation caused by calculi or by morbid states of the urine; external injuries, or blows on the hypogastrium, especially when the bladder is full; coitus when the viscus is distended with urine; horseback exercise, with inattention to the evacuation of the urine; the pressure of the fœtus upon the unemptied bladder during labours; protracted labours and the use of instruments to facilitate the process; operations performed on the bladder; the suppression of accustomed discharges, as of fluor albus, hæmorrhoids, catamenia, and the sudor pedum, to which some persons are subject; the incautious suppression, without suitable internal treatment, of cutaneous eruptions, or healing of external sores or ulcers; the retropulsion or misplacement of gout and rheumatism; inflammations of adjoining parts; obstructions to the discharge of urine from strictures of the urethra, or from enlargement or abscess of the prostate gland; repelled gonorrhœa, and the use of injections for its cure.

87. AMBROSE PARÉ, CABROL, and CHOPART have recorded some cases in which large quantities of cantharides had been taken as a cure for agues, and had occasioned cystitis of uncommon severity and fatal issue. The same result has followed the use of this substance as an aphrodisiac. Cystitis may also be the extension of inflammation from the pelvis of the kidneys to the bladder, or it may arise from the irritation of a calculus in that part of the ureter which passes between the coats of the bladder. It may also supervene in the progress of fevers, particularly of those characterized by stupor, coma, or delirium, or by congestion of the spinal cord, owing to the accumulation of urine of a highly irritating property; the local affection failing to excite the sensibility of the patient in these states, or the attention of the physician. The frequency and importance of this complication in fevers and in diseases of the brain and spinal cord should attract attention to it on every occasion, and on every visit.

88. Injuries and diseases of the spinal cord, its membranes, &c.; compression of, or hæmorrhage on, the cord; concussions of the brain or spinal cord, &c., are frequent causes of retention of urine, and thereby of cystitis. Even sudden jerks, as missing steps on descending stairs, coming with a jerk upon the feet when the body is erect, falling from a height on the feet, especially when much water is in the bladder and a predisposition to inflammation of it exists, are occasionally causes of the disease. It may be remarked, that a single cause will in some persons more certainly produce its effects than the concurrent operation of several causes where little or no predisposition to the disease exists.

89. ix. TREATMENT.—*A. Of Acute Muco-Cystitis.*—The antiphlogistic regimen and treatment

are required in all their details in this form of the disease. General and local *bleeding* should be prescribed, and even repeated, according to the age, habit of body, and constitution of the patient. Cupping over the sacrum, or leeches applied above the pubes or on the perineum, and repeated when circumstances indicate the propriety of the measure, are requisite; and in the milder cases, and in the less robust subjects, the local may supersede general bleeding. In some cases, especially when the symptoms indicate congestion or torpor of the abdominal viscera, or accumulation of sordes in the *prima via*, an *emetic* will be given with benefit. After its operation has been freely promoted the bowels should be sufficiently moved by means of *cooling aperients*, as the infusion of senna with magnesia, the neutral salts, or the carbonate of magnesia and sulphur, &c. Bleeding ought not to be carried too far, especially in the inhabitants of large towns, and in the aged, cachectic, or delicate. Nor should those purgatives which are liable to irritate the rectum or colon be employed; but the bowels ought to be kept regularly open. A warm general *bath*, or hip-bath, is always of service, and should be resorted to as early in the disease as possible after the above means have been employed, and should be repeated as often as the state of the patient will indicate. When the bowels have been evacuated, *opiates*, and *demulcents* or *emollients* are required, both to support the patient and to allay the local irritation. These may be variously combined and exhibited, and may be conjoined with the alkaline carbonates. Morphia, or the preparations of opium, may be used, according to the medicines intended to be given along with either of them or at the same time. I have generally preferred the soap and opium pill, conjoined with an equal quantity of Castile soap. If these fail or lose their effect, emollient enemata should be administered, with either the sirup of poppies or compound tincture of camphor added to them. When these also prove insufficient to allay the local irritation, opiate suppositories may be resorted to, and a belladonna plaster be applied above the pubes, or over the perineum, or a suppository containing some extract of belladonna may be tried. The state of the urine must be daily tested, and, as long as it continues acid, the carbonates of the fixed alkalies may be given, in demulcent vehicles, with such other medicines as the peculiarities of the case may suggest. As the disease lapses into a subacute or chronic state, the warm or hip-bath, opiates with soap or alkalies, the infusion of pareira or of diosma, the preparations of cubebs, small doses of copaiba or of the other balsams, and the infusion or tincture of hops, may be severally prescribed.

90. The acute form of muco-cystitis will be protracted, or pass into the subacute, and ultimately into the chronic form, if the *regimen* and *diet* of the patient be not duly regulated. All spirituous, vinous, and malt liquors should be relinquished, as well as acidulated or sweetened drinks or fluids. The food ought to be farinaceous, demulcent, and vegetable, and prepared in as bland a form as possible. The drink should consist entirely of linseed-tea, barley-water, or toast-water, gum-water, or marsh-mallow tea taken in moderate quantities.

91. In severe or obstinate cases some practitioners have recommended the injection of oil

and opium into the bladder by means of a gum-elastic catheter. As to this treatment, Mr. COULSON has very justly remarked, that the pain and irritation caused by the introduction of any instrument along the urethra are so severe as to deter him from resorting to this treatment; for, unless there be retention of urine, the use of the catheter, sounds, and bougies should be avoided.

92. *B. Treatment of Chronic Muco-Cystitis.*—This form of the disease is often complicated with stricture of the urethra, or with disease of the prostate or kidneys; and it often also is consequent upon the acute form of the disease, owing either to neglect or to the constitution of the patient. In all cases the treatment of this form of muco-cystitis is difficult, and more especially when it is complicated, and in the aged and cachectic. When the disease is simple, or consists chiefly of an abundant secretion of mucus (cystorrhœa), the decoction of pareira, or the infusion of buchu, with opium or morphia, or with the dilute phosphoric or nitric or nitro-muriatic acids, and the decoction or extract of uva ursi, are generally of service; but, where there are also much irritability and pain of the bladder, opiates given by the mouth or in enemata are most requisite, and should be conjoined with every other method of cure. Sir A. COOPER recommends the balsam of copaiba, in doses of eight or ten drops thrice daily, with mucilage, sweet spirits of nitre, and camphor mixture. Mr. COULSON advises small doses of copaiba, or of the essential oil of cubebs with hyoscyamus, either to be given alone, or with the infusion of buchu, or with the decoction of pareira. He adds, however, that both copaiba and cubebs should be given with care; for, after the prolonged use of these remedies, an aggravation of the disease may result. He frequently, therefore, gives the compound tincture of benzoin, in the dose of a tea-spoonful, three times daily; and, when the urine is alkaline, and contains much mucus with the phosphates, an infusion of the dried *Alchemilla arvensis* (one ounce to a pint of boiling water), the dose being two ounces of the infusion three times in the day. The muriated tincture of iron, the ammoniated tincture of iron, the balsams, Chio turpentine, and other kinds of turpentine, uva ursi, with camphor and nitre, the sulphates of iron and of zinc, have also been severally employed in this state of the disease, and are generally of service when aided by opiates, and when the digestive organs and bowels are duly regulated. DUPUYTREN relied much upon turpentine when the mucous secretion was great; and I have had occasion to observe its good effects; but it should not be long continued, although it may be given at intervals, or alternately with other means.*

[* The *copaiba* is much employed in this country in cases of vesical catarrh, and often with decidedly beneficial effects. It should be given in moderate doses, as 10, 15, or 20 drops every four hours, in emulsion of gum arabic and sugar. If it gripes, nauseates, or purges, *tinct. opii* or *morphia* should be combined with it; and if pyrosis or acid eructations be present, bicarbonate of soda is a very useful adjunct. Its use must be continued in chronic cases several weeks, the patient using at the same time the fluid extract of *uva ursi*. If its taste become disgusting, *turpentine* may be substituted for it. We have in many cases used the *uva ursi*, in connexion with alkalies, with a successful result. The *chimiphila umbellata* is also very useful in this disease. The *epinea repens* (May-flower) is extolled by Dr. IVEY, of New Haven, as a highly useful remedy in this affection. A wine-

93. Persons of a scrofulous diathesis, or those addicted to venereal excesses, or who have suffered from syphilitic affections, or who are subject to hæmorrhoids or to gout, are liable, when they are attacked, to an obstinate form of this disease. For these the treatment should have more or less reference to the state of constitution, while the local affection also obtains sufficient attention. The aged and cachectic also require to have their constitutional powers supported while the urinary disease receives requisite care. But in these latter persons palliation alone can be hoped for; and the prolongation of life, by means of a restorative or tonic treatment, opiates, and a regulated diet, is often the whole amount of benefit that can be expected.

94. When chronic muco-cystitis is associated with stricture of the urethra, or is produced by it, the treatment is extremely difficult. Mr. COULSON remarks that "the pain and irritation along the urethra are often so great as to render the use of catheters and bougies impracticable; and, unless the state of the urethra improve, no material benefit can be expected from internal remedies." Under these circumstances, having calmed the pain and irritation by means of sedatives, he proceeds to dilate the urethra with bougies or the gum-elastic catheter; and, if the stricture be of long standing and very narrow, he commences with armed bougies, introducing them once in three or four days.

95. The frequency of this, as well as other forms of cystitis in the gouty, and even also in the rheumatic diathesis, and of the occurrence of the disease in connexion with, or upon the disappearance of gout, suggests the propriety of modifying the treatment conformably with this connexion. In these cases I have found the opium and soap pill, with the extract of colchicum, taken at bed-time, and a sufficient dose of magnesia and sulphur, or magnesia and rhubarb, early in the morning, to prove of great service. One or other of the other means already mentioned, avoiding the acids, may also be given in the course of the day, as circumstances may indicate.

96. Other means, which more especially belong to the province of the surgeon, have been advised in the more severe and protracted cases of muco-cystitis. Sir B. BRODIE states that when "the symptoms are at their greatest height, the mildest injections (into the bladder), even those of tepid water, will do harm rather than good. They are especially to be avoided when the mucus deposited by the urine is highly tinged with blood. When, however, the symptoms are abated, the injection of tepid water, or decoction of poppies, is, in many instances, productive of excellent effects." The fluid should be allowed to remain in the bladder about thirty or forty seconds, and not more than two ounces should be injected each time. Distention of the bladder by the injection so as to cause pain is injurious, and should be avoided. The operation may be repeated once or twice in the twenty-four hours. When the symptoms have abated and assumed a still more chron-

glassful of a decoction, made with two drachms to half a pint of water, is to be given every two hours. In its effects it is closely allied to the *uva ursi* and buchu (*Trans. Amer. Med. Assoc.*, vol. iii., p. 314). See also a paper by Dr. LA ROCHE on *copaiba* in this affection, in *Am. Jour. Med. Science*, vol. xiv. Dr. GROSS speaks very favourably of the *benzoic acid*, given alone, or in combination with bals. *copaiba*, in doses of 15 to 20 grs. three or four times a day, or with a few drops of Haerlem oil.]

ic form, and the mucus is free from blood, then one minim of the strong, or ten minims of the diluted nitric acid, to two ounces of distilled water, may be used as an injection; the proportion of the acid being afterward increased. Mr. Coulson remarks that the tenacious mucus produced in this state of the disease deposits phosphate of lime; and when phosphate of lime from this source coexists, as it often does, with the triple phosphate in the urine, a compound salt is formed; and in such cases a weak solution of nitric acid (beginning with one minim of strong acid, increasing the quantity to two, to two ounces of distilled water) injected into the bladder acts as a salutary stimulant. As to LALLEMAND's cauterization of the mucous membrane of the bladder with solid nitrate of silver, in cases of chronic catarrh, and as to DEVERGIE's injections with balsam of copaiba and narcotics, I must refer the reader to the work of the author just mentioned, and to other surgical works.*

97. It should not be overlooked that excessive mucous secretion from the surface of the bladder, if neglected, or treated too long with some of the more heating substances which have been advised, may be followed by a chronic inflammation of all the coats of the bladder, and ultimately by a subacute or an acute form of the disease, which may destroy the patient. This result is most likely to occur when the diet and regimen so requisite to the success of treatment have been neglected. In the milder form of the disease, animal food in very moderate quantity may be taken. The diet should be chiefly farinaceous, but the white kinds of fish, boiled, may be allowed.† In the severer states animal food should be still more sparingly taken. If in these the vital powers be much depressed, sufficient light nourishment may be given, and tonics with the alkaline carbonates, opiates, &c., may be prescribed. Spirituous, vinous, and malt liquors should be strictly prohibited, and all irregularity of diet and regimen carefully avoided. When there is great debility, dry

[* Dr. Gross (*loc. cit.*) recommends, in obstinate cases of this disease, counter-irritation in the form of a seton, issue, or tartar-emetic pustulation, over the perineum or the suprapubic region. If there is reason to suspect renal disease, the counter-irritation should be over the sacrum or in the loins by means of a seton, and the discharge kept up for a long time. When irrigation is practised, a better mode than that recommended is to use a double catheter, and gently inject a pint of tepid water, so as to wash out the bladder thoroughly; and it may be repeated twice a day, unless the urine is bloody, or there are symptoms of cystitis present. With regard to the various medicated injections for a local alterative effect on the mucous membrane, we greatly prefer a solution of the nitrate of silver, in combination with the fluid, watery extract of opium or hyoscyamus, beginning with a weak solution, and gradually increasing its strength, throwing in about two ounces each time, and allowing it to be retained from five to ten minutes; the patient placing himself in different attitudes to bring it in contact with every part of the bladder, and repeating the injection once a day, or every third day, according to circumstances.

Where every thing has failed, it has been proposed by Mr. GUTHRIE to open the neck of the bladder by an incision, as in lithotomy, so as to allow a free outlet to the mucous secretion as fast as it is poured out, and thus afford the bladder comparative repose; on the same principle as the knife is recommended for anal fistule and fissure. This operation has been performed by Dr. W. PARKER, of New York, with evident relief of the symptoms, but the patient succumbed four weeks after from organic disease of the kidney and bladder. (See *New York Journ. of Med.*, 1850.)

[† We have generally found an entire abstinence from animal food the preferable course, and only allow mild broths when convalescence is fully begun. Vegetable acids are always prejudicial in this disease.]

sherry may be allowed, especially if acidity of the *prima via* be not experienced. In all cases the functions of the skin as well as of the bowels should be duly promoted.

98. *C. Treatment of Acute Cystitis—of Acute Inflammation of all the Coats of the Bladder* (§ 56).

—It has been above (§ 55) stated that the inflammation may affect one of the tissues of the bladder more than the others, or may implicate them all, chiefly through the medium of the connecting cellular tissue, and that a portion of the bladder may be thus affected, or the whole of the organ; that when the inflammation is seated in the neck of the bladder, the urine is retained by the tumefaction occasioned by it; and that when the parts through which the ureters pass into the bladder are chiefly affected, the swelling which results more or less obstructs the passage of the urine, and occasions dilatation of the pelvis, ureters, &c., by its accumulation in these parts and suppression of this excretion. The consequences of the retention on the one hand, and of the suppression on the other, are always most serious, and should be prevented by a most active treatment as soon as these important and always dangerous states are present. The former may be removed by surgical aid; the latter by prompt and judicious medical treatment. But in most cases the treatment should have reference to the cause of the disease and the diathesis of the patient. When the malady is produced by cold in any form, then the phlogistic form may be inferred, and suppuration may take place, especially in the phlogistic temperament and full habit of body. When it is occasioned by spirituous liquors, aphrodisiacs, or the suppression of the gonorrhœal discharge, although all the coats may be implicated, the mucous will generally be chiefly affected, and retention or suppression of urine less frequently result. If the disease occur in the gouty or rheumatic diathesis, or follow upon suppression or metastasis of either gout or rheumatism, all the coats may be affected, and neither the fundus nor its peritoneal covering escape.

99. In all these circumstances the treatment should be prompt and decisive, and the quantity of urine retained in the bladder carefully watched, by examining the hypogastrium and the quantity excreted. If the patient be young, or robust, or plethoric, although advanced in life, venesection should be prescribed and even repeated, and be followed by the local depletions, which may be sufficient for the delicate or weak, by cupping on the perineum, or by leeches applied to the part or to the pubes. Hot baths; warm fomentations above the pubes or on the perineum; the removal of the urine by means of the catheter whenever it may be required; emollient, laxative, and anodyne injections; cooling saline aperients, preceded by calomel and opium when the febrile symptoms are severe and the biliary functions are impaired; and demulcents with diaphoretics—are the means of cure which may be safely resorted to in all the circumstances of the malady just noticed. If the disease be consequent upon gonorrhœa, oleaginous or mucilaginous demulcents, with small doses of camphor, nitrate of potash and henbane, in addition to appropriate depletions, diaphoretics, aperients, &c., will generally remove the more urgent symptoms. If it be connected with gout or rheumatism, magnesia and sulphur in equal parts, either alone or with demulcents, and small doses of colchicum, will

be found very beneficial, by moderately promoting the abdominal secretions and the functions of the skin; this latter being too generally overlooked, especially in gouty affections. Under the above treatment the symptoms generally subside gradually; but if retention of urine be long neglected, or if the urine be suppressed, owing either to delay in adopting the above means, or the constitution of the patient and violence of the attack, delirium, coma, and death will generally result. It may be asked, What should be done in cases where the urine has become suppressed? I would answer, after the above means have been judiciously employed, that warm flannels, or stupes, moistened with spirits of turpentine, should be applied over the hypogastric region and perineum, and that emollient enemata, containing equal parts of this substance and castor oil, and one or more ounces of olive oil, be administered and repeated as they may be required, while diaphoretics should be assiduously continued.

100. When the inflammation of the fundus of the bladder implicates the peritoneal coat, or is associated with inflammation of the uterine organs or peritoneum, the treatment is not then materially different from that recommended above. Cupping over the sacrum, leeches to the hypogastrium, &c., the warm terebinthinate embrocations, or stupes, in these situations, calomel and opium, followed by the enemata and diaphoretics already advised, are the means most generally appropriate.* If cystitis be complicated with hæmorrhoids or inflammation of the rectum or colon, or with fistula, calomel should be withheld, as it generally increases these affections, and thereby prevents the resolution of the uro-cystitis; but the other means ought to be employed.

101. *D. Treatment of Chronic Uro-Cystitis.*—Chronic uro-cystitis is often consequent upon the acute, but it is oftener a consequence of stricture of the urethra, of enlargement of the prostate, of stone in the bladder, of prostatic calculi, of the abuse of spirituous liquors, especially of common gin; of the use of cantharides, or of cubebs or copaiba; or protracted gout and rheumatism, especially the former; and of the retention of the urine in the bladder after the desire to pass it. The nature of the cause influences more or less the treatment to be adopted. In strong, young, or plethoric subjects, and especially when considerable pain is experienced, local depletion, followed by warm baths, the semicupium, fomentations, &c., is always required. In many cases the removal of the primary disease should be the first indication, especially in the case of stricture of the urethra; and with this indication the employment of means which act more or less directly on the bladder should also be adopted. In most instances the selection of these means should be guided by the state of the urine. If this be acid or scanty, the bicarbonates of the fixed alkalies with nitrate of potash and sweet spirits of nitre, in demulcent or emollient vehicles, will be generally of great service; and anodynes, such as the sirup of poppies, tincture of henbane, compound tincture of camphor, tincture of hop, opiate suppositories, &c., will also be prescribed in many cases with advantage. The preparations of pareira brava, or of the diosma, or of uva ursi [or *Epigaea repens*, or *chimiphila umbellata*] may, in the more obstinate or chronic cases,

[* Anodyne suppositories are better suited to this disease than enemata.]

be given with the above, or the decoctions or infusions of these latter may be the vehicles for the exhibition of the former. When the disease occurs in the gouty or rheumatic diathesis, or appears after the suppression of either of these diseases, then the extract, tincture, or wine of colchicum in small doses, may be prescribed with the alkalies, and a small dose of opium or of morphia; and when the pulse presents much strength or hardness, the tincture of aconite, in the dose of one, two, or three drops, may be resorted to, although this latter is more appropriate in the more acute cases, and when the peritoneal covering of the viscus is implicated in the disease. The infusion of parsley-root is sometimes of service in chronic uro-cystitis, especially when made the vehicle for some of the medicines mentioned above. Mr. COULSON states that he has tried the infusion of wild-carrot seeds in this form of the disease with advantage, but that it should not be given if there be any irritation of the mucous membrane; and he adds that, as in these cases the bladder is, by its own efforts, seldom completely emptied, a catheter should be introduced from time to time, and the patient be instructed to do this for himself. Unless this direction be strictly attended to, the patient will become worse, and serious consequences ensue.

102. *E. When inflammation is extended to the peritoneal coat of the bladder*, either from the internal coats, or from parts in the vicinity of, or in contact with the peritoneal, the symptoms may then be very acute, and become chronic from neglect or injudicious treatment. This form of the disease is most frequent in females, especially after parturition or in some period of the puerperal state, and is generally contingent upon the occurrences which sometimes take place during this state. In some cases it is strictly a partial peritonitis, confined chiefly to the pelvic peritoneum; the symptoms, local and general, being distinctive of its nature and seat. (See art. PERITONEUM, inflammation of, § 76.) The seat of pain, tenderness, and tension, the rapidity of the pulse, the position of the patient, the expression of the countenance, &c., indicate the nature of the disease, which may be limited to the pelvic peritoneum, especially when coagulable lymph is thrown out, which forms adhesions between the opposite surfaces, and prevents the extension of the malady. In unhealthy constitutions, and in females in the puerperal states, the inflammation, instead of being thus limited, generally extends over the peritoneum; in place of coagulable lymph, a serous fluid, of varied appearances, is thrown out, and the morbid action, commencing in the hypogastric region, extends through the abdomen, which becomes tender and tympanitic. The pulse is so rapid as hardly to be counted; hiccough supervenes, and the disease presents the course and termination described in the article PERITONEUM (§ 19-36). In these cases the treatment is the same as I have advised in that article (§ 137-159, *et seq.*).

103. In rare instances an abscess forms below the peritoneum, between the bladder and the symphysis pubis, or some other adjoining part, as in a case related by Dr. ELLIOTSON. Sometimes also a pseudo-abscess is seated within the pouch of the peritoneum, between the posterior wall of the bladder and the rectum. Lymph, in these cases, agglutinates some folds of the intestines, or the sigmoid flexure of the colon and the fundus

of the bladder, and pus collects in the pouch formed by these parts. The contents of this pseudo-abscess may be absorbed, if in small quantity, old adhesions alone remaining; or they may find their way into the peritoneal cavity, and occasion general peritonitis and death. Cases of this nature are mentioned by Mr. COULSON, and they have been seen by myself, but only in females, and as consequences of pelvic peritonitis after parturition (see *art. PERITONEUM*, § 76, *et seq.*, and *PUERPERAL DISEASES*, § 221, *et seq.*).

104. V. MALIGNANT AND OTHER FORMATIONS are sometimes found in or attached to the parietes of the urinary bladder.—A. *Tubercle* is occasionally deposited in the parietes of this viscus, generally either under the peritoneal coat, at the fundus, and in the mucous membrane, near the urethra. In this latter situation the small granular deposits pass rapidly to ulceration. Tubercle of the vesical mucous membrane is, according to ROKITANSKY, rare, and is not always formed in connexion with tubercular affections of the urinary and sexual organs. Tubercle on the exterior of the bladder is generally seen associated with the same formations in the vicinity, especially in the female sexual organs. Mr. COULSON remarks that the morbid deposit may be so great as to glue together the different organs, and thus interfere with the free action of the detrusor urine; but this can only occur when the tubercular cachexia is inordinately developed. The most frequent appearance of tubercle in connexion with the bladder is in cases of tubercular peritoneum, that part of the membrane covering the bladder partaking in the general alteration, the deposit being commonly in small distinct masses, the membrane being spotted, dark-coloured, or rugous, or otherwise altered. (See *PERITONEUM*, § 111, *et seq.*)

105. B. A *polypous excrescence* from the internal surface of the bladder is very rarely observed. Dr. BAILLIE saw only one example of it, and that filled up the greater part of the cavity of the viscus. An instance of it occurred to Mr. CROSSE, of Norwich, in a child. Other cases of polypus vesicæ have been recorded by Mr. WARNER and others, but they require no particular notice. The very interesting and instructive case published by the late Mr. CROSSE will be found in Mr. COULSON's work.

106. C. *Malignant formations* in the bladder are not very rare. The worst form is that described by Mr. TRAVERS and others as the malignant medullary fungus, which arises from the sub-mucous tissue, and projects into the cavity of the viscus as a soft, vascular, and cauliflower-like mass, which bleeds upon the slightest touch. Mr. TRAVERS states that it springs from "the mucous coat of the bladder, and resembles that of the nares and uterus, breaking, bleeding, and reproduced as quickly as it is displaced. It is of very extensive attachment, and gradually reduces the cavity to very small dimensions. Portions of fungus and coagula of blood become plugged in the urethra, and form firm pellets, so as to produce retention of urine. It is a very painful disease. It keeps the patient in constant anxiety to void urine, which is more or less tinged with blood, and frequently he passes blood alone. He dies hectic and wasted." Mr. COULSON states that this malignant fungus is generally first developed near the neck of the bladder, the trigon, or the posterior surface; and that cases occur in

which the vegetations fill a diverticulum or sacculus, where they form a tumour which may cause retention of urine by its pressure. These tumours vary in size, some being, when solitary, as large as a goose's egg; others are small, especially when they are numerous. Another form of medullary cancer has been described by ROKITANSKY as occurring in small masses between the muscular and mucous coats of the bladder. It may make its way through the mucous coat and form a deep carcinomatous ulcer, or may protrude externally through the muscular and peritoneal coats. Fibrous or scirrhus cancer, although sometimes affecting the uterus and ovaries, very rarely attacks the urinary bladder. These malignant formations cannot be assigned to any local cause of irritation, or to any other cause beyond the cancerous diathesis, hereditary or acquired. (See *art. CANCER*, § 23, *et seq.*)

107. a. *The symptoms* of malignant tumours of the bladder frequently resemble those of stone. WARREN states that the first sign of this disease is a discharge of blood with the urine. The quantity is at first so small as scarcely to tinge the urine, but it gradually increases until it becomes an exhausting symptom. The amount of pain attending it varies in different cases, being slight or moderate in some, and severe in others. Constant desire to pass urine is one of the most common symptoms, accompanied with sympathetic irritation of the rectum and inclination to stool. When blood passes from the bladder after the introduction of a sound or catheter, or after the flow of urine has terminated, or very nearly terminated, there is much reason to infer that it proceeds from the coats of the bladder; and when this occurs in connexion with the other signs, and especially with the sense of the existence of a body or substance in the bladder, felt either by the patient or the operator when a sound is introduced, the existence of a malignant tumour, fungus, or polypus may be inferred. Ultimately, in these cases, consecutive disease and disorganization of the kidneys, with more or less marked disorder of the stomach and bowels, and exhaustion of the powers of life, is followed by a fatal issue. I may refer the reader to Mr. COULSON's work for some instructive cases and *post mortem* appearances of this disease.

108. Disease of a disorganizing nature may extend to the bladder from malignant disease of the rectum in men, or of the womb in females; and by means of ulceration a communication may be established between the rectum and the bladder, or between the bladder and vagina.* Mr. TRAVERS, however, doubts whether the ulceration of the bladder in these cases be truly cancerous. In this doubt Mr. COULSON appears to partake. I have seen a few cases of extension of malignant disease from the neck of the uterus to the bladder, but in most of them have had reason to infer that the disease in the latter partook of the same character as that of the former.

109. b. *The treatment* of malignant disease of the urinary bladder is chiefly palliative, by means

* The mode of treatment by *suture*, in cases of vesico-vaginal fistule, has been in vogue since the 17th century; but the profession is under great obligations to Dr. J. M. SIMS, of New York, for his improvement of the ordinary operation, which is sufficiently easy, simple, and safe, and in a very great degree successful. For a full description of his mode of procedure, see *New York Medical Gazette*, vol. v., 1854; *American Medical Monthly*, Feb., 1854; and Gross on "*Diseases of Bladder*," p. 156.]

of narcotics, sedatives, &c., administered by the mouth, or in enemata, or in suppositories, as advised when treating of CANCER, and of diseases of the UTERUS, &c. In many of these cases the hæmorrhage from the bladder is so excessive that means are required to arrest the discharge and to sustain the powers of life. For these the tincture of the sesquichloride of iron, the decoction of pareira brava, with nitric, or hydrochloric, or sulphuric acid, if the urine be alkaline; the uva ursi, with the alkalies, if the urine be acid; the secale cornutum, spirits of turpentine, and other anti-hæmorrhagics and astringents, the recumbent posture, &c., are the means chiefly to be confided in, conjoined with opiates, &c.

110. VI. ABNORMALITIES OF THE BLADDER are sometimes observed, either alone or in connexion with malformation of other parts of the urinary or sexual organs. They are generally congenital, and proceed from irregularities of fetal development. Numerous cases and various forms of irregularity of formation are on record; but as respects any treatment which may be adopted for them, they concern the surgeon more than the physician, and sufficient reference may be made to them in the subjoined Bibliography.

111. Foreign bodies are often found in the bladder, having been introduced at some previous period, or having passed into it from the rectum or some part of the intestinal canal, through a perforating ulcer or sinus formed between the bowel and bladder.* In many instances, when a foreign body has been found in this viscus, it had become incrustated by the urinary deposits to a greater or less extent. This subject will be found more appropriately discussed in surgical works, where also rupture of the bladder, hernia of the bladder, and wounds and injuries of the bladder, are most ably treated of by their respective authors.

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[* Worms, chiefly of the *ascaridæ* genus, have not unfrequently been found in the human bladder, having crept thither from some part of the intestinal canal, either by perforating its coats or through some ulcerous opening. Mr. LAWRENCE and T. B. CURLING, of London, have both described instances of this kind (*Medical Clin. Trans. of London*, vol. ii., p. 385, and vol. xxii., p. 279); and in this country, among several others, Dr. BARDWELL, of Indiana (*West. Journ. of Med. and Phys. Sci.*, vol. vii., 1834), and Dr. CAMPBELL, of Conn. (*Am. Journ. of Med. Sci.*, vol. xxi., p. 130). In the former case, many thousand worms were passed in the course of six months, of a lumbricoid kind, from six to nine lines in length, and about the thickness of a horsehair, with a black and rather large head, the body of a dark, dirty white. Some of them lived 24 hours after they had been voided. The patient, a man aged 30, recovered under the use of turpentine. In the latter case the worms were small, red-headed, and about half an inch long, the bodies composed of many minute cartilaginous rings, and furnished with a number of legs, arranged in two rows from one extremity to the other. They were hard, very active, strong, and tenacious of life. See also a case in Dr. GROSS's work, so often quoted (p. 332, 2d ed.), with a history of symptoms, treatment, and all there is known on the subject.]

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URINE AND ITS DEPOSITS.—CLASSIF.—GENERAL AND SPECIAL PATHOLOGY, AND THERAPEUTICS.

1. The urine is one of the chief depurating secretions in the animal economy, and one which, when interrupted or arrested, rapidly terminates existence. This secretion in some form or other occurs in all animals, either by a distinct apparatus, or by a vicarious or associated function, in which latter form it also takes place even in the vegetable creation; and in all it is characterized as the excretory function of nitrogenous elements and compounds, variously associated with other substances. In the human subject and in the more perfect animals the conditions of the urine depend upon the states of the frame generally, upon the states of the urinary organs, and upon the food and drink of the individual. Hence these conditions are of the greatest importance to the pathologist, by enabling him to recognise, 1st, those states of the system with which they are severally connected; 2d, those lesions, functional and structural, of the kidneys, of which they are often the symptoms and effects; and, 3d, the influences produced by the food and drinks of the individual upon his system and urinary organs.

2. The urine is derived from the blood—is a depurating secretion performed by the kidneys from the blood as long as these organs are actuated by the organic nervous influence distributed to them, aided by whatever share of influence may

be transmitted to them or their ganglia by the spinal nerves. The urine being derived from the blood, and being one of the chief depurating secretions by which the blood is preserved in due or healthy quantity and quality, it must be manifest that the phenomena connected with the urine and its secretion become important indications, not merely of the states of the blood itself, but also of the several sources by which the blood is altered or contaminated.

3. It was stated in the first part of this work, and then explained (in 1832), that the kidneys conveyed from the blood the fluids carried into the blood, and with these fluids the effete materials, the ultimate results of animalization, and various other elements and substances resulting from indigestion and mal-assimilation, or otherwise absorbed into the circulating mass. As long as the kidneys discharge their functions, an excess of the fluid elements of the blood, and of various saline and nitrogenous materials, are prevented from accumulating in the blood; these functions being strictly depurating, as respects the purity or quality of the blood, and eliminating, or excretory, or excrementitious, as respects not only the quality but also the quantity of the circulating mass.

4. It is thus obvious that the urine consists chiefly of the fluids and of the fluid parts of the aliments taken into the stomach, and carried into the blood; and that it contains not only saline and other ingredients derived from the ingesta, and from the changes which the ingesta undergo, in the digestive canal, and in their passage into the blood, but also the effete nitrogenous materials resulting from the waste and absorption of the tissues, which are first conveyed into the blood by the absorbents and veins, and afterward eliminated from the blood, with the fluids in excess, by the action of the kidneys.

5. Such being the source of the urine, it may be inferred that the quantity and condition of this excretion will depend upon a variety of circumstances which require the recognition of the pathologist in his investigations of disease—upon the states of the digestive and assimilating functions; upon the states of the circulating organs and of the blood; upon the states of the urinary apparatus; and upon the states of the other depurating and eliminating functions—upon those of the skin, lungs, liver, and intestines. In recent times, and in recent writings, the conditions of the urine have received a due, if not an excessive, share of attention, especially from the chemical pathologists; yet these conditions have been insufficiently investigated in their relations to the other depurating functions, and especially to that of the skin, this particular function being either altogether overlooked, or very imperfectly inquired into. When treating of the Blood (see § 115–160), and when giving a succinct view of pathology under the head of DISEASE (see § 94–104, and 163, *et seq.*), I there stated the same doctrines as those now enunciated, but more explicitly and fully than I have now done; and since then (published in 1832) the same views have received the approval of, because they have been altogether adopted by, more recent writers, although without acknowledgment of their long previous existence in the pages of this work. I may request those who are curious in this matter to read what I have stated in the articles and in the sections just referred to, and to peruse the

fundamental doctrines in Dr. GOLDING BIRD's work on "*Urinary Deposits*," where the subject of urinary pathology has been very ably discussed, and where not only the views, but even the terms, first adopted by me have been followed and employed. I should not have referred to these principles of urinary pathology if it had not been necessary, by asserting my own priority in respect of them, to defend myself from the contingent imputation of adopting the ideas of others.

6. *b.* The doctrines insisted upon in the early parts of this work respecting the depurating functions of the kidneys and of other organs, have been much more recently carried out by Dr. G. BIRD, as regards those of the kidneys, and in many places so conformably with these doctrines—although with too manifest a leaning to chemical pathology and neglect of a controlling vital influence—as to induce me to refer to his evidence on several topics, where I believe it to be accurate, or to support my own views. The fundamental principle he has laid down is correct as far as it extends, but it is too limited, inasmuch as it is confined to the functions of the kidneys. He states that "it is, indeed, a general law, that any substance which has entered the circulating mass, and not been required for the nutrition of the body, nor forming a normal element of healthy blood, always escapes from the system by the kidneys, providing it exists in a state of complete solution. Hence these most important emunctories have the duty of removing any imperfectly assimilated elements of the food which had been absorbed while traversing the small intestines, and entered the circulating mass, as well as excreting the often noxious results of unhealthy digestion. To effect these most important conditions, it is essential that the substance to be removed should be soluble, or at least capable of being readily metamorphosed into a body soluble in the water of the urine, as nothing can be excreted from the kidneys, without breach of surface, unless in a state of solution. The third function performed by the kidneys is their serving as outlets to evolve from the animal organism those elements of the disorganization of tissues which cannot perform any ulterior process, nor be got rid of by the lungs or skin. The disorganization of tissues here alluded to is a necessary result of the conditions for the growth and reparation of the body." "The old and effete atoms of the animal structure are not excreted in the form of dead tissue, but, becoming liquefied, they re-enter the circulation, their elements being rearranged. One series of combinations thus produced, rich in nitrogen, is excreted by the kidneys, while those products which contain a preponderance of the inflammable elements, carbon, hydrogen, and sulphur, are called upon to perform, chiefly through the medium of the liver, an important office previous to their final elimination from the system. Thus the blood is not only the source of the elements derived from the food which serve for the nutrition of the body; but it also serves, like a sewer, to receive the matter arising from the waste and liquefaction of the old and exhausted tissues." (P. 256.)

7. Now all the ideas contained in this quotation will be found fully and explicitly stated, as referred to above (§ 3-5) and in other places, but more correctly and more conformably with pathological conditions than in the above passage, in the *first volume of this work*, published many

years before the appearance of "*Urinary Deposits*." Besides, Dr. G. BIRD has overlooked the functions of the skin in relation to those of the kidneys, and has not taken a correct view of those of the liver in connexion with the functions of the lungs, while those of the follicular apparatus of the intestinal canal and of the skin have been altogether neglected. Yet all these functions, as I have elsewhere shown (see the articles BLOOD, CRISES, DISEASE, and EXCRETIONS and EXCRETING FUNCTIONS, &c.), are more or less intimately related to each other and to the depurating functions of the kidneys, and often evince, even in health, a vicarious increase when one or more of the others are impeded or diminished, and a marked diminution when they are augmented. It should also be recollected, when estimating the source and nature of the functions of the kidneys and of other eliminating organs, that it is not only the materials mentioned in the above quotation which are eliminated from the circulation by the kidneys, but also a portion of those resulting from the waste of the red globules and fibrin of the blood, and that the kidneys are not the only depurating organs, the functions of the skin, liver, bowels, &c., being generally more or less impaired or otherwise disordered in those diseases which evince the most remarkable alterations in the state of the urine, these functions, especially that of the skin, being too generally neglected by modern physicians in favour of the popular attractions furnished by the functions of the kidneys.

8. It is obvious, from what I have stated now and in earlier parts of this work respecting the sources of the urine, that this depurating secretion will vary in quantity and sensible appearances and physical properties, and even be remarkably altered, by a variety of causes—1st, by the quantity and nature of the ingesta, alimentary and liquid; 2d, by the imperfect and disordered products of indigestion and mal-assimilation resulting from impaired vital power or simple or complicated ailments; 3d, by the metamorphosis and waste of the several tissues and of the blood—the removal of effete materials into and from the blood—during the healthy processes going on throughout the frame; 4th, by the waste and metamorphosis of the structures and of the blood, when accelerated by local or constitutional diseases; 5th, by the absorption of morbid secretions, and deposits or formations carried into the blood, and partially, chiefly, or altogether eliminated by the kidneys and other emunctories; 6th, by the varying states of the other depurating functions—by the increase and diminution of one or more of these, diminishing, increasing, or altering more or less the functions of the kidneys.*

* "In morbid states of all the principal organs the urine is remarkably liable to change. This arises from various causes. If the stomach be the primary seat of disease, or if its condition be disturbed through sympathetic influences of other diseased organs, as is almost constantly the case, digestion is imperfectly performed, and the chyle, in consequence, becomes more or less unfitted for the purposes of nutrition and secretion. The kidneys, therefore, carry off more than their wonted quantity of excrementitious matter, while this matter appears under conditions more or less varied from the natural product. The whole office of appropriation is, also, more or less impaired, which farther modifies the condition of the blood and the formative action of the kidneys; though a part of the office of excretion, under these circumstances, devolves upon the skin and lungs. A third great cause of the variableness of the urine consists in unusual vital decomposition or wasting of the body, or of some of its parts, when it devolves upon the kidneys

9. Dr. PROUT considered that the elements of the albuminous tissues of the frame are so arranged, during the processes of metamorphosis or waste, as to be converted into uric acid, or urate of ammonia, and that the atoms or elements not composing these bodies form certain ill-defined principles. The ulterior changes which the gelatinous tissues undergo during destructive assimilation this very celebrated physician supposed to be intimately connected with their conversion into urea, and some saccharine principle, or its close ally, the lactic acid. BARON LIEBIG followed in the path pointed out and first trodden by Dr. PROUT, and has been in several matters supported by the researches of MULDER, TAYLOR, B. JONES, and others. According to LIEBIG's theory, the elements of muscular tissue are carried into the circulation, combined with water and oxygen; the latter, by its union with the carbon of the effete tissue, supports the temperature of the body. On reaching the structure of the liver, 50 atoms of carbon, 1 of nitrogen, 45 of hydrogen, and 10 of oxygen, with an unascertained but considerable proportion of sulphur, are filtered off from the portal blood in the form of bile. The more highly nitrogenized elements of the metamorphosed or wasted tissues are separated by the kidneys from the blood, chiefly in the form of urea and uric acid, while the carbonic acid formed by the slow combustion of the carbon of the original atoms of muscle in the capillaries is exhaled from the surfaces of the skin, and bronchi, and air-cells.

10. It is manifest that the atoms or elements of tissues, which have become worn out, or which have given place to new deposits in the course of nutrition, are carried into the circulating mass, where they undergo progressive changes under the influence of vitality, and are ultimately eliminated from the blood by the depurating organs. It has been supposed that the states in which the several materials are found on their elimination are such as may be altogether imputed to the action of the excreting organs; but it is more probable that the atoms or elements composing the

to co-operate, beyond their natural habit, with the lungs and skin, in removing the redundancy of waste materials. A fourth cause of the urinary changes, and an important one, lies in actual morbid states of the kidneys themselves. The kidneys, however, are not often the seat of morbid affections beyond those of a simple functional and transient nature, as induced by sympathetic influences exerted by the diseases of other parts, but to which influences the kidneys are extremely liable, and therefore to consequent modifications of the urinary product. Briefly, then, every alteration of the natural action of the kidneys, whether primary or sympathetic, and every defect in assimilation and appropriation, is attended by some change in the urine; while an endless variety is imparted to it by the qualities and quantities of the ingesta. From this circumstance, which should have prompted other conclusions, has arisen the belief that the state of the urine supplies some of the most important signs of pathological conditions, not only of the kidneys themselves, but of remote organs with which they may sympathize. From HIPPOCRATES to our day, elaborate disquisitions have appeared concerning the changes of the urine as indicative of particular forms of disease, of their special seats, of the different stages of their rise and decline, and of their degrees of severity and danger. The humoralists were apt to regard the unusual conditions of this product, and other 'vitiated secretions,' as the disease itself; and in this respect they are imitated by the humoralists of the 19th century. Chemistry has been also brought to bear upon the fluctuating states of the urine, and has increased the factitious importance of a symptom which is often as likely to denote some alimentary substance, or diverse forms of disease, or imperfect digestion, or some remedial agent, as the source from which it emanates."—"The Institutes of Medicine," by Martyn Paine. 8vo, N. Y., 1847.]

materials removed from the structures, as well as those composing the blood, more especially the albumen, fibrin, red globules, and even the saline ingredients, undergo a succession of changes or modifications during their circulation through the body, until the great or ultimate change is produced by the organs which discharge them from the economy. It is not, however, conformable to the laws of the human frame that each organ should perform so simple and definite a function as the chemical pathologists believe. The skin certainly exhales carbonic acid; but it also discharges other materials by means of its follicular apparatus; while the bowels, chiefly by the same or a similar apparatus, also excrete effete materials from the circulation; and, although the combinations which are found during their elimination may be viewed as chemical, they are the results of vital action in health, are more or less modified in disease, and are such as rapidly undergo farther changes after their discharge, or after death, which changes are more decidedly chemical, and such as their individual elements chemically dispose them to assume.

11. I. IN HEALTH, the urine presents certain conditions, *a.*, especially as respects *specific gravity*, at different periods and in different circumstances. These have been distinguished into, *first*, the urine which is excreted shortly after drinking freely of fluids, the nature of the fluids modifying the appearances and odour of the secretion. This (the *urina potus*) is generally pale, and of a specific gravity varying from 1.003 to 1.010. *Second*, the urine secreted shortly after the digestion of a full meal (*urina chyli*), varying in physical characters with the nature of the food, and other circumstances, and presenting considerable density, its specific gravity varying from 1.020 to 1.030. *Third*, the urine passed after a night's rest (*urina sanguinis*): this is of intermediate density, and varies from 1.015 to 1.025. In order to ascertain the specific gravity of the urine, in health or in disease, the portions passed before retiring to rest, and on rising in the morning, should be separately tested by the urinometer, and the average density of the two will be a near approach to accuracy. Dr. PROUT assigned 1.020 as the average gravity of healthy urine. M. BECQUEREL stated that it is 1.0189 in men, and 1.0151 in women, the mean in both sexes being 1.017; and Dr. ROUTH that the average of 18 healthy cases gave a specific gravity of 1.021.

12. The specific gravity of the urine at different periods of the day varies in disease, as well as in health, although in a less marked degree, and in some diseases more than in others; but this part of the subject has not been sufficiently investigated, and it is, moreover, liable to many sources of fallacy, as emotions of the mind, articles of diet, the beverages or drinks employed, the medicines taken, &c., all combine to render the results of observation uncertain. The nature, the stages, states, and course of disease, as of hysteria and other nervous disorders, febrile diseases, &c., also remarkably increase the difficulty.

13. *b.* The quantity of urine passed in the 24 hours, as well as its density and ingredients, varies very much in health, but still more remarkably in disease. The quantity and quality are modified by temperature, by exercise, by the functions of the skin, &c., by modes of living, clothing, &c. Dr. PROUT estimated the quantity at

30 to 40 ounces in the 24 hours. Dr. ROUTH found the average of 18 cases to be 35 ounces. M. BECQUEREL considered the quantity to be 43 ounces in men, and 47 in women, the general use of soups and weak sub-acid wines in France being productive of the increased discharge; but among the beer-drinkers of this country the amount given by Drs. PROUT and ROUTH would be found much below the average.

14. *c.* The quantity of the urine is, however, no measure of the depurating actions of the kidneys; for 20 ozs. of urine in the 24 hours may carry off as much solid materials as 40 ozs. at a different time or in a different person; for a density of the former amounting to 1.030 will furnish an equal quantity of those materials to those afforded by the latter at 1.015. Dr. DAY has shown that the formula for calculating the solids contained in the urine given by Dr. CHRISTISON is the most correct; and the following table, calculated from it by Dr. G. BIRD, will show at a glance the quantity of fluid and of solids existing in 1000 grains of urine of different densities. The gravimeter having shown the specific gravity, the proportion of solid matter is at once indicated by this TABLE:

TABLE I.

Sp. Gr.	Solids.	Water.	Sp. Gr.	Solids.	Water.
1.001	2.33	997.67	1.021	48.93	951.07
1.002	4.66	995.34	1.022	51.26	948.74
1.003	6.99	993.01	1.023	53.59	946.41
1.004	9.32	990.68	1.024	55.92	944.08
1.005	11.65	988.35	1.025	58.25	941.75
1.006	13.98	986.02	1.026	60.58	939.42
1.007	16.31	983.69	1.027	62.91	937.09
1.008	18.64	981.36	1.028	65.24	934.76
1.009	20.97	979.03	1.029	67.57	932.43
1.010	23.30	976.70	1.030	69.90	930.10
1.011	25.63	974.37	1.031	72.23	927.77
1.012	27.96	972.04	1.032	74.56	925.44
1.013	30.29	969.71	1.033	76.89	923.11
1.014	32.62	967.38	1.034	79.22	920.78
1.015	34.95	965.05	1.035	81.55	918.45
1.016	37.28	962.72	1.036	83.88	916.12
1.017	39.61	960.39	1.037	86.21	913.79
1.018	41.94	958.06	1.038	88.54	911.46
1.019	44.27	955.73	1.039	91.87	909.13
1.020	46.60	953.40	1.040	93.20	906.80

15. By measuring the quantity of urine passed in a given time, the weight of solids excreted by the kidneys may readily be calculated by means of the foregoing and the following tables, a pint of distilled water weighing 8750 grains. The following table is given by Dr. G. BIRD:

TABLE II.

Specific Gravity.	Weight of one Pint.	Specific Gravity.	Weight of one Pint.
1.010	8837 grains.	1.023	8551 grains.
1.011	8846 "	1.024	8560 "
1.012	8855 "	1.025	8568 "
1.013	8863 "	1.026	8577 "
1.014	8872 "	1.027	8586 "
1.015	8881 "	1.028	8595 "
1.016	8890 "	1.029	8603 "
1.017	8898 "	1.030	8612 "
1.018	8907 "	1.031	8621 "
1.019	8916 "	1.032	8630 "
1.020	8925 "	1.033	8638 "
1.021	8933 "	1.034	8647 "
1.022	8942 "	1.035	8656 "

16. It may readily be calculated from these tables, that if 1000 grains of urine, of the specific gravity of 1.020, hold 46.6 grains of solid matter in solution (Table I.), a pint of the same specific gravity, weighing 8925 grains (Table II.) will hold 415.9 grains solid matter; and that, if two pints and a half of urine be passed, 1039.72 grains will be discharged in the 24 hours. Dr. GOLDING BIRD has calculated from Dr. CHRISTISON'S

formula a very useful table for showing the number of grains of solids in, and the weight of, a fluid ounce of urine, of every density, from 1.010 to 1.040.

TABLE III.

Specific Gravity.	Weight of one fluid Ounce.	Solids in one fluid Ounce.	Specific Gravity.	Weight of one fluid Ounce.	Solids in one fluid Ounce.
1.010	441.8	10.283	1.025	448.4	26.149
1.011	442.3	11.336	1.026	448.8	27.188
1.012	442.7	12.377	1.027	449.3	28.265
1.013	443.1	13.421	1.028	449.7	29.338
1.014	443.6	14.470	1.029	450.1	30.413
1.015	444.0	15.517	1.030	450.6	31.496
1.016	444.5	16.570	1.031	451.0	32.575
1.017	444.9	17.622	1.032	451.5	33.663
1.018	445.3	18.671	1.033	451.9	35.146
1.019	445.8	19.735	1.034	452.3	36.831
1.020	446.2	20.792	1.035	452.8	37.323
1.021	446.6	21.852	1.036	453.2	38.014
1.022	447.1	22.918	1.037	453.6	39.104
1.023	447.5	23.981	1.038	454.1	40.206
1.024	448.0	24.951	1.039	454.5	41.300

17. By multiplying the number of ounces of urine passed in the 24 hours by the two last figures of the specific gravity, the quantity of solids excreted will be obtained. Thus, if three pints, or 60 ounces, be discharged in the 24 hours, and the density of the several specimens give an average of 1.020, the 60 ounces multiplied by 20.79 would give a product of 1247 grains, the quantity of solids excreted in the 24 hours. Dr. G. BIRD estimates the average amount of solids excreted by the kidneys of the healthy adult to be from 600 to 700 grains in the 24 hours; numerous circumstances connected with occupation, exercise, diet, regimen, &c., modifying the results.

18. *d.* The tints presented by the urine in different diseases are of great importance in respect both of diagnosis and of treatment. These tints vary with the degree of dilution and the nature of the ingredients from nearly colourless, to the usual pale amber colour, to deep brown. When very watery, urine presents a faint greenish tint, as in early infancy, and in hysteria and chlorosis. If bile or blood be present in the urine, a variety of colours, from red to brown, blackish-green, or apple-green are produced, the latter hue being sometimes indicative of cystine. A reddish tint may be caused by purpurine or by blood; if by the former, congestion of the portal circulation, or disease of the liver or spleen, may be inferred; if by the latter, hæmorrhage in some part of the urinary passages has occurred. In the former case the specific gravity is moderate, and heat produces no change; in the latter, heat and nitric acid occasion turbidity, and blood-disks are seen under the microscope. A brownish tint is caused by a concentrated or dense state of the urine, as in fevers, the specific gravity being high; or by obstruction to the discharge of bile in some part of the biliary apparatus, and the presence of some or all the elements of bile in the circulation; or by the existence of blood in a less degree or altered state, and shown by the tests just mentioned. Blood and bile may occasion a greenish-brown tint, the former when the urine is alkaline, the latter when the urine is very acid. A grass-green hue of the urine indicates excess of sulphur and the presence of cystine. It is unchanged by heat or nitric acid. It should not, however, be overlooked that numerous articles of diet and of medicine affect the appearance of the urine. Chamaephyla, hæmatoxylinum, indigo, rhubarb, senna, &c., produce this change in a marked degree.

19. *c.* The fluidity of the urine sometimes varies. It is more or less viscid, owing to the presence of mucus or pus, or both, especially when alkaline, and in the layer formed at the bottom of the vessel; and in a slight degree in diabetes mellitus, when the frothiness caused by agitation continues for some time. Although fluid while warm, it becomes in rare cases jelly-like on cooling, owing to the presence of self-coagulating albumen or fibrin. This state indicates severe organic disease of the kidneys. I have, however, met with it at advanced stages of pregnancy.

20. II. The CHEMICAL COMPOSITION OF THE URINE has engaged the attention of chemists and physiologists for many years; and even now the elements contained in this fluid, although nearly, if not altogether, ascertained, are still topics of controversy, as respects either the origin of certain of them, or the successive changes of which they may be the ultimate products. As to the general principle, that the urine is an excretion by which the blood is depurated from the effete materials carried into the circulation from the metamorphosis and waste of the tissues, &c., as stated above (§ 3-10) and in the commencement of this work (*see* BLOOD, § 115-160), no doubt can now exist; but the successive changes which these elements or materials undergo during their absorption and passage from their origins and sources, during their circulation, and during their ultimate discharge—from their origins to their elimination from the body—have been long topics of research and discussion, especially by the chemical physiologists and pathologists of recent times, who have been more disposed to view them as altogether chemical, than as vital and as modified, and even more or less altered, by the states of vital power and vascular action. To the specialist in medicine the chemical doctrine presents itself in its most favourable

aspect, as placing urinary pathology in an isolated yet scientific position. To the general or legitimate physician, the conditions of the urine, in all their phases, and in the successive changes from their origins to their ultimate results, are viewed as ever-varying effects of the influence of vitality throughout the frame, as manifested by the functions of digestion, assimilation, nutrition, metamorphosis, waste, and depuration; all which are not only under the complete and constant dominion of life, but are also the necessary agencies of the continuance of life; this department of pathology being inseparable, in its philosophic as well as in its practical relations, from all others which comprise the whole range and circle of morbid actions.

21. The urine in health contains: 1st, certain organic products, namely, urea, uric acid, creatine, creatinine, colouring and odorous elements; these more especially result from the metamorphosis and waste of the tissues and of the blood, and are separated from the latter by the kidneys; also other ingredients, more particularly lactic and hippuric acid, developed during the process of assimilation, and accidental matters carried into the circulation; 2d, inorganic products, being saline combinations, derived from the food, especially sulphates, phosphates, chloride of sodium, and soluble salts taken with the ingesta, and often decomposed in their transit into and from the blood; also saline substances, generated chiefly from the processes of destructive metamorphosis and waste, and of depuration, as sulphates and phosphates; 3d, matters derived from the urinary passages, being chiefly mucus, debris of epithelium, and a minute quantity of phosphate of lime present in mucus. M. BECQUEREL gives the following as the average composition of urine in males and females, and the quantity discharged in the 24 hours.

	Urine in Men.		Urine of Women.		Mean of Both.	
	In 24 Hours.	In 1000 Grs.	In 24 Hours.	In 1000 Grs.	In 24 Hours.	In 1000 Grs.
Weight of urine	19516		21124		20320	
Specific gravity	1.0189		1.0151		1.0170	
Solids	610	31.1	526.8	24.95	568	28
CONSTITUENTS OF SOLIDS.						
Urea	270	12.8	240	10.366	255	12
Uric acid	7.6	0.391	8.6	0.406	8.1	0.398
Fixed salts	150	7.63	126	6.14	138	6.9
Organic matters and volatile saline combinations. }	176	9.26	145	8	160.5	8.6

22. *a.* Urea.—This important excretion, composed of C 2, N 2, H 4, O 2 = 60, is the form in which a large quantity of nitrogen is eliminated from the body; 270 grains of urea being discharged by a healthy man in the 24 hours. This substance is the product of the destructive metamorphosis or waste of organized parts (§ 9, 10); but it is so rapidly carried out of the blood by the kidneys as to admit of only minute quantities of it escaping by the skin, unless when the functions of the kidneys are interrupted, and then it is discharged both by the skin and by the intestines in greater quantities. The food has a remarkable influence upon the quantity of urea in the urine. Dr. LEHMANN found the quantity of urea excreted by his kidneys while living on

strictly animal food, and while restricted to vegetable diet, as shown by the preceding table.

[Urea has been repeatedly detected in the blood under ordinary circumstances, and especially after extirpation of the kidneys in the lower animals; but it is removed with such rapidity by the kidneys, that there is probably never more than a fiftieth of one per cent. of the circulating blood. Though its source is supposed chiefly to be found in the food and the waste of muscular tissue, yet both creatine and inosic acid produce it in their descending metamorphosis. From the fact that caffeine and other substances increase its amount, the seat of its production would seem to be the blood itself. Dr. J. C. DRAPER, of New York (*Inaugural Dissertation*, 1856), from experiments on the urine of persons in different conditions of motion and rest, and by an examination of the diurnal and nocturnal variations in the amount of urea voided, com-

	Animal Food.	Vegetable Food.	Mixed Diet.	Non-nitrogenized Diet.
Urea in the urine } in 24 hours.... }	819.2	346.5	500.5	237.1

pared with an invariable standard, gives reasons for concluding that the differences in the amount of urea excreted are almost entirely attributable to the influence of the food, an individual in such a state of comparative rest as is observed during treatment for a fractured leg not excreting by any means so much less urea as might have been anticipated when compared with another individual who walked thirteen miles at the rate of four and a half miles an hour. But on examining the influence of the food it appears to be well marked. The greatest amount of urea is excreted within a few hours after dinner. Another maximum occurs also just after breakfast; but during the eight night hours far less is excreted than during the same period in the afternoon. The ingestion of food thus exercising so rapid and marked an influence on the quantity of urea, he refers to it as the cause of the increased excretion of that substance during the course of the day rather than to the increased motion of exercise then indulged in; and in view of this conclusion, it becomes probable that the nitrogen of the wasting muscular tissues escapes, not under the form of urea through the kidneys, but through the skin, or perhaps even as free nitrogen from the lungs. ("Human Physiology," by J. W. DRAPER, 8vo, New York, 1856.)

23. According to LECANU, the quantity of urea and of uric acid excreted in the 24 hours is very much influenced by age. The following are the results of his experiments, as to the amounts of these substances excreted in the 24 hours:

	Urea.	Uric Acid.
Adult men	431.9 grs.	13.09 grs.
Adult women	294.2 "	10.01 "
Very old men (84 to 86 years) ..	124.8 "	6.77 "
Children (under 8 years)	138.2 "	3.98 "

[To detect urea, Dr. BIRD recommends to place a drachm of urine in a watch-glass, and add about half that quantity of colourless nitric acid. If a normal proportion of urea exist, no change, except a darkening in tint, and the evolution of a few bubbles, will be observed, unless the weather be very cold, or the glass be placed in a freezing mixture, and then a delicate plumose crystallization of nitrate of urea will commence at the edges of the fluid. Under ordinary circumstances no crystals of urea will appear, unless the urine be concentrated by previous evaporation. In some cases an excess of urea exists, and then a rapid formation of crystals of nitrate of urea occurs, sometimes so copious that the mixture becomes nearly solid. Dr. B. thinks it important, when this is the case, to measure and ascertain the specific gravity of the whole quantity of urine passed by the patient in 24 hours; for unless this equals or exceeds the average proportion of health, there is no proof that an actual excess of urea is excreted by the kidneys. A particular specimen of urine may appear richer in urea than natural, from the diminished amount of water present.]

24. *b. Uric Acid.*—Uric or lithic acid, composed of C 70, N 4, H 4, O 6 = 168, is excreted by the kidneys to the amount of 8.1 grains in the 24 hours. Dr. PROUT's opinion, confirmed by Dr. B. JONES and Dr. G. BIRD, is that the greatest portion of the uric acid always exists in the blood in combination with ammonia; for this acid requires 10,000 parts of water at 60° for solution, while there does not exist quite 2500 times its weight. Urate of ammonia is soluble in 480

times its weight of water; and as it occurs in urinary deposits, it requires for solution 2789 parts of urine, according to the researches of Dr. B. JONES, who has shown that the presence of a moderate quantity of saline matter increases its solubility. Dr. G. BIRD states the following as the mode in which uric acid exists in healthy urine. "Uric acid, at the moment of its separation from the blood, comes in contact with the double phosphate of soda and ammonia, derived from the food, forms urate of ammonia, evolving phosphoric acid, which thus produces the natural acid reaction of urine. If the whole bulk of the urine be to the urate of ammonia formed, not less than about 2701 to 1, the secretion will, at the temperature of the air, remain clear, but if the bulk of fluid be less, an amorphous deposit of the urate will occur. On the other hand, if an excess of uric acid be separated by the kidneys, it will act on the phosphate of soda of the double salt, and hence, on cooling, the urine will deposit a crystalline sediment of acid sand, very probably mixed with amorphous urate of ammonia, the latter usually forming a layer above the crystals, which always sink to the bottom of the vessel." (*Op. cit.*, 84.)

25. Without referring to LIEBIG's views as to the physiological origin of uric acid, which are contradicted by the experiments of LEHMANN, and merely stating that these views are not corroborated by any subsequent researches, I may give the results of the researches of this latter physician:

Diet.	Quantity excreted in 24 Hours of		Proportion of Uric Acid to Urea.
	Uric Acid.	Urea.	
Exclusively animal	22.64 grs.	819.2 grs.	1:36.1 grs.
Mixed animal and vegetable.	18.17 "	595.0 "	1:27.5 "
Exclusively vegetable	15.7 "	346.5 "	1:22. "
Food free from nitrogen	11.24 "	237.1 "	1:21. "

Dr. BENCE JONES, who has investigated this and other subjects connected with the chemico-pathology of the urine, with great scientific acumen, has shown the immediate influence of food on the quantity of uric acid contained in the urine to be as follows:

	Specific Gravity.	Grains. Uric Acid.
<i>In 1000 Grains of Urine:</i>		
After animal food	1027	1.022
Before " "	1024	0.049
After vegetable food ..	1025	1.010
Before " " ..	1024	0.049

From these and other researches and considerations, it may be inferred that uric acid is derived from the nitrogenized elements of the effete molecules of the tissues, and from the elements of food abounding in nitrogen, which are not assimilated into the healthy constituents of blood; and probably from the latter source, in larger proportion; and thus these nitrogenized elements are excreted from the blood in the states of uric acid, of uric acid combined with ammonia, and of urea; the causes of the preponderance of either of these being not satisfactorily explained.

26. *c. Lactic acid and lactate of ammonia* were said by BERZELIUS to exist in the urine, but were denied by LIEBIG. That lactic acid exists in the blood, and is excreted by the skin in health, and more largely in some diseases, is admitted. It is,

however, found in the urine of herbivorous animals; and it probably undergoes some change before it is excreted by the kidneys in the human subject. Dr. G. BIRD considers that what was mistaken for lactic acid in urine is really a mixture of *creatinine* and *creatinine*, these substances being forms in which the nitrogenized elements of worn-out structures, especially muscular tissues, are removed from the system. Dr. PROUT believed that several of the constituents of urine were derived from the destructive metamorphosis of distinct and separate tissues, and these substances appear to support his views.

27. *d. Hippuric, or urobenzoic acid*, exists chiefly in the urine of herbivorous animals, and occasionally in that of man. Its quantity in health is not constant, probably owing to the nature of the food. It is, next to *bile* and *purpurine*, the richest in carbon of any of the products of vital chemistry; and hence its abundance in urine may depend upon the states of biliary secretion and of the respiratory functions, impairment of these increasing its excretion by the kidneys.*

[Though we are not disposed to deny that chemistry has been of great service in the diagnosis of calculous and urinary disorders generally, yet there is reason to believe that the treatment, to be successful, is not always to be regulated by the chemical indications present. The alkalies, especially the bicarbonate of potash and bicarbonate of soda, when given freely, especially at or near the times of eating, interfere with the process of digestion, by neutralizing the gastric acids, and thus aggravate the difficulty by deranging this important function. These, as well as other alkaline substances, should be given at least two hours from the time of meals, in connexion with the vegetable tonics. Prof. M. PAINE, in his very able work, "*The Inst. of Medicine*" (p. 233), thus speaks of the aid derived from a knowledge of the chemical constitution of the urine: "Coming to the bed-side, we find that all that is practically useful in relation to the urine is generally best ascertained by mere inspection; and upon this subject we have all, and more than is desirable, from HIPPOCRATES himself. Those philosophers, however, who are employed in interrogating disease by chemical analysis, are not often, or long, in the chambers of the sick. They carry on the investigation of morbid processes in the laboratory of the chemist, and then and there fabricate the appropriate reagents. He who studies organic nature according to the method of solidism and vitalism, has neither the leisure for these most difficult, unattainable, and laborious analyses, nor would they have any influence on his judgment as to the pathology or treatment of disease in the midst of such a multitudinous variety as is presented by the vital phenomena of disease. Of one thing, also, we may rest assured, that nature has supplied all those ready means for interpreting disease that may be necessary for immediate action; nor can we often delay the treatment of acute disease

for consultation with the laboratory. In respect to the blood, were it even practicable to learn from analysis its variable conditions in disease, it would reflect no light upon morbid states of the organs, since the qualities of that fluid vary with every varying change in the vital conditions of the solids, and therefore, too, would fail to indicate in the least the appropriate remedies. This is also true, in a general sense, of the urine and all other excretions and secretions. The ready sight, their sensible properties, the vital phenomena, physical signs, experience, and general principles, must be our guide. These may sometimes be facilitated by extraordinary modes of observation, but which are always within the reach and clear understanding of every practitioner; such as the usual mode of examining the blood in inflammatory diseases, evaporating the urine in diabetes, &c. On the contrary, were the humoral doctrines correct, the teaching and the practice of medicine should be restricted to chemists alone, since there is no branch of inquiry so difficult as organic analyses, while their uncertainty would soon prove that the *vis medicatrix nature* is the only ordination of nature for the maladies of the urine race."]

28. *e. Butyric acid* is sometimes found in the urine, and may be either referred to the butter used in food, or to the imperfect assimilation of saccharine matter. It is seen also in the creamy deposit formed in diabetic urine. This acid may also be derived from protein compounds.

29. *f. The colouring matter of urine* has been differently accounted for by SIMON, PROUT, HELLER, G. BIRD, and SCHERER. The last-named physician attributed it to the destructive metamorphosis or waste of red-blood corpuscles. Dr. G. BIRD investigated its nature and composition, gave it the name of *purpurine*, and viewed it as a principle of urine chiefly in disease; and as a result of impaired excretion of carbon by the lungs and liver, this element being, when existing in excess in the blood, partly eliminated by the kidneys in this form (§ 27, 28).

30. *g. Sulphur extractive* exists in urine, and is derived from the metamorphic destruction of albuminous and fibrinous tissues, which contain sulphur and traces of phosphorus. "While the greater quantities of their protein elements are converted into creatine and its allies and urea, a small proportion containing the sulphur and phosphorus is eliminated by the kidneys in the form of this peculiar extractive matter." The taurine, a constituent of bile, may also be one of the sources of the sulphur extractive of the urine. The nature of the food may also contribute materially to the quantity of this constituent.

31. *h. Ammonia* exists in urine "combined with uric acid, and probably with phosphoric acid and soda, forming the triple compound known as microcosmic salt."

32. *i. The fixed salts of urine* are those which are left after the other ingredients are destroyed by a red heat. They amount to nearly 140 grains in the 24 hours, and consist of combinations of chlorine, sulphuric and phosphoric acids, with soda, lime, magnesia, and potass. Of these the combinations of chlorine and phosphoric acid are probably derived from the food. Dr. G. BIRD considers that the phosphoric acid and soda in the urine exist in the state of the common rhombic phosphate unless it be combined with the phosphate of ammonia. The soluble phosphates

* To detect *hippuric acid*, evaporate a few ounces of urine to a sirupy consistence, and then add an excess of hydrochloric acid; a mixture of hippuric and uric acids will then be separated and fall to the bottom of the vessel. After a few hours' repose, the supernatant fluid should be decanted, and the deposit washed in a very little cold water. On boiling the residue in alcohol, in which uric acid is insoluble, the hippuric acid will be dissolved, and by spontaneous evaporation is left in thin, delicate needles, strongly coloured from adhering impurities.]

far exceed in quantity the insoluble salts, and are derived directly from the food, as well as from the albumen and other elements of the blood. The insoluble phosphates, forming part of the structure of the body, and derived from the blood during the process of nutrition, are conveyed back to the blood during the metamorphosis and waste of the structures, and are eliminated by the kidneys. "Some portion of the phosphoric acid of the urine is in all probability generated from the action of oxygen on many of the structures of the body, into the composition of which phosphorus largely enters, as the brain and nervous system generally. But the greatest part of the phosphoric acid is derived ready formed from without; the phosphates of lime and magnesia abounding in milk and most varieties of vegetable food; while the basic alkaline phosphates exist in flesh, in wheaten flour, leguminous seeds, as beans, peas, &c." The interesting researches of Dr B. JONES have shown that the quantity of phosphates, in a given quantity of urine, bears some relation to the periods of taking food, and to the nature and composition of the food. He found the quantity of phosphatic salts to be much greater after a diet restricted to vegetable, than to animal food. The quantity of phosphates of lime and magnesia in the urine is considerably increased after the ingestion of soluble salts of these two earths. The alkaline phosphates are most abundant shortly after a meal composed chiefly of bread, and are not materially affected by the circumstances which influence the excretion of the earthy salts. "A part only of the earthy phosphates contained in the food is absorbed into the circulation, the greatest proportion escaping by the intestines." BERZELIUS found in three ounces of human fæces six grains of earthy phosphates. The insolubility of the salts in water accounts for their presence in the fæces. A small quantity of phosphorus also exists in the urine in a non-oxidized form. The excess of phosphoric acid often found arises from the oxidation of the phosphorus of the urine.

33. *k.* The quantity of sulphuric acid in the urine is too great to be accounted for by its presence in the food as saline combinations; and sulphuric acid has been found in the urine while food quite free from sulphates has alone been taken. According to G. BIRD and MULDER, the origin of this acid is to be referred to the oxidation of the sulphur which exists with phosphorus in those tissues which contain albumen and fibrin. During the metamorphosis or waste of tissues, oxidation of the sulphur occurs, and explains the presence of at least a portion of the sulphuric acid met with in the urine. The existence of more than twenty per cent. of sulphur in taurine—one of the products of the metamorphosis of bile—accounts for a portion of the sulphuric acid, by referring it to the oxidation of the biliary sulphur during the recrementitious offices of bile in the economy. As a portion of sulphur is excreted from the body in a non-oxidized form, a part only of the sulphur not required for the purposes of the animal economy undergoes oxidation. Professor RONALDS found, in five specimens of urine of healthy persons, the proportions of sulphuric acid, and of the non-oxidized sulphur, existing in 1000 grains, to be as follows: 1.06; 0.17.—1.46; 0.18—1.42; 0.18—2.44; 0.153.—1.32; 0.165.

34. Dr. BENICE JONES has shown, by his interesting researches connected with the subject, that

the salts of this acid are increased in the urine by any kind of vegetable or animal food; that exercise does not appear to increase them, nor the administration of sulphuric acid, unless in large quantities; and that the ingestion of sulphur, or of the sulphates of soda or magnesia, always greatly augments the quantity of the sulphuric salts in the urine.

35. *l.* The chloride of sodium of the urine is obviously derived from the common salt taken with the food. Some of the saline constituents of the urine may be readily recognised by the crystalline forms they present when the urine is evaporated on a glass plate. MM REGNAULT, REISER, and BURRAL have shown that the chloride of sodium increased the excretion of nitrogen, as evinced by the augmentation of urea and the nitrogenized compounds in the urine. It may be inferred that common salt produces salutary effects: 1st, by furnishing hydrochloric acid to the stomach; 2d, by furnishing soda to the bile; 3d, by aiding the metamorphoses of the blood globules and of the tissues; and, 4th, by promoting the depuration of the blood. The absence or diminution of chloride of sodium in the urine of patients labouring under pneumonia, noticed by REDTENBACHER, was attributed to the alteration of diet during this disease. But Dr. LIONEL BEALE has established the following propositions, which show the insufficiency of this explanation: 1st. Chloride of sodium is totally absent from the urine of pneumonic patients at the period of complete hepatization of the lung. 2d. The chloride reappears after the resolution of the inflammation. 3d. The chloride exists in the blood in the largest quantity when most abundant in the urine, and *vice versa*. 4th. The chloride exists in very large quantity in the sputa of pneumonic patients. 5th. There is reason to believe that the chloride in pneumonia is determined toward the inflamed lung, and is reabsorbed and removed on the resolution of the inflammation. (*Transactions of Medical and Chirurgical Society*, vol. xxxv., p. 374, &c.) I may, however, remark that the quantity of chloride in the expectoration is increased beyond that existing in healthy pulmonary mucus, and is diminished in the urine, in acute bronchitis, in pleurisy, and in phthisis, although not so remarkably as in pneumonia.

36. III. THE FORMATION OF URINARY DEPOSITS.* *Et seq.*—When the several constituents

* CLINICAL EXAMINATION OF THE URINE.—Dr. GOLDING BIRD has given the following recommendations for ascertaining the state of the urine in disease, provided that it be an average specimen of that passed in the preceding twenty-four hours, or that resulting from the first micturition after a night's rest, unless the urine secreted at other times be required.

A. *Urine without Deposit, or poured from the Sediment.*—After ascertaining the acid, alkaline, or neutral states of the urine by means of test-papers, a little of the urine should be heated in a metallic spoon over a lighted candle, or in a test-tube over a spirit-lamp; and if a deposit occurs, albumen or an excess of the earthy phosphates is present; the former if a drop of nitric acid does not redissolve the deposit, the latter if it does. "If the urine be very highly coloured, and be not rendered opaque by boiling, the colouring matters of bile or purpurine are present. To determine this, pour a thin layer of urine on the back of a white plate, and allow a few drops of nitric acid to fall in the centre; an immediate and rapid play of colours, from bluish-green to red, will be observed, if bile; but no such change will be observed if purpurine alone exists. Should the high-coloured urine alter in colour or transparency by heat, the presence of blood should be suspected. If the addition of nitric acid to deep-red urine, unaffected by heat, produces a brown deposit, an excess of uric acid exists. If a specimen of urine be pale, immerse the gravimeter, and if the spe-

of the urine are in due relation to each other, the urine is clear, and of a pale amber colour. Its transparency is but slightly affected on cooling by the gradual subsidence of a slight mucous cloud sometimes entangling a few microscopic crystals of uric acid; but when one or more of these constituents "exist in real or comparative excess, or a new substance is superadded, the urine does not generally remain clear, but either immediate-

cific gravity be below 1012, there is a considerable excess of water; but if above 1025, the presence of sugar, or a superabundance of urea, is indicated. To determine the existence of either of these conditions, place a few drops of the urine in a watch-glass, add an equal quantity of nitric acid, and allow the glass to float in some cold water; crystals of nitrate of urea will appear in two or three minutes if the latter exists in excess. Should this change not occur, the urine must be examined specially for sugar, which, it must be remembered, may exist in small quantities, without raising the specific gravity of the fluid." For this purpose, boil a small portion with an equal bulk of liquor potassæ, in a test-tube, and the development of a brown colour will show the almost certain existence of sugar. An excess of colouring matter, rich in carbon, should always be sought after on account of its pathological importance. "This is readily done by boiling some urine in a tube, and, while hot, adding a few drops of hydrochloric acid. If an average proportion of the pigment exist, a faint red or lilac colour will be produced; but if an excess is present, it will be indicated by the dark-red, or even purple tint assumed by the mixture. Should the urine be alkaline, add a drop of nitric acid; if a white deposit occurs, albumen is present; if brisk effervescence follows the addition of the acid, the urea has been converted into carbonate of ammonia" (p. 16, 17).

B. Examination of the Sediment deposited.—"If the deposit is flocculent, easily diffused on agitation, and scanty, not disappearing on the addition of nitric acid, it is chiefly made up of healthy mucus, epithelial debris, or occasionally, in women, of secretions from the vagina, leucorrhœal discharge, &c. If the deposit is ropy, and apparently viscid, add a drop of nitric acid; if it wholly or partly dissolves, it is composed of phosphates; if but slightly affected, of mucus. If the deposit falls like a creamy layer to the bottom of the vessel, the supernatant urine being coagulable by heat, it consists of pus. Urine sometimes appears opaque from the presence of a light flocculent matter diffused through it, presenting neither the tenacity of mucus nor the dense opacity of pus. Although scarcely sufficient in quantity to interfere with the perfect fluidity of the urine, if a little be placed in a test-tube, and agitated with an equal bulk of liquor potassæ, the mixture will often become a stiff, transparent jelly. This peculiar appearance is demonstrative of the presence of the exudation, or large organic globules formed under the influence of irritation, providing the urine does not coagulate by heat; for should it do so, the existence of minute quantities of pus may be suspected."

"If the deposit is *white*, it may consist of urate of ammonia, phosphates, or cystine; the first disappears on heating the urine, the second on the addition of a drop of diluted nitric acid, while the third dissolves in ammonia, and the urine generally evolves an aromatic odour like the sweet-briar, less frequently being fetid. If the deposit be *coloured*, it may consist of red particles of blood, uric acid, or urate of ammonia stained with purpura. If the first, the urine becomes opaque by heat; if the second, the deposit is in visible crystals; if the third, the deposit is amorphous, and dissolves on heating the fluid. Oxalate, and, more rarely, oxalurate (?) of lime, are often present, diffused through the urine, without forming a visible deposit; if this be suspected, a drop of the urine, examined microscopically, will detect the character of the crystals. If the urine be opaque, like milk, allowing by repose a cream-like layer to form on the surface, an emulsion of fat with albumen is probably present. Agitate some of the urine, with half its bulk of ether, in a test-tube, and, after resting a few minutes, a yellow ethereal solution of fat will float on the surface of the urine, a tremulous coagulum of albumen generally forming beneath it."

Dr. G. BIRD adds, that much of the little time required for the investigation thus sketched may be saved by remembering the following facts: "If the deposit be *white*, and the urine acid, it, in the great majority of cases, consists of urate of ammonia; but should it not disappear by heat, it is *phosphatic*. If a deposit be of any colour inclining to yellow, drab, pink, or red, it is almost sure to be urate of ammonia, unless visibly crystalline, in which case it consists of uric acid" (p. 18-21).

ly upon being voided, or at least on cooling, becomes more or less turbid." When the urine, on cooling, becomes covered with a thin membrane-like scum, a *pellicle* is said to exist. When the substance causing opacity floats between the surface and the lower portions of the fluid, it is said to form a *cloud*. And when this falls toward the bottom of the containing vessel, the appearance was termed *encorema*. When a positive deposit collects at the bottom of the vessel, the term *sediment*, the hypostasis of the ancients, is commonly applied. The terms *pellicle*, *cloud*, and *deposit*, or *sediment*, are those commonly used in describing the states of the urine. These appearances are generally not fully developed until the urine is cooled down to the temperature of the air. This is especially the case with those deposits which are soluble in warm water; as the urates, particularly the urate of ammonia, which constitutes the chief part of reddish and fawn-coloured amorphous sediments.

37. *Urinary deposits*, including all substances which disturb the transparency of urine by their presence, whether they subside to the bottom of the vessel or not, have been divided by Dr. G. BIRD into: 1st. "Deposits composed essentially of ingredients derived, directly or indirectly, from the metamorphoses of tissues—(to which I would add, from the metamorphosis and waste also of the red globules, fibrin, and other constituents of the blood)—or from the organic elements of food; namely, uric acid and urates, uric oxide, oxalate of lime, oxalurate of lime, and cystine. 2d. Deposits composed of ingredients for the most part of inorganic origin, including phosphate of lime, ammonio-phosphate of magnesia, carbonate of lime, silicic acid. 3d. Highly-coloured deposits (black or blue) of doubtful origin; viz., cyanourine, melanourine, indigo, Prussian blue. 4th. Deposits consisting of non-crystalline organic products, including—*organized*: blood, pus, mucus, organic globules, epithelium, spermatozoa, confervoid bodies, vibrios; *non-organized*: milk, fatty matter, stearylith."

38. i. *DEPOSITS OF URIC ACID AND OF ITS COMBINATIONS.*—Uric acid, uncombined with a base, forming a deposit, is invariably in crystalline forms. But the crystals are seldom so large as to admit of their figures being recognised without the aid of the microscope. Uric acid presents a yellow or amber colour, unless when mixed with urate of ammonia, which is frequently the case, and then it is of a much paler hue. These deposits present every shade of colour, from the palest fawn to the deepest amber or orange-red. The deeper the colour of the urine the darker are the deposits.

39. *A. Diagnosis of Uric Acid Deposits.*—When heated in the urine, the uric acid deposit is not dissolved; the crystals merely become opaque. When mixed with urate of ammonia, Dr. G. BIRD recommends the urine to be warmed in a watch-glass; the acid then becomes visible at the bottom of the glass as soon as the urate dissolves. Heated with liquor potassæ, the uric acid deposit dissolves, forming urate of potash of ready solubility in the alkaline fluid. "Hydrochloric and acetic acids are without any action; but nitric acid readily dissolves it, and by careful evaporation a residue of a beautiful pink colour, becoming of a rich purple on being held over the vapour of ammonia, is left. This coloured residue is the murexid of LIEBIG, the purpurate of ammonia of

PROUT. Exposed to heat in a platinum spoon, the uric acid deposits readily burn, evolving an odour of bitter almonds, and finally leave a small quantity of a white ash, which contains phosphate of soda, or lime, or both."

40. *When urine contains an excess of uric acid* it generally forms crystals on cooling, uric acid being seldom deposited before emission. Sometimes, especially in the urine of gouty persons, many hours elapse before any is deposited, although a large quantity is present. Occasionally the acid is not deposited, but remains on the surface as a crystalline pellicle, presenting an iridescent play of colours in a bright light. Urine of a deeper amber colour than natural, or of a reddish-brown colour, usually deposits the largest amount of this acid; but very high-coloured urine seldom deposits uric acid until after the addition of a stronger acid; and urine does not deposit all its uric acid until decomposition has commenced. Urine depositing this acid always reddens litmus paper, and often contains an excess of urea, so as to crystallize when mixed with nitric acid. Its specific gravity is generally above 1.020, excepting in infants, in whom deposits of uric acid are common, although the urine may be pale and of a much lower density. These deposits "appear as a yellow crystalline sand, while the supernatant urine is of low specific gravity, often 1.006, as pale as water, and contains very little urea." This circumstance admits of explanation from the small proportion of alkaline phosphates, the presumed solvent for uric acid in the urine of infants. For the various microscopic characters of uric acid deposits, which can only be satisfactorily shown by engravings, I must refer the reader to Dr. G. BIRD's interesting work.

[*Microscopic Characters.*—All the varieties of uric acid crystals may be traced to some modification of the *rhombic prism*, the normal crystalline form of this substance. The rhomboidal crystals are sometimes so thin as to be merely pale, lozenge-shaped laminae; more generally, however, they are thicker. Many of them appear nucleated, as if one crystal included another. It seldom happens that the angles of these are sharply defined, the two obtuse angles being most generally rounded off, and sometimes the acute angles are blunted, so that the whole crystal appears elliptical. Where the deposit has been of long continuance, the rhomboid outline of the crystal is replaced by a square one. Several accidental varieties of these rhomboid and square crystals exist, the most curious of which presents a spindle-like figure, the obtuse edges being rounded, and the margin on either side excavated; and some appear to be composed of flattened cylinders. Some are very thin, longer than broad, representing square tables, with smooth or serrated sides and edges. Another variety forms thick, rhomboidal, cohering prisms, and another still, aggregated lozenges in spinous masses. When the urine cools very suddenly, or a strong acid is added to it, uric acid is sometimes precipitated in irregular masses resembling irregular fragments of yellow quartz. We have observed this appearance this very day (June 28, 1857) in the urine of a patient labouring under renal calculus of the uric acid kind.]

41. *B. Diagnosis of Deposits of Urate of Ammonia.*—These vary in colour, from white, through every tint, to a pale fawn (the oftenest met with), brick-red, pink, or purple. All these deposits

have certain characters in common. They never take place until the urine has cooled, and quickly disappear on the application of heat. The darker coloured deposits require a higher temperature for solution than the paler; and when the urine is scanty and concentrated, as in acute rheumatism, the addition of a little water may be required before they quite disappear. The addition of liquor ammoniæ or liquor potassæ quickly dissolves deposits of urate of ammonia, rendering the urine a little turbid from the precipitate of earthy phosphates. Deposits of urate of ammonia always contain small quantities of the urates of lime and soda, and often of magnesia and potass.

42. *Urine depositing urate of ammonia* presents several modifications: 1st, a pale urine of low specific gravity (1.012) with a nearly white deposit, which, instead of entirely falling, forms masses in the fluid, and appears as a mucous pus. The application of heat shows at once its real nature by causing its disappearance. 2d. A pale amber-coloured urine, of a specific gravity about 1.018, which, on cooling, deposits a copious fawn-coloured substance resembling powdered bath-brick mixed in the water, but very readily disappearing on applying a gentle heat. This deposit occurs often, readily disappears, and frequently attends a cold, obstructed perspiration, or slight indigestion. 3d. A deeper coloured urine, of a higher specific gravity (from 1.022 to 1.026), and deposits, on cooling, a reddish-brown sediment—the well-known brick-dust or lateritious sediment. This variety generally is present during febrile excitement, and becomes turbid on the addition of a drop of nitric acid, "not from the coagulation of the albumen, but from the precipitation of uric acid in very minute microscopic rhomboidal crystals." 4th. Urine of a very deep colour, approaching to a copper or purplish tint, or to purplish hue. This colour Dr. G. BIRD attributes to the presence of *purpurine*. He adds that, whenever a deposit of urate of ammonia occurs in such urine, either spontaneously or by immersing it in a freezing mixture, it combines with the pink pigment, forming a kind of lake, and which is often so abundant as not to entirely disappear by heat, until the urine is diluted with water. This state of the urine is often observed in acute rheumatism, gout, in diseases of the liver, spleen, &c., and has been attributed to the obstructed elimination of carbon.

[*Microscopic Characters.*—Dr. BIRD states that when a drop of urine, turbid from the presence of urate of ammonia, is placed between two pieces of glass and examined with the microscope, a mere amorphous precipitate is first seen; but, on minute examination, this is seen to be composed of myriads of excessively minute globules adhering together, forming little linear masses, often mixed with crystals of uric acid. Sometimes, especially if the urine has been long kept, the minute particles cohere, and form small opaque spherical bodies, appearing black by transmitted light, on account of their opacity. When examined by reflected light, on a black ground, they present a buff or fawn colour. On the application of slight heat to the drop of urine, the particles of urate of ammonia disappear, again becoming visible on cooling. A good mode is to place a drop of the turbid urine in a watch-glass and gently warm it. As soon as it has become clear, add a drop of almost any acid (the hydro-

chloric is perhaps the best); the muddiness previously produced by the urate will, on examination, be found to be replaced by lozenges of uric acid of a rhomboidal form. Very rarely the urate of ammonia occurs in large globules mixed with crystals of uric acid. This is occasionally observed in albuminous urine, and by its opacity is best observed by reflected light.]

43. ii. PATHOLOGICAL RELATIONS OF URIC ACID AND URATE OF AMMONIA.—Independently of changes in the quantities of these substances in the urine, caused by the quantity and nature of the food, very important alterations of the proportions of these substances accompany and characterize various pathological conditions of the frame. Uric acid and its combinations have been attributed to two sources, viz., the waste or disintegration of the tissues, and nitrogenized food. But it appears to me that too large a share of these sources has been imputed to the former (which is more correctly the nutritive metamorphosis, and waste of the tissues), while the metamorphosis and waste of the globules, fibrin, and albumen of the blood, as contributing to the formation of these substances in the urine, have been overlooked. In disease, especially in acute diseases, as long as the kidneys are enabled to discharge their functions, an increase of uric acid and its compounds appears in the urine; and this increase is to be imputed chiefly to the waste of the tissues and of the hæmato-globuline, for little or no nitrogenized food is generally taken in these cases, but emaciation, and with this more or less of anæmia supervene. The anæmia, which is often remarkable, especially in the advanced progress of these diseases, is often overlooked. In acute rheumatism, gout, fevers, diseases of the liver, spleen, &c., the elements and sources of uric acid and its compounds are abundantly supplied by the states of the blood to the kidneys, and uric acid, both pure and combined, is greatly in excess in the urine. MM. BECQUEREL and L'HERETIER found, in eleven cases of inflammatory fever and twelve of continued fever, the uric acid more than double that in health.

	Acute Inflammations.	Fever	Health.
Specific gravity of the urine	1.0216	1.0229	1.017
Uric acid in the urine.	1.041	1.312	0.371

44. That uric acid and its combinations may be formed to some extent in the blood, at least in some diseases, especially gout, rheumatism, erysipelas, &c., and eliminated by the kidneys, is rendered probable by the circumstance of urate of soda having been detected in the blood by Dr GARROD. But the presence of this combination in the blood does not preclude the elaboration of a portion of the uric acid and its compounds, or the modification and metamorphosis of one or more of them, or their elements, by the kidneys.

45. In diseases of debility, especially in those characterized by depressed or exhausted organic nervous power, and by a poor or anæmied state of the circulation in hysteria, chlorosis, disorders of irritation, &c., uric acid and its compounds are greatly reduced in the urine, unless the quantity of urine passed be remarkably diminished, and no deposits are formed.

46. The state of the perspiratory function is too often overlooked by those who attend especially to the urine. Whenever the functions of the skin are impeded or interrupted, those of the

kidneys are augmented; and the results are reversed when the perspiratory actions are increased. But the increase or diminution of either does not consist merely in the watery element, but also in the nitrogenized and other materials held in solution. This reciprocal or vicarious function, and more especially the frequent want or imperfection of compensation existing between these functions, are most intimately connected with the origin of many diseases, and are not the less productive of most dangerous results in the progress of others. I have always insisted, in my lectures (delivered from 1826 until 1842), upon the influence of an insufficiently depurated blood—of effete materials circulating in the blood—owing to impaired function of either the kidneys, the skin, or the intestinal mucous surface and follicles, or of two or all of these; or to an imperfect compensation of function of the others, when one is impaired or interrupted, in causing diseases not only of a serious and acute character, but also of a chronic and obstinate, although not dangerous kind. Most of the diseases of the skin, especially those which are most disposed to become chronic, are induced, or perpetuated, or both, not only by impaired depurating function of the skin and its follicles, but more especially and remarkably also by imperfect action of the kidneys, and of the intestinal mucous surface and follicles; the effete and nitrogenized elements and materials, and their combinations, retained and accumulating in the blood, irritating the cutaneous capillaries, and the capillaries of predisposed and sensitive surfaces and tissues. The crises of fevers and inflammatory diseases are merely the returning functions of depurating organs, and the free discharge by these emunctories of effete nitrogenous elements and materials and their compounds, chiefly by the kidneys, bowels, and skin. This doctrine has been fully elucidated in the *articles* BLOOD, CRISES, and DISEASE (published in 1832 and 1833), and has been applied to the illustration of the causes and phenomena of CRISES (see § 15-20). Long after the publication of my views, Professor LIEBIG referred the products of elimination from the blood by the emunctories, and especially those discharged by the kidneys, to chemical changes, but his explanations are opposed to clinical observation, while the researches of M. BECQUEREL (*Séméiotique des Urines*, &c., 8vo, Paris, 1841) tend to confirm the opinion contained in the articles now referred to.

47. (a) Excess of uric acid, or of its combinations with bases in the urine, the quantity of this fluid being natural, occurs in fevers, acute rheumatism, gout, erysipelas, inflammatory diseases, hepatic and cutaneous complaints, &c., chiefly from the waste and absorption of the tissues, and the metamorphosis of the elements and materials derived from these sources, and from the blood aided by oxygen conveyed into the circulation by the red globules. (b) A similar excess may also arise from an excessive indulgence in animal food, especially in highly nitrogenized flesh-meats, or from an indulgence in this kind of food beyond what is required for the nutrition of the several structures, or from a more moderate use of this food, due exercise, especially in the open air, being neglected. (c) Excess of these substances may occur in the urine, although the supply of nitrogenized food is very moderate, owing to impaired digestive, assimilative, and nutritive func-

tion. (d) Excess may also occur in consequence of impaired or arrested action of the skin and bowels; the kidneys discharging a more or less compensating function, and eliminating a portion or the whole of those elements and their combinations usually discharged by these other emunctories.

48. *Calculous Deposits of Uric Acid and the Urates.*—An abundance of uric acid and of the urates in the urine may occur without producing much disturbance to the urinary or other functions. This is especially the case with urate of ammonia, which can hardly be ascribed to disorder, but rather to the healthy discharge of the depurating function of the kidneys. But, as Dr. G. BIRD has justly remarked, "Uric acid or urates may be deposited in an insoluble form in the kidneys or bladder, and, aggregating, form a mass, on which, by a kind of imperfect crystallization, great quantities of the acid or its salts may be deposited, giving rise to the formation of a calculus. Uric acid is of more serious importance than most other elements of calculous formations, not only from its constituting a large proportion of all urinary calculi, but even when they are chiefly composed of other ingredients, the nuclei on which they are deposited are, in the great majority of cases, composed of uric acid. Of 374 calculi contained in the Museum of Guy's Hospital, at the time I examined them, the nuclei are in 269 composed of uric acid or urate of ammonia. On account of its solubility, urate of ammonia is not a frequent component of entire calculi, although it often enters with other ingredients into their composition. Indeed, calculi wholly composed of this compound are almost peculiar to childhood; in Guy's Museum there are but eight concretions entirely consisting of this substance, although it constitutes the nucleus in eighteen. It is hence very probable that if ever by medical treatment we can succeed in overcoming a calculous diathesis, or dissolving a stone in the act of growth, it will be by means directed to the solution of the uric acid or its combinations" (*Op cit*, p. 154).

[The symptoms attending the crystalline lithic acid deposit are sometimes severe, and chiefly met with among those who use considerable animal food and take but little exercise. The tendency to such deposits is often marked by sharp lancinating pains in the extremities, and by lumbar pains, combined with more or less irritation during micturition; and these symptoms are generally absent if the deposits are of a lateritious character, unless they occur in rheumatism, fever, or gout, when they may be expected to be present. Such crystalline deposits are to be suspected, when transient but sharp pains are experienced by the patient, and a sensation of scalding or irritation is felt after or during micturition, and no other symptom of constitutional disturbance is observed. The patient may labour under more or less derangement of the digestive organs, but not so strongly marked as in the phosphatic and oxalic forms of deposit, which are usually characterized by severe dyspeptic symptoms and constitutional disturbance.]

49. *iii TREATMENT OF DEPOSITS OF URIC ACID AND URATES.*—From the foregoing, it is apparent that excess of these materials in the urine, and the deposit of them, either in some part of the urinary apparatus, or after the urine is discharged, are contingent upon a variety of ante-

cedent disorders or pathological conditions, which, in individual cases, require due recognition and appropriate means; and not upon those alone, but also, in different cases, or in different circumstances, upon an excessive or improper diet and regimen, or upon insufficient exercise. One of the most important and most generally prevalent of these conditions, more especially when these materials are deposited in large or unusual quantities, and still more particularly when they are deposited in any of the urinary organs, is depressed or exhausted organic nervous power, occasioning impaired digestion, assimilation, and nutrition. This condition suggests the employment of such means as experience has shown to be most efficacious in restoring the organic nervous power to its former energy, throughout the organs devoted to digestion, assimilation, and nutrition. This indication of cure should be fulfilled, 1st, by medicinal treatment; 2d, by suitable diet and regimen; and, 3d, by exercise in the open air, and residence in a healthy locality.

50. *a. Medicinal treatment* comprises the several means of cure already recommended under the separate heads of INDIGESTION, GOUT, PYRO-SIS, &c.; but there are substances to which special reference may be made for removing and dissolving the deposits above noticed, and for counteracting the disposition to their formation. The medicines which may be employed in these cases are either restoratives and tonics, or are solvents of uric acid; and others may be so combined as to operate in this double capacity. The first of these consist chiefly of the tonic vegetable infusions and decoctions; the second of alkalies and alkaline salts; the former being generally made the vehicles for the exhibition of the latter—more especially of the following, viz., the liquor potassæ, BRANDISH'S alkaline solution, the carbonates of potass and soda; the citrates, acetates, and tartrates of potass and soda; magnesia, and the citrate and carbonate of magnesia; the biphosphates of potash and of soda; the phosphates of soda and of ammonia, and the benzoic and citric acids. Certain mineral substances are likewise of use, especially the alkaline preparations of iron, the nitrate and oxide of silver or bismuth, and the sulphate and oxide of zinc, which may be given in various states of combination, and in the form of pill. It may be remarked respecting certain of the foregoing, that the preparations, especially the carbonate of the fixed alkalies and the liquor potassæ, are often most beneficially conjoined with the iodide of potassium, and prescribed in a tonic bitter mixture; that the phosphate of soda may be taken freely in gruel, so as to act gently on the bowels; that magnesia will be most beneficial when given with sulphur, and so as to act upon the bowels, kidneys, and skin, which it will generally do when taken at night; and that the biphosphates may be prescribed in stomachic infusions with salts of the vegetable acids. Benzoic acid was recommended by Mr. A. URE, to prevent the formation of uric acid. It may be given in doses of five to ten grains, thrice a day, with carbonate or phosphate of soda, or with the carbonate of ammonia, dissolved in boiling water. Citric acid was strongly recommended by Dr. OWEN REES for diseases, especially gout and rheumatism, in which uric acid and urates are abundantly formed; and whether it be given as an addition to the patient's drink, or in combination with the alkalies, it is often of great service. With

magnesia, either in the form of citrate, or as recent lemon-juice or lemonade taken immediately after the magnesia, it is equally beneficial.

51. Most of the diseases, or slight states of disorder in which uric acid and the urates are deposited, are characterized by deficiency of the cutaneous excretion, and insufficient attention is directed to this function in many cases. The restoration of this excretion by means of the warm bath, or the vapour bath, followed by frictions of the surface, by walking, or other active exercises in the open air, is a most important indication of cure where these deposits appear in the urine, both in preventing and in permanently removing the complaints in which they are the general concomitants.

52. *b.* The mineral waters which contain the alkalies, or sulphur, as those of Vichy, of Ems, or of Harrowgate, will also be resorted to with benefit. But whatever be the treatment, the quantity of the flesh-meats used as food should be abridged, and farinaceous and vegetable substances, or the white kinds of fish, boiled, be partly substituted, more especially when active exercise in the open air is not enjoyed, and when the functions of the skin are imperfectly performed.

[We have generally been in the habit of recommending the free use of the *Saratoga* (*Congress-water*), fresh from the spring, if possible, in uric acid gravel, and have rarely failed to find it beneficial. It should be used as freely as possible, short of exciting purgation, and taken at different times in the course of the day. The *Sharon* and *Avon* sulphur waters, as well as those of *Virginia*, have also considerable reputation in the treatment of these cases; and they would be far more beneficial were proper attention paid to the diet.]

53. *c.* *Uric Oxide—Xanthic Oxide—Xanthine, Pathological Relations of.*—This substance is a very rare ingredient of calculous deposits or concretions, and it has been observed only in single instances by MARCET, LANGIER, LANGENBECK, DULK, BERZELIUS, and MORIN. The chemical constitution and the diagnosis of uric oxide are given by Dr. G. BIRD, to whose work I may refer the reader. The character of urine depositing this substance is not known. The microscopic examination of a fragment of calculus consisting of uric oxide did not furnish any information as respects a crystalline arrangement. The only recorded cases of the formation of this deposit occurred in children, and the calculi formed by it did not exceed a few grains in weight.

54. *iv.* **PURPURINE, ITS PATHOLOGICAL RELATIONS.**—Deposits of urate of ammonia coloured by this substance (§ 39–42) present tints varying from pale flesh-colour to the deepest carmine. "The presence of purpurine interferes with the ready solubility of the deposit with which it is combined on the application of heat, and free dilution with water is often required to aid its solution." Dr. G. BIRD states that he has never seen purpurine colouring any other deposits except those of urate of ammonia, and hippuric acid when precipitated from concentrated urine by hydrochloric acid. Uric acid scarcely appears to have any affinity for it. It cannot be mistaken for blood, on microscopic examination, owing to the absence of blood-disks. The chemical composition of purpurine occurring in disease is not exactly known. SCHERER states that that generated by the action of hydrochloric acid on urine

consists of 62.51 of carbon, 5.79 of hydrogen, and 31.70 of nitrogen and oxygen. Urinary calculi sometimes present layers of urate of ammonia stained with purpurine. Dr. G. BIRD remarks that all the deposits with which it is combined were, as far as he had observed, amorphous.

55. *A.* **The Characters of the Urine containing Purpurine.**—When an excess of urate of ammonia is present, it falls to the bottom of the vessel as the urine cools, carrying with it a great part of the purpurine. "If this excess be not present, the urine simply presents a pink or purple colour, and on dissolving white and pure urate of ammonia in it by heat, it is precipitated on cooling, deeply coloured by the purpurine. The presence of the yellow extractive which yields purpurine can be readily discovered by the action of hydrochloric acid. On evaporating urine containing purpurine to the consistence of an extract, and digesting it in alcohol, a fine purple tincture is obtained—the intensity of the tint being rather heightened by acids and diminished by alkalies." The specific gravity of this high-coloured urine, when the colour is as deep as that of brandy, varies from 1.022 to 1.030.

56. *B.* **The pathological indications of an excess of purpurine** are important. Dr. G. BIRD remarks that the existence of purpurine in urine appears to be "invariably dependent upon some imperfection in the excretion of carbon by these organs, whose special function it is to eliminate this element from the blood, as the liver and lungs, but especially the former. It is hence almost always connected with some functional or structural mischief of the liver or spleen, or some other organ connected with the portal circulation." I have for many years ascribed the presence of this colouring substance in the urine to an increased waste of the red globules of the blood, or of the hæmato-globulin by the kidneys, and that the diseases in which it most remarkably occurs, as fevers, gout, acute rheumatisms, phthisis, &c., are characterized not only by a rapid waste of the tissues, but also of the globules of the blood, giving rise in most cases to marked anæmia. There can be no doubt of biliary disorder, torpor, &c. of the liver—enlargements of the spleen, &c., being often associated with these and other diseases in which purpurine exists in the urine; but in these the waste of the blood-globules is not the less remarkable, this substance disappearing from the urine when the waste is diminished to the natural amount by restoration of vital power, by due oxygenation of the blood, and by improved digestion and assimilation.

57. *v.* **CYSTINE, ITS PATHOLOGICAL RELATIONS.**—This substance does not exist in healthy urine, and rarely occurs in morbid urine. It is probably derived from the sulphur extractive of urine (§ 30). In its chemical composition it contains no less than 26 per cent of sulphur. Cystine, Dr. G. BIRD states, has been found in urinary sediments by very few observers, and it was not recognised in this form until a long period after its discovery in calculi by Dr. WOLLASTON. In the rare cases in which it has been observed, it formed a nearly white or pale fawn-coloured pulverulent deposit, resembling pale urate of ammonia. The greatest proportion of cystine may be inferred to be merely diffused in the urine while in the bladder, as at the moment of discharge the urine is turbid, and immediately deposits a copious sediment. Dr. G. BIRD states that, on apply-

ing heat to the urine, the deposit undergoes no change, and very slowly dissolves on the subsequent addition of hydrochloric or nitric acid. "Pure cystine is soluble in the mineral, and insoluble in the vegetable acids; with the former, it forms imperfect saline combinations, which leave by evaporation gummy masses or acicular crystals. It is readily soluble in ammonia and the fixed alkalies and their carbonates, but insoluble in carbonate of ammonia. Heated on platinum foil it burns, evolving a peculiar disagreeable odour." Cystine may be distinguished from a deposit of urate of ammonia by not disappearing on heating the urine, and from the earthy phosphates by being soluble in very dilute hydrochloric or strong acetic acid. "The best character of cystine is its ready solubility in ammonia, mere agitation of some of the deposit with liquor ammoniac being sufficient to dissolve it; and a few drops of the fluid, when allowed to evaporate spontaneously on a slip of glass, leaves six-sided tables of cystine. The ammoniacal solution, when kept for some time in a white glass bottle, stains it black, from the combination of the sulphur of the cystine with the lead in the glass."

58 *a. The character of urine depositing cystine* is that of a pale yellow, or more of a honey-yellow than of an amber tint, presenting an appearance like diabetic urine. It is below the average specific gravity, is passed in larger quantity than usual, and is often neutral, seldom acid to litmus paper, and soon becomes alkaline. The odour of this urine is peculiar, and resembles that of sweet-brier. It is more rarely fetid, and when it is, the colour is generally greenish or greenish yellow. "A certain portion of cystine exists in solution in the urine, as the addition of acetic acid always precipitates a small quantity." Even when this deposit has vanished for some days together, crystals of cystine are then precipitated by acetic acid. Urea and uric acid are present in very small quantities, and in some instances the latter is nearly absent.

59 *b. Calculi composed of cystine* are generally pale yellow or fawn-coloured, but by long keeping they become greenish-gray, or a fine greenish-blue, probably owing to the action of light. The microscopic characters of cystine are very obvious. When it occurs as a deposit, it is always crystallized, never being amorphous. Among the crystals a few regular six-sided laminæ are often seen, but the great mass is composed of a large number of superposed plates, so that the compound crystals thus produced appeared multiangular; but I must refer the reader to Dr. G. BIRD's work, where this topic is well illustrated by wood-cuts.

60 *c. The pathological origin of cystine* is no farther known than that it is inferred to proceed from the waste of tissues, [especially the albuminous,] and probably also of the hæmato-globulin, or rather of some derangement of the normal course of this waste connected more especially with an excessive elimination of sulphur; every ounce of cystine containing more than two drachms of this element. Cystine may thus be formed from those elements of the tissues normally producing urea and uric acid with an excess of sulphur, owing probably to a deficiency of the process of oxidation in connexion with impaired vital energy. That these latter states obtain is evinced by the occurrence of cystine, or of cystin-uria, in scrofulous, chlorotic, and anæ-

mied subjects. The hereditary nature of this condition of the urine has been noticed by Dr. G. BIRD, who states that in one family alone several members were affected with cystin-uria; and that one instance exists in which it can be traced with tolerable certainty through three generations. In one case under the care of Mr. LUKE, extensive disorganization of the kidneys co-existed with a cystine calculus. Dr. PROUT has seen fatty matter mixed with the urine in cystin-uria, and suggests the probability of its connexion with fatty liver. Dr. G. BIRD thinks it not unlikely that the excretion of cystine may be a means, under certain circumstances, of compensating for deficient action of the liver *quoad* the excretion of sulphur. The existence of cystine in the urine of chlorotic and debilitated females has been met with in several cases by Dr. SHEARMAN, of Rotherham.

[According to our observations, cystine is not often met with in the urine of the human species, though very common in the dog. Dr. WOLLASTON called it *cystic oxide*, because peculiar to the bladder, and resembling some few of that class of substances in being soluble in both acids and alkalies. In calculi it exists in a perfectly pure form. It dissolves in dilute nitric, hydrochloric, sulphuric, oxalic, and phosphoric acids, but will not combine with the tartaric, acetic, or citric acids. It is dissolved by caustic ammonia, but not by the carbonate of that alkali; also by the fixed caustic alkalies and their carbonates. A dark brown colour is produced by evaporating nitric acid on cystine. It is insoluble in alcohol, and nearly so in water. The carb. of ammonia is the best precipitate for it, when in solution in acids, and the acetic acid from alkalies. The best mode of detecting cystine is to dissolve the calculous matter in caustic potash, then add a solution of acetate of lead in such proportions that the oxide of lead shall not precipitate, but be retained in solution by the excess of potash. This liquor becomes black when boiled, if cystine is present, a reaction dependent on the presence of sulphur in the cystine. Before the blowpipe it is consumed, yielding a very peculiar fetid smell. It may be easily distinguished from the other components of calculi by its being soluble in dilute hydrochloric acid, and a solution of carb. of potash.]

61 *d. Indications of Cure.*—Dr. PROUT advises the prolonged use of nitro-hydrochloric acid, and found it of benefit in some cases. Having viewed the existence of cystine in the urine as a result of debility in connexion with imperfect oxidation of the blood-globules, I have in one case prescribed the chlorate of potash with tonic infusions. This view of the pathology of cystine is suggestive also of the employment of the tincture of the chloride of iron, of the iodide of iron, of chalybeate mineral waters, and of other tonics, for its removal, aided by a generous diet, by active exercise in the open air, and by due attention to the functions of the skin and bowels. (See also the *Treatment of Debility, of Chlorosis, and of Scrofula*.)

62. vi. HIPPURIC ACID—HIPPIURIA.—This acid is constantly present in the urine of the horse, and generally also in that of herbivorous animals.—*a.* LEHMANN found it in diabetic urine, and LIEBIG detected it in healthy urine, although in minute quantity. As this substance never appears as a sediment until after the addition of a stronger acid, the *diagnosis* of it entirely depends

upon the characters of the urine containing it. The urine containing an excess of hippuric acid is either very slightly acid, or neutral. It may be even alkaline. When this state of urine is caused by the ingestion of benzoic acid, it is then very acid. Its odour is commonly that of whey, and its specific gravity is below the healthy state, varying from 1.006 to 1.008. Deposits of the triple phosphate of magnesia are not infrequent in it. For the modes of detecting this acid, and for its microscopic characters, I must refer the reader to Dr. G. BIRD's work.

[To detect *hippuric acid*, evaporate a few ounces of urine to a sirupy consistence, then add an excess of hydrochloric acid, when a mixture of hippuric and uric acids will be separated and fall to the bottom of the vessel. After a few hours' repose, decant the supernatant fluid, and wash the deposit in a little very cold water; boil the residue with alcohol (in which uric acid is insoluble), when the hippuric acid will be dissolved, and, on evaporation, will be found in thin, delicate, strongly-coloured needles. Hippuric acid requires nearly 400 times its weight of cold water for solution.]

63. *b. The pathological states causing this state of urine are not always obvious.* In the lower animals it proceeds from vegetable food, it being constant in such as are not exercised, and replaced by benzoic acid in those that are worked. When in excess in human urine, it is ascribed to diet; thus it has been found after a prolonged milk diet, after an excessive use of apples, and in the urine of infants. This acid does not necessarily interfere with the production of uric acid, but generally it is attended by a deficiency of urea. It has been found in urine containing albumen. Dr. G. BIRD ascribes it to a diet deficient in nitrogen, or to the mal-assimilation of the carbon in the food, and infers "that hippuric acid may be one of the agents by which the kidneys perform a vicarious function for the liver, in removing an excess of carbon from the system." In this respect it may be viewed as an analogous result to the production of purpurine and bile-pigment, each removing 63.93, 62.0, and 68.18 per cent. of carbon, respectively, from the system. It should be looked for in the urine when the functions of the liver, lungs, and skin are defective, when the food is deficient in nitrogen, and when the urine is copious, is slightly acid or neutral, and of low specific gravity.

64. vii. *OXALATE OF LIME—OXALURIA.*—Oxalate of lime often exists in the urine, and is frequently a constituent of calculous concretions. Its chemical and pathological relations have been ably investigated by Dr. G. BIRD, who contends for its frequent appearance as a crystalline deposit in the urine, in fine and well-defined octahedral crystals, and for "the connexion between the occurrence of this substance and the existence of a certain series of ailments generally characterized by nervous irritability." He considers that the depressing influences, always present in densely populated cities, are more productive of this than of earthy phosphatic deposits; and that traces of oxalate of lime, in the minutest microscopic crystals, may be detected in the urine of persons free from any apparent disease. Hence he regards it as one of the common results of metamorphosis of tissue. But this is very different from its presence in large crystals and in considerable quantities, these constituting a truly pathological condition.

65. *a. For the detection of oxalate of lime in the urine, I must refer to the work already quoted for the full details; generally, however, the existence of this substance may be ascertained by pouring off the upper six sevenths of the water passed a few hours after a meal, having given it time to repose in a glass vessel. A portion of the remaining seventh may be warmed in a watch-glass to dissolve the urate of ammonia. Having removed the greater part of the fluid, and replaced it by distilled water, a white glistening powder like diamond dust now becomes visible; and this under the microscope will be found to consist of crystals of oxalate of lime in transparent octahedra, with sharply-defined edges and angles.* Dr. G. BIRD states that, out of a great number of specimens of urine containing the oxalate, it has scarcely ever appeared in the form of a distinct deposit, but has remained diffused in the urine, even when present in so large a quantity that each drop, when placed under the microscope, was loaded with its crystals. But if any substance capable of being a nucleus were present, the oxalate would be deposited around it, although scarcely in cohering masses, and invariably colourless and beautifully transparent. The oxalate of lime, although absolutely insoluble in water, must be soluble in urine, for its lustrous crystalline form sufficiently indicates its previous solution, and it is not until after the urine has been voided several hours that the crystals of oxalate can be detected.

66. Occasionally some remarkable crystals of the oxalate resembling *dumb-bells*, or two kidneys with their concavities opposed, are met with, their surfaces being finely striated. But it is doubtful whether or no these are an oxalate of lime. Dr. G. BIRD considers them an oxalurate of lime, a salt which differs from the oxalate in ultimate composition only in the presence of the elements of urea and absence of the constituents of water. Dr. BACON has investigated these crystals minutely, and has concluded that the dumb-bell crystals consist of a "salt of lime containing either oxalic, oxaluric, or perhaps some other organic acid easily converted into oxalic acid; but the exact nature of the acid remains to be determined by future examination."

67. *b. The characters of urine containing the oxalate of lime are those of a fine amber hue, sometimes darker than in health, in a few cases paler than natural, and of a lower specific gravity, the odour being generally natural, or rarely aromatic like mignonette.* Frequently a deposit of urate of ammonia, sometimes tinted pink by purpurine, falls during cooling. The specific gravity of oxalic urine varies extremely. Of 85 different specimens, Dr. G. BIRD found 9 in which it ranged from 1.009 to 1.015; in 27 from 1.016 to 1.020; in 23 from 1.021 to 1.025; and in 26 from 1.025 to 1.030. Generally the heaviest specimens contained most of the oxalate. The quantity passed seldom exceeded the average, instances of positive diuresis being rare. Irritability of bladder was sometimes complained of. Acidity of the urine was well marked, even more so than in health, and always present. An increase in the quantity of urea was frequently found. Mr. STALLARD discovered in oxalic urine a great increase of the indeterminate organic matters (§ 21), often as much as double the average proportion in twenty-four hours.

68. *c. The complications of oxalate of lime with*

other deposits are of some importance. Dr. G. BIRD found the oxalate of lime unmixed with any other saline deposits in more than one half of the specimens of oxalic urine. "In a very few, crystals of uric acid were found from the first, mixed with the octahedra of oxalate of lime; and in nearly all the successful cases this acid appeared in the course of treatment, and ultimately replaced the oxalate altogether," at a period generally contemporary with convalescence. "Much more rarely, prisms and stellæ of the ammoniaco-magnesian phosphate were found mixed with the oxalate, and occasionally replacing it in the course of treatment; and still less frequently, the phosphate was observed in the urine some time before the appearance of the oxalate." Very few well-marked instances of a complication of the oxalic-acid urine with granular degeneration of the kidneys were observed. Of the 85 cases referred to above (§ 67), 43 were unmixed cases of oxalate; 15 were cases of oxalate mixed with urate of ammonia; 15 were mixed with uric acid; 4 were mixed with triple phosphate; and 8 with phosphate deposited by heat. Dr. G. BIRD constantly found a very large quantity of epithelial cells and scales in oxalic urine, indeed so constantly, that a white deposit of epithelium led to the suspicion of the presence of oxalate of lime.

69. *d. The pathological source of oxalate of lime in the urine is of great interest.* It is well known that a physiological connexion exists between sugar and oxalic acid; that the former substance is a common constituent of our aliments; and that most of the farinacea are partially converted into this substance during digestion. Under certain circumstances the sugar thus formed is carried into the blood, and is eliminated by the kidneys. In certain morbid states, a large proportion of the food may be converted into sugar in the stomach, which passes rapidly into the circulation, and is excreted by the kidneys as diabetic urine.* Recollecting the facility with which sugar and its chemical allies are, under the influence of oxidizing agents, converted into oxalic acid, it might be inferred that the existence of oxaluria is due to the presence of sugar in the blood. Dr. G. BIRD, however, argues against any connexion or relation subsisting between oxaluria and diabetic urine, inasmuch as sugar very rarely exists in the former; and as the latter rarely contains, in a given quantity, an

excess of urea, uric acid, or urates, and is remarkably free from saline deposits, the high specific gravity depending upon the large proportion of sugar. In oxaluria, on the other hand, a large excess of urea, of uric acid, and urates is present, and is as characteristic of this state of urine as the oxalate of lime itself. Hence he infers that there is no relation between oxalic acid and saccharine urine. From the symptoms present in cases where oxaluria is observed, there can be no doubt that the primary cause of this state of urine must, as Dr. PROUT has shown, be imputed to an unhealthy condition of the digestive and assimilating functions. That the oxalic acid is formed from its elements, either in the digestive canal or in its course to and in the blood, must be inferred, since Dr. GARROD detected, beyond any doubt, octahedral crystals of oxalate of lime in the serum of blood from a patient affected with albuminuria. "It is difficult to explain the presence of so insoluble a salt in solution in the blood; but it is probable that the opinion of Dr. SCHMIDT, of Dorpat, may be correct. He has assumed that there exists in the animal economy a tendency to the formation of a soluble triple compound of oxalic acid, lime, and albumen, which, by its decomposition, allows oxalate of lime to crystallize." Probably such a compound exists in the blood in disease; and when the acetic acid is added, as in Dr. GARROD's process, the albumen is separated and the oxalate set free.

70. The chemical relation existing between uric acid, urea, and oxalic acid, and the readiness with which the former of these substances is convertible into the latter, suggest the idea that oxaluria may be regarded as a form of what has been termed by Dr. WILLIS *azoturia*, of which an excess of urea is the prevalent indication, part of the urea, or of its elements, having been converted into oxalic acid. It may be inquired, Whence are the elements which form oxalic acid? Are they derived from the metamorphic changes of the structures, like healthy urea and uric acid? Dr. G. BIRD infers that they are. "Hence oxalate of lime must be regarded as one of the common results of metamorphosis of tissue." (*Op. cit.*, p. 210.) I am more disposed to agree with the opinion he has subsequently stated, viz., that although it is probable that such may be the origin of oxaluria (in the waste of the tissues), yet, the quantity of oxalate of lime being greatest after a full meal, and often absent in the urine passed in the morning, frequently disappearing when the diet is regulated, and reappearing on the use of unwholesome food, it is equally probable that this salt is derived from the mal-assimilated elements of food. It is sufficiently obvious, from the nature of the complaints in which oxaluria occurs, that it is always the result of imperfect assimilation of the aliments, owing to impaired organic nervous power, the mal-assimilated, or rather the non-assimilated, elements forming the product in question, aided by oxidation, which product is rather eliminated than formed by the kidneys. However minute and laborious may be the researches of organic chemists in endeavouring to show the elementary combinations and the atomic affinities of these elements, in the production of urinary deposits, the vital endowment, and the states of function depending upon this endowment, more especially demand attention; the chemical constitution of the urine being generally only a sign, but an

* The best tests for sugar in the urine are *Frommer's*, *Capezzuoli's*, and *Moore's*. *Frommer's Test*.—Add to the suspected urine, in a large test-tube, just enough of a solution of sulphate of copper to communicate a faint blue tint; a slight deposit of phosphate of copper generally falls. Then add *liquor potassæ* in great excess; a precipitate of hydrated oxide of copper first falls, which redissolves in the excess of alkali, if sugar be present, forming a blue solution like ammoniuret of copper. On gently heating the mixture to ebullition, a deposit of red sub-oxide of copper falls, if sugar be present.

Moore's Test.—Place in a test-tube about two drachms of the suspected urine, and add nearly half its bulk of *liquor potassæ*. Heat the whole over a spirit-lamp, and allow actual ebullition to continue for a minute or two; the previously pale urine will become of an orange-brown, or even bistre tint, according to the proportion of sugar present.

Capezzuoli's Test consists in adding a few grains of hydrated oxide of copper to urine contained in a conical glass vessel, and render the whole alkaline by adding *liquor potassæ*. If sugar be present, the fluid assumes a reddish colour, and in a few hours the edge of the deposit of oxide assumes a yellow colour, which gradually extends through the mass, from a reduction of the oxide to a metallic state (sub-oxide?).

important one, of the state of this endowment, particularly as manifested by the organic nervous system.

71. *e. The symptoms accompanying the excretion of oxalate of lime* have been minutely described by professors of the urinary specialty; and conformably with the importance they attach to an urinary deposit, they view it as the actual disease, or at least as a diathesis, instead of being merely a sign, or at most a result, of pre-existing disorder or disease, to which more especially rational medication should be directed. Oxaluria is not a sign of one, or even of two disorders merely, but of several, the chief morbid manifestations being depressed vital endowment of the digestive and assimilating organs, with lowness of spirits, irritability or nervousness, hypochondriacal feelings, impaired nutrition, anæmia, and often loss of sexual power. Pains in the loins, irritability of bladder, and high specific gravity of the urine—generally from 1.025 to 1.030—with various symptoms of impaired health, are also commonly experienced. The urine is invariably acid, often excessively so; and there is a marked tendency to eruptions of boils. Dr G. BIRD remarks that he has seldom met with phthisis in cases with oxalate of lime deposit, and that in very few instances has he seen oxaluria terminate in the formation of a calculus. He again states that the source of this deposit is to be imputed to metamorphosis of the tissues, and that this is the only way that the attending emaciation can be satisfactorily accounted for. I have already stated my belief that this deposit as well as the emaciation are the results of impaired or morbid assimilation of the food, and the consequent imperfect nutrition of the tissues (§ 70).

72. *f. Causes.*—This state of the urine is frequent in those who are subject to mental anxiety and to laborious mental occupations, more especially in men on the stock-exchange, in medical men, in barristers and solicitors, and in those who are engaged in occupations attended by much mental anxiety, and are excessively devoted to business or study. The *exciting causes* are chiefly neglect of health, chronic dyspepsia, hypochondriasis, exhaustion from disease, from syphilis or mercurial courses; venereal excesses, masturbation, involuntary seminal emissions, excessive discharges, and prolonged lactation, previous acute diseases, injuries affecting the spine, &c., &c.

73. *g. The treatment of oxalate of lime deposits* is generally successful, if the diet and the regimen of both mind and body be duly regulated. The food should be digestible, properly cooked, and the animal and vegetable in due proportion. Malt liquor ought to be avoided; and either a small quantity of brandy in much water, or a glass of dry sherry in two of water, may be taken with dinner. The medicines most appropriate are the nitric or nitro-hydrochloric acid (one part of the nitric to two of the hydrochloric) given in tonic infusions or decoctions. If anæmia or chlorosis exist, the tincture of the muriate of iron, with preparations of calumba or quassia; or the *mistura ferri composita*, or the ammonio-citrate or ammonio-tartrate of iron, should be prescribed. If the bowels be costive, the extract of taraxacum may be given with the former medicines; or the decoction of aloes be conjoined with the *mistura ferri composita*; or the *mistura*

gentiana composita may be given alone, or with tincture of serpentaria, &c. The sulphate of iron, or of quinine, or of zinc may be prescribed, where the foregoing fail, combined with small doses of camphor and henbane, or of conium. Dr. G. BIRD recommends recourse to colchicum for oxaluria, and states that, under the influence of this drug, copious deposits of oxalate of lime have become replaced by uric acid and the urate of ammonia, thus inducing a condition of urine much more amenable to treatment.

74. viii. CHEMICAL PATHOLOGY OF EARTHY SALTS IN THE URINE.—*Phosphuria*—*Phosphate of Lime*, *Ammonio-phosphate of Magnesia*, and *Carbonate of Lime*.—Phosphoric acid is excreted in considerable quantity from the blood by the kidneys, combined with soda, ammonia, lime, and magnesia; forming, most probably, ammonio-phosphate of soda, phosphate of magnesia, phosphate of lime. The first of these is soluble in water, and Dr. G. BIRD considers it to be the solvent of uric acid, and indirectly the source of the acidity of urine. The other two salts are insoluble, but the presence of a minute portion of an acid, even the carbonic, enables water to dissolve a considerable quantity. They are also soluble to some extent in hydrochlorate of ammonia. "In healthy urine, the earthy phosphates are held in solution by the acid of the superphosphates, produced by the action of uric (or hippuric) acid on the tri-basic alkaline salts; and these salts are also, according to ENDERLIN, capable of dissolving a certain quantity of phosphate of lime." The earthy phosphates are always abundant after a meal, the reverse applying to the alkaline salts. Phosphoric acid may be excreted in large excess without forming a deposit, owing to its combination with an alkaline base; and hence, when the excretion of an excess of this acid is looked for, it is not indicated by the amount of earthy salts deposited, for there "is always three or four times more phosphoric acid in a given specimen of urine, in the form of a soluble alkaline salt, than is precipitated as an insoluble earthy compound. The presence of an excess of lime and magnesia has more to do with determining a deposition of insoluble phosphate than an excess of phosphoric acid." The circumstances under which the earthy phosphates are deposited often are of so great importance as to require a recognition of their existence, as well as of the quantities of these phosphatic deposits.

75. A. *The Diagnosis of earthy Phosphates.*—*a.* Deposits of these phosphates are white, unless coloured with blood, are soluble in dilute hydrochloric acid, and insoluble in liquor potassæ and in ammonia. On heating the urine, the deposit merely agglomerates into little masses. A small quantity of a solution of sesqui-carbonate of ammonia added to a large quantity of healthy urine causes turbidity, from a deposit of the triple phosphate mixed with some phosphate of lime. "On placing a drop of this turbid urine under the microscope, myriads of minute prisms of the triple salt, mixed with amorphous granules of the phosphate of lime, will be seen floating in the fluid; these disappear on adding a drop of any acid. As these earthy salts are insoluble in water, they must be held in solution in the urine by the free acid which generally exists. If from any cause the quantity of solvent acid falls below the necessary proportion, the earthy phosphates

appear diffused through the urine, disturbing its transparency, and subside, forming a deposit. Hence, whenever the urine is alkaline, phosphatic deposits are necessary consequences. If urine be secreted with so small a proportion of acid as barely to redden litmus paper, a deposit of triple phosphate often occurs within a few hours after emission; probably owing to the presence of mucous matter, which induces the decomposition of urea and the formation of carbonate of ammonia, which, by neutralizing the solvent acid, precipitates the phosphates. The triple phosphate, which occurs spontaneously in prismatic crystals, is a neutral salt, "and may coexist as a deposit with very sensible acidity of the supernatant urine. It by no means follows that the existence of a deposit of this salt involves the necessarily alkaline state of the urine." Another triple phosphate, differing from the former in containing an excess of base, is of frequent occurrence in the urine when in an alkaline or putrescent state. It cannot be present in urine having the slightest acid reaction on litmus paper. Its crystals are invariably stellar or foliaceous. This salt is termed the basic phosphate. "When the triple or calcareous phosphates are separately exposed to the heat of a blow-pipe flame, they fuse with great difficulty, and not until the heat has been urged to the utmost. If, however, the phosphate of lime is mixed with a triple phosphate in about equal proportions, they readily melt into a white enamel. These mixed salts constitute what is hence termed the fusible calculus, and they can readily be detected by this property in concretions; a character very available in the examination of gravel and calculi, as the two phosphates generally occur together."*

76. *b.* The physical appearance of deposits of the earthy phosphate varies remarkably. Sometimes they appear as a white crystalline gravel, especially when the triple salt is the chief part of the deposit. But if a small quantity be present, it may readily escape detection by remaining a long time diffused in the urine. After a repose of a few hours, some of the crystals collect on the surface, forming an iridescent pellicle, "reflecting coloured bands like a soap-bubble or a thin layer of oil. If then the lower layers of the urine be placed on a watch-glass, and held obliquely over the flame of a candle or any strong light, a series of glittering points will become visible from the reflection of light from the facets of the minute prisms of the salt." (*Op. cit.*, p. 269.)

77. The phosphates often subside to the bottom of the vessel like a dense cloud of mucus, for which they may be mistaken. Sometimes they form, in very alkaline urine, dense masses, hanging in ropes, like the thickest puriform mucus, from which it is impossible to distinguish them by the unaided eye. Their disappearance on the addition of hydrochloric acid shows at once their nature. The examination of a few drops of the urine between two plates of glass, by the microscope, will detect the characteristic crystals of

the phosphates. Occasionally they are mixed in a deposit with the urate of ammonia, this latter being pale or nearly white. As phosphatic urine is usually very pale, it follows that any urate of ammonia deposited from it will be nearly white from the absence of colouring matter.

[*Microscopic Characters.*—According to BIRD, the neutral triple phosphate occurs: 1st, in well-defined colourless prisms, the angles and edges of the crystals being remarkably sharp and perfect. The triangular prism is most frequently met with, but it presents every variety of termination, sometimes merely truncated, often bevelled off, and not unfrequently the terminal edges are replaced by facets, presenting a very beautiful microscopic object of great transparency, or of an enamel-like opacity, so that they can only be viewed as opaque objects; 2d, the triple phosphate forms minute calculous concretions, composed of colourless acicular prisms, cohering at one end, so as to represent simple stellæ, or rosettes; 3d, Penniform crystals, resembling striated feather-like crystals, two being often connected, so as to cause them to resemble wings; 4th, Stellar and foliaceous crystals. Dr. BIRD regards this as usually a secondary product taking place out of the body, generally occurring in the form of six-rayed stars, each ray being serrated, or irregularly crenate, resembling a taraxacum leaf.]

78. *c.* States of Phosphatic Urine.—Although it may appear necessary for the urine to be alkaline for a deposit of phosphates to exist, yet generally urine which deposits the triple phosphate is acid at the time of its excretion. Some neutral salts redden litmus paper, and yet contain no free acid; and this fact may in some cases explain the occasional acid reaction where deposits of phosphates exist. Dr. O. REES has shown that hydrochlorate of ammonia may in some cases be the solvent of the earthy phosphates when in excess. Occasionally urine does not contain any visible deposit, and yet on the application of heat appears to coagulate from the deposition of earthy phosphates. The addition of a drop of nitric acid immediately dissolves this deposit, and distinguishes it from albumen. The precipitation of the earthy phosphates by heat has been ascribed by Dr. H. BRETT to the existence of carbonic acid in the urine in a free state. Dr. B. JONES has, however, shown that, if to any urine rich in phosphates, as that passed shortly after a meal, a minute portion of an alkali be added to neutralize any great excess of acid, the subsequent application of heat precipitates the earthy phosphates.

79. Generally, where phosphatic deposits, magnesian, calcareous, or both, exist for a considerable time, the urine is pale, often whey-like, passed in large quantities, and of low specific gravity—from 1.005 to 1.014. "This is especially the case where organic lesion of the kidneys exists." On the other hand, when the deposits recur and disappear in the course of a few days, the urine is generally of a deep amber colour, is of high specific gravity (from 1.020 to 1.030), often contains an excess of urea, and presents an iridescent pellicle on its surface by repose. This form of phosphatic urine is often met with in connexion with irritative or inflammatory dyspepsia and with mal-assimilation. Sometimes prisms of triple phosphate are seen entangled in the meshes of a mucous cloud for a day or two, and then disappear. Phosphatic

* Some writers speak of calculi composed of the "acid phosphate of lime." By this is meant, not the super-phosphate, but the neutral or di-phosphate of lime. When the di-phosphate of lime calculus is digested with water, it is decomposed into an insoluble sub-phosphate and a soluble super-phosphate, which possesses an acid reaction; and this fact led FOURCROY into the mistake of describing these concretions as composed of a super-phosphate of lime. Di-phosphate of lime constitutes the accidental bezoar, an intestinal concretion found in the stomach of the ox, deer, &c.]

urine occasionally varies from a whey-like hue to a deep brown or greenish brown, is very fetid, generally alkaline, "and loaded with a denseropy mucus often tinged with blood, and in which large crystals of the triple phosphate and amorphous masses of phosphate of lime are entangled. This variety is almost always met with, either under the irritation of a calculus, or even of a catheter worn in the bladder," or where actual disease of the mucous coat of this organ exists.

80. *d.* For the *microscopic characters* of earthy phosphates, I must refer to Dr. G. BIRD's work, where they are fully illustrated. I can only mention, 1st, the *prisms of neutral triple phosphates*; these are well defined, the triangular prism being the form most frequently met with, but it presents every variety in its terminations; 2d, *simple stella of the neutral salt*, the radii being more or less distinct or crowded; 3d, *penniform crystals of neutral salt*; this variety presents the appearance of striated feather-like crystals, two being generally connected, resembling a pair of wings; 4th, *stellar and foliaceous crystals of basic salt*; this variety is chiefly formed after the urine is discharged, and, when rapidly formed, it generally appears as six-rayed stars, each ray being serrated. *Phosphate of lime* generally presents no appearance of crystalline structure; it either resembling an amorphous powder, or being collected in rounded particles, often adhering to prisms of triple phosphate.

81. *B. Pathological Relations of the Phosphates.*—I have many years ago contended, and more recently, in various parts of this work, alluded to the fact, that the *secretions* are endowed, to a certain extent, with an emanation of vitality which for a time resists the changes which they are disposed to enter into, either when organic nervous influence is much depressed or when they are removed from the body. "Indeed, the vital influence modifies their physical conditions, in a more or less marked manner, as long as they continue subjected to its operation. From this source, also, they are imbued with a vital emanation, the presence of which is indicated by the continuance, for a time, of the specific characters of each. This emanation, being no longer required when they are removed from the body, is soon dissipated. The secretions, while within the sphere of the animal system, and for a short time afterward, possess this emanation of the vital influence, to an amount sufficient to give them certain characters, and to preserve them from the chemical changes to which their constituents are naturally prone; but when this influence becomes depressed, or ultimately ceases, they then undergo dissolution as unequivocal as that evinced by the textures of the body. In confirmation of this view, I need only refer to the comparative conditions of the more perfectly elaborated secretions immediately after their formation and excretion, and after periods of various duration have elapsed from the time of their discharge from the body." (*Physiol. Notes by the Author*, p. 636.)

82. The above doctrine was published by me in 1824; and both then and subsequently I have insisted upon its importance, and upon the obvious deductions which follow from it. While vital energy is perfect, or at least not materially impaired, the secreted fluids, especially while they remain undischarged from the body, are pre-

served by this emanation of vital influence from those changes to which their constituents are chemically disposed. But if these fluids are retained for an unusually lengthened period, or if vital energy, to which they owe their original natural character, be much impaired, those changes which their constituents are chemically disposed to undergo take place more rapidly after their discharge from the body, and in many instances even while they still remain in those receptacles or cavities which are provided for their reception and temporary retention. But with the various manifestations of depressed vital power, changes in the secretions are not only such as take place after these secretions are produced, but also those which occur during their production, and which depend upon the existing state of vitality throughout the body, and upon the manifestations and modifications of vitality in the organs especially destined to the formation of these secretions. When vital energy is impaired, or, in other words, when debility is manifest, whether constituting the only or chief pathological condition or associated with others, as with nervous susceptibility or irritability, or with febrile action, or with organic change, or with other alterations farther impeding or disturbing the functions of a secreting organ or organs, results will be furnished by the secretions varying with the manner in which the general impairment of vital power affects the functions of digestion, assimilation, nutrition, and waste—the successive conditions of nutritive supply, of vital cohesion and resistance, of molecular dissolution, of vascular depuration, and of ultimate discharge.

83. This doctrine, which, as I have shown, has been published and taught by me with reference especially to the several secretions and excretions—recrementitious, excrementitious, or depurating—is altogether applicable to the urinary excretion, and to the deposits which form in it, both after and previous to its discharge from the body, and in a more particular manner to the urine which furnishes the phosphates in great or unusual excess. The deposit of earthy phosphates may be viewed as resulting more especially from depression or exhaustion of vital power, as manifested chiefly by the nervous system, and is hence most frequently met with in the aged, and in those who labour under disease of the cerebro-spinal nervous system, or have experienced injury of the spine, or have suffered much from tear and wear of mind and body. The pathological conditions giving rise to the deposits of phosphate of lime are similar to those producing the triple salt. Indeed, they often occur simultaneously, especially when the urine is alkaline. Dr. G. BIRD considers that, when the deposit has consisted chiefly of the calcareous salt, the patients have presented more marked evidence of exhaustion, and of the previous existence of some drain on the nervous system, than when the triple salt alone existed, unless its source is strictly local.

84. When the triple phosphate occurs in small quantities, nearly or quite free from the phosphate of lime, the urine being acid or neutral at the time of emission, the cases are then the slightest of this class of disorders. Nevertheless, severe dyspepsia, irritability, restlessness, impaired assimilation, and emaciation are constantly present. When there is an excessive discharge of urea, the symptoms are more severe, and the exhaustion and nervous depression greater. The urine

is then of a rich amber colour, generally depositing phosphates on the application of heat, and of a specific gravity varying from 1.025 to 1.030. In mild cases of dyspepsia, especially in the gouty diathesis, an iridescent pellicle of triple salt, the urine being rich in urea and either acid or neutral, is often observed. This state of the urine is not infrequent in dyspeptic females at or about the climacteric period. Crystals of the triple salt occur in very old persons, especially in the ill-fed; in persons recovering from acute diseases, especially from rheumatic fever.

85 Early in continued fever the urine is high-coloured, and loaded with uric acid and urates. It is then generally acid, but after the end of the second week, or earlier, in the lower types of fever, the acidity often vanishes, and the urine becomes *alkaline* and deposits the phosphates. This is, however, more frequently seen in some types and states of fever than in others, especially in the typhoid and putro-adynamic, and when comatose symptoms appear. The treatment, particularly the use of alkaline medicines, or of the salts of the vegetable acids, has some influence in favouring the change to an alkaline state of the urine. In these cases, as well as in other diseases where the nervous energy is remarkably depressed or exhausted, more especially in the low forms of insanity, in cases of debility from venereal excess, masturbation, &c., after injuries of the spine, as remarked by PROUT, BRODIE, and others, the elements of urea become rearranged, or obedient to ordinary chemical affinities, and form carbonate of ammonia.

86 When the deposit of phosphates is copious, the two phosphates are generally mixed, either falling to the bottom of the vessel, or remaining suspended in the urine like mucus; the urine is then generally alkaline, and the odour ammoniacal or fetid. This kind of urine is most remarkable in organic disease of the urinary organs, or serious affections of the spinal cord followed by such disease. Conformably with the doctrine above insisted upon (§ 81-5), the impaired vitality of these organs depending upon depressed vitality of the frame generally, as in typhoid and putro-adynamic fevers, or of the urinary organs especially, as after injuries or diseases of the spine, its cord, &c., so affects the urinary secretion, both during the performance of this function and while the secretion is retained, as to favour the occurrence of those changes, even before it is discharged, which its ordinary chemical affinities dispose it to assume. The change thus produced in the urine may be followed by the formation of calculi in any part of the urinary apparatus, but most frequently by irritation of the urinary mucous surfaces and by the secretion of a quantity of viscid mucus, which may become puriform or changed, by the carbonate of ammonia formed in the urine, into a viscid and almost gelatinous or tenacious ropy fluid, sometimes preventing the discharge of the urine, and increasing the sufferings of the patient. Mr CURLING's view of this subject is different from that now stated. He believes that the result of the spinal lesion is the loss of the natural sensibility of the bladder. The effect of this is the secretion of unhealthy alkaline mucus, which acts chemically upon the urine, renders it alkaline, and leads to the deposition of the earthy phosphates. He thinks that the urine may subsequently be secreted in an alkaline state by the extension of the irritation from

the bladder to the kidneys, or by the latter sympathizing with the former. It should not, however, be overlooked, that injury of the spine not only deprives the urinary apparatus of that share of nervous power reinforcing the organic or ganglionic nervous influence which endows this apparatus, but thereby also modifies the secreting function of the kidneys. Whether the result be impairment only, or a modifying action also, there can be no doubt that the chief result of these injuries is paralysis of the bladder, especially as respects its contractile powers, causing retention of the urine, which, whether it be secreted in an altered or morbid condition, or rendered such after its secretion, owing to impaired vital influence, more readily irritates the urinary mucous surface than in its healthy state, and gives rise to mucous discharge and the consecutive lesions of the urinary organs.

87 The urine may be alkaline and loaded with phosphates, owing to disease of the *Urinary Bladder* (see that article), more especially of its mucous surface. This state of the urine thus arises from three important pathological conditions: 1st, from vital depression, as manifested chiefly by nervous debility and irritability; 2d, from injuries and diseases implicating the spinal cord or its membranes; 3d, from disease of the urinary organs. But it should not be overlooked that the second condition affects the urine by first disordering the functions and subsequently the structure of these organs. It is important to be able to distinguish between these sources of alkalinity of the urine, especially between the presence of a general morbid condition and a strictly local disease. Dr BENGE JONES has established that urine is alkaline from ammonia when the cause is local, and from a fixed alkali when the ailment is general. Hence urine may be alkaline, and not ammoniacal, although when the latter it is necessarily the former. The urine is sometimes alkaline after breakfast, owing to the presence of a fixed alkaline carbonate. The urine, in such cases, turns red litmus paper blue, whatever may be the alkali present; but if it be a fixed alkali, the paper remains blue after being dried before the fire; but if it be the volatile alkali, the paper resumes its red tint when thus exposed. When the urine is alkaline from ammonia, Dr. B. JONES has farther shown, abundant crystals of triple phosphate are always found, while, when ammonia is absent, these crystals are rarely present, and are replaced by a copious and dense deposit of phosphate of lime. He has arrived at the following conclusions as to the relation borne by phosphatic salts to certain pathological states:

88. 1st. No determination of an excessive secretion of phosphatic acid can be furnished by the deposit of earthy salts, unless the quantity of lime and magnesia in the food be taken into account; 2d. No *real increase* of phosphatic salts occurs in spinal diseases, notwithstanding the existence of deposits; 3d. In fever and in most acute inflammations, the phosphatic salts are not increased; 4th. In old cases of mania, melancholy, paralysis of the insane, or in chronic diseases in which nervous tissues are influenced, no conclusions can be drawn; 5th. In fractures of the skull, the phosphatic salts increase only when any inflammatory action occurs in the brain, and in acute phrenitis an excessive increase takes place; 6th. In delirium tremens there is a marked deficiency of phosphates, unless they are introduced with

the ingesta; an excess is, however, met with in some functional affections of the brain.

89. In some instances the urine is copious, pale, and freely deposits the phosphates, the patient being emaciated, and the urinary organs free from disease. In these the formation of a calculus may be dreaded. But when this does not exist, it will often be found that *tabes dorsalis* from masturbation is the cause both of the constitutional and of the urinary disorder. Dr. GOLDING BIRD states that the deposits of phosphates, where no organic disease exists, are often absent, not only for hours but for days together; and this fact will often indicate a favourable termination of the case; and he comes to the following conclusion: "that, where the presence of a deposit of phosphates is independent of the irritation of a calculus, or of organic disease, it is most abundant in the urine passed in the evening, and absent or replaced by uric acid or urates in the morning, the urine being always of a tolerably natural colour, never below, and often above the mean density. Where the presence of phosphatic salts depends upon the irritation of a calculus, or upon organic mischief in the urinary passages, the urine is pale and whey-like, of a density below the average, often considerably so, and the earthy deposit is nearly equally abundant in the night and morning urine." (*Op. cit.*, p. 293.)

90. *C. Therapeutical Indications.*—*a.* When phosphatic deposits depend upon *irritative dyspepsia*, or upon *nervous or febrile disorder*, independently of affection of the spine or of the urinary organs, the treatment should be directed rather to the constitutional, digestive, and assimilative disorders, than to the state of the urine, which ought to be viewed only as a symptom. In these cases, depression of spirits, hypochondriasis, and various dyspeptic symptoms, are present; and the urine has a high specific gravity, contains an excess of urea, and deposits crystalline or amorphous phosphates. In these the urinary deposits should be viewed as the results of defective vital and nutritive powers, and as exhausting the nervous energy; and the treatment ought to be directed to the functions of the stomach and bowels, and to the improvement of the general health, by means of stomachic or tonic aperients, by a light, digestible, and generous diet, and by bitter infusions or decoctions. To remove the more painful symptoms, the oxide of bismuth or of zinc may be given with the extract of ox-gall, and the extract of henbane or the *pil. saponis composita*. In these cases the means advised in the articles *DEBILITY*, *HYPOCHONDRIASIS*, *INDIGESTION*, &c., will generally be appropriate.

91. *b.* When the phosphatic deposits depend upon *exhaustion or injury of the spinal cord*—upon *tabes dorsalis*, &c., then the medical means require modification. In these, great emaciation, copious phosphatic deposit, the phosphate of lime predominating remarkably, pain and weight in the lumbar region, copious pale urine and low specific gravity, and dryness of the skin, require not only the restoratives and tonics already advised, but also a recourse to opiates, conjoined with aromatics, diaphoretics, &c.. When these cases proceed from a blow or other injury of the spine, or wrench of the back, then the terebinthinate liniments or embrocations along the spine (see Form. 296, 311), the cold salt-water douche on the loins, followed by frictions or liniments, the *emplastrum roborans*, &c., will be of great

service. In many of these (especially when caused by masturbation) the preparations of iron, the nitro-muriatic acid in tonic infusions, the tincture of sumbul or of musk, or of serpentaria, with tincture of opium, are severally productive of more or less benefit. In mild and prolonged cases of this kind, a calculus is not unfrequently insidiously formed in the pelvis of the kidney. For these, the mineral acids have been recommended, as they hold the phosphatic salts in solution: of these, nitric or nitro-muriatic acid may be preferred; but it has been doubted whether they reach the kidneys or act upon the deposit. However, when given judiciously or conjoined with bitter tonics, they improve the general health, and thereby either prevent or arrest the increase of the deposit.*

[Believing, with Dr. PROUT, that a perfectly healthy condition of the urine is not only one of the most natural, but probably also one of the most powerful solvents for all the ingredients likely to exist in urinary calculi that we can hope to possess, and that there is scarcely any form of stone that will long bear the continued action of healthy urine without becoming more or less dissolved or disintegrated, we direct the patient to drink very largely of pure rain-water, sometimes aiding the diuretic effect by parsley-root tea, infusion of juniper, the cucurbitaceous seeds, &c., in order to a copious secretion of healthy urine. Urinary deposits are often thrown down from the amount of urine being too small to hold them in solution; increase the quantity secreted, and the urine again becomes limpid and free from sediment. Great water-drinkers, as BOUCHARDAT says, are never afflicted with urinary calculi.]

92. *c.* When phosphatic deposits proceed from *lesion of the urinary organs*, their connexion with a morbid secretion from the mucous membrane of the bladder is well known. The disposition of the phosphates to adhere to this surface generally increases the difficulty of treatment. For this state of phosphatic cystitis, weak acid injection

[* BERZELIUS believed that he had proved by his experiments that the mineral acids never reach the kidneys in a free state, and never increase the acidity of the urine. This is doubtless the case generally with the vegetable acids also, which undergo decomposition or combustion in passing through the circulation. It certainly is very difficult to acidify alkaline urine. OEFELA, however, states that he detected *nitric, sulphuric, hydrochloric, oxalic*, and perhaps *acetic* acid in the urine of dogs poisoned by these acids, but never in a free state. WOHLEB concludes from his experiments that *oxalic, tartaric*, and *benzoic* acids (and probably, therefore, all acids) are never eliminated in the urine in a free state, but always in combination with a base. Dr. BENGE JONES states that, in his experiments with *sulphuric acid*, given freely many days in the form of lemonade, it does, after a while, pass off with the urine; but 354 grs. of dry *tartaric acid*, given after eating, were not sufficient to render the urine acid. Changes, however, in the condition of the digestive and assimilative organs readily affect the urine, as in the experiment of BERZELIUS, where he gave phosphoric acid freely for a considerable time without acidifying the urine; but as soon as it purged the patient, the urine lost its alkalinity, and deposited *uric acid*. Mr. BRANDE states very truly that, when mineral acids are given to relieve phosphatic deposits, they are apt to induce *red gravel* (uric acid); that the vegetable acids are less apt to cause the deposition of red gravel in the urine than the mineral ones. We conclude that all acids are very uncertain remedies in phosphatic gravel or calculi; that, at best, they are only palliative; and that, for the most part, when they do prove beneficial, it is by a tonic influence on the digestive organs and improving the functions of assimilation. When employed, it should always be in conjunction with the bitter tonics.]

tions into the urinary bladder have been advised, in order to wash away the phosphatic formation. A few drops of the hydrochloric acid, with as many of the vinum opii in tepid barley-water, may be injected daily. Dr. G. BIRD advises, in almost every case where phosphatic alkaline urine exists, to wash out the bladder by injections of warm water. (See also the treatment of *mucocystitis* in art. URINARY BLADDER, § 89-97.)

93. ix. DEPOSITS OF CARBONATE OF LIME.—Carbonate of lime sometimes occurs in small proportions in deposits of earthy phosphates, when the urine is decidedly alkaline, owing to the decomposition of the phosphate of lime by the carbonate of ammonia which replaces the urea. Its appearance is that of an amorphous powder; and its presence may be recognised by the addition of any dilute acid, which dissolves it with effervescence; but the deposit should be previously washed to deprive it of any adherent carbonate of ammonia.

94. x. DEPOSITS OF BLUE OR BLACK MATTERS.—Certain colouring matters, communicating to the urine a blue or black tint, the products of diseased action, are met with on rare occasions. Three blue pigments, viz., cyanurine, indigo, and percyanide of iron; and two black, melanourine and melanic acid, have been distinguished. These colours, as well as green, have been mentioned by many of the older writers noticed in the bibliography, and have doubtless been owing to the presence of blood or bile altered by the urine. —(a) *Cyanurine* was discovered by BRACCONNET, and noticed by several more recent observers. Urine containing it is of a deep blue colour, the colouring matter being deposited by rest, and readily separated by the filter. The origin of this substance, as well as its pathological indications, if any, are obscure, and merely furnish a subject of conjectural discussions to chemical pathologists.

95. (b) *Indigo* is sometimes prescribed empirically in some diseases, as epilepsy; and it may thus pass into the urine, and form a blue deposit. PROUT and SIMON have shown that it may be generated in the economy, the urine acquiring a dark blue colour, and depositing a substance of the same hue, which, when collected on a filter, presents all the characters of indigo. The origin and pathological indications of this substance, when not taken internally, are unknown.

96. (c) *Prussian blue, or sesqui-ferro-cyanide of iron*, has been found in the urine after taking the ferro-cyanide of potassium upon preparations of iron. It furnishes no pathological inferences.

97. (d) *Melanourine and melanic acid* are black pigments which have been rarely met with in the urine. It is probable that they are merely the colouring matters of the blood altered by the state of the urine. Many years ago a clergyman in London, with whom I was well acquainted, experienced a dangerous immersion in the river, and was saved with difficulty. He soon afterward began to pass black urine, for which I was requested to visit him. He complained only of a slight weight in the region of the kidneys. The urine was quite black, was passed in about the usual quantity, and was retained nearly the usual time. The lower extremities were not affected. A portion of the colouring matter was deposited, but the supernatant urine was not materially altered from its black colour. I attributed the colour to the escape of red globules of blood with

the urine, owing to congestion of the kidneys, and their alteration by the state of the urine. Conformably with this view, I directed blood to be taken from the loins by cupping. The urine soon afterward resumed its healthy appearance, and no farther complaint was made.

98. xi. ORGANIC DEPOSITS IN URINE.—The deposits in the urine which have been noticed above are recognisable by their forms and chemical properties; those which remain to be mentioned either possess or have possessed organization, and can be distinguished only by an examination by means of the microscope or of tests.

99. A. BLOOD AND ITS ELEMENTS are often seen in the urine, and suggest important pathological and therapeutical indications. The urine may contain only the serum of the blood, or liquor sanguinis; or with this a considerable proportion of red globules; or it may contain a very large proportion of blood, hardly or not at all changed from its normal characters.

100. (a) *Serous or albuminous urine* is readily indicated by heat, and by adding a drop of nitric acid, which coagulates the albumen contained in it. Urine containing much albumen is either free from, or contains but a very small amount of, colouring matter. The reddish urine in granular disease of the kidneys furnishes less albumen by heat than the straw-coloured. Nitric acid and a mixture of one part of nitric and three of hydrochloric acids are more delicate tests of the presence of albumen than heat. Several sources of fallacy have been pointed out by writers which should not be overlooked when resorting to these tests. 1st. Heat will produce a white precipitate in urine containing an excess of earthy phosphates, but this will disappear on adding a drop of nitric acid, and distinguish it from albumen. 2d. Nitric acid will produce white deposits in patients taking copaiba, cubebs, or other resinous substances; but heat has no such effect. 3d. Nitric acid will, in some instances, produce a buff-coloured amorphous deposit in the high-coloured urine in fever, but heat does not cause this change. 4th. Albumen combined with alkalis does not coagulate by heat; therefore nitric acid should be used if the urine be alkaline. 5th. Albumen in an incipient state may not be detected by heat, but readily by means of the acids.

101. Albumen is sometimes found in the urine in a coagulated state, presenting a tubular vermicular appearance, being casts of the uriniferous tubules of the kidneys, often with portions of epithelium adhering to them; and, according to Dr. G. JOHNSON, loaded with fatty globules. These casts, when recently passed, appear like large hairs, but form after a time a dirty-white sediment, which a solution of potash gelatinizes, and distinguishes from mucus. This deposit is pathognomonic of the changes which terminate in granular disorganization of the kidneys.

102. *Blood* passed in considerable quantity in the urine may either be more or less intimately mixed in the urine, or it may have coagulated in blackish masses like pieces of black currant-jelly, linear masses like leeches being passed through the urethra with great suffering. In the former case the blood generally is poured out in the kidneys or their pelves; in the latter it is most frequently effused in the bladder. In either case the urine is always more or less coloured, often so deeply as to present a Port-wine colour; the microscope showing some entire blood-globules,

and others with their investing membrane broken down, and their coloured contents diffused in the urine. If the quantity of urine be small, the urine may appear like the washings of meat, or of a dirty or dingy hue, the red globules being still recognisable by the microscope. The coagulation of the urine by repose seldom occurs: it is owing to the presence of fibrin, which, however, is very rarely effused without an admixture of blood-globules, giving the coagulum a reddish colour, or of a fatty matter, imparting to it a whitish or opaline hue.

103. *Hæmatosin*, or the colouring matter contained within the sacs of the blood-globules, imparts to the urine a deepness of tint in proportion to the quantity of the colouring matter which has escaped from the sacs of the blood-globules, or rather to the number of these globules which are ruptured. Generally, however, the urine, when recently voided, contains some globules that remain entire; and, with the colouring matter, more or less albumen, which is affected, as shown above, by heat and nitric acid, excepting that the coagula are more or less brown, owing to the presence of hæmatosin. When, however, the urine is much loaded with *purpurine*, or *uric acid*, or with *bile*, these may be mistaken for hæmatosin. The first of these will not be affected in colour or transparency by a boiling heat; the second is not affected by heat, and is at once distinguished by the characters of the deposit; the third may be detected by pouring a thin layer of the urine on a white plate or sheet of writing paper, and letting a drop or two of nitric acid fall upon it, when a change of colours, in which green and pink predominate, will be produced. *Hæmatoxylin*, *pareira*, *chamaphila*, and *senna*, the former especially, will impart a reddish or brownish hue to the urine; but these will be distinguished from hæmatosin by the knowledge of their having been taken, by the black precipitate produced by sulphate of iron when the first of these has produced the redness; and by the absence of albumen and hæmatosin as regards all of them.

104. The presence of blood-globules in the urine is best determined by the microscope. If the blood be recently effused, they will either be found adhering in rouleaux, or unaltered in figure. But if it have been effused for some time, or if the effusion has been slow, or the exudation of an asthenic character, the linear arrangement of the globules is lost, the investing membrane, being ruptured, is collapsed around their corpuscles or nuclei, and ultimately the globules appear irregular in their margins.

105. (b) *The pathological indications of the presence of the elements of blood, or of blood in any form, in the urine, has always been of importance; but it has become of even greater importance to the physician since the enlightened investigation by Dr. BRIGHT of the diseases of the kidneys.* When pure blood, or even the admixture of its globules in large quantity, is observed in the urine, it may be presumed that active or passive hæmorrhage from some part of the urinary passages has occurred; the more pure the blood, and the less intimately mixed with the urine, the more probable is the effusion to have taken place in the lower passages of the apparatus. If the quantity of hæmatosin be so small as only to tint the urine, it is to be presumed that both it and the albumen also present result from the congested state of the kidneys connected with

the cachectic inflammation of these organs, which terminates in the organic changes which render them incapable of eliminating the nitrogenized elements of urine and of depurating the blood, although the secreting power is so far preserved as to separate the albumen and water, this latter element being ultimately very incompletely removed. (See art. KIDNEYS, § 83, *et seq.*)

106. When the presence of albumen in the urine was first shown to be a proof of granular disease of the kidneys, I contended (see art. DROPSY, § 36, *et seq.*) that this state of urine existed in several other diseases, especially in the febrile and exanthematous maladies of children, and when congestion of the kidneys is occasioned by other affections or circumstances, although not always or continuously observed, that yet it was a contingent and occasional or temporary occurrence. Since this statement was made, from a varied observation, the truth of it has been confirmed by many subsequent observers. When blood is voided in large quantity, or when coagula are passed with the urine, breach of surface or lesion of a blood-vessel may be inferred; but the particular cause of lesion, whether congestion, rupture of a vessel, or injury, or irritation of a calculus, or malignant or fungoid disease, and the seat of either of these morbid conditions can be ascertained only from a careful examination of existing symptoms, in connexion with the changes in the urine just mentioned (§ 105, 106), and with the circumstances attending the retention and calls to void this excretion.

107. (c) *Therapeutical Intentions*.—These are varied, or even opposite, according to the conclusions at which the physician will arrive after due examination and consideration of the peculiarities of each case, respecting the seat, cause, and vital conditions of hæmaturia, as fully set forth under this head in the article HÆMORRHAGE. (See *Hæmorrhage from the Urinary Organs*, § 204–220.)

108. *B. PURULENT MATTER IN THE URINE.*—Pus is seen in the urine consequent upon supuration in the kidneys, or in any part of the urinary organs, or in parts communicating with the urinary apparatus. It is also contended that, in cases of abscess of internal viscera, the purulent collection is sometimes absorbed and discharged with the urine. But it is more probable that pus-globules, when absorbed, are metamorphosed, either during their passage into or during their circulation in the blood, and that they cannot be eliminated by secreting organs unless thus metamorphosed or reduced to simpler elements.

109. a. *The appearances of purulent urine vary with the seat of the disease.* This urine is generally acid or neutral. The pus falls to the bottom of the vessel by repose, and forms a dense homogeneous deposit, of a pale greenish or cream colour. It never hangs in a stringy form in the urine like mucus, unless the urine be alkaline, and it becomes uniformly diffused in the urine by agitation. If the deposited pus be agitated with an equal quantity of liquor potassæ, a dense translucent gelatinous mass, of a thick mucous appearance, is formed. When the pus is agitated with ether, fat is dissolved, and left in the form of butter-like globules, when the ether is allowed to evaporate. The urine decanted from the purulent deposit yields albumen on the application of heat or nitric acid. When purulent

urine is alkaline, the deposit is viscid, and is not readily diffused by agitation through the fluid, resembling some mucous deposits. The presence of albumen in the purulent urine, "and the conversion of the deposit into a white granular mass, destitute of its previous viscosity, by the addition of acetic acid," indicate the nature of the deposit. In females, the urine may contain a purulent matter derived from the vagina, in cases of leucorrhœa—a circumstance requiring consideration.

110. *b. Microscopic Characters.*—Pus consists of round globules, somewhat larger than blood-globules, floating in an albuminous fluid, or *liquor puris*, which differs from the *liquor sanguinis* chiefly in the absence of fibrin, and consequently in the inability of coagulating spontaneously. Under the microscope, the globules appear "white, roughly granular exteriorly, and are much more opaque than blood-globules. On the addition of a drop of acetic acid, the interior of the globule becomes visible, and is found to be filled with several transparent bodies or nuclei." Hence the pus-globule is a regularly organized body, consisting of a granular membrane enveloping transparent nuclei, being, in other words, a nucleated cell. (See DISEASE, § 131, 132, and the *Microscopic Characters* more fully in the art. Pus, and in URINARY BLADDER, § 48.)

111. *C. MUCUS* is present in healthy urine in very small quantity. When irritation exists in any part of the urinary apparatus the mucus is greatly increased, and generally in proportion to the amount and extent of it, this secretion varying from a flocculent cloud in the urine to the production of a fluid so viscid as to form a copious ropy deposit. This condition of the urine is generally alkaline, and undergoes a putrefactive change soon after it is passed, or even before being voided if it be long retained. Although it be acid when passed, it rapidly becomes ammoniacal. Mucus contains no albumen admitting of coagulation by heat or nitric acid (§ 100), and hence mucous urine simply "can never be albuminous like pus, unless the albumen be derived from some other source. Agitated with ether, mucus gives merely traces of fat, and in this respect also differs from pus." (For the *pathological and therapeutical* relations of Mucous Urine, see the art. URINARY BLADDER, § 47, *et pluries*.)

112. *D. EPITHELIUM.*—Exfoliation of the epithelial covering of the genito-urinary mucous surface is constantly taking place, but with very different rates of rapidity. This covering is sometimes partially detached, so as to appear like patches of membrane-like mucus; some of the epithelial cells being irregularly lacerated, others entire, and readily recognised by the aid of the microscope. When distended by fluid they are oval cells, which become irregularly angular and flattened when partially empty. When quite empty they present in each a central nucleus projecting above the surrounding surface. These cells are said sometimes to contain fat-globules, especially in the Morbus Brightii. When the exfoliation of epithelium is copious, a deposit is thereby formed in the urine, resembling mucus, but differing from it in the absence of viscosity. With liquor potassæ this deposit gelatinizes nearly as perfectly as when pus is present. When an abundance of epithelium is found in the urine, oxalate of lime often also is present; the irritation of the mucous surface of the urinary pas-

sages, especially in the kidneys, very probably at the same time that it detaches the epithelium, converts the uric acid and urates into the oxalate.

113. *E. SPERMATOCYTES*, or what has been called spermatic animalcules, are sometimes found in urinary deposits, when the urine of the male adult has been allowed to repose for a time.—*a.* The only means of distinctly determining the presence of semen in the urine is by ascertaining the existence of spermatozoa by the aid of the microscope. "These minute bodies never occur living in urine, unless protected by the presence of a deposit of pus, in which they retain their power of moving a long time after emission." In the microscope, "the spermatozoa will be observed as minute ovate bodies, provided with a delicate bristle-like tail, which becomes more distinct on allowing a drop of urine to dry on the glass. Mixed with these are generally found round granular bodies, rather larger than the body of a spermatozoon, and nearly opaque from the numerous asperities on the surface of the investing membrane. These appear to be identical with the seminal granules described by WAGNER and others." (*Op. cit.*, p. 359.)

114. *b.* The presence of spermatozoa in the urine furnishes certain *pathological indications* of much importance. They may be present owing to the discharge of urine immediately or soon after seminal emission, the urine washing away the portion of semen which may remain in the urethra; or owing to a costive motion having pressed upon the spermatic receptacles, so as to press out a portion of their contents. However the presence of these bodies in the urine may be accounted for, the fact that they are commonly observed in persons who have weakened their sexual organs, either by excessive female intercourse, or by the unnatural vice of masturbation, is indisputable; and in such persons chiefly, or only spermatozoa, and the much-discussed affection of spermatorrhœa, is observed. The pathological and therapeutical indications furnished by this condition of the urine are considered under the head of IMPOTENCE, and more fully under that of POLLUTION, *voluntary and involuntary*.

115. *F. FATTY OR OILY MATTER* has not unfrequently been found in the urine, generally, however, in minute traces only, and very rarely in any considerable quantity. It is most probable that some of the instances in which oil has been said to have existed in the urine have been those in which the oil-like pellicles of the earthy phosphates have formed on the surface of the urine. The genuine states of fatty urine have generally resembled milk in colour and opacity, and have gelatinized on cooling. The term chylous urine has been applied to these states by Dr. PROUT. Dr. EICHHOLZ and Dr. G. JOHNSON contended that oil or fat existed in the urine in granular disease of the kidneys, owing to the superabundance of fat in the epithelial cells of the tubular structure of the kidneys, and to the escape of these cells from the tubuli and admixture with the urine. But the quantity of fatty matter thus mingled with the urine is rarely such as to give rise to appearances indicative of its existence, unless the deposit be examined under the microscope, when the cells containing oil, sometimes presenting casts of the tubes from which they have been detached, may be observed.

116. In most cases of chylous urine, albumen is present in very varying quantity, and forms

with the fat an intimate admixture or emulsion. The fat may be obtained by agitating the urine with an equal quantity of ether in a tube. The presence of fat in albuminous urine may be viewed as a strong indication of organic disease of the kidneys; but the combination rarely exists in such a manner as to give rise to the chylous appearance of the urine. It should not be overlooked that instances sometimes occur in which hysterical females, to create interest in their cases, or to obtain other ends, have imparted a morbid appearance to their urine, by adding to it milk, or small quantities of blood or other matters, by which the medical attendant has been deceived. Such instances have come before me and other physicians with whom I am acquainted. I have rarely seen cases of chylous urine. The most remarkable instance of it which I have observed was in a mulatto young man from the West Indies. Dr. G. BIRD states that, in the chylous urine he has examined, he has failed in detecting under the microscope the slightest appearance of oil-globules, blood-disks, or pus-granules; the opacity appearing to depend upon the presence of particles so minute as to present no defined form. M. L'HERITIER has, however, remarked that oily globules can always be detected in fatty urine; and Dr. SIMON, of Berlin, has made the same remark, and has stated that he has met with three varieties of fatty urine: one in which the fat is merely diffused through it, and collects on its surface by repose, as in cases recorded by Dr. ELLIOTSON; the other in which the fat is combined with albumen; and a third, in which the fatty matter existed with casein as an emulsion, forming the true milky or chylous urine. Dr. BENGE JONES has investigated this state of the urine, and has arrived at the following conclusions respecting it:

1st. The fat on which the milky aspect of the urine depends appears after the absorption of chyle, but the albumen, fibrin, blood, and alkaline salts may be found even when no food has been taken, and consequently no chyle formed. 2d. During absolute rest, albumen disappears from the urine, and does not reappear in any quantity, even after taking food, unless active exercise is employed. A short time before rising early, the urine gelatinizes by repose, but is free from fat. 3d. This state of urine does not depend upon the presence of an excess of fat in the blood, as proved by actual analysis. 4th. The seat of this disease is probably some slight alteration in the structure of the kidneys, by which, when the circulation through these organs is most active, one or more of the constituents of the blood exude from the capillaries and escape into the urine.

Dr. G. R. BOUVIN, of Demerara (Dr. G. BIRD states), has observed cases of chylous urine so frequent in creoles and negroes as to be often epidemic in that country. This state of the urine appears to be attended by irritative fever and emaciation, as in diabetes. He attributes the disease to lesion of the assimilative functions; and he treats it by the free administration of a decoction of the mangrove bark (*Rhizophora racemosa*). This medicine acts freely on the skin, increases the secretion and alters the character of the urine, and improves the general health.*

117. *G. CONFEROID GROWTHS*.—*Torula Cerevisiæ*—*Fungoid Growths*—*Vibriones*, &c., have been described as existing in the urine, in certain states of the frame, chiefly characterized by remarkable depression of vital power. The existence of these may be imputed to the presence of albuminous, fibrinous, saccharine, or other matters in the urine, and to changes which have taken place in these after the urine has been discharged, although they may possibly be formed in the bladder, when the urine is long retained in these morbid states in this viscus, especially when the vital energies are very much depressed, and the other circumstances favourable to these productions, already adverted to (§ 82), are present.

118. *H. HYDATIDS* have been passed in the urine; but cases in which they thus have been observed are extremely rare. Instances have, however, been recorded in the Philosophical Transactions (No. 273), and in the Medical Observations and Inquiries by Mr. RUSSEL (vol. iii.). A case came before me many years ago, in which a number, varying in size from a small pea to that of a large bean, were passed in the course of two or three days. Soon afterward the case passed from under my observation, without being able to ascertain its issue.

119. *xii. FOREIGN BODIES*—*Worms*, &c., have been often found in the urine, in some cases in consequence of having been introduced into the bladder, in others from having been put into the urine with the intention of deception; and in more instances owing to their passage by ulceration, penetration, or otherwise, through the parietes of some portion of the digestive canal, or

glass vessel, a cotton-like, cloudy deposit first appeared, afterward oblong points or specks, which, increasing in number and agglomerating, covered the surface of the fluid and the sides of the vessel, in the form of a firm, tenacious pellicle. EQUISIER followed, sustaining the same positions. In 1840, Dr. G. BIRD published the results of his observations on the urine of thirty pregnant females, and came to the conclusion that the pellicle noticed by NAUCHÉ—as composed of the triple phosphates, with some granular and oily matter; and though furnishing a strong corroborative test of pregnancy, is not, however, an entirely reliable one. Our distinguished countryman, the late ELISHA K. KANE, in his inaugural dissertation (*Am. Journ. of Med. Science*, N. S., vol. iv., 1842), from a great number of experiments and observations, came to the following conclusions:

"1st. That the kiesteine is not peculiar to pregnancy, but may occur whenever the lacteal elements are secreted without a free discharge at the mammae.

"2d. That though sometimes obscurely developed, and occasionally simulated by other pellicles, it is generally distinguishable from all others.

"3d. That where pregnancy is possible, the exhibition of a clearly-defined kiesteine pellicle is one of the least equivocal proofs of that condition; and,

"4th. That when this pellicle is not found in the more advanced stages of supposed pregnancy, the probabilities, if the female be otherwise healthy, are as 20 to 1 (81 to 4), that the prognosis is incorrect."

More recently, Dr. G. T. ELLIOT, Jun., of New York (*N. Y. Journal of Med.*, Sept., 1856), has published the results of his experiments on the urine of 160 pregnant females, and concludes that there are no recognisable peculiarities in the urine of pregnancy, that there is nothing positive in the indications furnished by kiesteine, and that its appearances can scarcely ever be called "corroborative" of pregnancy (*Loc. cit.*, p. 181). On the whole, the opinion of LEHMANN seems most probable, viz., that "kiesteine is nothing else but the formation of crystals of triple phosphate, and fungoid and confervoid growths, which take place when the urine becomes alkaline" (*Phys. Chemistry*, Philad., 1856). According to Professor DRAVEN, kiesteine is composed of casein, butyric fat, and the phosphate of magnesia, and is a normal ingredient in the blood, especially of pregnancy, being generated from its albumenoid compounds at the rate of about 30 grs. per hour (*Human Phys.*, N. Y., 1856, p. 231).]

* *Kiesteine*.—In 1831, NAUCHÉ, of Paris, described a peculiar gelatino-albuminous ingredient, found, as he supposed, only in the urine of pregnancy. When the urine of a pregnant female was allowed to stand in a

abdominal parietes. Whoever may be desirous of perusing cases of this description will find a number of them related in the *Ephemerides of Natural Curiosities*, and in the *Memoirs of the French Academies*, and various other works enumerated by PLOUQUET and REUSS.

120. IV. GRAVEL.—*Urinary deposits*, such as are above described, are formed on the cooling of urine, and are, as described, either loose and pulverulent, or more concrete, crystalline, or sand-like. These deposits, although associated with, or symptomatic of, various diseases, may occasion, as respects their effects upon the urinary organs, but little disorder. But when deposits are formed in the warm urine within the urinary apparatus, owing either to the quantity of these matters contained in the urine, or to changes in the states of their constituents, or of temperature, vital endowment, &c., and are discharged with the urine in the form of a fine powder, or of crystalline, sand-like particles, or of small masses, then the disease is termed *gravel*, and the symptoms are sometimes very severe.

121. The discharge of such gritty matters as these with the urine is usually attended by symptoms of irritation, and pain in the region of the kidneys, ureters, bladder, and in the urethra, thereby constituting while characterizing the complaint commonly denominated gravel. The signs of irritation may be slight, or they may be severe in one or other of the situations just named, or even in two or more of them. But the signs, as well as the causes which produce this condition of the urine, are the same as those which attend the formation of calculi in the urinary apparatus, although they are very frequently much less severe. The chemical constitution of the gravel discharged is generally the same as that of urinary calculi; the difference consisting chiefly in the constituents precipitated from the urine being detached or incoherent, or forming numerous minute crystals, instead of large concretions, of many concentric layers. In the former case, the deposits within the urinary organs are washed away by the urine before they have been sufficiently long retained to concrete into a nucleus, or to become a large calculus—or to assume the characters now to be described.—*CALCULI*. The *treatment of gravel* is manifestly the same as that recommended for urinary deposits and *urinary calculi*. (See § 179, *et seq.*)

122. V. URINARY CONCRETIONS OR CALCULI.—Correct views as to the composition and formation of urinary concretions or calculi are of comparatively recent date. Previously to VAN HELMONT these concretions were believed to be derived from matters contained in the food and drink; but he contended that they are not formed from these sources. HALES confirmed the opinions of VAN HELMONT as to the differences between urinary concretions and common stones, and first directed attention to the discovery of a solvent for these concretions. BOYLE, WHYTT, ALSTON, SLARE, and others, subsequently speculated on the subject of solvents for calculi. WHYTT proposed lime-water for this purpose; and ALSTON contended that, although lime-water is of some service in urinary affections, it is not a solvent of calculi. At the commencement of the last century the Leyden School of Medicine taught more correct doctrines of the formation of urinary concretions than had previously been entertained, and showed that these nuclei were de-

rived from the kidneys or from the bladder. VAN SWIETEN contended that the elements of calculi exist in the urine of men the most healthy, and that if the urine be evacuated before these elements concur in the formation of a concretion, no such production takes place. He considered that the concurrence of the elements in the formation of calculi is exerted more or less slowly in different persons; and that according to the rapidity or slowness of such formation, the concretions are formed either in the kidneys or in the bladder. In 1776 SCHEELE discovered uric acid, and found it in all the calculi he examined, as well as in all the urine. BERGMANN soon afterward discovered lime in certain concretions. In 1797 WOLLASTON published his discovery of three calculi in addition to those described by SCHEELE—viz, the fusible, mulberry, and the bone-earth—and demonstrated the chemical composition of these calculi. A few years afterward, FOURCROY and VAUQUELIN announced the presence of urate of ammonia and silica in urinary concretions. Dr. WOLLASTON, in 1810, discovered cystic oxide as an urinary calculus. Dr. MARCET published an able work on urinary concretions in 1817; and Dr. PROUT furnished, in 1821, more extended and exact views as to their formation in his treatise on this subject. Since this period the works of Mr. WILSON, of Sir B. C. BRODIE, of Mr. CROSSE, of Norwich, of Dr. T. THOMSON, of Dr. CUMIN, of Dr. OWEN REES, of Dr. BENGE JONES, of Mr. COULSON, and the more recent publications of Dr. PROUT, have carried the pathology and treatment of urinary concretions to their present very high position in practical medicine and surgery.

123. A. The *form* of urinary concretions is generally more or less globular or ovoid, especially after remaining long in the bladder. Renal calculi are, however, often of an irregular form, owing to their being moulded in the pelvis of the kidney, &c., or are branched like a coralline. Sometimes those found in the ureter are cylindrical. When two or more calculi exist in the bladder they often present a polyhedral or an irregular shape, from one or more of their sides being flattened, either by attrition or by diminished concentric deposition on these sides. When the calculi formed in the kidneys and passed into the bladder are irregular or branched, the shape of the nuclei which they constitute is not altogether removed by the successive deposits formed around them in the bladder. When a portion of a calculus is embraced by a fold of the mucous membrane, or sacculated between the muscular fasciculi or coats of the bladder, the part exposed to the urine increases by successive deposits, so that the sacculated portion ultimately appears to form a pedicle to the entire calculus. (COULSON.)

124. B. The *size and weight* of urinary concretions are most various—ranging from a few grains to many ounces. EARLE mentions one weighing forty-four ounces; LISTER, one of fifty-one ounces; and MORAND, one weighing six pounds three ounces! The concretion described by EARLE measured sixteen inches in circumference. The *number* of calculi coexisting in the bladder or in the kidneys is often very various. Most frequently vesical calculi are solitary; but two or even more are not uncommon. They are often numerous in one or both kidneys, but generally not equally so in both. From ten to twenty or even thirty in both are not uncommon. An

equally great number are very rarely found in the bladder, although it is stated that fifty-nine small calculi were found in the bladder of BUFFON.

125. *C.* The surface of calculi also varies in its colour and characters. The colour passes from "white through pale yellow to brown, brownish-green, and even almost to black. Phosphatic calculi are often white; those of uric acid vary from yellow to brown; those of xanthic oxide have a cinnamon brown tint; while calculi of oxalate of lime vary from yellow to yellowish-brown, brownish-green, or even blackish-green." The surface is either smooth, and even polished, or covered with minute crystals, or more or less rough, and even tuberculated, as in the mulberry calculus.

126. *D.* The internal structure or section of a calculus is either uniform, or formed of concentric layers surrounding the nucleus; and, in addition to the concentric lines indicating the separation of the layers, other lines, radiating from the nucleus to the periphery, are observed in many of the concretions. In some the concentric layers are easily separable, in others very firmly adherent, especially when the layers are indicated only by very faint lines, as in the oxalate of lime calculus.

127. *E.* The chemical composition of the nu-

cleus, and of the concentric layers or deposits, may be the same; or that of the superimposed strata may differ from the nucleus, or each of the strata may be different. The constituents are, first, those which form entire calculi or layers, in a nearly pure state, and, secondly, those which contain, associated with these constituents, small quantities of other substances.

128. *First Class.*—1. Uric acid. 2. Uric or xanthic oxide. 3. Urate of ammonia. 4. Cystic oxide, or cystine. 5. Ammoniaco-magnesian phosphate. 6. Oxalate of lime. 7. Phosphate of lime. 8. Carbonate of lime. 9. Mixed phosphate of lime, and phosphate of magnesia and ammonia.

129. *Second Class.*—Those concretions which, with the foregoing, contain the following in small quantities: 1. Urate of potass. 2. Urate of soda. 3. Urate of lime. 4. Urate of magnesia. 5. Carbonate of magnesia. 6. Silica. 7. Organic matter, fat, extractive, albumen, vesical mucus, blood. In addition to these, oxide of iron, benzoate of ammonia, phosphate of iron, urea, oxalate of ammonia, hydrochlorate of ammonia, in very minute quantities, are said to have been formed.

130. The following TABLE, drawn up by Dr. BENCE JONES, shows the readiest means of ascertaining the composition of urinary calculi:

1. By Heat.	2. By Acids.	3. By Alkalies.	Nature of Calculus.	Additional Tests.
Destroyed by heat.	With nitric acid, red.	Soluble in carbonate of potash, evolving ammonia.	Urate of ammonia.	Soluble in water when boiled.
		Soluble in carbonate of potash, evolving no ammonia.	Uric acid.	Not soluble in water when boiled.
	With nitric acid, not red.	In ammonia, soluble, crystallizing when evaporated.	Cystic oxide.	Soluble in strong caustic potash; the solution gives sulphuret of lead when boiled with a solution of acetate of lead.
In ammonia, soluble, not crystallizing when evaporated.		Uric or xanthic acid.	Dissolves without effervescence in nitric acid, leaving a lemon-coloured residue, soluble in strong sulphuric acid, not precipitated by dilution.	
Not destroyed by heat.	With hydrochloric acid, soluble; before heat effervesces.	In ammonia with difficulty soluble, not crystallizing.	Fibrin.	With nitric acid becomes yellow.
		Solution in acid, when neutralized, gives a white precipitate with carbonated alkalies and oxalate of ammonia.	Carbonate of lime.	Soluble in dilute acetic acid, with effervescence.
	With hydrochloric acid, soluble; after heat effervesces.	Solution in acid, when neutralized, gives a white precipitate with carbonated alkalies and oxalate of ammonia.	Oxalate of lime.	Insoluble in acetic acid. Decomposed by strong sulphuric acid, yielding carbonic acid and carbonic oxide.
		Solution in acid, with excess of ammonia, gives a white crystalline precipitate.	Phosphate of ammonia and magnesia.	With phosphate of lime is very fusible before the blow-pipe.
	With hydrochloric acid, soluble, without effervescence, or before or after heat.	Solution in acid, with excess of ammonia, gives an amorphous white precipitate.	Phosphate of lime.	With phosphate of magnesia and ammonia is very fusible before the blow-pipe.
Solution in acid, with excess of ammonia, gives a white, partly crystalline, partly amorphous precipitate.		Mixed phosphates.	Easily fusible, without addition, before the blow-pipe.	

131. *i. Uric Acid Calculus.*—Uric acid is the most frequent constituent of urinary concretions, either alone or in combination with bases, especially urate of ammonia, &c. Calculi consisting of uric acid only, or containing in addition a small quantity of colouring matter, are more common than those of any other single constituent. Mr. COULSON states the relative number of pure uric acid calculi in the Museum of the College of Surgeons to be one third of the whole collection. Dr. PROUT estimated the general average of this concretion in the several known collections to be nearly 1:6½. The relative proportions of those

composed chiefly of uric acid mixed with urate of ammonia, and of urate of ammonia with minute proportions of urate and oxalate of lime and phosphates, are estimated at 1:3½; and including the calculi in which the nuclei are formed of uric acid, the proportion is about 1:1½. The calculi into which uric acid enters in larger or smaller proportions, as one of the constituents, in the Collection of the London College of Surgeons, are as 1 to 1.36 of the whole number. Two chief varieties of this calculus consist—1st, of that in which the uric acid is deposited in more or less distinct concentric layers, the section of the calculus pre-

senting a series of concentric circles of a compact and semi-crystalline structure; 2d, of that in which the acid forms a mass of crystalline amorphous grains. These varieties, however, often are mixed, or pass into each other. The first of these have a somewhat granular or finely tuberculated, but smooth or polished surface. When broken, the fragments are angular, whose surfaces are fibrous, as if the concretion were composed of crystalline fibres radiating from the centre to the circumference. The fracture is always in the direction of these radiating fibres and of the concentric layers. The second variety, in which no concentric lamellæ are seen, consists either of a firm aggregation of crystalline grains presenting a radiated appearance, or of a porous and earthy structure, often more or less loosely cohering. These calculi are less regular than the former, "have a rough surface, a granular and unsymmetrical fracture, and are most frequent in the kidneys. The nucleus of the laminated variety frequently presents this character. This form of calculus is more liable than the compact laminated variety to spontaneous fracture in the bladder." Calculi sometimes present cracks in the direction of the radiating fibres, probably owing to an unequal density in the deposits.*

[* CHARACTERISTICS AND TESTS OF URINARY DEPOSITS.

I. Coloured.

(A.) *Crystalline*, which is uric acid, rhombic form, or square tables, soluble in nitric acid by heat in effervescence; on evaporation, leaves a beautiful pink deposit (*mureid* of Liebig), becoming purple on the addition of ammonia; soluble in a boiling solution of potash, from which hydrochloric acid precipitates it as a white, gelatinous substance, speedily becoming crystalline. Before the blow-pipe blackens and dissipates with a peculiar animal odour.

(B.) *Amorphous*, which may be,

I. *Pink, red, or yellow Urate of Ammonia*; is soluble in hot water, and again deposited on cooling; soluble in boiling solution of carbonate of potassa; boiled with solution of potassa, evolves ammonia; has all the characters of uric acid with nitric acid. Before the blow-pipe comport itself as uric acid, except that it gives out ammonia and decrepitates strongly.

II. *Red or brown Blood*.—Urine becomes opaque by heat or nitric acid; microscope detects the blood disks, which often subside, and form a distinct layer at the bottom of the vessel. Chloride of sodium and other neutral salts heighten the colour.

III. *Green or brown Bile*.—If from the brown colouring matter (biliphoen), on addition of nitric acid, the urine becomes blue, then green, afterward violet and red, and lastly assumes a yellow or yellowish-brown colour; if in small quantity, the intermediate colours are not observed; hydrochloric acid changes the urine to green. If from *bilin*, this may be detected by *Pettinkofer's test*, as follows: (Add to the urine, by drops, two thirds of its volume of sulphuric acid, keeping the mixture below 144°; add a few drops of a solution of cane-sugar (1 to 5 of water), and shake the mixture, when, if *bilin* be present, a violet-red colour will be developed.)

II. Colourless.

(A.) *Crystalline*, which may be,

I. *Oxalate of Lime*.—Octahedral or quadrilateral crystals, insoluble in acetic acid, soluble in nitric and hydrochloric acids; boiling with carbonate of potash forms soluble oxalate of potash and insoluble carbonate of lime. The former gives characteristic reactions with chloride of calcium, sulphate of copper, and nitrate of silver; before blow-pipe becomes carbonate of lime. On continuing the heat, lime only is left, giving out heat on the addition of water, and browning turmeric paper.

II. *Phosphate of Ammonia and Magnesia* (triple phosphate).—Right rectangular, or trilateral crystals, soluble in diluted mineral and acetic acids, from which, by an addition of ammonia, precipitated in a crystalline form; soluble in boiling solution of potassa, with evolution of ammonia. Before the blow-pipe gives off ammonia, and runs into a white enamel; addition of phosphate of lime imparts ready fusibility.

III. *Cystine*, in simple or compound tables, insoluble in boiling water, soluble in ammonia (with odour of sweet-briar) and alkalies, and precipitated by acetic acid;

132. A third variety of uric acid calculus is known as the pisiform, and is very common. It is seldom solitary; many may exist at the same time in the bladder, and some may be voided by the urethra. They are chiefly formed in the kidneys, and are rarely larger than a common bean or large pea. They have irregular angular shapes caused by attrition against each other, are crystalline, laminated near the surface, and often coated with a thin layer of urate of ammonia.

133. The specific gravity of uric acid calculus varies with the density, and is usually from 1.5 to 1.786; but it has been observed in rare instances as low as 1.276. The colour of this calculus varies from pure white to a deep brownish-red, the colouring matter being of the same nature as that of the urine. (§ 18.) Uric acid is insoluble in alcohol and ether, but is soluble in solutions of potash and soda when heated, and in phosphate and biborate of soda, and is precipitated from these by acids. Solutions of the alkaline bicarbonates do not dissolve it. Nitric acid dissolves and decomposes it, equal volumes of carbonic acid and nitrogen being evolved. "Sulphuric and hydrochloric acids do not affect it. Uric acid is a feeble acid, but combines with bases, and forms salts with them. The alkaline urates are sparingly soluble, but very much more so than the pure acid."

134. ii. *Urate of ammonia calculus*, unmixed, is rare. In the collection of the College of Surgeons it exists in the proportion only of one in 500, although this substance forms the nucleus of nearly one third of the whole collection.—(Coulson.) Dr. Prout, in 1823, first fully demonstrated the nature of this concretion, which seldom exceeds an inch in diameter, and is almost peculiar to childhood. It very rarely occurs in an unmixed state after puberty, and its formation is attended by much constitutional irritation. It is flattened, ovoid, smooth, of a brownish-grey or clay colour, often with a greenish tinge. It is usually compact in structure, earthy and brittle, consisting of thin concentric layers, so closely applied to each other as to appear homogeneous. The laminæ are, however, easily separated. Urate of ammonia is a common deposit from urine, having an alkaline reaction, carrying with it more or less colouring matter, which gives it a yellow or brown hue. In its pure state it is white, and much more soluble in water than uric acid.

135. This salt is often associated with oxalate of lime in calculi, the formation of this latter being preceded by a condition of the urine which favours the deposit of urate of ammonia, so that the nucleus may be formed of urate of ammonia, while the surrounding layers are a mixture of these salts. These calculi sometimes also con-

insoluble in alcohol, tartaric and oxalic acids, and bicarbonate of ammonia.

(B.) *Amorphous*, may be,

I. *Phosphate of Lime*, readily soluble in dilute hydrochloric and nitric acids, sparingly in acetic; precipitated by ammonia in an amorphous condition, forming, when collected on a filter, a horny mass; oxalate of ammonia in these solutions gives a white precipitate. Before the blow-pipe, first black, then white, leaving an ash which is neutral.

II. *Urate of Ammonia*.—Characters as above. (Coloured B.)

Pus.—The microscope detects pus globules. The urine coagulates more or less by heat; soluble in a solution of potassa, forming a tenacious, glairy fluid.

Mucus.—Insoluble in potassa; imparts little or no albumen to the urine; therefore slight or no coagulability by heat, &c.]

tain a small quantity of urate of lime. Urate of ammonia is also frequently associated with the earthy phosphates, either as a nucleus or in alternate layers, or mixed in various proportions with the other constituents.

136. iii. *Xanthic or uric oxide calculus* is so very rare as hardly to deserve notice, only four specimens of it having been found. It may be distinguished by the means stated in the Table given above (§ 130).

137. iv. *Cystic oxide calculus* is also rare. It is a product of the kidneys only, and hence should be differently named. Dr. PROUT found it only in four out of seven museums. That of the College of Surgeons contains one or two specimens. It is small, round, and yellowish, with a smooth semi-transparent and glistening surface. This substance is generally free from admixture with others; "but uric acid sometimes forms the nucleus, and a layer of uric acid has been found surrounding a nucleus of cystic oxide. It is also occasionally associated with ammoniaco-magnesian phosphate and carbonate of magnesia."

138. v. *Oxalate of lime calculus*, in an unmixed state, exists in the Museum of the College of Surgeons in the proportion of 1:20; in that of Saint Bartholomew, as 1:15; and in that of Guy's Hospital, as 1:14½. When oxalate of lime calculi having nuclei of urate of ammonia are included, the proportion in the Museum of the College of Surgeons is 1 in 3½. If all the calculi be taken in which the oxalate of lime exists in any amount, then the proportion is, according to Dr. PROUT, in St. Bartholomew's Hospital, 1:4½; in Guy's, 1:4; in Norwich, 1:7½; in Manchester, 1:6½; in Bristol, 1:3½; in Swabia, 1:27; and in Copenhagen, 1:2½, the average proportion being 1:4½. Oxalate of lime calculus is rarely pure, being associated with urate of ammonia, uric acid, urate and carbonate of lime, colouring matter, and blood. This calculus, long known by the name of Mulberry Calculus from its tuberculated surface and its resemblance to that fruit, has usually a rounded shape, its surface being dark-brown, or nearly black. Its internal structure is compact and hard, imperfectly lamellated, the layers forming waving lines, the colour of which is such as to give the surface of its section a resemblance to a section of a piece of gnarled oak, varying from white or yellow to yellowish-brown, or dark brownish-green. The tubercles of the surface appear to consist of stellate crystals. A second variety of the oxalate of lime calculus is crystalline throughout, its surface being studded with crystals of the oxalate in acutely-angled octahedra, these being nearly pure oxalate of lime. A third variety consists of small rounded masses, with a smooth, polished surface, known as the hemp-seed calculi. It is occasionally crystalline at the centre and laminated toward the surface, but the laminæ are so fine as to give the section almost a compact appearance. It is composed of mixed oxalate and phosphate of lime in variable proportions.

139. vi. *Phosphate of lime calculus* is rare, especially in a state of purity. Two varieties have been described, "one evidently of renal, the other of vesical origin. Although entire calculi of pure phosphate of lime are uncommon, this substance is often found nearly pure in the laminæ of alternating calculi." Dr. PROUT states that calculi of phosphate of lime are in the ratio of 1:32½ in St. Bartholomew's Hospital; of 1:29 in Guy's;

of 1:132 in Norwich; and of 1:155 in the Bristol hospital. The general proportion of these calculi to others is 1:117. No specimen exists in the Museum of the College of Surgeons, and in some other collections. The calculi considered renal are composed of the neutral phosphate of lime; those considered vesical are more common than the former. Concretions of neutral phosphate of lime are usually pale-brown, with a polished surface, regularly laminated, and the laminæ so slightly adherent as to be easily separable into concentric crusts. In some, radiating lines are seen perpendicular to the laminæ. Those calculi contain animal matter which is precipitated from the alkaline urine with the phosphate of lime.

140. vii. *Ammoniaco-magnesian phosphate calculus* is commonly known as the "triple phosphate." This double salt rarely forms an entire calculus, but is a very common constituent of other calculi, either mixed with phosphate of lime, as in the fusible calculus, or forming layers in alternating calculi. The proportion of calculi consisting of pure phosphate of magnesia and ammonia, in the collection of St. Bartholomew, is as 1:129; in Guy's, as 1:43½; in the Bristol hospital, 1:218; in Copenhagen, 1:19½; in the Museum of the College of Surgeons, 1:200; while the other collections mentioned by Dr. PROUT contain no specimen. The general ratio is 1:126½. Ammoniaco-magnesian phosphate is a frequent deposit from alkaline urine, but usually mixed with more or less phosphate of lime. Calculi of this double salt "are generally white, uneven, and roughened by the projecting summits of the crystals, which are transparent in the recent state, but opaque and without lustre after being kept for some time. These calculi are either not laminated or imperfectly so, are friable and easily reduced to powder. But occasionally they are hard, compact, and laminated; exhibiting a semi-transparent crystalline fracture, which gives them the aspect of alabaster." (COULSON, *Op. cit.*, p. 291.)

141. viii. *Fusible Calculus*.—Calculi known by this name consist of a mixture of phosphate of magnesia and ammonia, with phosphate of lime in very variable proportions; and they form a considerable portion of all collections. In the College of Surgeons they are as 1:13½; in St. Bartholomew's as 1:12½; in Guy's, 1:3½; in Norwich, as 1:19; in Manchester, 1:8½; in Bristol, 1:12; in Swabia, 1:11½; and in Copenhagen, as 1:19½, according to PROUT, the average proportion being 1:12½. Fusible calculi are white, gray, or dull yellow, and more friable than any others, "being sometimes so soft as to whiten the fingers like chalk when handled: these are not laminated. Others have distinct lamellæ, with sparkling crystals of triple phosphate between them, which are so slightly adherent as to be readily separated; others, again, are composed of crystals aggregated into a confused mass." These calculi are usually globular or ovoid, but sometimes very irregular in shape, being occasionally moulded by the cavity in which they are formed. "They often attain a large size, and sometimes fill the whole cavity of the bladder; in this case impressions of the folds of the mucous membrane are visible on the surface, and when two or more in the bladder, they take a cubic or tetrahedral form." Excrescences composed of triple phosphate are sometimes found, resembling pearls. The ammoniaco-magnesian

phosphate is most abundant in those which have a shining crystalline texture, the phosphate of lime in the earthy and amorphous variety. The fusible calculus is found in all parts of the urinary organs, and in large cysts, or in cavities in the prostate gland. According to Mr. TAYLOR, the earthy phosphates are rarely succeeded by any other deposit; the only exceptions being one in the College of Surgeons, in which layers of mixed phosphates exist in an oxalate of lime calculus, and one in St. Bartholomew's Hospital, in which a fusible calculus is surrounded by a layer of uric acid. The two ingredients of fusible calculi seem to have a distinct origin, the ammoniaco-magnesian phosphate being derived from the urine, while the phosphate, with a small proportion of carbonate of lime, is secreted together with mucus by the irritated mucous membrane. This is shown in calculi formed around a foreign body introduced into the bladder. This body is first incrustated with phosphate and carbonate of lime, derived, it is believed, chiefly from the mucous surface of the bladder; and subsequently, the irritation being extended to the kidneys, the urine becomes alkaline, and ammoniaco-magnesian phosphate is deposited, the layers near the nucleus containing more phosphate of lime than those near the surface of the calculus. As a secondary deposit the mixed phosphates are very common, few calculi remaining for a long period in the bladder without being incrustated by them. The uric acid calculus is least subject to this incrustation. These calculi commonly contain urate of ammonia and animal matter in considerable proportion, together with carbonate and urate of lime and uric acid.

142. ix. *Carbonate of lime calculus*, associated only with a little animal matter, is very rare in the human subject, but common in herbivorous animals, usually mixed in these with carbonate of magnesia. Carbonate of lime is, however, often found in variable proportion in the oxalate of lime and phosphatic calculi. BRUGNATELLI, PROUT, and SMITH have described the carbonate of lime calculi. They are always small, the largest not exceeding the size of a large almond; are white or gray, but sometimes yellow, brown, or reddish, and the surface is dusted over with a white powder. They show no concentric laminæ, but irregular waved lines similar to those in the mulberry calculus. They are sometimes remarkably hard, and capable of receiving a high polish. Others passed by the urethra of a rounded and flattened form are compact, lamellar, and light brown. "No specimens of this calculus exist in the museums enumerated by Dr. PROUT, nor in that of the College of Surgeons." "Mr. SMITH describes eighteen removed from the bladder of a young man; and BRUGNATELLI forty-eight from a similar source, and sixteen, the size of a nut, from a woman."

143. x. *Alternating calculi* form a very large proportion of those formed in the human urinary apparatus. This alternation of the constituents in the layers of the same calculus is manifestly owing to successive changes in the urinary secretion, depending upon varying states of the constitution and vital and assimilative power. Alternating calculi consist of a series of alternating layers, differing in chemical composition. Some are composed of two layers, a nucleus of uric acid being covered by a deposit of urate of ammonia, or of oxalate of lime, or phosphate of lime,

or mixed phosphates. The nucleus may be oxalate of lime, followed by uric acid, or urate of ammonia, phosphate of lime, or mixed phosphates. "Other calculi have three differently-constituted layers; thus, a nucleus of uric acid may have deposits of oxalate of lime and mixed phosphates, or oxalate of lime and uric acid; or a nucleus of oxalate of lime, covered by uric acid and urate of ammonia; or a nucleus of mixed phosphates followed by phosphate of lime and mixed phosphates. Others, again, consist of four or even more layers: thus, a nucleus of uric acid incrustated by urate of ammonia, uric acid, and urate of ammonia; or oxalate of lime, followed by uric acid, oxalate of lime, phosphate of lime," &c. (*Op. cit.*, 296.)

144. The proportion of *alternating calculi*, of two layers differing in chemical constitution, appears from several sources to average 1:2½. The proportion of calculi consisting of three alternations are 1:8½; and of those of four alternations in the Norwich collection are 1:26½. The order in which different deposits succeed each other in calculi has been examined by Dr. PROUT, with the view of elucidating the changes in the economy upon which this order depends. He found that the frequency of alternation of uric acid and oxalate of lime is nearly equal; that oxalate of lime follows urate of ammonia more frequently than uric acid; that the general ratio in which phosphates succeed other deposits in all the collections is 1:4½; and that a decided deposition of the mixed phosphates in calculi is not followed by other deposits.

145. xi. *Fibrinous calculus* was first described by Dr. MARCET. It is stated by Dr. PROUT to be usually of an amber colour and waxy consistence, with more or less of a fibrous texture. As to the chemical tests for this and the other calculi described above, I must refer the reader to the *Table* given above from Dr. BENGE JONES (§ 130); and to the chapter on "The Chemistry of Urinary Concretions," in Mr. COULSON's able work already referred to.

[*Chemical Composition of Calculi in the United States.*—It is to be regretted that so little attention has been paid to the chemical analysis of our calculi. So far as they have yet been ascertained, they are as follows:

Of the 15 calculi, removed from as many patients, by Dr. J. MASON WARREN, of Boston, 2 were of pure lithic acid; 1 lithic acid with layers of phosphates; 3 phosphate of lime; 3 oxalate of lime; 2 oxalate of lime, with phosphates; 1 cystic oxide; 2 triple phosphates.

Of the 22 calculi, in the Museum of the Boston Society for Medical Improvement, from various parts of New England, 5 consist of uric acid, surrounded in one by thin layers of oxalate of lime and the mixed phosphates; 3 of uric acid and the urates; 1 of urate of ammonia; 2 of uric acid and mixed phosphates; 1 of urate of ammonia and mixed phosphates; 1 of uric acid and urate of ammonia, inclosed by mixed phosphates; 1 of uric acid and mixed phosphates, with urates of potash and ammonia; 1 of urate of ammonia and oxalate of lime; 2 of phosphate of lime; 2 of mixed phosphates; 2 of oxalate of lime; and 1 of oxalate of lime and mixed phosphates.

Of 5 operations for stone, performed by Professor F. H. HAMILTON, of Buffalo, 1 was a fusible calculus, with oxalate of lime as a nucleus; 1 urate of ammonia; 1 fusible calculus with carbon-

ate of lime; 1 fusible calculus with traces of lithates.

Of 22 calculi removed by Professor VAN BUREN, of New York, 2 were pure lithic acid; the rest were compound in their character, principally triple phosphates.

Of 14 cases of lithotomy performed by Dr. J. DICKSON, of Alleghany, Pennsylvania, in 13 the stone was lithic acid; in 1 phosphate of lime. Of the cases of urinary disease occurring in Western Pennsylvania and Ohio, the same surgeon states that the great majority labour under the lithic acid diathesis, about ten per cent. under the phosphatic, and about five per cent. under the oxalic.

Dr. CHARLES FRICK, of Baltimore, states that the great majority of urinary concretions in that city are composed either of uric acid or oxalate of lime, the phosphatic being very rare; of 32 separate specimens of calculi removed by Professor N. R. SMITH, of Baltimore, the same chemist found, on analysis, 4 of pure uric acid; 4 of pure urate of ammonia; 10 of pure oxalate of lime; 6 of phosphates; 2 of urate of lime; 1 of pure cystine; 15 contained uric acid, either alone or combined. The patients came from different parts of the Middle and Southern States.

Of 4 cases of calculi removed by Dr. OGIER, of Charleston, South Carolina, 2 were mulberry, and 1 principally phosphate of ammonia and magnesia.

Of 71 separate specimens of calculi removed by Dr. DUDLEY, of Kentucky, the results of analysis by Professor PETER, arranged with reference to the nuclei and bodies of the calculi, are as follows:

1. Predominance of the uric acid in the nucleus in 36	6
2. " of urate of ammonia " 41	38
3. " of oxalate of lime " 14	
4. " of earthy phosphates " 8	
5. " of cystine " 3	2
6. " of foreign substance " 4	3
	<hr/> 71

Simple Calculi; whole number, 31.

1. Predominance of uric acid in the concretion	5
2. " of urate of ammonia " 9	
3. " of oxalate of lime " 9	
4. " of earthy phosphates " 6	
5. " of cystine " 2	
	<hr/> 31

Compound Calculi; whole number, 40.

II. Number of specimens in which uric acid predominated:

Number of calculi having a nucleus of uric acid, 1.

A. Nucleus of urate of ammonia:

1. Bodies principally oxalate of lime	10
2. " " urate of ammonia	7
3. " " uric acid	3
4. " " fusible	9
	<hr/> 29

III. Number of specimens in which oxalate of lime predominated:

A. Nucleus of oxalate of lime:

1. Bodies principally phosphates	2
2. " " uric acid	2
3. " " urate of ammonia	1
	<hr/> 5

IV. Number in which earthy phosphates predominated:

A. Nucleus of earthy phosphates:

1. Bodies principally phosphate of lime	1
2. " " fusible	1
	<hr/> 2

V. Number in which fusible phosphates predominated:

A. Nucleus of foreign substances:

1. Bodies, triple phosphates, phosphate of lime, and urate of ammonia	1
2. Bodies fusible, trace of uric acid and urate of ammonia	1
3. Bodies fusible	1
	<hr/> 3

Total..... 40

The conclusions arrived at by Dr. PETER are, first, that calculous diseases are more frequent in the limestone than in the freestone regions of Kentucky; and, secondly, that there is a larger proportion of phosphatic and oxalate of lime deposits, with a greater number of nuclei of urate of ammonia, and fewer of pure uric acid in the limestone than in the freestone districts of the State, or where the water is free from calculous matter.

Dr. E. B. HASKINS has analyzed 176 Tennessee calculi, of which 107 were duplicates, the weight of the concretions ranging from 2 grains to 1027, the average being 91 grains, and the aggregate 16,038; the lowest specific gravity 1.198, the highest 1.812; average, 1.509. Of this number there were of

Earthy phosphates, 9, with an average spec. gr. of 1.338	
Urates, 5, " " " 1.604	
Oxalate of lime, 1, " " " 1.659	
Mixed, 30, " " " 1.538	

Chemical Results.—The whole number of calculi analyzed was, as already stated, 176, 107 being duplicates, leaving thus 69 separate specimens. The results are arranged with reference to the nuclei and bodies of the concretions:

1. Predominance of the urates in the nuclei, 43 (3 duplicates)	45
2. Predominance of oxalate of lime in the nuclei, 20 (6 duplicates)	14
3. Predominance of triple phosphate in the nuclei, 101 (95 duplicates)	6
4. Predominance of phosphate of lime in the nuclei	9
5. Predominance of uric acid in the nuclei, 4 (3 duplicates)	1
6. Predominance of foreign matter	1
	<hr/> 69

The number of *simple calculi*, or nuclei without bodies, was 44. The number of compound concretions, or those having a body upon a nucleus, was 132, of which 78 were duplicates, leaving 54 separate specimens.

1. Predominance of urates in the bodies	8
2. " of triple phosphates in the bodies, 93 (75 duplicates)	18
3. Predominance of oxalate of lime in the bodies	15
4. " of phosphate of lime in the bodies, 15 (3 duplicates)	12
5. Predominance of uric acid in the bodies	1
	<hr/> 54

The *compound calculi*, or those having both a body and nucleus, may be arranged as follows:

I. Number of specimens in which urates predominated:

1. Number of calculi having nuclei of urates 8

II. Number of triple phosphate bodies, 93 (75 duplicates):

1. Number having nuclei of triple phosphate, 76 (75 duplicates)	1
2. Number having nuclei of urates	12
3. " " of oxalate of lime	5
	<hr/> 18

III. Number of phosphate of lime bodies, 14 (2 duplicates):

1. Number having nuclei of urates	7
2. " " of triple phosphate, 4 (2 duplicates)	2
3. Number having nuclei of oxalate of lime	3
	<hr/> 12

IV. Number of oxalate of lime bodies:

1. Number having nuclei of oxalate of lime	2
2. " " of urates*	12
3. " " of foreign matter	1
	<hr/> 15

V. Number of uric acid bodies:

Number having nuclei of urates	1
Total	<hr/> 54

[* Dr. HASKINS uses the term "urates" instead of "urate" of ammonia, because he has never found this substance to exist in any other form than in combination with urate of lime, or of soda, or both.]

These results are very similar to those of the Kentucky calculi. Excluding duplicates, we have 71 Kentucky specimens, and 69 Tennessee. Of the former, the nuclei in 6 were composed nearly entirely of uric acid, and in 8 of earthy phosphates; in the latter, of uric acid in 1, and of earthy phosphates in 8.

Bases of the Urates.—Dr. HASKINS analyzed 84 specimens of the urates, with a view to determine their bases, and the results arrived at were as follows: Ammonia was found in all; lime with ammonia in 83; soda with ammonia and lime in 55; and soda with ammonia alone in 1. For magnesia and potash no search was made. The ammonia largely predominated over both of the other constituents. Urate of lime, which has generally been regarded as a rare ingredient of urinary calculi, was present in 83 of the examinations, and usually existed in larger quantities than the soda.*]

146. VI. CAUSES OF URINARY CALCULI.—The causes of urinary concretions may be inferred from what I have stated above with reference to the pathological conditions occasioning the several forms of urinary deposit, the concretions taking place in different parts of the urinary apparatus being merely early deposits in those situations of the same constituents as are precipitated by the urine after being discharged from the body. Whether the concretions are formed within the body, or the deposits take place after the urine is evacuated from the body, many, indeed most of their causes, are the same; the states of the urine which produce them arising chiefly from, (a), age and habits of life; (b), from climate, locality, and race; (c), from diet and regimen; (d), from morbid digestion and assimilation; (e), from pathological states of the kidneys, and from the metamorphosis of tissues and of blood-globules, in connexion, (f), with constitutional and vital conditions. But it may be asked, Wherefore should concretions form within the urinary organs, consisting of the same or nearly the same constituents as are deposited from the evacuated and cold urine? To this question the chief answer must be that which I have stated above (see § 80-4), namely, that low states of vital power favour the more rapid evolution of that portion of vital emanation which all secretions (the urine as well) possess for a shorter or longer period after secretion, according to the amount of vitality endowing the secreting organs, in connexion with the extent of change in the constitution of the secretions, with their accumulation and retention, and with the amount of vital influence and animal heat retained by them, or furnished to them during their retention. Although these causes of urinary deposit and concretion have been above considered with reference to the deposits found after the urine is evacuated, certain topics connected with them, more especially with the formation of calculi, require a more particular notice than they have yet received.

147. Deposits from the urine, more or less abundant, after evacuation may proceed for a very long time without any deposit taking place within any part of the urinary apparatus. This immunity from the formation of calculi may arise either from the circumstance of the urine having not been saturated with the substance or sub-

stances which usually pass into calculus, or from the states of vital power being unfavourable to the formation of renal or vesical concretions, or from the absence of other causes which favour such formation.

148. i. *Age and Sex*.—The liability of children to calculi has been remarked from the days of HIPPOCRATES; and Mr. COULSON quotes the "*Methode of Physick*," in which the author, PHILIP BARROUGH, remarks that "stones in the bladder do engender oftener in children than in older folk."—(*Lib. iii., c. 41, editio quinta, 1617.*) Although the liability of strong and well-fed children may not be greater than that of any other class of subjects, yet there is no doubt of weakly, unhealthy, and ill-fed infants and children being more frequently affected with gravel and calculi than older persons. Of 478 operations for stone in the Norwich hospital during a period of forty-four years, 227 were in children under fourteen years. According to Dr. PROUT, the following is the relative frequency of urinary calculi at different ages: Under 10 years of age, 500; from 10 to 20, 192; from 20 to 30, 104; from 30 to 40, 94; from 40 to 60, 112; from 60 to 70, 97; and from 70 to 80, 12. Taking into consideration the numbers of those living at the most advanced ages, urinary concretions are more frequent at these ages than in the prime of life.*

149. Females, notwithstanding their more sedentary habits, and their liability to retain their urine for long periods, are less frequently subject to calculus than males. This is partly owing to their temperate and abstemious habits, and partly to the facility with which a small calculus may escape from the female bladder soon after its descent from the kidneys, and before its retention in the bladder has enabled it to acquire a great size by successive depositions around it. The female urethra, admitting of greater dilatation, and being less complex than the male urethra, and otherwise differently connected and circumstanced, allows the spontaneous passage of calculi which would be retained in the male bladder, and could be removed only by an operation.

150. ii. *Habits of Living*.—Sedentary habits and luxurious feeding are more or less influential, according as they may be associated with other causes, in occasioning urinary concretions. The former impairs very remarkably the functions of the skin, and prevents that amount of blood-depuration which these functions effect; the latter furnishes the pabulum or source from which urinary concretions are in great part derived. When these habits exist in, or are conjoined with, a gouty diathesis, the occurrence of gravel or calculi is often observed; and much more remarkably when a meat diet and malt liquors are very liberally indulged in; for this diet, especially the more nitrogenized kinds, forms urea and the urates in great abundance, and generates either gout, or gravel, or calculi, or both, and subjects the kidneys to a much greater amount of depurating function by increasing the

[* For the above details we are indebted to the able work of Professor GROSS on "Diseases of Urinary Organs."]

* M. CIVALE, in his "*Treatise on Calculous Affections*," states that of 5376 cases, 2416 were children, 2167 adults, and 793 old persons. He says that 1946 occurred before the age of ten, 943 from ten to twenty, 469 from twenty to thirty, 330 from thirty to forty, 391 from forty to fifty, 513 from fifty to sixty, 577 from sixty to seventy, 199 from seventy to eighty, and 17 after eighty. Instances of calculus have been recorded from birth, and very soon after birth. Mr. COULSON operated for stone on a child of eighteen months, and upon a man of eighty years of age.

quantity of morbid materials which require removal from the blood.

151. When the skin ceases to discharge its share of this process of blood-depuration, an increased demand is made upon the kidneys, and an increased supply of the constituents of urinary deposit is furnished to these organs. It will thus appear very manifest that, as the same causes as are more or less concerned in the production of gravel and calculi are also productive of gout, these two diseases must be frequently associated in the same person. The association of calculi with rheumatism is much less frequent than with gout; but when it occurs it may be imputed in great measure to a similar combination of causes.

152. iii. *Climate, locality, and race* very considerably influence the occurrence of urinary concretions. It is very difficult in many instances to explain the operation of these; but there is no doubt of these maladies being more frequent in humid, temperate, and changeable climates, than in very warm or very cold countries; in some localities than in others even of the same country; and in the white than the dark races. Holland, France, England, Germany, have been regarded as furnishing the greatest number of calculous cases; but other countries are by no means exempt from them. Within the tropics, urinary concretions are more rarely observed than in temperate countries, and chiefly or only in the very young and ill fed. The marked infrequency of these concretions in the dark races is chiefly to be imputed to the very small proportion of animal food constituting the diet of these races, especially within the tropics, and to the greater activity of their cutaneous functions.*

* Dr. GROSS (on the Diseases and Injuries of the Urinary Bladder, &c., 8vo. Philad., 1851) confirms the rare occurrence of urinary calculi in the coloured races. In ten years he never met with an instance of gravel or of stone in a coloured person. Dr. DUDLEY, in Kentucky, who has the largest practice there, never operated for stone on more than two or three persons, who are constantly exposed to hard labour, and fare often upon the coarsest food. Dr. GROSS states that urinary calculi are rare in Canada, in Texas, Mexico, and California; that in the United States a larger number of children are subject to calculi in Kentucky, Ohio, Tennessee, and Alabama than in any other part; and that the inhabitants of Missouri, Iowa, Wisconsin, Michigan, Indiana, New York, and New Jersey are comparatively exempt.

[It is proper, in this connexion, to give a more detailed account of the results of Professor GROSS's researches in regard to the prevalence of stone in the bladder and calculous disorders in the United States. From these it appears that the great stone regions of this country are, as far as is at present known, Kentucky, Tennessee, Virginia, Ohio, North Alabama, and perhaps Missouri, the disease being comparatively infrequent in all other sections of the country. The causes of these differences are as yet not satisfactorily known. They cannot be satisfactorily explained, on the ground of difference of climate, geological formation, or habits of life, nor in the food, drinks, and occupations of the inhabitants; for in these respects, for example, there is but little difference between Kentucky and Indiana, yet calculous affections are very common in the former and very rare in the latter. Corn-bread and pork constitute the staple articles of food throughout the Southern and Western States, with unleavened biscuit of wheat, potatoes, hominy, cabbage, turnips, and tomatoes, with coffee, tea, and milk at breakfast and supper. Eggs, poultry, and milk are also freely used. In the calculous districts lime-water generally prevails, and is used freely by nearly all the inhabitants; but the same is true also of some parts of New England and Canada, Indiana, Illinois, &c., where stone in the bladder is rarely met with. The Germans are remarkably exempt from calculous affections, and they consume large quantities of malt liquors. The climate is essentially the same in the calculous and some of the non-calculous districts. The prevalent diseases in the calculous regions are intermitting and remitting

The imputed infrequency of calculi in very cold countries is accounted for with much difficulty, especially as animal food is generally freely used. The active employments followed by the natives of these countries, a fish diet adopted by many, and other unascertained influences, may combine to produce this partial immunity. The greater prevalence of calculous diseases in Norfolk than in any other county in England is fully admitted. Mr. CROSSE, the eminent surgeon of Norwich, considered this prevalence to be owing to a combination of causes—to the variableness of the climate of Norfolk, to the prevalence of northeast winds, and more especially to the frequency of dyspepsia and acidity in the stomach, and to the consequent superabundance of uric acid in the urine. SOEMMERING states that calculous and gouty affections are unknown, or most rare, in some situations bordering on the Rhine. LIEBIG imputes this immunity to the Rhenish wines, which contain a considerable quantity of the bitartrate of potash. This salt, he contends, changes in the progress of digestion to the carbonate of potash, and acts the part of an alkali.

153. It was formerly believed that the waters of a locality had some influence in producing urinary concretions. This opinion has, however, been controverted by several modern writers, and it is undetermined whether or no the waters which abound in calcareous or other mineral substances have any effect in occasioning urinary

fevers, neuralgia, pneumonia, dysentery, rheumatism, and dyspepsia; and urinary deposits of all kinds, especially the lithic acid and urates, are common. The causes, then, which favour the formation of stone in the bladder remain, for the most part, undetermined, though there can be no doubt that such affections must be influenced to a greater or less degree by climate, food, and drinks, occupation, &c. We believe it will yet be made to appear that the hygrometric state of the air (a high dew-point) is one of the most efficient predisposing causes. In all the New England States calculous affections are very uncommon, although much of the drinking-water is strongly impregnated with lime. The number of lithotomy cases that fell to the charge of Professor J. C. WARREN, during a period of forty years, was only 25; and he is said to have been the only surgeon in Boston who performed that operation during that whole time. Only three of these cases were natives of Boston; the others came from different parts of New England. Dr. NATHAN SMITH was of opinion that more cases of the disease originated in Vermont and Maine than any of the other New England States, and these States abound in limestone more than any of the others. Up to 1855, Dr. J. M. WARREN, of Boston, had operated for stone 18 times; Dr. V. MOTT, of New York, 163 times; Dr. F. H. HAMILTON, of Buffalo, 5 times; Dr. A. TROWBRIDGE, of Watertown, N. Y., 18 times; A. MARCH, of Albany, 16 times; W. PARKER, of New York, 24 times; Professor VAN BUREN, of New York, 20 times (besides several operations by Drs. CARNOCHAN, POST, BUCK, WOOD, HOFFMAN, WATSON, &c.). During 17 years and a half (1837 to 1855) only 14 cases of stone in the bladder were treated in the New York Hospital, which receives annually about 3500 patients. In the Pennsylvania Hospital at Philadelphia, from the time it was opened for the admission of patients, in 1753, till May, 1848, 100 years, only 83 patients were cut for this disease, of which few originated in Philadelphia or vicinity. Up to 1842, Professor GIBSON, of Philadelphia, had operated for stone 50 times; Dr. J. RHEA BARTON, 36; GEORGE M'CLILLAN, 30 (and before his death, 50). Dr. PANCOAST has had (1856) 41 cases; Dr. J. DICKSON, of Alleghany, Pennsylvania, has operated on 14 cases in the last seven years.

Dr. METTAUER, of Virginia, has performed the operation for stone 91 times; Dr. P. C. SPENSER, of Petersburg, Va., 24 times; Dr. DUDLEY, of Kentucky, 207 times; Dr. GROSS, 40, &c. These constitute the vast majority of operations of this kind performed in the United States during the last 30 years.

With regard to age, American statistics are extremely deficient. Of Dr. DUDLEY's patients, three fourths were under 15 years; and of 27 Kentucky cases of Dr. GROSS, 14 were under this age.]

calculi. The subject has not been investigated with precision, and the arguments on both sides are loose, and indeterminate as to facts.

154. It has been contended by Mr. COPLAND HURCHISON and Sir G. BALLINGALL that sailors and soldiers are almost exempt from urinary concretions. But when it is considered that both sailors and soldiers are of those ages in which these concretions are seldom observed, the extent of this exemption cannot be great. Whatever it may be, the activity of the digestive, assimilating, and depurating functions in these classes and at their periods of life evidently constitutes its chief cause.*

155. iv. *Diet and regimen* has more influence on the frequency of calculous diseases than is generally believed. The evil produced by animal food used in excess—and many use it in excess relatively to the amount of exercise taken—has been already adverted to (§ 150). Highly nitrogenized animal diet furnishes a rich and an abundant chyle, which, during its circulation in the blood through the several viscera, becomes oxidized and otherwise changed, and, in various states of metamorphosis, under the influence of vitality, originates the most important parts of those materials which require a continued elimination from the blood; and if this end be not attained by the active discharge of the several depurating functions—by the kidneys, skin, mucous surfaces, &c.; and if it be not promoted by exercise sufficient for its fulfilment, an accumulation of these materials in the blood takes place, and, becoming more and more highly animalized and morbid, and irritating by their retention and accumulation, occasions serious diseases, among which Gout (as shown in that article, § 33–42) and urinary concretions are the most common.†

156. v. *Metamorphosis and waste of tissues*, &c.—It will be seen, from what has been stated above (§ 41–5), that Baron LIEBIG and Dr. GOLDING BIRD have attributed the solid materials dissolved in the urine, with their deposits and concretions, to the chemical combinations of the elements resulting from the metamorphosis and waste of the tissues in the course of the regeneration and nutrition of these tissues. But if we take into consideration the great amount of these materials discharged into the urine, and refer them only to the sources from which these writers derive them, it must follow that these tissues ought to be renewed several times every successive year of existence! It must be admitted that the metamorphosis and waste of the tissues—to which I would add similar changes in the red globules of the blood also—furnish some part of these materials; but a much greater share is supplied by the food, by the chyle conveyed into and

circulating with the blood, and by the successive changes therein produced, under the influence of vitality; the regeneration and nutrition of the tissues requiring only a small but appropriate portion of the constituents thus supplied, the less appropriate materials being eliminated from the circulation by the kidneys, skin, and other depurating organs.

157. vi. *Indigestion, fermentation, and mal-assimilation* are causes of urinary deposit and concretion intimately connected with a too full, rich, or unwholesome diet. Numerous articles of food are indigestible in their nature, more especially if not sparingly partaken of, and are liable to become rancid in the stomach, and to occasion rancid eructations; while others are more disposed to fermentation, and to generate acidity in the stomach and bowels; both rancidity and acidity sometimes occurring simultaneously, according to the nature of the food, to the quantity taken, and to the powers of digestion and assimilation. Owing to undue and superabundant quantity, or to improper quality, or to both, an imperfectly digested and assimilated chyle is formed and carried into the circulation, furnishing the material elements of disease, and more especially of urinary concretions. But it is not only to full diet, much animal food, or to unwholesome aliment, that these concretions may be remotely imputed, but also to insufficient food, especially in early life. In this latter case the powers of life are so reduced by the insufficient nourishment as to imperfectly digest and assimilate what is taken, and the blood is thereby diminished in quantity and impaired in quality.

158. vii. *Constitutional and vital conditions* manifestly combine with the preceding causes in occasioning concretions in the urinary apparatus. These conditions I have viewed above (§ 45, 157) as consisting of more or less manifest impairment, not only of the digestive, and assimilating, and depurating functions, but also of the vital endowment throughout the frame. This general impairment of vital power accounts for the prevalence of urinary excretions in delicate and in imperfectly or improperly fed children, or previously to puberty, and in the aged, and for the comparative rarity of these concretions in persons during the prime of life, or during the period of sexual activity, and in those who are neither over-fed or under-fed, and who are not exposed to the remote causes above mentioned.

159. viii. *Bodies or substances introduced or passed into any portion of the urinary apparatus* are liable to become the nuclei around which urinary concretions may form and increase by successive deposits. Numerous instances of bodies having passed into the bladder, and become the nuclei of large calculi, are recorded by medical writers. To these it is unnecessary to refer, as they are sufficiently known; but they satisfactorily prove that these bodies give rise to the first act of deposition or crystalline formation by the urine, when more or less loaded or saturated with the constituents of urinary deposit and concretion.

160. ix. *Morbid states of some part of the urinary passages* may be attended by an extravasation of a minute quantity of blood, or by a purulent or mucous discharge, which, either in the uriniferous tubes, or in the pelvis of the kidney, or in the bladder, may become the cause of deposit, by attracting the uric acid, the urates, or

[* There is good reason to believe that the use of sorrel and the footstalks of the rhubarb plant favour the production of oxalate of lime deposits, as they both contain oxalic acid, combined in excess with potash. The free use of sugar may also act as a powerful predisposing or exciting cause.]

[† Dr. W. P. C. BAETON, formerly at the head of the Medical and Surgical Bureau at Washington, expresses the opinion that sailors are entirely exempt from calculous diseases. The same opinion substantially is expressed by Surgeons FOLTZ, RUSCHENBERGER, GREEN, HORNER, CORNICK, and others of the United States navy. Urinary deposits occur among landmen and marines, but rarely, if ever, among those who have been brought up at sea. The same singular immunity exists among the seafaring people of all nations. The cause assigned by our author, viz., the activity of the digestive, assimilating, and depurative functions, is doubtless the principal one.]

other saline constituents of the urine, and form the nucleus of successive deposits. It is not improbable that a change, such as I have just stated, may take place in some portion of the kidney, or even in some other part of the urinary apparatus, owing either to external injury, or to other causes, and, by favouring the concretion of the superabundant saline constituents, or uric acid in the urine, thus form the nucleus of a renal calculus, which may either remain long in the kidney, and increase slowly, or pass into the bladder, and become, as in the case of a foreign body, the centre around which successive and large deposits collect. Most calculous concretions are thus formed, their nuclei and earlier deposits being formed in the kidneys, their chief increase taking place in the bladder.

161. *Inferences.*—The efficient causes of urinary calculi may doubtless operate differently in different diatheses and constitutions, and in different circumstances, more especially in determining the nature of the deposit; but there is some reason for concluding, 1st. That a diet composed chiefly, or of a large proportion of animal food, tends to increase the quantity of the uric acid and urates, and to favour their deposition, and to lessen the generation and deposition of the phosphates; 2d. That rancid and acescent ingesta, and rich sauces, exert nearly similar influences to the foregoing; 3d. That whatever promotes the functions of the skin tends to prevent the deposition of uric acid, and to favour that of the phosphates; and, 4th. That indolence and indigestion tend to increase the deposition of uric acid and to lessen that of the phosphates, both by producing acidity of the *prima via*, and by impairing the functions of the skin and liver.

162. x. *The origin and growth of urinary calculi* was first clearly stated by VAN SWIETEN (*Comm. in Aph. Boerh.*, 1414). He remarks, that "stones proceed from elementary principles, which, in a state of solution, previously existed in the humours, and when these meet with an indissoluble basis, they fix themselves thereto, and form a calculus, which continually increases in bulk from the application of fresh calculous matter." This statement is probably correct as far as it goes, but various topics connected with the original nature and primary formation of urinary concretions are not comprised in it. Dr. GOLDING BIRD and others contended for an oxaluric diathesis, which gives rise to the secretion of oxalic acid and oxalates from the uric acid and urates existing in the blood. Dr. OWEN REES has opposed this doctrine, and has argued that the oxalic acid and its compounds are not produced from uric acid or from urates already existing in the blood, but that the change is effected in the urine, after its secretion by the kidney. "In this latter case the uric acid in combination will be secreted as such into the urine, but by after processes, occurring either in the urinary passages, bladder, or chamber vessels, it will present itself converted into a compound of the oxalic acid." If this be really the case, then we must admit that the state of system in which we observe a tendency to the formation of oxalate of lime in the urine must be considered identical with that accompanying the uric acid diathesis, and as requiring the same treatment, and the same precautionary measures.

163. Dr. ALDRIDGE, of Dublin, has shown the manner in which uric acid and its compounds

become decomposed into an oxalic salt. "He has proved that uric acid may be theoretically considered as representing the elements of oxalate and carbonate of ammonia, hydrocyanic and formic acids, if we merely add to its atoms the elements of water in varying proportions. He has demonstrated that this really occurs; for, by heating urine, and in some cases by evaporating it, he has succeeded in causing a deposit of oxalate of lime, while evidence of the presence of hydrocyanic and formic acids could be obtained from the fluid." (O. REES, *on Calc. Dis.*, &c., p. 5.)

164. a. The chemical reasoning, Dr. O. REES remarks, which shows how unlikely it is that oxalate of lime should exist in the blood, is quite borne out by pathological conditions. He therefore concludes, in opposition to Drs. GARRUD and G. BIRD, that, whenever oxalate of lime is found in the urine, it should be regarded as *produced after secretion*, and that there is no such thing existing as an oxalic diathesis. LEHMANN, who has also opposed the opinions of the late Dr. BIRD, has stated that morning urine, left to stand some hours, often contains oxalate of lime in quantity, when the fresh urine did not contain any trace of it. WOHLER and FRERICHs found that the urates when injected into the blood produced oxalate of lime in the urine. Dr. O. REES thus "regards oxalate of lime merely as uric acid, or urate altered after secretion," and that the lists of calculi contained in museums will show that the uric acid diathesis produces nearly the whole of the calculous diseases observed, especially by forming the nuclei of most of those which are formed of other constituents.

165. The greatly increased quantity, and the insolubility of uric acid, are quite sufficient causes of the deposit of it in the kidneys, especially when in excess, and in the circumstances about to be noticed (§ 167, 169), without calling in the aid of any other agency. If the deposition of the uric acid in the calculous form in the kidneys, where it originally takes place in the great majority of cases, if not in all, and if the calculus, having passed into the bladder, "fail to produce any great irritation of the vesical mucous membrane, then it will be enlarged by the continued deposition of uric acid layers; but if, as is generally the case, this calculus irritate the surfaces, then the bladder becomes inflamed, and the mucous membrane throws out an alkaline fluid, which now decomposes the ammoniacal salts contained in the urine and liberates the ammonia. This may unite to a portion of uric acid, forming urate of ammonia, so that the next layers of the calculus may consist either entirely of urate of ammonia, or of that salt in admixture with uric acid. The changes may cease here, and the calculus, though it increase under these conditions, be thus compounded merely of two constituents. The next change may, however, occur, and may determine the formation of a more compound form of concretion; and this will consist in the pouring out of an excessive quantity of alkaline secretion by the inflamed mucous surface. This will not only completely neutralize the acidity of the urine, but cause, like all alkaline solutions, a precipitation of the earthy phosphates." (*Op. cit.*, p. 28.) These will coat the calculus, intermixing or not with the urate of ammonia, or uric acid, according to the amount of secretion and its alkaline character.

166. b. In respect of the phosphatic deposits

and *concretions*, Dr. O. REES farther contends for their production uniformly from irritation or disease of the urinary mucous surfaces, and for the presence of uric acid or some other form of concretion being a sufficient cause for the formation of phosphatic layers on a calculus. In answer to the questions as to how phosphatic calculi are formed when *no* other calculous matter can be detected as a nucleus, and what were the conditions antecedent to the phosphatic deposit in such cases, he states that these calculi are rarely met with, and when present are the consequences of disease of the mucous membrane of the bladder, and where, of necessity, the alkaline secretion consequent upon irritation of this membrane is poured out from it in quantity. "This state of things often follows upon enlargement of the prostate with stricture, so that the bladder is not easily emptied." The retained portions of urine will have their earthy phosphates precipitated by the alkaline secretion of the diseased mucous membrane, and the formation of a calculus result. Hence it follows, 1st, that the presence of other calculous matters, by irritating the bladder, causes a deposition of the earthy phosphates, these matters forming the nuclei around which the phosphates are deposited; 2d, that the alkaline secretion from the irritated urinary mucous membrane occasions a concretion, independently of such nuclei, by precipitating the phosphates. It was long ago remarked by Dr. PROUT, that these salts, when present, were always found covering other deposits, and rarely alternating with them; so that, if the nucleus were phosphatic, the crust would be the same, and no covering be found of any other form of calculous matter.

167. Since uric acid is the nucleus of the great majority of calculi, the conditions under which this deposit occurs should be considered. In persons subject to the continued excretion of uric acid and the urates, the quantities discharged may be very great, without showing any tendency in these substances to concrete into the calculous form. These materials may even give rise, from their abundance, to attacks of "gravel," without any considerable calculus being formed, and very common means may give relief. In other cases, the deposits in evacuated urine may be in far less proportion, and yet the tendency to concrete into calculi be very early shown. These facts, as Dr. O. REES contends, seem to prove that, in order to produce a calculus, some condition must be present besides that which we recognise in a tendency to the deposit of solid matter from the urine. It is necessary to bear in mind what has been said above (§ 166) respecting the chemical effect of the alkaline secretion from the inflamed urinary mucous membrane, upon which he places more stress than the proofs may be supposed to warrant. But besides possessing the imputed chemical qualities, Dr. O. REES infers that the secretion from the inflamed membrane evinces mechanical conditions which must influence the result where a tendency exists to deposit solid matters from the urine, and that the secretion from the inflamed mucous surface, being of a tenacious character, and containing fragments of epithelium and mucous corpuscles, will cause the particles constituting the deposit to unite and form a nucleus or concretion of successive deposits.

168. Instead, therefore, of viewing the earthy

phosphates as secreted by the mucous membrane, Dr. O. REES believes that this membrane acts merely through its alkaline secretion, which precipitates the earthy phosphates from the urine; and he farther infers, that the same conditions noticed with regard to the bladder are present also in the kidneys, and that it is to these conditions in these latter organs, rather than to what exists in the bladder, that we ought to look for the chief cause of the formation of nuclei, and the very general origination of calculi in the kidneys. "At any rate, this would appear to apply so far as the production of a nucleus is concerned." The mechanical conditions presented by the pelvis and urinary tubules certainly are far more favourable to the agglutination of deposits than those observed in the bladder; for these are smaller conduits and cavities, and in the immediate vicinity of the tubules the first deposited matters are brought in intimate contact with the spheroidal epithelium, which under irritation rapidly desquamates and is more especially liable to entangle floating particles of deposit, and so to favour the formation of calculus. "The reasoning," Dr. O. REES adds, "I have used with respect to the bladder applies with full force to the formation and growth of calculi in the kidney. From what I have now adduced, I would submit, that if we except cases in which are formed the four following rare substances, viz., cystine, carbonate of lime, silicic acid, and uric oxide, we may consider all calculous disease as originating in the gouty or uric acid diathesis." (*Op. cit.*, p. 38.)

169. A nucleus may form in any part of the urinary canals; but the tubules are by far the most frequent seat of the original deposit. Small particles are sometimes found in the secreting structure; and if these do not pass onward to the tubular structure, they may increase by deposit of successive layers until a calculus of considerable size is produced. In this case a portion of the organ, corresponding to the development of the concretion, may be destroyed, and symptoms varying with circumstances be produced. The first deposit may, however, pass lower down into the tubular structure, or thence into the pelvis of the kidney, and either remain in either of these situations or pass along the ureter into the bladder, causing more or less distress, in some cases extreme suffering, during its passage; and having reached the bladder, it may be expelled through the urethra by the stream of water, or remain in the bladder and become the nucleus of a large concretion.

170. VII. SYMPTOMS OF URINARY CALCULI.—*i. In the Kidneys.*—The symptoms produced by a calculus or calculi in the kidney vary with the size, form, or smoothness of the stone, its situation in the organ, and the constitution, temperament, and diathesis of the patient. The calculus may remain in the kidney, or even several may remain, or pass thence into the bladder. If it remain, either relief of more or less severe symptoms may take place after a time, owing to a cystic covering forming over it, or disorganization of the kidney sooner or later supervenes and destroys the patient. If the calculus remain in the kidney and become encysted, more or less severe pains in the loins or in one or both sides, often extending down the thigh or thighs, and sometimes upward under the shoulder blades, colicky pains in the abdomen, nausea, vomiting,

hæmaturia, and frequent calls to pass the urine, are complained of. These symptoms may gradually subside, and they may recur oftener than once, after indefinite periods and with various degrees of severity, especially after sudden or severe exertion, particularly when the trunk of the body has experienced a shock or concussion. The pain often becomes dull or aching, or is seated chiefly on one side of the abdomen, or extends to the groin, or a sympathetic pain, resembling neuralgia, is experienced at a distance from the region of the kidney, and not unfrequently extends to the testicle of the affected side. After a lengthened period, and after frequent recurrences of the symptoms in slighter grades, the patient either experiences an immunity from farther suffering, or complains only of slight and wandering or recurring pains, which often may be traced to one or other kidney.

171. In less favourable cases of retention of the calculus or calculi in the kidney, the symptoms assume the features described when treating of *Inflammation of the Kidney* (§ 48, 49, 59, *et pluries*), and of *Pyelitis* (*art. KIDNEY*, § 174-183, 192-198, *et pluries*), and are fully described, with the several relations of this subject, in the article, and more especially at the places now referred to. I may, however, remark at this place the difficulty of diagnosis between a calculus in the right kidney and the passage of gall-stones. At the commencement of the irritation produced by a calculus in the right kidney, and when the symptoms are very severe, or when a calculus has entered the ureter from the pelvis, the complaint may readily be mistaken for gall-stones, especially when the vomitings, pain, and spasm are very urgent, and if all the symptoms be not carefully examined. I have found it even recently very difficult to determine at first as to the seat of disease; and this difficulty is increased if there be, as there frequently is, pre-existing disorder of the biliary functions, more especially interruptions of the biliary secretion, or some degree of jaundice. As the symptoms of renal calculi proceed, and especially as the calculi pass into or along the ureter, the nature of the complaint becomes more manifest, and indeed is most frequently so from the commencement, especially when the symptoms attending the secretion and excretion of urine are well marked, and blood-globules are observed in the urine. When the hæmaturia is very considerable, especially after exertion or sudden movement of the trunk, in connexion with the other symptoms of *calculus nephritis* (see *KIDNEY*, § 48, *et seq.*), the nature of the case is evident; and if the draining of blood continue for a considerable time, and the local symptoms are very acute, the oxalate of lime calculus is not unfrequently its cause.

172. ii. The *diagnosis* of renal calculus is rendered most difficult in the gouty and rheumatic diathesis, and in cases of chronic disease of the urinary bladder and prostate gland; for the pain in one or both sides of the lumbar region may be rheumatic or gouty, or may proceed from cachectic nephritis, or BRIGHT'S disease, or from pyelitis or abscess of the kidney, occurring either primarily, or caused by calculi, or following chronic uro-cystitis or stone in the bladder, or even from inflammation or abscess of the lumbar muscles. If any tumour or swelling be detected in the region of the kidneys, the antecedent symptoms should be duly estimated, and the examination

directed to the existence of collections of matter in the pelvis and calices of the organ, or to their distention by urine from obstruction of the ureter, or to the presence of malignant disease of the kidney. Of these several states of disease, as well as of the passage of a calculus along the ureter, no correct diagnosis can be formed until the urine be tested, and the results considered with due reference to the quantity, specific gravity, appearances, deposits, and quality of this secretion; to the ability of retaining it, to the frequency of the calls to void it, and to the particular alterations of sensibility complained of in the regions of the kidneys, ureters, bladder, and urethra, as well as in the testes, abdomen, and lower extremities, and to the states of constitution and of vital power. In the course of renal disease associated with calculi, the symptoms are so varied, and manifest so numerous combinations, with the seat, duration, extension, and associations of morbid action, that descriptions applicable to all cases would be hopeless; but, by recollecting that irritation existing in one part of the urinary apparatus will extend to, and more or less affect the whole; that although the symptoms will be present chiefly in the situations just indicated, they may extend still farther; and that a correct examination of the urine will indicate with more or less accuracy the nature of the affection, especially when viewed in connexion with the local and constitutional symptoms, the difficulty of forming a diagnosis between the disorders which result from renal calculi and those which most nearly resemble them will altogether disappear. In this subject I must refer the reader to what I have stated respecting the inflammatory and organic diseases of *KIDNEYS* and *URINARY BLADDER*, and the complications which they present in practice.

173. iii. The *symptoms* indicating the *passage of a calculus from the kidney to the bladder* may be so slight, especially when the calculus is small and smooth, as to occasion but little inconvenience, and to excite no anxiety or even the attention; and it may remain long afterward in the bladder without the patient being aware of its presence. But if the renal calculus be large, or rough, more especially if it be an oxalate, its passage along the ureter is attended by the most excruciating suffering. The pain is seated more especially in the loins, generally of one side, extends from the course of the ureter and down the thigh, the cord to the testes; and is attended by retching, vomitings, and by intermitting colicky or abdominal pains. The patient is bent double, or to one side, rolls about, and is in the greatest agony. In the less severe cases there are rigors, nausea, restlessness, pain in the back, stretching in the course of the ureter to the bladder, thigh, and testicle, often with its retraction, coldness of the extremities, and prostration. The descent of the calculus commonly occupies from 12 to 24 or 36 hours. "The calculus may become impacted in the vesical orifice of the ureter; the flow of urine from the corresponding kidney may then be prevented; dilatation of the ureter, and distention of the tubular structure of the kidney will ensue, terminating in absorption of its secreting surface; but most of the usual symptoms of stone in the bladder will be absent."*

* M. CIVIALE classifies *uric acid gravel* under three varieties: 1. The passage of gravel spontaneously and without pain; 2. Nephritic colic with emissions of gravel;

174. iv. *The symptoms of a calculus in the bladder* are well known, and require at this place but few remarks. But in tracing back the history of these cases, and when inquiring into their existing states, the facts should not be overlooked, 1st, that stone in the bladder originates, in the great majority of cases, in a calculus formed in the kidney, which, having passed into the bladder, forms the nucleus of farther deposit and concretion in this organ; 2d, that the formation of the calculus in the kidney, and its passage thence along the ureter into the bladder, must have been attended by more or less ailment referable to these situations; 3d, that a calculus very rarely or never originates in the bladder without previous disease either of this viscus, or of the prostate gland, or of the urethra.

175. *The symptoms chiefly characterizing the existence of a concretion in the bladder* are frequent calls to micturate, pain at the end of the penis, hæmaturia, especially after exertion, and pain with or without hæmaturia on a jolting motion or succussion of the trunk. If these, however, be alone recognised, they may mislead the physician; for they may all be present, and yet a calculus may not be present in the bladder. Hence the necessity of inquiring into the history of the case, and of duly estimating the early symptoms. For some malignant growth may exist in the bladder and occasion all the symptoms just mentioned. A calculus in the vesical cavity generally falls behind the prostate, but it shifts according to the posture of the patient. In the earlier stages of vesical calculus, the viscus being yet healthy, a dull pain, with a sense of weight about the neck of the bladder, or uneasiness, extends to the hypogastric region, perineum, groins, or thighs. If the stone be smooth, the symptoms commence and advance so slightly and slowly as to excite but little attention and no anxiety; but sooner or later, either from the size of the calculus or the irritation produced by it, the features of the affection become manifest. The bladder is irritable and cannot contain its contents; the calls to micturate are more frequent; and the expulsion of the last drops is attended by pain, shooting along the perineum and penis, and centring in the glans. Sometimes when the urine is flowing in a full stream, it is suddenly stopped, as if by some body falling into and obstructing the orifice of the urethra. Exercise, sudden movements, and the jolting of a carriage occasion great suffering, and even a discharge of bloody urine, which in plethoric or other habits of body may be of considerable extent or continuance; as the disease continues, and the bladder becomes more affected, micturition becomes more and more frequent and distressing. Patients oft-

en grind their teeth with agony; and the last drops of urine are expelled with spasm of the bladder, which endures for some time. The urine and contents of the vesiculæ seminales are sometimes passed involuntarily, and increase the distress and exhaustion of the patient. There is occasionally priapism, with or without sexual desire.

176. I need not farther describe the symptoms of vesical calculus, but merely briefly advert to the importance of recognising some of the complications of this malady, and which may either precede it or follow it, more especially the latter. Of these the most important is disease of the kidney or kidneys. This may have preceded the vesical calculus, and been associated with, or caused by, the formation of the renal calculus which formed the nucleus for farther deposit and concretion when it passed into the bladder. But in this state of complication the renal disorder is generally slight, or even hardly exists when the calculus has reached the bladder. If, however, it be arrested in its course, more particularly at the vesical extremity of the ureter, the renal complication may be most severe and dangerous. After the calculus has been long in the bladder and superinduced much disease in this viscus, the interruptions in the way of urinary excretion, the extension of irritation along the ureters, and other circumstances, often develop serious disease, and even extensive disorganization of the kidneys. In some cases, also, the irritation of the bladder by a calculus may superinduce prolapsus ani in children, or even in older subjects, and hæmorrhoids in the latter class.

177. v. *Diagnosis.*—The symptoms described above (§ 174–6) generally lead to the important measure of ascertaining beyond a doubt the existence of a stone in the bladder, viz., to *sound-ing*. The circumstance of malignant disease of the bladder being often attended by most of the symptoms characterizing vesical calculus; and the fact of this operation, which is so requisite in the latter malady, being often most injurious in the former, should lead us to pause before it is resorted to, and the states and appearances of the urine very minutely examined. In cases of vesical calculus the urine generally contains more or less of the ordinary sedimentary and organic matter, and the blood discharged with the urine is generally in smaller quantity than in malignant growths in the kidneys or bladder.

178. In calculus, hæmaturia generally follows upon some unwonted exertion. In malignant growths in the bladder or kidneys, the tendency to nausea and vomitings is greater, and there are more marked appearances of cachexia and of anæmia than in calculus. In some cases, also, a careful examination of the abdomen will lead to the detection of tumours, if there be malignant disease of the kidneys, especially after the bowels have been freely evacuated. Malignant disease of the kidneys or bladder, or fungoid growths in the latter, especially when far advanced, is characterized by discharges of urine with much blood, intermixed with which the cells constituting malignant disease may be detected by the aid of the microscope. Dr. OWEN REES reposes much confidence in the evidence furnished by these cells of the existence of such disease. He describes them to be “of variable size, the smaller being about four times the diameter of a blood-corpusele, the larger twice that size, or even of

3. Nephritic colics without expulsion of gravel. The disease in those, as well as phosphatic gravel, cystine, and oxalate of lime, may go on in spite of medical treatment, when the difficulty may arise from some morbid state, which paralyzes the efforts of nature and art. For example, the gravel may not be able to make its escape, because it is retained in the kidneys or ureters, or in the bladder, where it may be retained, 1st. By a spasmodic contraction of the urethra or neck of the bladder; or, 2d. By one or more contractions in the deep-seated portion of the urethra; or, 3d. By a tumefaction or other disease of the prostate; or, lastly, by a paralysis of the bladder. M. CIVIALE rejects entirely the prevailing doctrines respecting the influence of *nitrogenized* food in the production of gravel and stone, and repudiates all attempts at cure by *chemical remedies*, either internal or external, and especially by *alkaline remedies*. He, however, attaches great importance to the influence of age, sex, climate, and food, in the production of calculous affections.]

greater diameter. They are colourless and more transparent than the white corpuscles of the blood, and contain within them nuclei of varying size. These nuclei differ in number in each cell. Sometimes only one is present; sometimes four or five. Though there would appear a general tendency on the part of these bodies to assume the circular form, they are for the most part of irregular outline. Sometimes a mass of them may be seen agglutinated together, and then they are more or less square, or they may approach to the hexagonal form." Dr. O. REES states that he has never seen corpuscles like these in the urine, except in cases of malignant disease. Where these are found, he contends that the sound should never be introduced into the bladder, as it may be followed by excessive, or even fatal hæmorrhage, a case of this latter issue having fallen under his observation.

179. VIII. TREATMENT OF URINARY CONCRETIONS.—i. *Of Calculi in the Kidneys.*—When the symptoms indicating the existence of calculi in the kidney are severe, and the patient is strong or plethoric, or not reduced by hæmorrhages from these organs, then cupping over the loins, followed by warm baths and fomentations, will afford relief. The preparations of soap and extract of henbane, or of belladonna, may be prescribed internally, while mucilaginous or demulcent fluids, containing the carbonates of the alkalies with narcotics, should be freely administered. The bowels ought to be kept open by means of olive oil in frequent doses, or by the citrate of potash taken freely, in a state of effervescence, and with the alkali in excess. If hæmaturia be excessive, the acetate of lead with opium, or the spirits of turpentine, cautiously exhibited in small doses, epithems of the same being applied to the loins, will be found of service; or the gallic or tannic acids, &c., may be prescribed. In cases where it might be injurious to abstract blood, dry-cupping over the loins may be employed.

180. Having removed the more severe symptoms by these or similar means, a course of medicines calculated to prevent the formation of uric acid and urates, and to lessen their irritating effects, should be entered upon. But such a course will prove ineffective if the diet and regimen of the patient be neglected. The citrate and bicarbonate of potash, the citrate or carbonate of magnesia, and other antacids, conjoined with tonics, will generally be of service, both in preventing acidity and promoting digestion, and in depurating the blood. A vegetable and farinaceous diet should be adopted, the quantity of flesh-meats much diminished, and the white kinds of fish, boiled only, and with no other sauce than a squeeze of lemon, should replace a large portion of the other articles of animal food usually taken. The beverage of the patient may consist of any of the mineral waters in which the alkalies most abound; or distilled water may be drunk, when effervescing with the bicarbonate of potash and citric acid or lemon juice, or with the addition of either the citrate of potash or citrate of magnesia, according to the state of the bowels. When the bladder is irritable, the several kinds of soap, with henbane or with opium, may be taken at bedtime. In all these cases, I have seen much benefit result from the use of distilled* water, as the

vehicle for depurants of the blood, and for the important domestic purposes of making tea, coffee, &c. The due promotion of the functions of the skin, in this class of patients, and the use of the warm bath, of flannels next to the skin, should not be overlooked.

181. ii. *The treatment of the passage of renal calculi* is often of urgent importance, owing rather to the agony produced than to the danger incurred. The sufferings of the patient are generally increased in these cases by constant or frequent retchings, which also require to be assuaged. A warm bath should be immediately ordered, and before it is ready, or while it is being prepared, from 40 to 50 minims of laudanum, or a lesser dose of BATTLE'S solution of opium, may be given. If the symptoms be still severe, and the vomitings continue after the patient's removal from the warm bath, creasote may be prescribed with demulcents, or other substances; or hydrocyanic acid, or chloroform, may also be added to these. The warm bath may be repeated, or warm fomentations be employed, and emollient and mucilaginous fluids, containing alkaline carbonates and anodynes, be freely taken. If the patient's sufferings be not very considerably relieved by these, the extract or tincture of belladonna may be added to the pills or mixtures already advised, and to the fomentations, which should be continued until complete relief is obtained.

182. During the passage of calculi from the kidneys, the state of the urine should be carefully ascertained, and the bowels satisfactorily evacuated, either by magnesia or the citrate of magnesia taken in demulcent vehicles, or by oleaginous enemata, administered in large quantity, and repeated as they may be required. After relief is obtained, the medical treatment advised for renal calculi should be persisted in for some time, conformably with the indications furnished by the appearances and deposits of the urine. The diet and regimen recommended above (§ 180) should be continued throughout, or modified according as the state of the patient and the alterations in the urine may suggest, due care being taken not to reduce the digestive and the assimilative functions, not to lower vital or constitutional power, and not to impair the secreting and depurating actions.

183 *The treatment of vesical calculi* differs but little from that advised. The avoidance of exertion or of sudden movements, &c., as advised for renal disease, strict attention to diet, and the adoption of the medical treatment recommended for the several kinds of urinary deposit, conformably with the kind existing in the urine, and for renal concretions, are also required for vesical calculi. In many cases, however, the irritation produced in the bladder, the consequent inflammation, hæmaturia, &c., and the complication of disease of the kidneys, of the prostate, &c., render the treatment most difficult, and its benefits often doubtful, however rationally conducted. It is unnecessary to add at this place to what I have already stated when describing the treatment of diseases of the URINARY BLADDER and of the KIDNEYS, and when noticing the indications of cure furnished by URINARY DEPOSITS. When a stone exists in the bladder and produces irritation of more or less manifest severity, the probability of that irritation being followed by the consequences just named, however judicious the medical treat-

[* Pure rain-water will answer equally well. We have often known great relief afforded by merely substituting this for the water usually drunk.]

ment may be, is very great; and hence the necessity of removing the stone by a surgical operation, unless the consecutive diseases or lesions—the superinduced complications, forbid its performance. As to this and other topics connected with the surgical treatment of vesical concretions, I must refer the reader to the very able surgical works enumerated in the subjoined BIBLIOGRAPHY AND REFERENCES.

[We should, however, in this connexion, remember the remark of PROUT, that as healthy urine contains no free uncombined alkaline or acid ingredient, lithic agents, or, more properly, *lithonlithics*, are to be sought for among a class of harmless and unirritating compounds, the elements of which are so associated as to act at the same time, with respect to calculous ingredients, both as alkalies and acids. The substances which approach the nearest to such are the solutions of the supercarbonated alkalies, containing a great excess of carbonic acid, and which may be used in two forms—1st, as natural mineral waters, as those of Saratoga, &c.; or, 2d, artificial soda or potash waters. If the calculus is of the *lithic acid* variety, from half a drachm to one drachm of bicarbonate of potash and as much tartarized soda may be dissolved in a pint bottle and taken twice a day with an equal quantity of soft or rain water; while, if the urine is alkaline and the concretions are of the phosphatic variety, the alkali may be omitted altogether, and the compound consist either of pure water impregnated with carbonic acid gas, or occasionally some acid, as the *nitric*, may be substituted for the alkali. *Lime-water* has been recommended for the *urates* by CHEVALLIER, on the ground of its forming a very soluble salt, *urate of lime*, with uric acid; and he also thinks it useful for phosphatic calculi, either by depriving them of a portion of the uric acid they contain, and thus rendering them less dense; by decomposing the ammoniacal salt which enters into the composition of some; or by acting on the animal matter which holds the molecules of these calculi together. The phosphate of soda and borax are also employed, on chemical grounds, as good solvents for lithic acid. On the whole, we have no good reason for believing that any of the agents recommended as true solvents for calculi exert any such effect in any considerable degree, but many of them, especially the alkalies, relieve the pain and irritation of the urinary organs, from their sedative influence upon the mucous surfaces, or from their effect on the digestive organs. Perhaps, also, the benefit which often results from their use may be in part owing to the fact that they are accompanied generally with the copious use of aqueous fluids. With regard to the reputed influence of lithonlithics when injected into the bladder, we must refer to the surgical works of BODIE, CHELIUS, VELPEAU, and GROSS.]

184. IX. DISEASED EXCRETION AND SUPPRESSION OF URINE.—The urine may be voided not only in the very different degrees of quantity, and in the states of chemical constitution described above as indications and important parts of disordered vital function and of local disease, but it also may be discharged with more or less effort and suffering on the part of the patient. It may, moreover, be retained in the bladder, owing either to paralysis and over-distention of the organ, or to mechanical obstacles at the neck or outlet of the viscus, or in some part of the urethra. The urine is also often either secreted in remarkably

small quantity, or suppressed altogether, owing to disease of the kidneys, the blood and nervous masses becoming poisoned by the arrest of the important depurating function of these organs, and by the resulting excrementitious plethora of the vascular system, and accumulation of urea, &c., which these organs eliminate from the blood as long as these functions continue. An altered or poisoned state of the blood may also arrest the functions of the kidneys.

185. i. *Difficult excretion of urine, urinæ difficilis excretio*, or *Dysuria* (from *δύς*, difficult, and *ουρον*, urine), is entirely symptomatic of disease affecting some part of the urinary apparatus, or some organ or part in the vicinity. It is generally characterized by heat and pain, as well as difficulty and delay, in procuring the discharge. *Dysuria* may depend upon the properties or chemical constitution of the urine, especially in irritable states of the urinary bladder and urethra; and in such cases, as well as in others where these properties are not present, it may be symptomatic of disease of the kidneys, especially of inflammatory and organic diseases. Most frequently, however, it is a symptom of the diseases of the urinary bladder and of the urethra, and of gravel and urinary concretions. It is not unfrequently present in diseases of the neck and body of the uterus, in the severe cases of dysmenorrhœa and leucorrhœa; in dysentery and inflammation of the rectum, and in cases of inflammatory hæmorrhoids.

186. ii. *Strangury, stranguria* (from *σπράγγειν*, to squeeze, and *ουρον*, urine), is a more severe degree of the preceding complaint, and is most frequently a symptom of diseases of the urinary organs, more particularly of over-distention of the bladder, of lesions of the neck of the organ and prostate gland, and of the urethra, and of urinary calculi and gravel. In dysuria the urine may flow in a full stream; but in strangury it is much interrupted, or passes in small quantities, or in drops, after great effort.

187. iii. *Ischuria* (from *ἰσχω*, I arrest, and *ουρον*, the urine) has usually implied an arrested discharge of urine; the arrest taking place either in the kidneys—*ischuria renalis*; *anuria* (WILLIS), renal ischuria; or in the bladder, from paralysis of the organ, or from some obstruction at its outlet—*ischuria vesicalis*, *I. vera*, *I. retentionis*, vesical ischuria; or in the urethra—*ischuria urethralis*, from stricture, phymosis, &c. Besides those symptomatic states of ischuria, or of retention and suppression of urine, other forms of retention arising from calculi, and from disease of, or tumours in, the uterus or vagina, &c., may be enumerated. This subject is more fully discussed in the article SYMPTOMATOLOGY (see § 210–218); but there is one part of it, and that of the highest importance, which requires a more particular consideration, namely, *Ischuria Renalis*, *Anuria*, of Dr. WILLIS, or *Suppression of Urine*, the excretion not being eliminated by the kidneys, urine not being secreted.

188. iv. *Suppression of urine* is always a symptom of pre-existing disease, but of so many, and of so dangerous maladies, as to require a short notice at this place. It is very doubtful whether or no it ever is a primary or idiopathic malady, in the strict acceptation of the word; although it occasionally deserves this rank as much as some others which have been so denominated. It is often observed in the course of pestilential mala-

dies, more especially in the severer grades and advanced stage of *pestilential cholera*. It is also not infrequent in the *hæmagastrie pestilence*. It sometimes occurs as a fatal, or at least a most dangerous symptom of exanthematous fevers, more particularly of *scarlet fever*. In these, and in other continued fevers, in which it is occasionally observed, suppression of urine has been either too often overlooked, or not viewed with due consideration. In all these maladies it may be either *partial* or *complete*. In either case, the consequences, as respects the blood, nervous system, and structures generally, may be readily inferred. It also frequently supervenes, either partially or completely, in cases of inflammation, acute or chronic, of the kidneys, and of organic lesions of those organs, most frequently of *granular disease*, or cachectic inflammation of the Malpighian bodies, but most generally in a partial or incomplete form. *Suppression* of urine is a more complete or rapidly dangerous or fatal form; often follows injuries and diseases of the spinal cord or its membranes, although *retention* is a more common result; and it is not an infrequent consequence of various modes of poisoning, owing either to inflammatory action or congestion thereby induced in the secreting structure of the kidneys, or to a paralysis of the ganglia and nerves supplying these organs.

189. *A. The symptoms* caused by *suppression of urine* vary with the circumstances of the case, and more especially with the slowness or rapidity with which suppression takes place, and with the disease of which it is a consequence.—*A.* When this condition proceeds from granular lesions, atrophy, or other organic change in the kidneys, it is generally slow in its progress, and it is often not observed, or rather the diminished excretion of urine has been of considerable continuance, before it has attracted notice; the urine being not only very scanty, but also very much altered from the healthy state, as shown in the articles on *Dropsy* and diseases of the *Kidneys*, and in the preceding sections. In these cases, with the slow progress of diminution of urine and of the solid constituents of this excretion, the cutaneous and pulmonary exhalations are sometimes increased, and their odour is most offensive; effusion often gradually supervenes in the cellular tissue and in the shut cavities, sometimes with evidence of a chronic inflammatory irritation of the serous membranes investing these cavities; and ultimately the dangerous and commonly fatal phenomena rapidly supervening upon the acute form of suppression, or of that occurring in the advanced stage of malignant maladies, make their appearance.

190. *B.* When suppression of urine takes place more rapidly, the disease is then characterized by many of the symptoms of continued fever. There are pains in the back, but chiefly in the loins and in the lower extremities, with nausea and vomiting, and often with a sense of weight or of uneasiness if actual pain or severe aching in these situations be not felt. In some cases vomitings are urgent, and the fluid thrown up is generally watery, and in a few instances has an urinous odour. The pulse is rapid, full, and distended; perspiration, at first scanty, becomes more copious, in some instances abundantly so, and ultimately it has often an offensive urinous odour. After a time varying from three to five days, or occasionally longer, effusion takes place in the

cellular tissue and shut cavities, with a tumid or bloated state of the countenance, especially about the eyes. In cases of somewhat longer duration, œdema of the face and extremities comes on and advances more slowly; but as these changes advance, sopor supervenes and passes into profound coma, and sometimes into coma terminating in convulsions, especially in children. Generally long before these symptoms appear, either the extreme diminution of the quantity of urine, or its entire suppression, has been recognised by the physician, if he have been consulted so early; and when the catheter is introduced to determine correctly the existence of urine in the bladder—the presence or absence of which, however, is generally evinced by the state of the hypogastric region—nothing beyond a very minute portion of a thick, muddy, or mucous and offensive urine is withdrawn. This form of suppression of urine, whether occurring primarily, as I believe I have seen it in a very few instances, or in the early progress of other diseases, or in the gouty diathesis, or as a consequence of misplaced or suppressed gout, may be ascribed to a state of congestive inflammation of the secreting structure of the kidneys, in which the organic nervous or vital influence of these organs is rapidly exhausted or suppressed.

191. *C.* When suppression of urine, or anuria, occurs in the advanced progress of malignant or pestilential maladies, the duration of the symptoms more especially appertaining to it is much shorter, and the course of the malady in which it appears is very much hastened by it to a fatal issue. The changes usually consequent upon the anuria often do not take place until shortly before death; the earlier effects of the lost function of the kidneys being chiefly an aggravation of all the symptoms and diagnostic characters of the malady in which it occurs. It is very remarkable in the case of malignant scarlet fever and pestilential cholera and yellow fever. Very soon, however, generally in a day or two, and often after a few hours, as in pestilential cholera, sinking, sopor, convulsions or coma, &c., occur and terminate life; œdema of the face and extremities, effusion within the cranium, &c., also taking place shortly before death in scarlet fever, and sometimes in the hæmagastrie pestilence. In pestilential cholera, the watery discharges from the stomach and bowels prevent the excrementitious plethora of the vascular system from taking place, that occasions the coma, effusion, &c., which are usually the results of anuria, when it supervenes in the course of other acute maladies.

192. *D.* Drs. WILLIS and SCHÖNLIN described a form of anuria which sometimes occurs in weak and cachectic children, and which I have observed also in the children of the poor living in cold, damp, or low situations. In these the digestive mucous surface is much disordered; the secretions and excretions are acid and offensive, and the cutaneous surface is affected by various eruptions, chiefly erythematous, vesicular, and pustular. The urine is scanty, is sometimes more or less albuminous, is voided in drops after short intervals, with pain and difficulty, and is ultimately quite suppressed. The pulse is at first quick and weak, but it gradually becomes slower, as sopor, coma, or convulsions supervene. These symptoms are usually preceded by constipation, by œdema of the face and extremities, by vomitings and retchings, and are ultimately followed by

death. In some cases, especially when perspirations are abundant towards the close of the disease, this excretion has a urinous or an acid and offensive odour. The breath also often has a similar odour.

193. *E. In fatal cases* of rapid or sudden suppression of urine, and when this event occurs in exanthematous and malignant diseases, the kidneys are found of a very dark colour, from the congestion of dark blood, or they present a livid or bluish-brown tint; or they are flabby, enlarged, and friable. These changes are most remarkable in the secreting structure, the tubuli being often filled with epithelial debris. In malignant scarlatina, suppression of urine presents appearances in the kidneys described when treating of SCARLET FEVER (see § 66). In the slower or more chronic cases, the appearances are altogether the same as those stated when treating of granular or cachectic inflammation of the kidneys (§ 99, et seq.). The changes in the cases of suppression of urine in children, which I have had an opportunity of observing, were similar to those which I have mentioned under the head of scarlet fever. Indeed, in some of these cases I had viewed the disease as an abortion or latent state of scarlet fever, in which the affection of the throat and skin had not appeared, as I have described it in that article. (See § 26, et seq.)

194. It is manifest that the fatal result, in cases of suppression of urine, arises from two pathological conditions: 1st, from the excrementitious plethora of the vascular system, the superabundance of the watery element causing effusion on the brain, its membranes, cellular tissues, and shut cavities; and, 2d, from the accumulation of urea, uric acid, &c., in the blood, which poisons the nervous masses and vital structures, thereby aiding the destructive effects of effusion, or even proving fatal independently of these effects.

195. *F. The treatment* of suppression of urine is rarely encouraging, owing to its want of success, and the fatal results which surely follow the very general failure of it. Yet treatment should not be neglected, as it may succeed in a few or rare cases. Besides, hopes of success may be reasonably entertained, if the suppression be incomplete. In cases occurring in acute, exanthematous, malignant, or pestilential maladies, the small quantity of urine passed before complete suppression takes place may or may not be albuminous, and of diminished specific gravity; it is sometimes thus altered in scarlet fever, but it is not, as far as I have seen, in other malignant diseases. In these, if the state of the pulse and other circumstances allow, the patient should be cupped on the loins, and the operation repeated, to an extent according to the features of the case and the effect produced. If the loss of blood cannot be hazarded, dry-cupping should be adopted; and the patient, under all circumstances, should be placed in a warm bath, rendered more or less alkaline by the addition of the carbonate of potash or soda. After leaving the bath, a turpentine epithem or embrocation may be placed over the loins, or an embrocation consisting of equal parts of the compound turpentine and camphor liniments should be applied in the same situation, or over the abdomen. The bowels must be kept freely open by the more diuretic purgatives, and by terebinthinate or other enemata; and diuretics should be taken, variously combined, or conjoined with sedatives or anodynes, according

to circumstances, more especially the preparations of taraxacum, of digitalis, of scopolium, &c.; the carbonates, the nitrates, the acetates, the tartrates, the bitartrates, and the biphosphates of the fixed alkalies, in large doses, or in as large as the stomach will tolerate. If these fail, the following may be tried as a *dernier ressort*:

No. 364. R Olei Terebinthinæ, ʒij.; Spirit. Ætheris Nitrici, ʒss.; Spirit. Juniperi Comp., ʒss.; Olei Cajuputi, ℥xx.; Potassæ Nitratis, ʒj.; Pulv. Tragacanth. Comp., ʒliij.; Pulv. Glycyrrhæ, ʒss.; tere bene et adde Syrupi Rosæ, Syrupi Tolutani, ʒiij.; Aquæ destillatæ ad ʒviij. Misce bene. Sit mist. cujus capiat Coch. ʒj. larga, 3tis, 4tis, vel 6tis horis, prius agitata phiala.

If the vomiting preclude the retention of these medicines, a very small quantity ($\frac{1}{2}$ or i minim) of creasote may be added, or from three to six drops of tinctura opii, to each dose, or both may be given in addition, and the terebinthinated embrocation applied over the epigastrium. When suppression of urine follows chronic disease of the kidneys, complicated with dropsy, and more especially when it is associated also with organic disease of the heart, then little or no permanent benefit will be derived from any means of treatment; those just mentioned being the most appropriate, and sometimes affording temporary benefit.

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THE BIBLIOGRAPHY OF URINE, URINARY DEPOSITS, AND CONCRETIONS, especially of the Causes, Symptoms, and Treatment of Urinary Concretions, is the most extensive of any branch of Medical Literature. I have mentioned only a few of the best works and memoirs on these subjects; but those who desire to be further informed will find numerous other references in *Flouquet's Literatura Medica Digesta*, articles *Calculus Urinarius* and *Urina*; in the *Repertorium* of *J. D. Reuss*, arts. *Calculus Urinarius*, vol. xii., p. 178-217, and *Urina*, vol. xv., p. 154-174; and in the Appendix to Mr. Crosse's able and laborious work, referred to above. Most of the References I have adduced are, however, not contained in these works.

[AM. BIBLIOG. AND REFER.—But very few monographs on the disorders of the urine and its deposits have yet appeared from the pens of American practitioners. The special works of *Prout*, *Bird*, *Marckwick*, *Willis*, *Rees*, *Griffith*, and other British writers on these subjects, are familiar to American practitioners; and in no part of the world, it is believed, are these affections treated more judiciously and scientifically than by the physicians of the United States, especially those more recently educated. All the recent improvements, both of a medical and surgical kind, have been here introduced; and lithotomy has been practised more generally, it is believed, than in any other country, except France. In no other nation has the operation of lithotomy been generally more successful than in this, and in no other can any surgeon boast of a greater number of successful cases than our own *Dudley*.† Without any disparagement to other authors, it will be conceded that the work of Professor *S. D. Gross*, already referred to, on "*The Diseases, Injuries, and Malformations of the Urinary Bladder*," &c., is not surpassed by any other on the same subject in any language, as it embodies all that is positively known on these affections up to the present time. We take pride in referring American practitioners to this most enlightened work.—*S. D. Gross*, Elements of Path. Anat., Svo. Phil., 1845; a Pract. Treatise on Diseases, Injuries, and Malformations of the Urin. Bladder, the Prostate Gland, and the Urethra, Svo. Phil., 1855.—*J. S. Dorsey*, on the Lithontriptic Virtues of the Gastric Liquor, Philad., 1892.—*T. D. Mutter*, Am. ed. of *Liston's Surgery*.—*Wm. Gibson*, a Sketch of Lithotripsy, Am. Journ. Med. Sci.—*A. H. Stevens*, Notes to Cooper's First Lines of Surgery, Svo. New York; and Lectures on Lithotomy, N. Y., 1838.—*Valentine Mott*, Am. edit. of *Velpeau's Surgery*, transl. by Townsend, 3 vols., Svo. New York, 1850.—*A. S. Doane*, Am. ed. of *Good's Study of Medicine*, 2 vols., Svo. N. Y., 1848.—*D. M. Reese*, Amer. edit. of *Cooper's Surgical Dictionary*.—*G. Buck*, Description of the Perineal Fascia, Trans. Amer. Med. Assoc., vol. i., p. 267.—*Charles Frick*, on the Urine, Svo. Balt., 1850.—*E. K. Kane*, on Kyesteine, Amer. Journ. of Med. Science, vol. iv., p. 13, N. S.—On Crushing Stone in the Bladder, see *Randolph*, *N. R. Smith*, and *Gibson*, in *Am. Journal of Med. Science*, vols. xv., xviii., and xix., and Amer. edit. of *Chelius's Surgery*, edited by *South*, 3 vols., Svo. Phil., 1847; also *Gross* on Urinary Organs.—*B. H. Dudley*, on Nature and Treatment of Calculous Diseases, Svo. Lex-

[* Out of 207 cases, 201 were cured; 1 in 34 fatal.]

[† An analysis of 354 cases of lithotomy performed in Great Britain gives one death in 44.]

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of Calculi, in Com. of Massachusetts Medical Society, vol. i., p. 53.]

URTICARIA.—SYNON.—*Urticaria* (from *Urtica*, a Nettle, the eruption resembling that caused by it), Swediaur, Vogel, Willan. *Febris Urticata*, Vogel. *Exanthema Urticatum*, Borsieri. *Scalatina Urticata*, Sauvages. *Purpura Urticata*, Juncker. *Uredo*, Linnæus. *Essera*, Heberden. *Erysipelas Urticatum*, *Exanthesis Urticaria*, Young. *Epinectis pruriginosa*, *Aspretudo*, Auct. *Exanthesis Urticaria*, Good. *Nesselfieber*, *Nesselsucht*, *Nesselschlag*, Germ. *Fièvre Orliée*, Fr. *Orticaria*, Ital. *Nettle-rash*.

CLASSIF.—ORDER GENUS (Willan), III.

CLASS, I. ORDER (Author).

1. DEFINIT.—A febrile, non-infectious exanthema, characterized by an eruption of prominent wheals or spots, paler or redder, or even both, than the surrounding surface, rarely of long continuance, often recurring or becoming aggravated in fits, and always attended by a burning and stinging sensation.

2. I. DESCRIPTION.—Dr. WILLAN has enumerated six species of Urticaria: 1st. *Urticaria febrilis*; 2d. *Urt. evanida*; 3d. *Urt. perstans*; 4th. *Urt. Conferta*; 5th. *Urt. Subcutanea*; and, 6th. *Urt. tuberosa*. These have been arranged by M. RAYER under two heads, according as their course is acute or chronic.

3. i. URTICARIA ACUTA.—The first variety under this head is the *Urt. febrilis*, which is generally caused by the ingestion of various articles, and frequently by shell-fish (see § 427, *et seq.*), and is to be imputed rather to a peculiar susceptibility or idiosyncrasy of the individual than to any noxious or poisonous quality in the article occasioning the eruption. Commonly in an hour or two after the ingestion of the article causing this affection the patient complains of a weight at the epigastrium, of nausea, sinking, or giddiness. These are followed by febrile symptoms, by heat of skin, and by the appearance of an eruption on the shoulders, breast, the loins, the inner sides of the arms, thighs, &c., generally consisting of reddish or whitish elevated spots, surrounded by bright crimson areolæ. The spots are generally irregular, but sometimes circular, varying in size, and elevated above the surrounding surface. When numerous in any part they are often confluent, the skin presenting a red tint, and being stiff and swollen (*Urt. Conferta*). The eruption is attended by distressing itching, pricking, or stinging, especially during the night; and sometimes the confluent variety is associated with erythematous blotches. When this form of the disease is caused by shell-fish, or by poisonous ingesta (§ 427, 434), the eruption is sometimes preceded or attended by vomiting or purging, or by both; and spasms, sensations of choking or suffocation, convulsions, sinkings, &c., have even supervened, and in rare instances terminated fatally. In the slighter cases of urticaria, caused by the ingesta, the white itching elevations of the skin are not observed, a simple efflorescence, resembling scarlatina, and belonging rather to erythema than to urticaria, being the characteristic symptom. After twenty-four, thirty-six, or forty hours the eruption usually declines, and soon afterward leaves only slight traces on the skin, which are effaced in a few days.

4. Febrile urticaria sometimes appears without any appreciable cause, except teething in chil-

dren, and intense moral emotions in adults. The symptoms are nearly the same as those caused by the ingesta, excepting that vomiting and purging are not observed, that the febrile symptoms continue longer, usually a week or longer, and that the eruption is less general, but appears and disappears in almost all parts of the surface, preceded by slight febrile symptoms. The patient can often excite spots of urticaria by friction, but these generally disappear in a few hours. In some instances the rash continues for two or three weeks (*Urticaria perstans*, WILLAN), and is attended by anorexia, functional disorders of the digestive organs, febrile symptoms, general depression, malaise, &c. The eruption usually declines imperceptibly, but it often returns with itching in different parts, and at last disappears. When urticaria has been severe, or has continued long, a slight desquamation generally follows.

5. URTICARIA CHRONICA.—Chronic urticaria often lasts for months. M. RAYER states that he has known it to continue for several years. This form of the disease is most frequent in females, and in persons with a delicate or sensitive skin. Although most common in those who complain of disorder of the digestive functions, yet it sometimes occurs in persons who are otherwise in good health. The eruption appears at irregular intervals, sometimes in one place, at other times in another (*Urt. cranda*, WILLAN), without fever, and often for a few hours only. The patches are generally irregular, and closely resemble the wheals produced by flagellation. They have no erythematous areolæ, and are attended only by severe pruritus. In some cases, instead of itching, a stinging or pricking sensation under the eruption is experienced (*Urt. Subcutanea*, WILLAN). In these the eruption is scanty, consisting of a few red points, but little elevated above the surface, and a small number of spots, that appear at very remote intervals. M. RAYER considers this form of urticaria to be very uncommon, and to be caused by violent moral emotions.

6. A severer variety of nettle-rash sometimes appears (*Urt. tuberosa*, WILLAN). It consists not merely in slightly prominent elevations, but in true tuberosities of various sizes, which are hard, deep-seated, extending to the subjacent cellular tissue, attended by slight ecchymosis, and by a tense and sore state of the limbs. These tuberosities generally appear in the evening or at night, with itching and stinging, and disappear before morning, leaving the patient weak, restless, and depressed. They occur more particularly on the loins and extremities, but they may come out over the whole of the body, causing swelling of the neck, limbs, and even the face; and are attended by various symptoms, as dyspnoea, irregular action of the heart, &c. They are usually developed with febrile action, and subside with the remission of the fever, reappearing with its accession (*Febris intermittens Urticata*, FRANK).

7. The varieties of chronic urticaria are very irregular in their courses. They sometimes disappear for several days, and reappear with or without an appreciable cause, after uncertain intervals. They often are not entirely removed for many months, in rare instances, not for some years; and either spontaneously or by a methodical plan of cure. TURNER, HEBERDEN, RAYER, and others, mention cases which continued many

years. I have recently attended a case with Mr. PETTIGREW, which resisted for above a year the most active treatment. When the eruption of these chronic forms of the disease is very severe, it is followed by a bran-like desquamation, constitutional symptoms of varied characters and severity being present, or recurring irregularly.

8. The associations of urticaria are common, and often important. With constitutional disturbance and disorder of the digestive organs, often depending upon an improper regimen and diet, urticaria is very generally associated. J. FRANK saw it complicated with quotidian and tertian agues, at Pavia, in May and June, 1794, and at Wilna, in March and April, 1812, in so many cases as to appear epidemical. In acute rheumatism the wheals of urticaria may appear, although not so frequently as the efflorescence of erythema or roseola. Nettle-rash is uncommon in connexion with diseases of the respiratory organs and passages. It is sometimes observed during various chronic visceral diseases, or cancerous and organic maladies, and after miscarriages occurring in nervous females. Urticaria may be complicated with other cutaneous eruptions, especially with erythema, or with roseola, or with lichen, and occasionally with impetigo. WICHMANN saw it associated with variola; HUFFELAND with measles; RAYER with prurigo; and I have seen it in a case of jaundice, and in another of senile prurigo.

9. ii. THE CAUSES of urticaria are most frequently articles of diet, which, owing to their unwholesome or indigestible natures, or to idiosyncrasy or peculiarity of susceptibility, disorder the digestive and assimilating organs, and which, by passing into the circulation, excite more or less febrile action, and affect the capillary vessels of the skin. The ingestion of numerous articles is liable to induce urticaria, one article being more certain to occasion it than another, in those predisposed to it. Mussels, cockles, lobsters, crabs, shrimps; the roe of a fish; dried, smoked, and salt fish; dried, smoked, and preserved meats; mushrooms, nuts, and kernels of fruits (see art. POISONS, § 434, *et seq.*); cucumbers, and unripe or stale fruits; some kinds of honey, preserves; oatmeal, especially when long kept; certain medicines, as the balsams, resins, &c., and many other articles, according to particular idiosyncrasies, often occasion this eruption. I have seen it caused by fresh pork. Some persons are so susceptible as to become affected by it after slight friction. J. FRANK states that it is rare in Italy and frequent in Russia. This is to be attributed chiefly to the general use of olive oil in the former, and of animal oils and rancid substances, and dried meats and fish in the latter country. Nettle-rash is most common in summer, especially in women and persons of a nervous and sanguineous temperament; and is much more frequent in children, the young, and adults, than in the aged. Cold, or rather exposure to the air, appears to have considerable influence on the development of the wheals of urticaria, especially in respect of certain parts of the surface which are usually covered.

10. iii. DIAGNOSIS.—It should not be overlooked that the leaves of the *urtica urens*, *urtica dioica*, and *rhus toxicodendron*, the bite of the common bug, of the gnat, of the flea, and the hairs of certain caterpillars, may occasion an eruption of wheals, which, although evanescent, may at first,

if the cause be not inquired after, be mistaken for urticaria. The white and raised wheals surrounded by areolæ, characterizing *urticaria*, differ from patches of *erythema* in these respects, and in stinging, pricking, and itching. *Erythema nodosum* is distinguished from *urticaria tuberosa* by the persistent nature of the former, and the intermittent course of the latter. *Roseola* cannot be confounded with the wheals of urticaria, as it presents red spots and patches, and not the dull white spots of urticaria, and is not attended by pruritus, and the pricking or stinging of this latter. The history and all the phenomena of the case will prevent the eruption from being, at any time during its course, mistaken for either *measles* or *scarlatina*. The papulæ of *Lichen Urticatus* are much more likely to be mistaken for urticaria, but they are less extensive and less prominent than the spots of urticaria; their colour is deeper, they are harder, and they never disappear spontaneously. The bites of insects already mentioned, although causing wheals and itchings, cannot be mistaken for any form of urticaria.

11. iv. PROGNOSIS.—This eruption has appeared as a salutary crisis in some instances of internal inflammatory disease, as remarked by KOCH, RAYER, and others. While, on the other hand, the sudden disappearance of urticaria has been followed by the development or the increased activity of some internal disease. This has very probably been owing to the occurrence or progress of the latter causing the subsidence of the urticaria, rather than to the suppression of this eruption. No one of the forms of urticaria is attended by any danger, although the chronic states are often accompanied with much distress, and frequently resist the most appropriate treatment for a long time. The acute forms following the ingestion of poisonous articles, however severe, or even when fatal, cannot have the unfavourable results imputed to the eruption, inasmuch as these results proceed from other changes produced by these causes, the eruption being the least important of their effects.

12. v. TREATMENT.—When acute urticaria is produced by the ingestion of poisonous substances, or by articles which are injurious from the idiosyncrasy of the patient, emetics and the other means advised when treating of those poisonous articles which usually cause this eruption, are required (see *art. Poisons*, § 443, 450). After the stomach and bowels have been evacuated, liquor ammoniæ acetatis and nitrate of potash may be given in the camphor mixture, or in any demulcent infusion or decoction; or the hydrochlorate of ammonia in similar vehicles. Subsequently a warm bath may be resorted to and repeated, and the bowels kept open by means of cooling aperients. I have found olive oil, taken in frequent doses on the surface of mint water, and the application of this oil to the surface, either before or after a warm bath, of very great service. In full and robust habits of body, or in the young and strong, especially if visceral congestion be present, vascular depletions, in form and amount according to the circumstances of the case, should be early prescribed, a strict diet and regimen enforced, and in all cases a free state of the bowels, by means of cooling aperients, and emollient and demulcent decoctions, be preserved. The insomnia and restlessness so generally observed in the severer cases of this eruption require opiates, but they should

be conjoined with cooling diaphoretics and alkalies. I have found James's powder, or the antimonial powder, with the compound soap-pill, or the compound ipecacuanha powder, or a full dose of the carbonates of the fixed alkalies, or of magnesia, in a demulcent infusion, very successful in mitigating these symptoms, especially when either of these means has been resorted to after due evacuation of the bowels, and when taken early in the night, or rather in the evening. If febrile action be present, saline aperients, the acetate or citrate of potash or soda, with nitrate of potash, and spirits of nitric ether, in mint water, or in camphor mixture; or the citrate of magnesia, in doses sufficient to act on the bowels, will be found of great service.

13. The chronic states of urticaria are often most difficult to remove; and more especially as they are generally caused by errors in diet, and perpetuated by the use of articles which either disorder the digestive organs, or impair the depurating functions, or otherwise affect the circulating fluids, so as to irritate the capillary vessels of the skin. In these cases patients should adopt a restricted diet and regimen, and avoid spirituous, vinous, and fermented liquors, all kinds of shell-fish, and live entirely on farinaceous and vegetable food. I have seen the most obstinate cases, which had been treated by the too generally prescribed preparations of arsenic, iodine, &c., in large and improperly combined doses, yield to the use, chiefly or entirely, of farinaceous and vegetable diet, and distilled water; the secretions, excretions, and depurating functions generally being duly promoted by gentle cooling aperients, such as those mentioned above.

14. When the chronic states of urticaria assume a remittent or intermittent form, and if they do not readily yield to the means already advised, then the preparations of cinchona may be given with the carbonates of the fixed alkalies, or with the solution of the acetate of ammonia, or with the addition of the nitrate of potash; and warm alkaline baths, or vapour baths, be resorted to. External applications, especially those which are oily or greasy, should be avoided, excepting the olive and almond oils, to which the hydrocyanic acid may be added when the stinging and pricking are distressing. But even these should be washed off in a few hours, before they are made rancid by the air and the cutaneous exhalation.

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sion of Urticaria by Cold Application.)—J. Houghton, in Cyclop. of Pract. Med., vol. iv., p. 371.—(See also Bibliog. and Refer. to art. SKIN, Diseases of, and art. POISONS, &c.)

UTERUS.—Some of the diseases of the uterine organs have been considered in the articles on the OVARIA and their diseases, on MENSTRUATION and its disorders, on DROPSIES of the ovarium, uterus, and Fallopian tubes, on LEUCORRŒA, and on the diseases of the VAGINA and VULVA. Certain uterine maladies have also been fully described with reference to the puerperal states, when treating of PUERPERAL DISEASES. It now remains for me to view those morbid conditions of the uterus which are not noticed under other heads, and which appear to be of such importance as to require attention.

I. MORBID SENSIBILITY OF THE UTERUS.—SYNON.—*Hysteralgia* (from *ὑστέρα*, the womb, and *ἄλγος*, pain); *Metralgia*; *Uteralgia*; *Hysteradynia*. *ῥστεραλγίης*, Hippocrates. *Neuralgie de l'Uterus*, *Métralgie*, Fr. *Der Gebärmutter-schmerz*, Ger. *Neuralgia of the uterus*. *Irritable uterus*.

CLASSIF.—I. CLASS, V. ORDER. (See Preface.)

1. DEFIN.—*Pain of the uterus, generally very severe, sometimes continued, at other times remittent or intermittent, particularly of the neck of the organ; occurring generally at a mature age, but seldom after the cessation of the catamenia; and not necessarily depending upon very manifest organic disease, although more or less inflammation and alteration of structure frequently exists.*

2. *Morbid sensibility of the uterus occurs, according to my observation, in two forms: 1st, in that which has been denominated irritable uterus, when indications of a slow, chronic, and often most protracted state of irritation, amounting in some cases to inflammation and its usual consequences, are present in the os and cervix uteri; and, 2d, in that which is more neuralgic, where these indications are not manifest, and where the nervous characters of intermission, &c., are most evident. An approximation of the characters of the one affection to those of the other may, however, be remarked in some instances.*

3. i. IRRITABLE UTERUS, or *irritability of the uterus*, was first fully described by Dr. GOOCH. The notices taken of it in the works of RIEDLIN, POUTEAU, RIVERIUS, STOLL, and some others, are extremely unsatisfactory, and even calculated to mislead, it having generally been referred by them to rheumatism or gout affecting the womb.* Since the publication of Dr. GOOCH's observations on this affection, Prof. DEWEES has directed attention to it; and the more recent writers on

the complaints of females have farther illustrated this subject, and shown its connexion with chronic inflammatory irritation.

4. Irritable uterus is seldom met with before twenty-three years of age, and as seldom after the menstrual epoch has ceased. Dr. GOOCH says that it is not attended by change of structure, and that it does not tend to such change, while Dr. DEWEES states that he has usually found some change about the neck of the uterus. In the cases of this affection for which I have been consulted, some have been unattended by any manifest alteration of structure, and others have been accompanied by indications of chronic inflammation of the cervix and os uteri. (§ 21, et seq.) In a case in my own family, no alteration could be detected for a very long time, but a change of structure subsequently became manifest, and assumed a malignant form.

5. ii. SYMPTOMS.—A. The constitutional symptoms are increased frequency of pulse on the slightest emotion or exertion; sometimes flushes, alternating with chilliness, previously to the exacerbations; pain in the lowest part of the abdomen along the brim of the pelvis, and often also in the loins, exacerbated by exercise, while it is diminished, although not removed, by perfect quietude in the horizontal posture; the pain sometimes recurs in paroxysms, even when the patient reclines, or is quite still, and is generally increased for a few days either before or immediately after menstruation; emaciation, paleness, weakness, and increased sensibility and irritability of the whole frame; an irregular state of the bowels, with difficult or painful micturition, and a pale, white tongue, particularly in the morning. Sometimes the pulse is soft, at other times firmer than usual; and although generally somewhat quickened, it is occasionally not above the usual frequency. The skin is commonly dry, and its temperature sometimes augmented, while the hands, legs, and feet, particularly the latter, are cold. The febrile exacerbations seldom terminate in perspiration. The patient occasionally complains of headache, which is often increased toward night. The appetite is usually impaired or capricious; and the bowels either are confined or much relaxed—most frequently the former, the latter more particularly when acted on by purgatives, which generally excite a paroxysm of pain. The urine is either sparing, high-coloured, and depositing a copious sediment; or it is pale, copious, and limpid, particularly when the affection is complicated with hysteria or neuralgic pains in other parts of the body: it is generally voided with difficulty and pain referred to the urethra; sometimes it is retained for a long period, and passed with great suffering.

6. B. The local Symptoms.—If the uterus be examined, it will be found exquisitely tender, particularly its orifice and neck, the former generally being neither misshapen nor indurated, although frequently somewhat swollen—a state in which the cervix often also participates. When the pain is excited by an examination, or by coitus, which is also very painful, it does not readily subside; and it is often induced by the patient seating herself suddenly upon a hard chair or bench, and usually by the sexual congress. In addition to these she frequently complains of a throbbing or fluttering sensation in the pelvic cavity and vagina. Walking, riding, or any exercise increases the symptoms, and causes severe

[* Professor C. D. MEIGS expresses the opinion ("Females and their Diseases," Phil., 1848, p. 418) that what goes under the name of dysmenorrhœa is, for the most part, "rheumatic disorder." "The uterus becomes sensible on pressure with the finger; a pessary in contact with it produces heat and pain, while the touch reveals no change in the form, dimensions, or resistance of the cervix." Dr. M. thinks it "identical with what has been called irritable or neuralgic uterus;" states that it may continue for a long time without inducing any cognizable change in the parts. The volatile tinct. guaiac, so much extolled by DEWEES in dysmenorrhœa, proves efficacious, according to Professor M., "in virtue of its anti-rheumatic therapeutical force." The same able writer and teacher states that the gravid uterus is also the frequent subject of rheumatic attacks (Loc. cit.). Dr. M. also admits that "the womb, like any of the other tissues, may be the seat of a pure neuralgia or preternatural sensibility of the nerves of the tissues" (p. 437), which would be likely to be aggravated at the menstrual period.]

lancinating pains through the pelvic cavity, particularly in the course of the urethra, and about the centre of the sacrum: as these subside, a dull, diffused pain is felt in the same direction. Leucorrhœa frequently accompanies this affection, and often becomes abundant, the discharge varying from a thin, transparent, and inodorous matter to a thick, muco-purulent, and offensive fluid. There is often increased heat of the vagina. The uterus is occasionally found lower in the vagina than natural, and its neck is generally shortened and enlarged, and sensible to the touch. Pain is felt immediately behind the mons veneris and anterior part of the brim of the pelvis. The catamenia are at first but little affected in this complaint, but they ultimately become more and more scanty, while the sufferings of the patient are generally increased at their accession. They often prematurely cease, the patient being reduced by the protracted disease and by the confinement.

7. ii. NEURALGIA UTERI, or *uterine neuralgia*, has been considered a distinct disorder by some writers, and a modification of irritable uterus by others. (See NEURALGIC DISORDERS, § 43.) In this form of altered sensibility of the uterus, the pain is most exquisite, is generally referred to the body of the organ, does not continue for a very long time, and subsides entirely, or nearly entirely. It is altogether paroxysmal, and sometimes almost periodic. The general or constitutional symptoms are less evident, or altogether absent in this affection; but the debility and exhaustion may be greater. Examination per vaginam does not excite the pain in the intervals, although it may aggravate it in the paroxysm; and neither heat, nor leucorrhœal discharge, is usually present. This form of complaint is not commonly—or it is rarely—induced or aggravated by the causes which occasion or increase the sufferings in irritable uterus. The chief features of the neuralgic disorder are the extreme violence of pain during the paroxysm, and the complete or nearly complete subsidence of it during the intervals. Cases, however, occur in which the symptoms of the one form of disorder appear to lapse into those of the other.

8. C. The *diagnosis* of morbid sensibility of the uterus is manifest in the severity of the pain, and in the localization of it in the *cervix* and *os uteri*, especially of the *irritable form* of disorder, these parts evincing the utmost tenderness on examination, and the existence of great irritation, and ultimately of chronic inflammation and its consequences; namely, excoriation, leucorrhœal discharge, &c. The *neuralgic form* of disorder, as well as the *irritable form*, is unattended by any manifest change of the body of the womb, the symptoms of metritis or inflammation of the body of the uterus (§ 53, *et seq.*) also being absent. Although both affections are independent of displacement of the uterus, yet they may be accompanied with displacements in one or other form. They cannot be mistaken for dysmenorrhœa or painful menstruation, for they may be present during the intervals between the menstrual periods, although they may be aggravated by the accession of these periods. On vaginal examination of cases of these complaints, the uterus is usually found in its natural position, excepting that it is sometimes situated lower down in the pelvis, or otherwise more or less displaced. In recent cases it is free from organic change, be-

yond slight tumefaction or fulness, and occasionally softness of its mouth and neck; but in protracted cases, the changes produced by continued irritation and consecutive chronic inflammation usually supervene.

9. D. The *prognosis* of the above states of morbid sensibility of the uterus is favourable as regards the life of the patient, although it is not so favourable as respects a quick recovery. It may, if the causes continue to operate, be followed, after some years, by organic change, or even by malignant disease of the *os* and *cervix uteri*. While most of these cases will recover, if judiciously treated, some can only be relieved, and others may continue to suffer for many years, especially if the secret habits or vices in which the malady has originated be persisted in. The issue of these cases will depend much on the causes inducing them, on their recurrence, and on the physical and moral conditions of the patient.

[Idiopathic *uterine neuralgia* is, no doubt, often mistaken for what has been called by VALLEIX, *utero-lumbar neuralgia*. MALGAIGNE has also called attention to this affection, as well as MITCHELL, BEAU, and others. The former writer regards it as a variety of the *lumbo-abdominal neuralgia*, consisting essentially in an irritation of the lumbar nerves, the irritation usually concentrating itself on the *cervix uteri*. If the neuralgia is confined to one side of the lumbar region, the pain in the neck of the uterus is also confined to one side, and when it exists on both sides of the vertebræ, the pain in the cervix is more strongly marked on the side in which the neuralgia is most intense. This affection has been called by some *hysteralgia*, *rheumatism of the womb*, &c.; but it is simply *utero-lumbar neuralgia*. It is generally accompanied with leucorrhœa, or a discharge of mucus from the vagina. The prominent local symptoms of this disease, then, are pain in the uterus and over the lumbar region, increased by pressure; uterine sensibility, sensibly augmented by a digital examination, sexual intercourse, or the introduction of a speculum; also a discharge of mucus, &c. The diagnostic signs are sufficiently clear, viz., pain on pressing the lumbar vertebræ and the *cervix uteri*. The prognosis is favourable, provided the disease be recognised and the proper treatment carried out. The treatment consists mainly in powerful revulsives to the spine and cauterization of the *cervix uteri*. VALLEIX recommends a succession of blisters over the lumbar and sacral region, and also the actual cautery to the cervix. MALGAIGNE prefers scarifications of the neck of the uterus. MITCHELL, of Dublin, relies on the red-hot iron to the spine. A nitric acid issue on the side of the lumbar vertebræ has been found also very successful, and it is not likely to cause strangury, so often the result of the application of blisters to this region. If this affection is characterized by periodicity, quinine and other anti-periodics will be useful, and indeed will often effect a cure without local remedies.]

10. E. Causes.—a. The *predisposing causes* of these states of morbid sensibility of the uterus are constitutional sensibility and irritability, the nervous and irritable temperaments, the impulsive and susceptible disposition, a spare habit of body, previous liability to painful, difficult, or scanty menstruation, repeated abortions, and masturbation.—b. The *exciting causes* are not accu-

rately ascertained; but they appear to consist chiefly of fatigue, exertion, prolonged walks, or dancing or standing too long, and falls on the hips or back, or succussions of the body, particularly when the uterus is susceptible, or during the catamenia. Riding on horseback or in a carriage, especially if the road be rough, and during the menstrual period, or without duly evacuating the bladder; the use of cold or astringent lotions or injections to stop a profuse lochia or leucorrhœa; exposure to malaria, &c.; sitting on damp or cold stones, earth or iron seats, venereal excesses, and self-pollutions; neglected or protracted leucorrhœa.

11. *F. The nature of irritable uterus* was supposed by Dr. GOOCH to be similar to that of painful menstruation, the former being permanent, the latter recurring with the periodic discharge. He farther inferred that it is not inflammatory, because it does not terminate in change of structure; but it may, and often does, terminate in such change. He states that, after repeated examinations, nothing is discovered excepting exquisite tenderness and slight swelling, or rather tension of the cervix and os uteri. He farther supposes that the fact of many cases, after having lasted for years, terminating in entire recovery, is a sufficient proof that it is a disease of function only. Dr. DEWEES contends that it consists of a chronic inflammation, which he conceives may exist in some instances for an almost indefinite period without any very manifest derangement of structure; and he states besides that he has generally detected in this affection increased heat, and tumefaction as well as pain, which he views with justice as characteristic of chronic inflammation. M. GENESE nearly adopts the views of Dr. GOOCH, which, however, are much more applicable to the nature of neuralgia of the uterus than to the irritable form in which morbid sensibility of the os and cervix uteri most frequently occurs in practice. (See NEURALGIC AFFECTIONS, § 43, 44.)

12. My experience, derived from many cases in which my opinion has been requested in consultation, leads me to conclude that the two forms of morbid sensibility of the uterus are characterized by very different pathological conditions: 1st, that *neuralgia* of the uterus is an affection of the nerves of this organ, induced by depressing and exhausting causes, and is altogether independent of inflammatory action and organic change, although it may be associated with one or other of the several displacements and organic lesions of the womb about to be noticed; 2d, that *irritability* of the uterus is caused by irritation of the os and cervix uteri, this irritation being attended by exquisite morbid sensibility and tenderness, and by some degree of inflammatory action; that the irritation superinduces chronic inflammation of these parts, which may be protracted for a very long period, before it is followed by excoriations, by a morbid secretion and discharge from the excoriated surfaces, and from the irritated mucous glands in these situations, and ultimately by granulations, ulcerations, and even more serious organic change. According to this view, the greatest number of the cases formerly termed irritable uterus, or which had this term appropriately applied to them at an early stage only, were actually instances of irritation followed by chronic inflammation of the os and cervix uteri and its consequences. The writings

of Dr. HENRY BENNET have fully demonstrated the existence of these lesions, which, although denied by Dr. ROBERT LEE and some others, have been very often observed by Dr. SIMPSON, Dr. TYLER SMITH, Dr. West, Dr. WHITEHEAD, of Manchester, M. CHOMEL, and numerous continental writers, and by myself. The imperfect manner in which affections of the os and cervix uteri were observed when Dr. GOOCH wrote, prevented the true state of these parts from being duly recognised and estimated; and yet his admission of the existence of tenderness, fulness, tension, &c., in this situation, is a sufficient proof of the presence of inflammatory irritation, or of irritation usually passing into inflammation. (See *Inflammation of the Os and Cervix Uteri*, § 21, et seq.) When writing upon this subject in 1829, I remarked that, if morbid sensibility of the os and cervix uteri exist for some time, it often induces, or is attended by, an alteration of the circulation in these parts, by swelling and tension, by great tenderness, and by increased secretion from their surfaces—the augmented secretion generally tending to prevent the disorganizing effects of inflammatory irritation or action from taking place.*

[* We are inclined to believe that the pure "*irritable uterus*" very seldom occurs in practice; for however unaccompanied it may be in the commencement, by the time the physician is called in more or less engorgement or inflammation has ensued from the irritation set up. At least such has happened in nearly every case that has come under our observation; so that the definition of the disease by Dr. GOOCH, who first called attention to it, will not hold true, viz., "a painful and tender state of the uterus, neither attended by nor tending to produce change in its structure." Dr. DEWEES has given a very accurate account of this affection ("*A Treatise on the Diseases of Females*," p. 306. Phil., 1833), from which Dr. COPLAND has very freely drawn in his description, both of the general and local symptoms, as well as the diagnosis and treatment. According to our countryman (Dr. D.), the irritable uterus may be distinguished from a neuralgic condition of this part by the following signs: In *neuralgia of the uterus* there is an entire absence of the general or constitutional symptoms attending irritable uterus, especially the evening febrile movement; there is seldom a vaginal or leucorrhœal discharge; there is no preternatural heat in the vagina, nor is the uterus so sensible to the touch unless examined during the painful continuance of the paroxysm, and then, perhaps, it is more exquisitely sensible than it is in the pure irritable uterus. In *neuralgia*, moreover, the pain is less constant, but is more violent during the paroxysms, which generally observe periodicity. In *neuralgia*, a paroxysm may be suddenly induced by passions or emotions of the mind, which is never the case in the irritable uterus, though the latter is susceptible of great and occasional augmentation of pain, through the medium of the circulation, by errors in diet or improper exposure.

Dr. DEWEES also calls attention to the fact that irritable uterus is very apt to be confounded with prolapsus uteri, inasmuch "as the local symptoms of the latter are a miniature representation of the former," and as, in the former, the womb is certain to descend more or less, and hence is supposed to be the cause of all the difficulty. If a pessary be employed under such circumstances, the symptoms will necessarily be aggravated, and the case rendered still more difficult.

By way of diagnosis, the mode of conducting an examination is all-important. The patient is to be placed upon her back, with the knees drawn up, the parts well lubricated; then passing the finger gently into the vagina, seek for the cervix uteri; and when found, direct the attention of the patient to the degree of sensation produced by touching it, as well as the body of the uterus and the sides of the vagina. Inquire if there be any extraordinary sensibility in either of these parts, and if so, in which part it resides. If there be tenderness, the use of a pessary or any mechanical means for supporting the uterus is out of the question.

The irritable uterus has also been confounded with dysmenorrhœa and carcinoma of this organ, but it may readily be distinguished from the former by the circumstance that in dysmenorrhœa pain is only felt during the menstrual discharge, while the irritable uterus is not nec-

13. iii. TREATMENT.—Very different means are requisite for these two forms of morbid sensibility of the uterus. It should not be overlooked that the one is unconnected with inflammatory action, is purely nervous, and is sudden in its accession and in its subsidence, while the other is more or less inflammatory either originally, or consecutively upon irritation, the morbid action, owing to the organization and sympathies of the parts affected, being more or less modified in character, and prolonged in duration. The circumstance of the os and cervix uteri being possessed of sensibility only inferior to that of the clitoris,* their erectile organization, and their abundant supply of mucous follicles, often render them exquisitely tender and painful when inflamed, or even when they are the seats of irritation, and enable them to furnish an abundant secretion tending to resolve or to diminish inflammatory action, and to prevent the usual consequences of this action. Notwithstanding the advantages these parts derive from their organization, vital powers, and free discharge from their surfaces, when irritated, inflamed, or otherwise affected, inflammatory action, when once developed in them, is the more disposed to be protracted, but it is, from these circumstances, much less liable to consecutive alterations of structure; the chief organic lesions which occur being superficial excoriations, granulations, and ulcerations, with a more or less abundant leucorrhœal discharge. These alterations are the more likely to take place when the uterus falls low in the pelvis, when the morbid secretion accumulates, or is retained, in the vagi-

essarily attended by dysmenorrhœa, nor is the latter usually attended by this irritable condition of the uterus. A digital examination will readily distinguish irritable uterus from carcinoma uteri by attending to the marks laid down by our author.

With regard to the pathology, we are disposed to coincide with Dr. DEWEES in the opinion that there is in this disease more or less inflammation of a sub-acute kind of all the tissues of the neck of the uterus, and perhaps the body also. Heat, swelling, and pain to a greater or less degree, we have always found present in this disease; and in a case now under treatment, of four years' standing, there is a swollen, tender condition of the cervix uteri, with slight ulceration. In another chronic case, which came under my care recently, there was considerable enlargement and ulceration of the neck of the womb. The pathology of Dr. DEWEES appears to us, therefore, more accurate than that of GOOCH, who denies the presence of inflammation in irritable uterus. The most frequent exciting cause of this affection, according to our experience, is repeated abortions occurring in females of a highly nervous, susceptible temperament, and delicate organization; although we have met with it, but less frequently, in those of robust habit and of a sanguine temperament.

The treatment of this affection is necessarily protracted, difficult, and uncertain, and the patience of both physician and patient is likely to be exhausted before a cure is effected. Our water-cure (?) establishments abound with such cases, where they are generally treated with little discrimination and less success. Most of these cases are there treated for prolapsus; and in one institution, where such patients congregate in great number, we found it a common practice to subject the uterus daily to a pressure of some 20 lbs. of water to a square inch, introduced by a flexible tube attached to a hydrant! The treatment laid down by our author comprises all that is known, and may be summed up as follows: Absolute quiet in a recumbent posture, counter-irritants, anodyne injections and suppositories, laxatives and enemata, and tonics, with great attention to diet, &c.]

[* M. JOBERT maintains that the projecting portion of the cervix uteri is entirely deprived of nerves, and is, under all circumstances, insensible. Of course, he denies that it is ever the seat of pain. BOUILLAUD goes still farther, and denies that the uterus receives any nerves whatever from the cerebro-spinal axis; this, however, is refuted by the positive observations of TIEDEMANN, ROBERT LEE, MÜLLER, HERSCHFELD, BOULAN, and others.]

na, when vital or constitutional power is depressed or exhausted, and when the treatment pursued, and other circumstances, permit the air to have access to the irritated or inflamed parts. This form of altered sensibility of the uterus, however severe the pain characterizing it, being either identical with, or nearly allied to, irritation or chronic inflammation of the neck of the organ, the treatment appropriate to it will be necessarily the same as advised for that disease; the more painful symptoms being treated by such combinations or modifications of the remedies as have been found most beneficial in neuralgic affections, and in irritable and exhausted states of the system.

14. The neuralgic affection, or the nervous form of morbid sensibility of the womb, will, therefore, be chiefly considered at this place; the means, however, to be recommended for it will often be also required in the inflammatory states, and their consequences hereafter to be noticed, either conjointly with other constitutional and local remedies, or after recourse has been had to them. The indications of cure in this affection are, 1st, to subdue the sufferings of the patient; and, 2d, to prevent their recurrence, by restoring the constitutional powers, and healthy state of the uterus. Certain of the means calculated to fulfil the first will often aid the accomplishment of the second intention. The means to be employed with these views are the same as have been fully considered when discussing the *Treatment of NEURALGIC AFFECTIONS* (see § 80, *et seq.*); and they may be used as there recommended and prescribed.

15. In the more violent cases, the more energetic sedatives and narcotics may be applied locally, in the form either of suppositories, or of injections thrown into the vagina, or of enemata, the bulk of which should not exceed three or four ounces; sufficient care being taken not to prescribe too large a dose of the more sedative substances, especially in the injections, as the effects produced by them when thus exhibited may be as violent as when taken by the mouth. In a case which I attended with the late Dr. MOORE, very marked relief was procured by carrying, by means of a small piece of sponge, about half a drachm of the tincture of belladonna, in a female syringe, and pressing it out when it reached the os or cervix uteri. The paroxysm generally subsided after a very few minutes, and the more restorative means recommended in the article now referred to were afterward taken. These should be adapted to the peculiarities of the case, and more especially with due regard to the states of the vascular system, and to the causes and associations of the complaint. These last it is most important to recognise; for not only may the disorder be the result of depressing or exhausting causes, but it may be complicated with one or other of the several forms of displacement of the uterus, and even with tumours or other organic changes of the organ.

16. Besides the means now mentioned for the removal of the paroxysm, others may be tried; chloroform taken in doses of from twenty to thirty drops, by the mouth, or injected into the vagina, in the same or somewhat larger quantity; or suppositories, in which the extract of belladonna forms an ingredient, may be introduced; or other narcotics may be similarly employed. In the most severe cases vomitings or retchings may occur

and add to the patient's distress; for these the *oxalate of cerium* has been prescribed by my friend Dr. PANTON, conformably with the opinion entertained of the salts of cerium. In a case which I attended with Dr. PANTON, the oxalate of cerium was suggested by him, in doses of two grains, thrice daily, and gave great relief. Besides these, various means have been recommended to be applied either above the pubis or over the sacrum. Embrocations of turpentine containing opium, or warm epithems of turpentine, have often succeeded in giving relief in a short time when thus employed. Aconite or veratria applied over the sacrum, has been resorted to; a small quantity of the extract or of the tincture of either of these being mixed in an ointment or liniment, but the use of these powerful sedatives requires caution, although externally applied. In some instances warm narcotic injections, repeated and varied according to circumstances, will be of service.

17. If this complaint be dependent upon chronic inflammatory irritation or action, or upon some other lesion of the uterus (§ 21, *et seq.*), the means required by such lesion should be adopted in addition to that which may appear most appropriate of the remedies now advised; and the diet and regimen of the patient ought to be regulated with due reference to such associations and to other peculiarities of the case. In the great majority the recumbent posture, varied as may be required, rest, and ease of body and mind, are necessary, and in all strict avoidance of the predisposing and exciting causes, both ascertained and inferred, should be insisted upon. A reference to these causes will show (§ 10, 22) that certain of them, when once indulged in, are not readily relinquished, and that persistence in them will render the most judicious treatment of no avail.*

18. The means which are most suitable for the fulfilling of the *second* intention, viz., the restoration of the general health, and of the healthy state of the sexual organs more especially, are the same for this complaint as for accomplishing the second indication of treatment advised for the several forms of inflammatory irritation or action of the uterus (§ 108, *et seq.*). In some instances, in which I viewed neuralgic or very painful affections of the uterus as the result of the influence of malaria, I have during the intervals between the paroxysms, and with the view of restoring the healthy functions, prescribed either the arsenical solution in the usual doses, or the preparations of iron with quinine and camphor.

II. INFLAMMATIONS OF THE UTERUS AND APPENDAGES.

[* If the *uterine neuralgia* be secondary or sympathetic, our therapeutic measures should be directed to the removal of the primary cause, be it engorgement, ulceration, or displacement. If it be primary, we have generally found *cauterization*, with nitrate of silver, or the red-hot iron, successful in accomplishing a cure. In some cases it has been necessary, in addition, to insert an issue on the sides of the lumbar vertebrae or in the hypogastric region. If the pain be periodical, it should be met, as in case of other forms of neuralgia, by quinine, arsenic, &c. Temporary relief is afforded by suppositories of belladonna, henbane, and opium. In some cases relief will be afforded by the introduction of the uterine sound into the cavity of the uterus, as MALGAIGNE has advised, on the principle that it modifies the nervous sensibility of the mucous membrane. In some cases, where the pain has been very severe, we have found a combination of tinct. aconite and chloroform act very promptly in relieving it. They should also be used externally over the hypogastric and lumbar regions by friction.]

CLASSIF.—III. CLASS, V. ORDER (*Author in Preface*).

19.—DEFINIT.—*Pain and weight or uneasiness in the hypogastric region, and behind the pubis, often with pain in the lumbar and sacral regions and in the regions of the ovaria, extending to the groins and tops of the thighs, with more or less symptomatic fever, increased towards evening.*

20. Inflammations of the uterus present very different phenomena and occasion very different results, according as the morbid action is seated chiefly or entirely in the neck of the organ, or in the body, or in the internal surface, of the uterus, or as it may implicate the peritoneal surface of the fundus. The symptoms vary also with the degree in which the adjoining viscera are affected either coetaneously or consecutively—with the nature and extent of the complications, so often presented by inflammation of this viscus; and they vary with the grade of morbid action, and with the manner in which the sensibility and sympathies of the uterus are excited.

21. i. INFLAMMATION OF THE NECK AND MOUTH OF THE UTERUS AND ITS CONSEQUENCES.—Inflammation of the cervix and os uteri is generally *chronic* and often very protracted. It is rarely acute unless it be caused by the gonorrhœal virus, several instances of this form of disease having come before me, one of them at the commencement of my practice, when the possibility of the occurrence was generally denied by the physicians of this country. But this specific form of the disease will be noticed hereafter. When inflammation attacks this part of the uterus it is often slight and insidious in its accession, and, being frequently attended by more or less discharge, is too commonly viewed as a form of leucorrhœa, and considered of comparatively slight importance. This circumstance often tends to its neglect at a period when a judicious treatment might have removed the disorder without any difficulty. But, being overlooked or neglected, and perpetuated or aggravated by persistence in the causes which occasioned it, the disease becomes most obstinate and protracted, and is followed by changes of structure which generally render the treatment more or less difficult. In all cases where the local and constitutional symptoms suggest even the idea of disorder or disease of the uterus, the advice given by a most eminent and able physician, M. CHOMEL, should be followed: "La fréquence et la diversité des affections de l'utérus, la forme latente de beaucoup d'entre elles, l'éloignement qu'éprouvent la plupart des femmes à parler des sensations et des dérangements dont cet organe est le siège, sont autant de motifs pour le médecin de porter de lui-même son attention de ce côté, d'adresser aux femmes les questions relatives à ce sujet, et enfin de ne négliger aucun des moyens d'exploration, toutes les fois que quelque circonstance en indique la nécessité. L'oubli de ce précepte deviendrait la cause d'erreurs de diagnostic aussi graves que fréquentes." Unfortunately the worst features of our common nature—the most bitter manifestations of the "*odium medicum*," which is generally the most bitter and unjust against those by whom success is achieved—have been displayed respecting a recourse to those means which are requisite to "exploration," and the existence of those lesions which are to be ascertained chiefly by the exploration in question—namely, by examinations *per vaginam*, by means

of the senses of touch and sight. On this subject it is quite unnecessary to remark farther, than that the abuse of any particular mode of investigation, or an improper recourse to and employment of it, cannot invalidate the proofs of the great advantages which are derived from its proper and judicious use; and that the evidence and practice of men of character, position, and experience, are not to be impugned or disparaged by others who are not entitled in any point of view to become the censors of their professional brethren.

22. *A. The causes of chronic inflammation* of the neck of the uterus and its consequences are those which have been enumerated as producing the two chief forms of altered sensibility of the organ (§ 10), more especially difficult or disordered or arrested menstruation, excessive sexual indulgences, and masturbation; falls on the back or hips, or injuries in the vicinity of the pelvis or peritoneum; difficult and instrumental labours and abortions; the extension of inflammatory irritation to the neck of the uterus from the vulva and vagina; gonorrhœal infection; the foul air ascending open privies; the use of pessaries; displacements of the womb; cachectic habits of body, and neglect of cleanliness. In many cases the cause of disorder is either not manifest or can only be inferred. The disease seldom occurs before puberty, or long after the cessation of the menses. It is most frequently observed from twenty to fifty years of age.

23. *B. Symptoms.*—The existence of inflammation of the neck and mouth of the uterus is evinced by the appearances of the part, by the local signs and symptoms, and by the sympathetic or constitutional phenomena. The appearances of the cervix and os uteri, it might be supposed, could not fail of evincing the existence of inflammation of them, more especially since those appearances have been disclosed by the use of the speculum. Even previously to the use of this instrument, this disease might have been detected by the sense of touch and the phenomena resulting from examinations by this sense, and by the secretions and alterations of sensibility attending it. If the appearances constituting inflammation of these parts admitted of doubt, and consequently of discussion—although discussion has not in this instance been always the consequence of either doubt or unbelief—surely the several results of inflammation, more especially tumefaction, excoriation, granulations, ulcerations, &c., need not have been misunderstood nor misrepresented. When treating of LEUCORRHOEA in 1841 (published in 1842), I referred the two most important states of this complaint to “inflammatory irritation of the mucous glands of the os and cervix uteri,” and to chronic inflammation of the internal surface of the uterus, and contended that these forms of leucorrhœa, especially the latter, are not unfrequently of a specific inflammatory nature, or gonorrhœal. Of this specific form I have seen several cases, the first of which occurred at the very commencement of my practice (in 1821); the last very recently, the inflammation having extended to the Fallopian tubes. (See *art. LEUCORRHOEA*, § 19, *et seq.*)

24. *a. The appearances of the cervix and os uteri* vary with the severity and character of the inflammation—with the amount of irritation and congestion preceding and attending it; with the intensity of the morbid action; with its duration

and the amount of exudation and secretions accompanying it; with its extension to the internal surface of the cervix; and with alterations of structure which may have already taken place. The earliest appearances are not always observed, for congestion or irritation, of a more or less inflammatory character, may have existed for a longer or shorter time before the complaint had advanced so far as to induce the patient to have medical advice. When the mucous surface of the cervix is simply congested or inflamed, it usually presents a red or livid hue, instead of the pink or pale rose colour of health; it is often dotted with florid papulæ, or with whitish pustulæ, according as its mucous glands are inflamed or distended with a muco-puriform matter. Frequently the surface of the cervix is covered with this matter so as to prevent its exact state to be observed until this secretion is removed. At first the cervix is somewhat swollen or enlarged, but still soft; but with the persistence of the inflammatory action, and with the exudation into the structure of the cervix, more or less induration is superadded. At this early period the os and cervix uteri are hotter and more tender or even painful to the touch than in the healthy state; but the amount of tenderness and of pain appears to depend more upon the temperament and susceptibility of the patient than upon the severity of the inflammatory action—or rather upon the irritable character of this action; the pain being in some cases, both in this stage and throughout the disease, such as to constitute the irritable uterus of several writers, as noticed above (§ 3, *et seq.*).

25. *b. As the disease becomes more chronic or protracted*, the cervix becomes somewhat elongated, and approaches nearer or almost lies upon the posterior part of the vagina. At the same time the os uteri is more open than natural, owing, in some cases, to the congestion, inflammation or enlargement of the muciparous glands at the orifice and internal canal of the neck, externally to the os internum of the uterus, and in others to congestion of its internal mucous surface and subjacent tissues. This inflammatory state of the mouth and canal of the cervix was shown, when treating of LEUCORRHOEA (in 1841), to be a frequent cause and form of that complaint, as it is an associated condition of chronic inflammation of the cervix; and it usually presents a dark reddish or livid hue. The muco-puriform matter secreted by the inflamed mucous surfaces of the cervix varies much in appearance and quantity in different cases; but the chief part of this secretion, as I have stated in the article just referred to (§ 19, *et seq.*), manifestly proceeds from the cervical canal. The state and character of this secretion, especially upon its discharge, depend much upon the time of its retention in the vagina and upon the exclusion or access of air.

26. *c. Inflammation in the neck of the uterus* may continue a long time without giving rise to its usual results. This may be owing to the partial resolution it may experience from the exudation or secretion from its surface and from the mucous glands, or from the menstrual flux. But after an indefinite time, the mucous membrane of the cervix and os uteri, more especially that portion immediately surrounding the mouth of the cervical canal, undergoes farther change, generally commencing with excoriations or abrasions of the surface and passing on to ulcerations, but very rarely with loss of substance. These may

present minute red granulations, or vegetations of a livid hue. When an abrasion or excoriation is alone present, the surface is generally of a vivid red, and the granulations on its surface are very minute; this state of the lesion occurs chiefly within the mouth and canal of the cervix, and most frequently in single females. In a more decided form of ulceration, the granulations of the ulcerated surface may be firm, of a vivid red hue, scarcely bleeding on pressure, or they may be large, fungous, livid, and bleeding readily on a slight touch. Sometimes the granulations or vegetations on the inflammatory sore rise above the level of the surrounding parts, bleed profusely when they are touched, or even separate partially. Inflammatory ulceration of the cervix is rarely or never excavated; it is always on a level with or above the non-ulcerated tissues, and its margin never presents any abrupt induration. Hence the difficulty of determining its existence and limits by the touch, and the source of differences of opinion as to the existence of ulceration of this part. The cervix very seldom presents more than one ulceration situated around the mouth, dipping into its cavity, and extending more or less on the outer surface. If the ulcerated state consist of several patches, it may be referred to aphthous or ulcerated mucous follicles.

27. The form of the os uteri is generally changed, owing to the existence of the ulcerated state now described both within and around this part. The lips of the os swell, enlarge, expand, and open the cervical canal. This opening varies with the amount of inflammation and of the changes above described, but it is generally greatest in females who have had several children. When with these changes the lips of the os uteri are much hypertrophied and indurated, the opening may admit the first phalanx of one or even of two fingers, and it may then assume the form of two segments of a sphere, separated by a deep fissure, within which the ulcerated surface is situated.

28. Ulceration, or the changes now described as constituting the ulcerative state of the cervix and os uteri, gives to the surface of these parts a soft, velvety character, when examined by the touch. This sensation and the open state of the os uteri are the chief indications which this sense can furnish of the existence of this lesion; but, as inflammation alone will open the cervical canal, and as the velvety sensation cannot be depended upon, the existence of ulceration can only be determined by an instrumental examination. The state of the parts detected by touch, and the symptoms about to be noticed, warrant a resource to this examination. "In nearly all the cases in which ulceration occupies the exterior of the cervix, it will also be found, on examination, to penetrate more or less deeply into its cavity. The entire canal of the cervix, as far as the os internum, may be ulcerated. Even when the cervical canal is free from ulceration, if ulceration exists externally, it is generally inflamed to a greater or less depth." The natural coarctation of the os internum appears generally to constitute a barrier to the extension of ulceration into the cavity of the uterus. But to this rule there are exceptions, as respects the inflammatory state, which obviously extends in many instances.

29. *d. The discharges from the vagina* caused by chronic inflammation of the cervix uteri are identical with those which are described under

the head of LEUCORRHOEA. For, as I described these in that article as resulting from inflammatory action, as evinced by the local and general symptoms (see § 19, *et seq.*), their connexion with the changes above described and disclosed by the speculum is obvious. The discharge generally consists of various proportions of mucus and pus, it is rarely the latter only or chiefly, unless the inflammation be specific or gonorrhœal. It is not unfrequently tinged with blood, especially after violent exertion or sexual intercourse. In these circumstances, the blood is exuded from the ulcerated or granular surface, and is seldom in considerable quantity—when in quantity it may be unmixed with the muco-puriform discharge.

30. *e. Hypertrophy* of the neck of the uterus is generally a consequence of chronic inflammatory action, congestion and swelling of this part being an early result. It may, however, remain long without farther change, its structure retaining its softness and elasticity. After a time, the exudation of plastic lymph in the interstices of its structure either is considerable, or becomes partially organized, and renders it both hypertrophied and indurated. At first the inflammatory action is often acute, as indicated by increased heat, vivid redness, and tenderness on pressure; but these signs subside, the hypertrophy advancing with more chronic indications; and sometimes so far as to very greatly increase the size of the cervix. In virgins and women who have not had children, the cervix seldom enlarges to any great extent. It may be indurated and yet not increased in size; but when it is enlarged in this class of patients it seldom is more than two or three times the natural size. In women who have borne children the hypertrophy of the cervix with induration may, according to Dr. J. HENRY BENNET, in extreme cases reach the size of the fist. Some French writers ascribe the ulcerations existing in these cases to the hypertrophy; but he justly contends that the ulceration may commence as early as the hypertrophy and advance with it; and he has seen ulceration confined to one lip, accompanied with induration and hypertrophy of that lip only. When the chronic inflammation causing these changes in the cervix has followed a miscarriage or delivery, the hypertrophy is generally the more remarkable. Hypertrophy and induration are commonly confined to the cervix, but sometimes they extend to the body of the uterus, indicating that it is also the seat of chronic inflammation.

31. As the indurated cervix enlarges, the external opening expands and assumes a transverse form; so that instead of a nearly circular orifice, there is a deep fissure with well-defined lips. This occurs more especially when the induration is attended by ulceration. Sometimes one of these lips may be many times larger than the other. When the superior lip is much enlarged it covers the os uteri, which is underneath it; when the inferior one is thus changed the os is above it. Dr. H. BENNET says that he has seen both the superior and the inferior lips separately enlarged to such an extent as to form a kind of tumour projecting a couple of inches beyond the non-hypertrophied lip. He states that the hypertrophied cervix is sometimes divided into separate lobes, owing to antecedent laceration of the cervix during an abortion or instrumental labour. The laceration not healing, the ulceration in the

course of time is followed by hypertrophy of the segments into which the cervix is divided. These segments sometimes assume a stony hardness; and they may be mistaken for scirrhus, but may be distinguished from that malady as follows: "When the lobular, knotty irregular condition of the cervix is the result of laceration, and is simply inflammatory, the fissures which separate the lobes radiate round the cavity of the os as a centre—which is not the case in a cancerous tumour—each separate lobe being perfectly smooth in itself, and free from tubercles, or superficial irregularities. Not only is this lobular form of induration erroneously considered cancerous, but even the hard inflammatory hypertrophy is still more erroneously considered to be frequently malignant."

32. *f. Displacement* is often consequent upon inflammatory hypertrophy of the cervix; the entire organ generally descends, and the cervix is thus brought nearer the vulva, and at the same time directed backward. The retroversion of the neck of the uterus is commonly met with in married females suffering from inflammatory induration. With them it is chiefly owing to intercourse, and generally becomes permanent. Enlargement and induration, when very considerable, often occasion more or less prolapsus, unless the vagina be very contractile. In women who have had many children, and in whom the vagina is lax, and offers an insufficient support to the uterus, the prolapse may be so great, especially when standing, as to reach the vulva, or even to appear externally. When the cervix thus lies low in the vagina, a sensation of weight, dragging, and bearing down is experienced, especially when erect. This sensation is caused by the traction of the organ on its ligaments and organs with which it is connected, and by the pressure of the cervix on the vagina and vulva. The hypertrophied cervix may be directed anteriorly, or behind the pubis, and be more or less high. This position is generally owing to some enlargement of the body of the uterus, causing the organ to fall back into the cavity of the sacrum, thus throwing up the cervix. The enlarged cervix occasionally lies diagonally, or to either side, but this position seldom amounts to a diseased condition.

33. *g. Pain* is not always experienced in chronic inflammation of the neck of the uterus, and when it is felt, the situation of it is very often such as not to designate the seat of disease. In some cases pain is almost or entirely absent, although there may be leucorrhœal discharge, and considerable constitutional disturbance, even with slight feverish symptoms towards evening. My experience enables me to vouch for the accuracy of Dr. J. H. BENNET's remarks respecting the seat of pain; for in several cases to which I have been called, an examination has confirmed the connexion of the pain with the local affection. The pain is dull, aching, constant, and generally circumscribed, usually felt in one or both the ovarian regions, but much more frequently in the left than in the right; pain of a similar character is also often experienced in the back, and even still more frequently, according to my experience, in the lower region of the sacrum, just above the os coccygis. When it is felt in this situation the neck of the uterus will be found low in, and pressing upon the posterior walls of, the vagina. Sometimes the pain in the

back is scarcely perceptible, or is described only as a "weakness," excepting after fatigue, when it is usually more severe. The patient says that her back is broken, and that she can neither stand, sit, nor walk with comfort. "When there is pain in the region of the uterine neck, it is experienced behind and above the pubis. It is seldom circumscribed, like the ovarian pain, but radiates all over the lower hypogastric region. These three pains—the lumbo-sacral, the ovarian, and the lower hypogastric (I name them in the order of their relative frequency)—may exist conjointly or separately. They are produced alike by inflammation without ulceration, and by inflammation with ulceration. They are, however, much more marked when there is ulceration, more frequently severe, and much more constant."

34. These pains are not to be mistaken for *neuralgia* of the uterus, which is much more acute, comes on suddenly after intervals, and ceases as suddenly, and is seated in the uterus itself (§ 14, *et seq.*). The neuralgic pain is sometimes present only for an hour or two, and rarely longer than ten or twelve hours, the intervals being characterized by freedom from pain. It is sometimes symptomatic of organic disease of the womb, as fibrous tumours in the structure of the organ. But it is often felt independently of any evident lesion, the os and cervix uteri being healthy and free from any morbid sensibility.

35. In addition to the pains described, the patient sometimes complains of pain in the hip, round the crista of the ilium, in the groin, and down the thigh; posteriorly along the course of the sciatic nerve and its divisions, and anteriorly and internally along the course of the anterior crural and obturator nerves. These pains I have referred rather to chronic inflammation of the inner surface of the uterus and enlargement of the organ than to chronic inflammation of the cervix. In the former case they may be caused by deficient support of the vagina, partial prolapse and pressure; in the latter case they may be sympathetic. The pains caused by diseases of the uterus are always increased by standing, sitting, walking, and exertion, but relieved by reclining and the horizontal posture.

36. *h. The functions of the uterus* are often interfered with during the continuance of chronic inflammation of the cervix. As respects *menstruation*, it may be stated, that it may for a time go on without any marked change. But it usually becomes more painful, very scanty, or excessively abundant, and irregular as to the interval, the duration, and the quantity. The pains, especially on its accession of this period, are greatly increased in the situations above described, and are often attended by retchings and vomiting, by recurring uterine tormina, and by marked tenderness of the hypogastric region. The irritation, congestion, enlargement, and other lesions of the cervix become aggravated during this period.

37. This disease must necessarily be a cause of sterility in many instances, the morbid states of the cervix and os, and the discharges from them, interfering more or less with impregnation, not only in recently-married females, but also in women who have borne children. Some females, however, become pregnant, notwithstanding the existence of extensive disease of these parts; but when it takes place under these circumstances it is generally painful, and apt to termi-

nate in abortion. Sterility proceeding from this disease may be removed by curing its cause. Dr. BENNET states that he is continually seeing patients who have ceased child-bearing for years, owing to inflammatory disease of the cervix, recover the power of conception when the local affection is cured. Sometimes they become pregnant even before they are quite well, in which case they seldom miscarry, even if the treatment is suspended, although the pregnancy is often laborious.

38. *i. Uterine inactivity*, or exhaustion, is often a symptom of chronic inflammation of the os and cervix uteri, especially when attended by profuse leucorrhœa and ulceration or granulations, or when the disease is severe. Dr. J. H. BENNET remarks that this absence of natural sensations, or sexual desire, sometimes exists independently of any physical pain, and occasions great unhappiness in married life. He attributes this change to the modified vitality of the diseased uterine organs and impaired general health. The cases of this description which I have met with have been chiefly those in which there was reason to believe that the complaint had been caused by self-pollutions, and where the tenderness of the os uteri and adjoining parts rendered sexual congress more or less painful; for instances are not rare of masturbation being persisted in, although marital congress is resisted or evaded. When the cervix is so tender from this disease as to render congress painful, the sensation is experienced at the time and for some hours afterward, or even longer. It may be felt either behind the pubis or in its usual situations. But although the disease may be severe, the cervix being ulcerated and enlarged, congress may not be painful. Whether painful or not painful—the former especially—this act may be followed by a discharge of a little blood, or even by considerable hæmorrhage. That the evasion of marital congress is owing rather to the circumstance just adverted to than to the disease of the cervix, is evinced by the fact that such evasion is not manifested in other diseases of the uterus, or very rarely.

39. *k. Constitutional and general symptoms* are always present when the cervix uteri is diseased. It should not be overlooked that this part of the uterus possesses marked sensibility and intimate relations with all parts of the economy, through the medium chiefly of the ganglial and sympathetic system. Hence the digestive functions are more or less disordered according to the duration and severity of the local complaint; and there are frequently both nausea and vomiting on the accession of the catamenia. The disorder of the stomach and digestive organs is often somewhat similar to that consequent on early pregnancy, and is the consequence of the inflammation. The leucorrhœa so generally present has been too often imputed to this disorder of the digestive organs, instead of these complaints being regarded as results of the inflammation of the cervix. The urinary function is often more or less disturbed, in respect both of the saline constituents of the urine, and of the frequency of the calls to discharge this secretion, and the sensations attending the act. Dysuria is sometimes complained of, and a portion of the secretion from the inflamed cervix often passes from the vagina at the time of micturition.

40. The pulse is sometimes very materially affected, and becomes more or less accelerated to-

wards evening; and, as debility increases, it is generally weak, or small and irregular, and readily accelerated on any mental or physical excitement. A protracted state of the disease, especially when characterized by granulation, ulceration, and abundant leucorrhœal discharge, ultimately occasions anæmia, pallor, a sickly or sallow appearance of the countenance, loss of flesh, and a flabby state of the muscular structure. Contingent upon the course of the disease, various sympathetic affections often appear, especially nervous headache, depression of mind, a sense of weight or pressure at the summit of the head or on the forehead, pain and tenderness in the course of the spine, and numerous hysterical symptoms. These phenomena are generally exacerbated during the catamenial period, especially when this period is disordered in any way. Most of the symptoms described in the articles HYSTERIA and SPINAL IRRITATION originate in this disease of the cervix and os uteri.

41. Dr. J. HENRY BENNET was the first who gave full accounts of the diseases of the cervix of the uterus; and he was followed by Dr. WHITEHEAD of Manchester, Professor SIMPSON of Edinburgh, and Professor MILLER of Louisville, U. S. Various other writers on uterine diseases have coquetted with the subject, and, after having endeavoured to controvert the statements of these physicians, have at last fallen in with their views. From these and other sources of information, furnished not only in this country, but even much more abundantly on the continent, as will be seen in the BIBLIOGRAPHY, the great importance of inflammatory disease of the cervix uteri is made apparent. Dr. WHITEHEAD has given an enumeration of the lesions of this part of the uterus; and, although I do not profess this or any other specialty, but endeavour to practise as a physician in all medical cases, yet I am sometimes consulted respecting uterine diseases, and I am thus enabled, from some experience, to say that the statements and descriptions furnished by the physicians whom I have mentioned are unassailable.

42. "1st. Inflammation and superficial erosion, implicating one or both lips of the os uteri, and more or less of the external and internal cervix; 2d. Varicose ulceration, commonly occupying the back part of the anterior lip, sometimes confined to the posterior, and occasionally implicating both. It gives rise to hæmorrhages obeying, more or less perfectly, the menstrual periods, and to purulent discharges in the intervals; 3d. CEdema of the cervix; 4th. Fissured ulceration of one or both commissures, of the anterior or posterior lip, or implicating all these parts at the same time; 5th. Induration of the cervix, with or without abrasion of surface; 6th. Endo-uteritis, or inflammation of the lining membrane of the uterus, affecting the body as well as the neck, and sometimes accompanied with induration of the cervix, or erosion of one or both lips of the os uteri; 7th. Follicular ulceration; 8th. Gonorrhœal inflammation, affecting the lips and adjacent cervix, and especially liable to spread to the lining membrane of the entire organ; 9th. Syphilitic disease in its primary, secondary, and tertiary stages; 10th. Prolapsus uteri, which owes most commonly its existence to disease of the lower part of the uterus, as the primary exciting condition."

43. To this enumeration of lesions, given by

Dr. WHITEHEAD, may be added *hypertrophy*, with or without ulceration, or granulation, or dilatation of the cervical canal. This, in one or other of these states, is a frequent consequence of chronic inflammation of the cervix. *Gonorrhæal inflammation* of the cervix and its canal is of greater importance than is usually considered. I have seen several instances of this form of disease, and in nearly all it extended to the lining membrane of the uterus, and was accompanied with great suffering. In three cases of married ladies, not only did this extension occur, but the *ovaria* also became remarkably enlarged. Recovery ultimately took place, but the *ovaria* remained more or less enlarged in all.

44. *C. In the virgin and unmarried female*, inflammation and its consequences noticed above are by no means infrequent; and, although partially described by me in the article *LEUCORRŒA* in the section on "*Leucorrhæa from inflammatory irritation of the mucous glands of the os and cervix uteri*" (§ 19, *et seq.*) before the appearance of Dr. HENRY BENNET's work, yet to him the distinction is justly due of having first fully described and elucidated this subject in respect of this class of patients; and I can fully corroborate his statement that inflammation and ulceration of the cervix uteri in the virgin is not an uncommon disease, and that to it may be referred most of the severe forms of dysmenorrhæa and leucorrhæa which resist the ordinary modes of treatment. Even within these few months I have been called to several cases, under the care of other practitioners, where this disease existed, from ages varying from nineteen to thirty. Scanty, excessive, and irregular menstruation, as well as the complaints just mentioned, not unfrequently proceed from inflammatory states of the cervix, and internal surface of the uterus, as shown in the article on *MENSTRUATION*. (See more especially § 85-129.)

45. The *causes* of inflammation of the cervix uteri in unmarried females have been already noticed. (§ 10, 22.) The *symptoms* in them are not materially different from those already described: the permanency of a leucorrhæal discharge; the local pains; dysmenorrhæa, and otherwise disordered menstruation; spinal irritation; sympathetic pains in the hips, thighs, spine, and under the left mamma; bearing down, weight in the pelvis, debility, pallor, anæmia, emaciation, &c. In addition to these, *partial prolapse* of the uterus, and other *deviations* of its position, are not infrequent in this class of patients.

46. *D. During pregnancy* inflammation and ulceration of the os and cervix uteri may be present, having existed previously, or supervened subsequently to impregnation. MM. BOYS DE LOURY and COSTILHES first noticed this state of the disease; and soon afterward Dr. HENRY BENNET, in 1846, and Dr. WHITEHEAD, in 1847, fully illustrated this association of inflammation of the cervix uteri. Dr. BENNET remarks that he formerly believed that the disease mostly originated subsequently to conception. This opinion, however, his later experience on a wider field has shown to be erroneous. Although it sometimes thus originates, the cervix is diseased in the majority of cases previous to conception. He adds that the disease generally produces sterility when it attacks young married females at the onset of their married life, but not so generally arrests

conception when they have had children before they are attacked. The *indications* furnished by tactile and ocular examinations in this state of the disease are the same as already described. The disease is attended by pains in the back, sacrum, above and behind the pubes, and by a sense of weight and bearing down, and mucopurulent discharge. As pregnancy advances the pains increase; the sickness and vomitings attending this state become severe; and the mucopuriform discharge is often accompanied with more or less hæmorrhage. Dr. H. BENNET has very satisfactorily shown that this disease in the pregnant state is often a cause of the various disorders complained of in this state, or hæmorrhage, obstinate sickness, death of the fœtus, abortion, moles, &c.; and Dr. WHITEHEAD has fully corroborated this statement. These are most important practical facts; and, however sneered at by some, doubted by others, and disbelieved by a few, I have had occasions, since the date above mentioned, to be convinced of the truth of the statements made by these physicians. I may here adduce a summary of Dr. WHITEHEAD's researches on the influence of the lesions under consideration in producing *abortions*; and in this he confirms what had been previously adduced by Dr. H. BENNET. Inflammatory ulceration was the cause of abortion in 26 in every 100 cases; and this event occurred between the middle of the sixth and the middle of the ninth month of pregnancy. Varicose ulceration induced abortion in 6 or 8 out of every 100, and it operated during the latter two or three months. Œdema of the cervix, acting likewise in advanced pregnancy, was observed in about 1 in 25 or 30 cases. Fissured ulceration was found to exist in 20 to 24 out of every 100 cases, and may cause abortion from the fourth to the middle of the seventh month.

47. *E. During and after abortion and parturition*, inflammation, ulceration, and induration of the neck of the uterus are often productive of much and serious disorder. Induration, enlargement, and rigidity of the os and cervix uteri, in abortion or in labour at the natural period, render these acts both difficult, painful, and prolonged; and these lesions of this portion of the uterus, as well as ulceration, often occasion hæmorrhage after abortions and parturition, and this hæmorrhage is frequently followed by profuse, purulent, or muco-purulent discharge. "When the patient first attempts to rise and walk, she feels a sensation of weight and bearing down, which gradually increases, instead of diminishing. If the hæmorrhage and purulent discharge are continued and abundant, and the uterine pains are very severe, several weeks often elapse before she is able to leave her bed; and when she does, she remains weak, languid, and is unable to make the slightest exertion." Inflammatory ulceration, during the first stage of the puerperal period, powerfully predisposes to puerperal fevers, and to abscess of the ligaments. It is so commonly developed after abortion, Dr. BENNET remarks, that he always looks for it when the patient does not rally, but presents the symptoms already described.

48. *F. In advanced life, and after the cessation of the menses*, inflammation and ulceration of the neck of the uterus are sometimes met with. At this period, especially when the menstrual epoch has long ceased, ulceration is the form which in-

flammation of this portion of the uterus generally assumes. The most prominent symptoms at this epoch are severe and constant pain in the sacrum and lower part of the back, less severe and less constant pains in the ovarian regions, and in the hypogastrium, leucorrhœal discharge in some cases only, and bearing down and prolapse of the uterus much less frequent and more slight than in younger females. Ulceration of the neck of the uterus, in advanced age, seems to be oftener the remains of inflammatory disease present at the time when the menses ceased, than an affection which had commenced subsequently to that period.

49. ii. INFLAMMATION OF THE BODY OF THE UTERUS IN THE NON-PUERPERAL STATE.—SYNON.—*Metritis; Hysteritis; Inflammatio Uteri.*—Inflammation of the womb may assume various forms or states. It may be *acute, sub-acute, or chronic*; it may be *sthenic, or asthenic, or septic*; it may be *common or specific*; and it may affect either the *internal surface, or the whole body of the organ*. In the article on PUERPERAL DISEASES I discussed *Inflammations of the Uterus, its Appendages, and Veins* (see § 176, *et seq.*) with reference to the several puerperal conditions; and I now proceed to consider those forms of inflammation of this organ which I have now mentioned, and as they commonly occur in the non-puerperal state.

50. A. INTERNAL METRITIS.—*Endo-Metritis.*—*Non-puerperal Inflammation of the internal surface of the womb*, in its most frequent forms, has been partially considered under the head LEUCORRHŒA (§ 25, *et seq.*) and MENSTRUATION (§ 78–129). I have there shown that inflammatory states of the internal surface of the uterus may occasion certain forms either of leucorrhœa, or of menstruation, varying with the modified states of vascular action, not only in the uterus, but also in the cervical canal; the morbid action being rarely limited to the former, but generally extending to the latter, and often also to the substance of the uterus. Dr. H BENNET considers that a *sero-sanguinolent* discharge is as characteristic of endo-metritis as the rust-coloured expectoration is of pneumonia. The internal cavity of the uterus in health is not much larger than that of the neck; but it is not improbable that, during the period of menstruation, or when congestion or inflammatory action exists in this part, this cavity may be somewhat enlarged, as, indeed, the whole organ frequently is in these circumstances. If in addition to the discharge just noticed, there be a dull, deep-seated pain behind and slightly above the pubis, and more or less general febrile reaction, endo-metritis may be confidently inferred. Since, in the introduction of the uterine sound, and its improvement by Professor SIMPSON, a recourse to it has been considered as a means of diagnosis in endo-metritis; for, if the os internum of the cervix be so completely open as to allow the uterine sound to pass freely into the uterine cavity, and if this cavity be increased in size, and be more sensitive, the above symptoms being also present, this complaint is certainly present. But endo-metritis may exist and not be attended by the sero-sanguinolent discharge alluded to. It is only when the inflammation is most severe that it is present. In the less severe and congestive states, it is characterized by the discharges and the symptoms described in the sections on LEUCORRHŒA above

referred to, and, during the menstrual periods, by the painful, difficult, inflammatory, or hæmorrhagic symptoms described in the article MENSTRUATION. (See § 78–129.)

51. As endo-metritis is commonly attended by chronic inflammation of the cervix and os uteri, the symptoms of the latter are generally present. Nevertheless, the former gives rise to nearly the same symptoms; yet the deep-seated and constant pain behind and partly above the pubis, the sensation of weight and bearing down, the swollen, sensitive, and enlarged conditions of the organ evinced on examination, the states of the discharge and of menstruation already noticed, and the accompanying febrile action, although often slight, but always increased towards night, sufficiently indicate the nature of the disease.

52. The progress and termination of endo-metritis depend much upon its causes and the circumstances in which it originated. It is often attended by more or less inflammatory action in the cervical canal, and in the substance of the organ; and, according to the extent of this association, to the occurrence of the disease after difficult or instrumental labours or after abortions, and to the domestic, moral, and hygienic conditions of the patient, the course, duration, and termination of the complaint should be imputed. A *chronic form* of the disease is apt to supervene, especially in the circumstances now alluded to; and even in favourable cases the acute form generally passes into the chronic, the constant discharges from the internal surface and neck of the uterus, whether sanguinolent, serous, mucopuriform, or purulent, and the catamenial discharges, whether difficult, scanty, or excessive, or attended by coagula, or by plastic exudations, ultimately tend to reduce the acute into a chronic state of the disease. *Ulceration* of the internal surface of the uterus has been rarely noticed as a consequence of endo-metritis. When this occurs, the cavity of the uterus is considerably enlarged, and contains pus, mucus, and a bloody matter, which are discharged more or less freely, and often at intervals. Dr. HALL DAVIS examined the uterus of a woman which exhibited these appearances, with several large ulcerations in the internal surface.

53. B. ACUTE METRITIS, in the non-puerperal state, is a rare disease. At the commencement of my practice (in 1822), having described an undoubted instance of it, at a meeting of a medical society in this city, the case was considered apocryphal. Since then, I have been requested to see other cases, both simple, specific, and complicated, but in most of them the inflammation had commenced in the neck and internal surface of the uterus, or had extended to these parts, and thence to the body of the organ, and in some instances to the uterine appendages. On referring to the notes which I took of the more remarkable cases—since the one in 1822—which I have seen, I find that the disease occurred in seven married females who had never been pregnant, and in three unmarried females. In four cases it was referred to gonorrhœa communicated by their husbands, and in three of those the disease extended to the uterine appendages, the ovaria becoming acutely inflamed and ultimately remarkably enlarged. These four females had never been pregnant. I have notes of the disease as I observed it in six married females who had had

children, but who had not been pregnant for a very considerable time previously to their attacks. In two of these last, the cause and course of the disease were so singular as to require a more particular notice in the sequel. Within these few years other cases have been seen by me; and I am at this time seeing in consultation a very acute case of the disease in a single woman. In none of these instances could any doubt be entertained as to the seat of the malady.

54. *a.* The seat of metritis is the whole body of the uterus; but the disease may commence in different ways. It may attack the whole organ primarily, or extend to it from the internal surface of the neck. These parts may themselves be affected consecutively upon inflammation of the vulva and vagina, especially when they are inflamed by specific, or asthenic, or contaminating causes. Inflammation of the body of the uterus, in the non-puerperal state, seldom extends to the peritoneal surface so as to give occasion to either partial or general peritonitis, as so generally observed in puerperal metritis. An instance, however, occurred, to which I was called towards its close, of a lady who had been treated by very astringent injections for the removal of profuse discharge from the internal uterine and cervical surfaces. With the suppression of the discharge, acute metritis supervened, and was very rapidly followed by inflammation of the peritoneum covering the pelvic viscera, and ultimately by death; the progress of the disease being manifested by examination after death. Metritis, in very rare cases, may occur in the non-puerperal state from the extension of inflammation from the rectum or bladder. Many years ago I attended, with Dr ROBERT LEE, a married lady, who was attacked at first with dysenteric tenesmus, manifestly owing to inflammatory action which had commenced in the rectum and sigmoid flexure of the colon. Soon afterward unmistakable evidence of acute metritis appeared. This lady had not conceived for several years. Soon after the full development of the metritis, which was attended by intense suffering, phlegmasia alba dolens of the left thigh began to appear, and when the subsidence of it commenced, the right thigh became similarly affected. She ultimately recovered. But disease may commence almost simultaneously in the rectum and vulva from certain septic emanations, especially in females who have had children. I was called to two families living in the opposite outskirts of London, during a very warm autumn, after a hot summer. The privies of both houses were open, very full, and offensive. Several younger members of these families were attacked by dysentery, with distressing tenesmus, and their mothers became the subjects of both the dysenteric affection and asthenic inflammation of the vulva, rapidly extending to the vagina, and to the neck and body of the uterus. In both these cases the symptoms of acute metritis were unmistakable and most violent, and were, with the dysenteric affection, manifestly caused by the state of the privies, to which, indeed, the patients themselves referred them. I have, both in this and in foreign countries, had frequent reason to impute the occurrence of DYSENTERY (see § 24) to open privies, &c.; but these two are the only instances I recollect of both dysentery and acute metritis having appeared coetaneously in the same female.

55. *b.* *Symptoms.*—The patient complains of

severe and constant pain deeply seated in the hypogastric region, chiefly behind and above the pubis, darting into the ovarian regions, around the hips, and sometimes down the thighs, with a sensation of weight and uneasiness in the pelvis, and of severe pain of the lower lumbar, lumbodorsal, and sacral regions. Pain, on firm pressure, is felt just above the pubis, in the median line, and equally to the right and left of that line. On examination, the vagina is generally hot and dry; the cervix and os uteri are swollen and sensitive to the touch or to pressure. The body of the uterus is enlarged, and attempts to ascertain its size are attended by extreme pain, and often by nausea or retchings. The symptoms are always aggravated by sitting down on a hard seat, or by an examination per vaginam, and the patient is unable to walk or stand, or to sit up in bed. She generally lies on her back with her knees drawn partially upward. Calls to pass urine are frequent, and attended by dysuria. The bowels are usually constipated, and costive motions are passed with extreme pain and difficulty, the hardened faeces being surrounded by much mucus. In many cases violent paroxysms of pain occur after intervals of comparative ease.

56. This acute state of the disease is not often preceded by chills or rigors, and it is at first not attended by any vaginal discharge, unless it have supervened upon vaginitis, or endo-metritis, as in some cases of asthenic or diffusive inflammation of the vagina and vulva. However, when the inflammation has commenced in, or extended to, the inner surface of the uterus (§ 50), a sero-sanguinolent, or purulent discharge takes place. As the disease subsides, a copious discharge, of various appearances, occurs. In addition to the usual febrile or constitutional symptoms, especially thirst, restlessness, scanty, high-coloured urine, constipation, headache, want of sleep, &c., there are constant nausea; a white or furred tongue; pain and swelling of the mammae, and sometimes hysterical symptoms, but chiefly in nervous and hysterical females. In less severe cases the symptoms are milder, and the nature of the complaint is evinced chiefly by a careful digital examination.

57. *c.* *Terminations.*—In from seven to fourteen days the disease subsides, generally without either suppuration or inflammation of the uterine veins, in the non-puerperal state; but this latter result may occur in this state, as shown in the case attended by Dr. R. LEE and myself (§ 54), and in two other cases for which I was consulted, and which terminated fatally, the uterine phlebitis having been followed by secondary purulent formations, as shown by examination after death. It is chiefly in the cachectic habit of body in females addicted to intoxicating liquors, as in one of the two cases just now alluded to; and when the causes are of a septic or infecting nature, and the disease assumes an asthenic character, that either the veins become implicated on the one hand, or the peritoneum on the other.

58. Acute metritis may degenerate into the chronic state, and occasion the inflammatory forms of *leucorrhœa* and of disordered *menstruation* (see those articles), or various consecutive lesions; and it may give rise to purulent collections, either near to, or even in the cavity of the uterus. In either case the collection, as it becomes increased, is evacuated sometimes more or less suddenly, and after a greater or less increase

of suffering, per vaginam. When matter is formed near the outer surface, it most frequently extends to the cellular tissue between the lateral ligaments, and finds its way, as in cases of suppuration occurring in those ligaments.

59. *d.* The prognosis of acute non-puerperal metritis is generally favourable when the constitution of the patient is sound; when the disease is treated promptly and judiciously, and the causes are not of a contaminating or specific nature, as in the cases above alluded to (§ 54). In drunken females, in the cachectic, and when the disease has been produced by infectious or contaminating agents, the extension of inflammation to the ovaria, to the veins, or to the peritoneum, should be dreaded; and in either case the patient's life may be placed in the utmost jeopardy. Even if the acute should lapse into the chronic state, or give rise to chronic inflammation of the lateral ligaments, much and prolonged suffering will result.

60. *e.* *Diagnosis.*—Acute metritis may be mistaken for acute cystitis, or the latter for the former. But a careful examination of the hypogastric region, of the state of parts per vaginam, and of the condition of the urine and the phenomena attending the discharge of it, will readily disclose the organ affected. When the lateral ligaments are inflamed, the pain and tenderness on pressure are experienced on one side of the median line, or in one side of the pelvis; "and the finger passed up towards the uterus, detects the inflammatory tumour lying on one side of the uterus."

61. *f.* *Examinations after death* from acute metritis in the non-puerperal state are rare, unless death has been caused by uterine phlebitis or by peritonitis, as in the cases alluded to above which occurred in my practice. In these cases the uterus was considerably enlarged, and very much softened, especially towards its internal surface. The substance of the organ was infiltrated with a dark ichorous fluid in one case, and with a greenish brown fluid in the other. The cavity of the uterus was much enlarged in both, but much more so in one than in the other, and its surface was covered with a chocolate-coloured or rusty exudation in the one, and by a rusty purulent exudation in the other; this latter containing a little of a softer matter of the same appearance and of an offensive odour. The spermatic veins were inflamed, and contained coagulated blood, phlebitis extending throughout the uterine and spermatic veins to the vena cava, with coagula mixed with an ichorous or sanious purulent matter. In one case purulent collections, more or less of a sanious appearance, and offensive odour, existed in the liver; and in another, matter was formed in one of the eyes, which had burst shortly before death. In a third case above alluded to (§ 57) peritonitis supervened, the uterus presenting but slight alterations of structure, but the peritoneum exhibited the lesions described in the article on this membrane. (See § 80, *et seq.*)

62. *C.* *SUB-ACUTE AND CHRONIC METRITIS.*—*Sub-acute metritis* is merely a less severe form of the acute, most of the symptoms described above (§ 53, *et seq.*) being present, but in a slighter degree. The *chronic* form of the disease may, like the acute, vary much in severity; but, unlike it as respects frequency, is a common form in its simple and complicated states. It gener-

ally is seated in a part of the body of the uterus; and, in the opinion of Dr. H. BENNET, in nine cases out of ten in the posterior wall of the organ, in its inferior region, adjoining to the base of the cervix. It is commonly the result of extension of chronic inflammation of the cervix, and in some instances of the acute or sub-acute state of the disease. In these instances it may exist either in the anterior wall, or in one of the lateral walls, of the uterus.

63. *a.* The symptoms vary much with the exact seat of the disease, and with the periods during or near menstruation. In the intervals between these periods the patients are comparatively easy; the local symptoms are either much mitigated, or but little complained of; and fever is either slight, or experienced chiefly in the evening or night. In many cases, however, the functions of digestion, assimilation, and nutrition are impaired, and various nervous symptoms are experienced. When the vascular determination preceding menstruation supervenes, then all the symptoms characterizing the disease are developed. A constant, dull, aching pain is felt in the lower hypogastric region, behind and a little above the pubis, and in the left or right ovarian regions, most frequently the left. A dull aching pain is also present under the left mamma or in the left hypochondrium, in the lumbar-sacral region, extending around the hips, and down the insides of the thighs, and is often more complained of than the deep-seated pain in the pelvis. Walking, descending a stair, or riding in a carriage, and every kind of motion, are extremely painful, more especially before, during, and after menstruation; and in some cases are then agonizing. On the accession of this period, the patient's sufferings are sometimes aggravated by sickness and vomiting.

64. On examination per vaginam, in addition to co-existing disease of the cervix, the seat of disease is easily detected. The finger, when passed to the base of the cervix, and around it, meets with an exceedingly sensitive elevation, in some cases regular, in others irregular, but spherical. Pressure on the tumefied part is very painful. Occasionally there is hardly any perceptible swelling, but exquisite tenderness, pressure giving rise to sickness. The womb is generally movable, but the attempt to move it is attended by pain and nausea. Owing to its mobility, inflammation and enlargement of a portion of the uterus is generally attended by more or less displacement of the organ, which falls more or less in the direction of its enlargement. If the posterior wall be the seat of enlargement, as is most commonly the case, the organ falls backward towards the cavity of the sacrum, and the cervix is turned upward and towards the pubis, producing *retroversion*; but never in such a manner as to press upon the urethra, as sometimes occurs in retroversion during pregnancy. The cervix, however, may remain in its usual position, and not be anteverted, it forming an angle with the body of the uterus, which is said to be *retroflexed*. If it be the anterior wall which is tumefied, the uterus may fall forward, especially in married females, and occasion *anteversion*. When retroversion is connected with much enlargement, the uterus presses upon the rectum, and becomes a mechanical obstruction to the process of defæcation. In both forms also of displacement, especially when very marked, considerable disorder

of the functions of the urinary bladder results, the calls to urinate being often, difficult, or otherwise affected. Chronic metritis affecting chiefly one of the sides of the uterus, or associated with disease of the appendages of that side, may likewise occasion more or less displacement in that direction; but this is comparatively rare. Chronic metritis may not be necessarily attended by any vaginal discharge; but such discharge is most frequent, owing to the co-existence of inflammation of the cervix and vagina, and is either muco-purulent, or purulent with a more or less sanguineous tinge.

65. *b. The constitutional symptoms* of this disease, especially when protracted, are well marked, and are, according to my observation, well described by Professor SIMPSON and Dr. H. BENNET. The countenance is generally pale and sallow, and offers an expression of languor and pain; the "*facies uterina*" being more especially manifested by this malady, and particularly during or near the period of menstruation. Emaciation is a frequent sign, although not always recognised or recognisable at first. Nausea is generally present; in the most severe cases it is almost constant; in the less severe, only at the accession or during menstruation. Nausea, or sickness with loathing of food, but without vomiting, is so characteristic a symptom of metritis that, when it is present in chronic inflammation of the cervix, the extension of the disease to the body of the uterus may be inferred. Besides the intimate sympathy existing between the stomach and uterus, numerous other sympathetic derangements occur in the course of the disease, more especially palpitations, heartburn, headache, feverishness, want of sleep, restlessness, morbid states of the urine, constipation, dysuria, painful defæcation, &c.

66. *c. The progress and terminations* of chronic metritis are very variable. It is generally present for some time before the symptoms mentioned above are developed. It is at first attended by slight or obscure symptoms, which become more severe about the period of menstruation, and more and more constant with the advance of time, until the patient is prostrated by their severity and continuance. While recurring menstruation, by the vascular determination and congestion characterizing it, tends to exacerbate the disease, the vascular discharge, especially when considerable, reduces the severity of it, favouring a partial resolution, and perpetuating the chronic condition, when unaided by judicious treatment. When, with the periodical exacerbations, other causes of developing uterine inflammation are conjoined, the chronic may pass on to the acute form, and, in either form, may be extended to the uterine appendages, or even to the peritoneal surface. Cancerous degeneration of this state can rarely or never occur, unless in the cancerous diathesis. The most common consequences of chronic metritis are those already noticed, namely, displacements, enlargements, and the extension of the disease to adjoining organs or parts.

67. *d. Diagnosis.*—Patients affected with chronic metritis, existing either simply or with chronic inflammation and ulceration of the cervix, but a few years ago, were generally considered as subject only to functional dysmenorrhœa, or to displacements of the uterus. Dr. HENRY BENNET referred these latter to chronic metritis,

and viewed them when present as consequences of metritis, which, however, might exist without having as yet been followed by these consequences. Whether or no displacements of the womb ever occur without previous inflammation and its consequences, enlargement, &c., becomes a question, and one which requires solution; but there appears no reason to doubt the fact of the latter often producing and frequently being associated with the former. However, it should not be overlooked that, when an enlargement of the uterus is great, when it is not attended by any considerable pain or tenderness on pressure, it very probably arises from the formation of a fibrous tumour in the uterine walls. In these cases, there is generally displacement in the direction of the uterine tumour. When the tumour is large, it is often attended by more or less inflammatory action; and when this obtains, then both pain and tenderness may be expected. "An inflammatory tumour also of the broad ligaments may be mistaken for chronic metritis, occupying the lateral region of the womb, especially if the tumour be lying on the uterus, as is often the case." The symptoms characterizing the latter affection will be noticed in the sequel; but both affections are sometimes associated.

68. It may be difficult to distinguish cancer of the womb from chronic metritis. If the uterine swelling presents nodosities or irregularities of surface; if the pains are lancinating; if the general health is very much impaired; if the patient is sallow, cachectic, emaciated, anæmied, and weak, well-founded suspicions of cancer may be entertained. It is chiefly from the history of the case, and from the consideration of a variety of circumstances, that a correct diagnosis can be formed. Cancer most frequently commences in the cervix, and extends to the body of the organ. But in both situations it is either latent, or it does not come before the physician until it has made considerable progress. It is then, or it soon becomes, immovable, owing to adhesions between the uterus and surrounding tissues. "In chronic metritis there may be adhesions, but they are not of the perfectly immovable nature of those observed in the malignant affection. In cancer, the nodosities and inequalities are sharp, knife-backed, irregular; in chronic metritis, they are spherical and regular in their irregularity. Cancerous tissues are seldom very sensitive to the touch, whereas it is the reverse with the inflamed uterus. Cancer has a tendency to progress and to pass through its periods in the course of a limited space of time, say one, two, or three years. The symptoms indicating the existence of chronic metritis, on the contrary, may generally be traced back for several years, and when recognised, the disease appears to remain nearly stationary, if left to itself. The consideration of these differences will also prevent cancer being mistaken for chronic metritis. If cancer of the uterus has become ulcerated, the distinction is still plainer." (*Op. cit.*, p. 44.)

69. *D. ENLARGEMENT OF THE BODY OF THE UTERUS.*—Hypertrophy, or overgrowth of the uterus, more especially of its body, may in many cases be traced back for weeks or months to an abortion, or a severe labour, or to disease after delivery. It may, however, originate independently of any of the puerperal states. But in most circumstances it commences without marked severity, generally with slight ailment only, and

even when supervening upon abortion or delivery, it manifests merely a state of incomplete convalescence. When inflammation in any form follows either abortion or delivery, the process by which the womb is restored in a few weeks to its condition previously to conception—the *process of Involution*, as termed by ROKITANSKY and WEST—is checked. This process takes place in the structure of the uterus, which, having performed its grand function, undergoes a state of degeneration, and a partial conversion into a fatty matter, rendering it more susceptible of being either absorbed or eliminated in the lochia. During the second week after parturition this process is most active; but it proceeds also during the third and even fourth week. The process of reconstruction soon follows, and, according to the German microscopists, cells, nuclei, caudate cells, and the elements of new fibres are formed, and the organ is built up anew. The manner of this reconstruction has not been satisfactorily explained by histologists; but it appears most probable that this renewal goes on *pari passu* with the removal of the old materials. The interior of the uterus undergoes similar changes to those which take place in its substance. "It is not until its lining membrane, with the exception of that of the cervix, has been several times reproduced and then cast off in a state of fatty degeneration, that it resumes the same condition as before impregnation. The occurrence of inflammation appears to interrupt these processes, for, though fatty degeneration of the tissues takes place, yet the removal of the useless material is but imperfectly accomplished, while the elements of the new uterus are themselves, as soon as produced, subjected to the same alteration; and the organ remains, long after the mischief has passed away, increased in size, and, at the same time, composed of a tissue inapt for all the physiological processes of conception, pregnancy, and child-bearing." (WEST, *Lect.*, p. 92.) This result will follow not only the mild, or chronic, or sub-acute states of inflammatory action developed in the organ during the process of involution, but even any excitement of the sexual organs occasioning determination of blood to the organ, more especially sexual intercourse too soon after delivery or abortion.

70. *Symptoms, &c.*—Enlargement of the uterus consequent upon *deficient involution* may continue a considerable time without causing more at first than protracted convalescence, and a feeling of local and general ailment; but generally farther disorder ensues, often with increased organic lesion. A sense of weight and bearing down; pains deep in the pelvis, back, and sacrum, often extending to the hips and thighs, numbness or pains in the limbs; difficult and painful defæcation, frequent micturition, &c., are usually complained of. After a time various complications of this lesion occur, more especially prolapsus, retroversion, congestion or chronic inflammation, frequent, or difficult, or excessive menstruation, &c.

71. *True hypertrophy*, or enlargement of the uterus independently of defective involution, occurs in both married and unmarried females. Dr. WEST considers that it is met with in the former chiefly, and remarks that "excessive or intemperate sexual intercourse does not produce it, though that leads to its own train of evils; but there has in many instances seemed good reason for associating the condition with the imperfect

performance of that function, and sometimes the evidences of that being the case have been conclusive." There can be no doubt of this being a not infrequent cause, although it is not the only organic lesion consequent upon this cause, ovarian disease being perhaps an equally frequent result. Although true or primary hypertrophy of the uterus may be most frequent in married females, it is by no means rare in the unmarried, especially after twenty-six or twenty-eight years of age, where there is reason to infer that the vice of masturbation has been long practised. It is in this class, as well as in widows, and in married women who have either impotent or nearly impotent husbands, a consequence of frequently-excited and imperfectly-gratified desire. Sexual intercourse is imperfectly performed, and although frequently attempted, never duly consummated; and thus congestion of, or active vascular determination to, the uterus is maintained, without conception and its successive changes taking place, whereby the mischief resulting from reiterated and inefficient sexual efforts is prevented. Hypertrophy of the *neck* of the uterus has already been noticed (§ 30, 31). Enlargements which result from the development of tumours in the organ are more appropriately considered in the sequel.*

72. *iii. INFLAMMATION AND ABSCESS OF THE FALLOPIAN TUBES AND CELLULAR TISSUE.*—Inflammation and abscess of the uterine appendages were, until recently, described only as a disease of the puerperal state. Under the head OVARIA, I have considered inflammation and other diseases of these organs, independently of the puerperal state; and in the article on PUERPERAL DISEASES, "*Puerperal Inflammations of the Uterine Appendages*" have received due attention (§ 187, *et seq.*). It now only remains for me to describe *inflammation and abscess of the Fallopian Tubes and Cellular Tissues, independently of the puerperal conditions*. This disease has been noticed by MM. GENDRIN, VELPEAU, MARÉCHAL DE CALVI, and by Dr. DOHERTY, CHURCHILL, and LEVER; but it was not fully discussed until Dr.

[* Inasmuch as both hypertrophy and atrophy of the uterus are, in part, normal at the periods of puberty and involution, there is some danger of confounding morbid with the healthy conditions of the organ. Like other organs, the weight and dimensions of the adult, healthy uterus fluctuate considerably. The following measurements will be found sufficiently accurate: Entire length, from 24 to 26 lines; greatest breadth, 18 lines; thickness, 9 lines; cervix, from 10 to 12 lines long; its breadth, from 6 to 8; its thickness, from 5 to 6 lines; length of uterine cavity, 12 lines; its breadth, 9 lines; greatest thickness of the fundus, 5 lines; of the sides, 4 lines; of the cervix, 3 lines. After one or more births, all these measurements increase from one fifth to one quarter. The weight of the uterus varies from 8 to 12 drachms, and may, after several pregnancies, amount to two ounces. Hypertrophy or atrophy may involve the whole or only a part of the organ. An atrophic condition is probably a frequent source of sterility; the organ, and especially the cervix, is small and anæmic, its tissue dense, and the ovaries in an equally undeveloped condition. After the climacteric period the cervix often disappears entirely, and nothing but an indurated ring remains at the summit of the vagina. We meet with hypertrophy of the uterus as a morbid state more frequently than atrophy, partly the result of irritation set up by other morbid processes, and partly as an exaggerated expression of the normal condition. The former may consist in fibrous or other tumours, involving the substance or cavity of the uterus, which may give rise eventually to expulsive efforts, or blenorrhagic affections of the mucous surfaces. Disease of the ovaries may also give rise to it by the consensual irritation thus set up. Where hypertrophy is confined to the cervix, the anterior lip is more frequently enlarged than the posterior.]

HENRY BENNET directed due attention to it in his work on *Inflammation of the Uterus and Appendages*. This malady in the puerperal states is always severe and generally dangerous; but in the non-puerperal conditions it is commonly much more mild, and is often either not recognised or confounded with other diseases. Indeed, inflammation of the uterine appendages occurring after parturition presents as great difference from the same disease in the ordinary state of the system as puerperal metritis offers to non-puerperal metritis. In the puerperal states of these maladies, as I have shown, inflammations of the womb, ovaries, Fallopian tubes, cellular tissues, &c., have a tendency to extend to the peritoneum, or to diffuse themselves, and produce most important and often fatal consecutive changes. But in the non-puerperal form, there is a tendency to assume the sthenic instead of the asthenic diathesis, and to limit itself to the tissues primarily attacked; peritonitis and other consecutive or fatal alterations rarely occurring.

73. *a. The causes of non-puerperal inflammation of the Fallopian tubes are the same as those which more commonly produce metritis* (§ 10, 22) and *ovaritis* (§ 6, *et seq.*); especially arrested menstruation, disordered states of this function, and abortive impregnation.

74. The inflammation may originate either in the cellular tissue, in the ovaries, in the tubes, or in the uterus, the disease of the one structure often extending more or less to the others. This extension of inflammatory action from the one part to the rest and to the peritoneum is most remarkable in the puerperal states (*see* OVARIA, § 6, *et seq.*, art. PUERPERAL DISEASE, § 181, *et seq.*), but it is much less so in the non-puerperal condition, the disease being generally limited to the cellular tissue, and to the organs contained between the folds of the peritoneum, this surface seldom being implicated in this condition. Dr. H. BENNET states that he has repeatedly seen inflammation of the Fallopian tubes supervene in females labouring under chronic inflammation or ulceration of the cervix uteri, this latter being the point of departure of the inflammatory action.

75. *b. The symptoms of non-puerperal inflammation of the uterine appendages are nearly the same as those of acute metritis* (§ 53). These are the usual febrile phenomena: severe pains in the lower hypogastric region, increased on stretching the body to the erect posture, or on walking; a sense of weight and tenderness deep in the pelvis; difficult or painful micturition and defecation, &c. These symptoms are also present in metritis; but the pain is greatest in the ovarian region, to the right or left of the median line, where, if the ovarium be much affected, some degree of swelling may be perceived. So nearly, as may be expected, does the one disease approach to the other in characters and course, that, unless there be from the first a deep-seated tumour of an inflammatory nature perceptible in one or both ovarian regions on external pressure, it is most difficult to distinguish the one malady from the other by any other means than by a careful digital examination. The bladder having been emptied, the patient placed on her back, and the knees flexed, the finger should be passed into the vagina, and carried underneath and round the cervix, the left hand being firmly applied over the hypogastric region, above the pubis. By pushing the vaginal cul de sac by the finger in the several

directions around the cervix, especially while external pressure is being made, the presence of inflammation of the cellular tissue, ovaries, and Fallopian tubes, or of its consequences, is evinced by an unusual resistance on the side or sides of the uterus. "The vaginal cul de sac has disappeared, and resting on the side of the cervix and body of the uterus, there is an indurated swelling, very different from the normal condition, and from what obtains on the other or healthy side, supposing disease to exist on one side only, as is most frequently the case. Pressure on the indurated parts is attended by very great pain, and there is a marked increase of the natural heat." By directing the finger around the inflammatory tumour, while the left hand is pressed downward, the tumour is found to be movable and distinct from the parietes of the pelvis. This tumour being generally situated close to the side of the uterus, seems to form one mass with this organ. Hence inflammation of the lateral ligaments may be confounded with metritis even when a vaginal examination is resorted to, and an inflammatory swelling recognised. If this examination should not be satisfactory, the uterus and appendages may be farther examined per anum. Dr. H. BENNET believes that a tumour formed by an inflamed lateral ligament is more intimately connected with the uterus when it is purely phlegmonous, or the result of inflammation of the cellular tissue, than when it is formed by the inflamed ovary. It is, however, very difficult to distinguish between these and acute or chronic metritis.

76. *c. Progress and Terminations.*—In the acute stage, inflammation of the lateral ligaments is attended by the usual train of febrile symptoms. As it passes into a *chronic state*, it occasions numerous morbid phenomena, which have been noticed as characterizing other chronic uterine diseases, especially dyspepsia, cephalalgia, constipation, palpitation, insomnia, debility, emaciation, evening exacerbations of fever, &c. It may terminate in resolution in the first stage, when promptly and judiciously treated; but, unlike metritis, which very rarely, in the non-puerperal state, terminates in suppuration, inflammation of the Fallopian tubes, especially when seated chiefly in the cellular tissue, generally ends in suppuration—it being purely phlegmonous inflammation.

77. *d. Suppuration* may be expected in the course of a few days from the commencement of the inflammation, unless checked by early and energetic treatment. The occurrence of rigors, followed by sweats, and a temporary abatement of the more acute symptoms, and sometimes a deep-seated fluctuation perceptible to the touch through the vagina, or even through the abdominal parietes, indicate the presence of suppuration. The purulent collection in this part is rarely absorbed; but it generally finds an exit, before the acute inflammatory symptoms have subsided. Adhesive inflammation connects the abscess with either the vagina, rectum, abdominal parietes, or bladder, the contained pus making its way after a variable period in one or other of these directions, most frequently in the upper part of the vagina, or in the rectum. It very rarely opens into the bladder or abdominal parietes. It sometimes opens in more than one situation successively. The abscess may, however, ulcerate through the peritoneal folds of the lateral ligament, and be evacuated into the peritoneum, causing acute peritonitis; or "the purulent mat-

ter may pass along the round ligament and appear in the labia externa, or, escaping from the pelvis along with the large femoral vessels, follow their course, and point in the thigh. These, however, are quite exceptional cases, and are very rarely met with, especially in the non-puerperal form of the disease."

78. *e.* The abscess generally opens into the vagina or rectum, or into both. The perforation commonly occurs during exertion, or when coughing, or in the act of defecation; and the purulent discharge is very frequently either mistaken for an increased flow of the whites, or overlooked when it is passed from the rectum with the stools. This usually obtains when the disease is either not recognised, or viewed as metritis. In some cases, the perforation is attended by a sense of bursting. The discharge may take place a few days after the development of the inflammation, or not until after several weeks. The quantity of pus discharged varies from a few drachms to half a pint. The opening of the abscess into the vagina is the most favourable issue that can occur. The pus occasions some irritation of the vagina, but this is seldom considerable. The opening of the abscess into the rectum is the next most favourable termination, but it generally causes considerable irritation of this bowel, with dysenteric stools or tenesmus. The perforation of the bladder or of the abdominal parietes by the abscess is so rare, and the occurrence so manifest, that the phenomena attending it require no remark, farther than that, as in the case of the rectum, the urine does not pass through the opening, owing to the pressure of the abdominal organs keeping the opening closed.

79. When the pus is discharged, a decided lull is observed in all the symptoms. The deep-seated pains, the tenderness and swelling, and the febrile disturbance rapidly subside. When the abscess has opened into the vagina, the improvement is often rapid, and the patient is believed to be convalescent. But, as Dr. H. BENNET justly observes, this improvement is often deceptive, with reference to the future. On making a careful examination, the tumour on the side of the uterus is diminished in size, and is much less sensitive to the touch; but, although less in size and less inflamed, it is nearly always still perceptible; and the symptoms indicating chronic uterine inflammation generally exist; pain, heaviness, bearing down, tenderness, often swelling in one or both ovarian regions; pain in the back, inability to stand erect, or to walk for any time, or to go up and down stairs, being complained of. The orifice by which the pus was discharged may remain open, or it may close. In the former case the pus escapes as it is formed, and after some time it becomes closed, and the tumour is resolved, the disease being brought to a close in the course of a few weeks, or of a month or two. This, however, occurs only in some cases; for in others the closing of the orifice is followed by a re-formation of the abscess; and before it again escapes, by the former or another opening, the acute inflammatory symptoms previously experienced are reproduced, generally in a mitigated form. The vascular determination attending menstruation favours the reappearance of acute symptoms, and thereby perpetuates the disease. These returns of the malady become less and less frequent as the inflammatory swelling of the uterine appendages diminishes, and as the struc-

tures return to their natural condition. "A female who has suffered inflammation and suppuration of the lateral ligaments, even in its mildest form, may be from several months to one or more years before all trace of local inflammation has disappeared, and before she can be said to be radically well." During this period she is never quite free from symptoms of uterine irritation, or of slight exacerbations of her former malady, especially at the menstrual periods, which are often delayed or irregular; the quantity of discharge being generally scanty, seldom excessive. A leucorrhœal discharge is always present, in various quantity. (See PUERPERAL DISEASES, § 181, *et seq.*)

80. *f.* The Prognosis of this disease in the non-puerperal state is not serious as regards the life of the patient: in the puerperal state it is much more serious (*see* PUERPERAL DISEASES, § 183, and 256, *et seq.*), and often most unfavourable. Apart from this state, this disease seldom terminates fatally, although it entails suffering for months or even for years. Acute metritis generally terminates by resolution, under judicious treatment (§ 111, *et seq.*), without suppuration, and without consecutive lesion; but inflammation of the lateral ligaments, although apparently not a more severe disease at its commencement, and period of full development, occasions lesions which time only can remove, or which are never completely removed.

81. iv. ASSOCIATIONS OR COMPLICATIONS OF INFLAMMATIONS OF THE UTERUS, &c.—Inflammation of the vagina and vulva may be associated with inflammation of the neck of the uterus, or even with internal or endo-metritis also; and the inflammation may commence either in the vulva or vagina, and extend to the neck of the womb, or in this latter, and extend to the former. In cases of gonorrhœal inflammation of the neck of the womb, it may be inferred that the inflammation commences most frequently in the vulva and vagina; but such may not always be the case; for it is not improbable that the neck of the uterus is sometimes primarily affected. In the cases, fortunately rare, in which septic or contaminating causes produce an asthenic or diffusive form of vaginitis, as well as in gonorrhœal inflammation, the disease is always prone to extend from the neck to the internal surface of the womb, and even also to the uterine appendages.

82. Various derangements of the uterus, formerly considered as functional, are in most cases merely symptoms or associations of inflammation of the cervix and internal surface of the uterus, as Dr. H. BENNET has fully succeeded in demonstrating, and as I have stated to be the case in several forms of LEUCORRŒA, and of disordered MENSTRUATION. The leucorrhœal discharge varies with the tissue affected and the nature of the affection. It may consist of natural mucus from the mucous follicles of the vulva, vagina, and cervix uteri; of a white creamy mucus secreted by the mucous membrane of the cervix and vagina, from congestion of this membrane, such congestion not always amounting to disease; and of a puriform mucus, or a white or ropy transparent mucus mixed with pus, which is always the product of inflammatory action and of its consequences. These three forms of vaginal discharge may be combined in chronic inflammation of the cervix. But this disease may exist without any leucorrhœal discharge whatever, the morbid se-

cretions being absorbed in the vagina. (See *art. LEUCORRHOEA*, § 19, *et seq.*)

83. Amenorrhœa and other menstrual disorders are often consequences or complications of uterine inflammations. Dysmenorrhœa is very frequently a result of inflammation of the cervix uteri; and when thus associated, other disorders are often superinduced, more especially the several states of hysteria, convulsive affections, spinal irritation, &c. The changes which take place in the cervix and its canal, in consequence of inflammation or ulceration of them, are often such as occasion difficult menstruation as the consequence of contraction of the os internum, or of the canal which forms the cavity of the cervix. The swelling and hypertrophy of the cervix are frequently associated with this contraction, when the cervical canal itself is not the chief seat of inflammation. Dr. SIMPSON believes that, unless the uterine sound pass, without effort, into the uterine cavity, there is contraction of the os internum; while Dr. HENRY BENNET contends that there exists, at the os internum, a kind of muscular sphincter, formed by a strong band of the circular muscular fibres of the cervix, and destined to close the uterus during pregnancy; and that this sphincter in the healthy state prevents the uterine sound from passing into the uterus without considerable pressure be made; and he adds, that when the inflammation of the cervix ascends as far as the os internum, or when endo-metritis exists, or the organ is enlarged by the formation of tumours in its body, then the sound passes readily into the uterine cavity, thereby furnishing a sign of the presence of these diseases.

84. It has been considered that *menorrhagia* and *uterine hæmorrhage* generally are results of active or passive congestion, or of tumours or polypi, or of malignant disease, of the womb. Dr. HENRY BENNET, however, contends, and with apparently much truth as well as talent, that, in the absence of malignant disease and of uterine tumours, the quantity of blood lost during menstruation is seldom increased, for a continuance, so as to constitute menorrhagia, and that the menstrual periods are seldom morbidly approximated, unless there exist some degree of chronic inflammatory disease of the cervix, or unless menstruation be finally disappearing. Congestion of the uterus he admits to exist in menorrhagia, but it is generally the result of inflammation of the cervix; and it assumes an active or passive character, according to the constitution of the patient, and to the amount of reaction produced by the disease on the system. If the inflammation is active and has not debilitated the patient, the hæmorrhage is also active or sthenic. If the disease of the cervix has existed long, and has produced anæmia or debility, the hæmorrhage is passive or asthenic. It is difficult to explain the reason why inflammation, granulation, or ulceration of the cervix should, in some cases, render menstruation scanty, too rare, or difficult, and in others profuse or too frequent. But the fact is proved by observation, and it may be referred to the states of innervation of the uterine organs in different persons, and to the sympathies exerted between this very sensitive part of the uterine organs, in connexion with the vascular conditions of these organs, and of the system generally. Dr. BENNET, however, believes that, where the inflammation extends to the body of the womb, menstruation is generally scanty or retarded;

whereas, when it is limited to the cervix, it is often profuse or more frequent than usual. Although this association of inflammation of the cervix uteri with disordered menstruation is so common, as now stated, still cases occur in which this latter must be referred to other pathological sources. Indeed profuse menstruation is occasionally produced by mere congestion or determination of blood to the uterus, independently of the existence of inflammation of the cervix, especially when the catamenia are finally disappearing. The association of inflammatory ulceration of the cervix uteri with hæmorrhage during pregnancy, in the opinion of Dr. H. BENNET, very frequently exists; the former being the source of the latter, and thus furnishing a natural explanation of the presumed menstruation of pregnant females.

85. That chronic inflammation of the neck and of the body of the uterus should occasion, and be associated with, *sterility*, with *abortion*, with *hysteria*, in its several forms; with *spinal irritation*, with *chlorosis*, and with various anomalous *neuralgic* and other *affections*, in different cases, according to the circumstances peculiar to the individual, cannot be doubted, although the relation between it and these ailments was overlooked until Dr. H. BENNET and some contemporary physicians, British and continental, insisted upon the fact of its frequent existence. Besides the complications of this disease with these complaints, the former is often associated with other lesions of the uterus itself and its appendages, as with *enlargements*, *polypi*, and *fibrous tumours* of the womb; with the various forms of *displacement* of the organ, with *lesions* of the *ovaria*, and with *uterine phlebitis*.

86. Besides the above associations, others affecting the adjoining organs or parts are not infrequent, and are to be viewed as being much more frequently consequent upon chronic inflammation of the cervix and body of the uterus, than existing as the primary affections. Inflammation of the urinary bladder, or of the rectum and sigmoid flexure of the colon, more especially of their mucous surfaces; hæmorrhoids, and prolapsus or fissures of the anus, and syphilitic disease of the cervix uteri, severally occur as complications of one or other of the forms of metritis. Of these the diseases of the rectum and urinary bladder are chiefly consequences of the extension of severe or protracted inflammation of the cervix and body of the womb, sometimes extending also to the uterine appendages, these latter, in a few instances, being the medium of morbid connexion between the different maladies. It is comparatively more rare for disease of the large bowels, or of the bladder, to occasion any of the forms of metritis, than for this last to cause, by the extension of inflammatory action, one or other of the former. Yet I have seen instances, in the non-puerperal states, of metritis which had supervened on dysentery, and even of asthenic inflammation, that had extended to most of the pelvic viscera, consequent upon a dysenteric attack. Such complications as these are, however, much more frequent and fatal in the puerperal states; and in these the veins are also very commonly implicated. This complication of metritis with uterine phlebitis may occur even in the non-puerperal state, as I have seen in a few instances. In a very remarkable case of this kind, which was seen in consultation with me by Dr. R. LEE,

metritis supervened upon dysentery in a married lady, aged about 35 years, and who had not been pregnant for several years. Uterine phlebitis also took place, and was followed by phlegmasia dolens. Inflammation of the cæcum and pericæcal tissues may extend to the uterus and uterine appendages; but this is a very rare occurrence.

87. III. TREATMENT OF INFLAMMATIONS OF THE UTERUS AND APPENDAGES.—Much of what I have stated above respecting the treatment of the nervous and irritable states of the womb (see § 13, *et seq.*) is applicable to inflammatory action in either the cervix or body of the organ. It is manifest that, as the several inflammatory states of the uterus, whatever may be their precise seats, occur in the nervous, the debilitated, the anæmied, as well as in the plethoric and the robust, the treatment, especially the general or constitutional, must depend in great measure on the knowledge, acumen, and experience of the physician, by which he is enabled to ascertain the precise peculiarities of each case. A most important part, however, of the treatment is entirely local or surgical; but, in the management of female diseases, no division should be made into medical and surgical means, for here, as in all other departments of practice, surgery, although ancillary to, is also a part of, medicine.

88. I. OF INFLAMMATION OF THE NECK OF THE WOMB, AND ITS CONSEQUENCES.—There are few complaints more prone to relapse, and in its severer states more difficult to remove, than the one now under consideration. But these are not the only evils; the difficulty often of conducting the treatment conformably with the requirements of the case and the prepossessions of the patient, is also a positive obstacle to success, particularly in females whose circumstances of life require exertion, or prevent them from enjoying the requisite comfort and ease, and in unmarried females. The treatment must necessarily depend upon the peculiarities of the case, with what is known or inferred as to its causes, upon the duration of the disease, and upon the alterations which have taken place in the part. But in this, as well as in all other inflammations of the uterus, the *indications of cure* consist, *first*, in subduing inflammatory action and painful symptoms; and, *second*, in restoring the constitutional energies, and thereby the healthy state of the uterus. It often becomes a great difficulty to know when to discontinue the first indication, and when to aim at the second; for a too early adoption of means calculated to restore the health may occasion a relapse of inflammatory action and its attendants.

89. A. *The treatment before any organic lesions have taken place*, and while inflammatory action is unassociated, comprises the two *intentions of cure* just stated (§ 88). The means which are found most successful in fulfilling the *first* intention are the horizontal posture, and quietude of mind and body; injections of an emollient, refrigerant, or anodyne kind; cooling diaphoretics, with or without narcotics, warm or tepid hip-baths, local depletions, alterants, and sometimes derivatives. This state of the disease, especially at its commencement, is so often unattended by severe symptoms, unless when it is associated with the neuralgic and irritable conditions described above (see § 5, *et seq.*), that it seldom comes under medical care; and it is not, commonly, until either excoriations, granulations, or superficial ulcerations, very frequently associated

with *leucorrhœa*, *disordered menstruations*, and *deviations* from the natural position of the womb, that medical aid is resorted to. In all cases, due care should be taken to ascertain the admitted and probable *causes* of the complaint. It will be seen, on referring to these causes (see § 10), that certain of them can hardly be fully ascertained, although they may be inferred with a near approach to certainty; and in some cases they will be admitted by the patient, if inquiries be made with due address. The state of general health should also receive attention, and the treatment be regulated accordingly, and with strict reference to the condition and periods of the uterine functions.

In the *mild cases*, if they have not been of long duration, and if the cause have been only temporary in its operation, and not a persistent or habitual vice, means directed to the improvement of the general health, to the regulation and promotion of the secretions and excretions, more particularly to the prevention of fecal and urinous accumulations, aided by rest, the avoidance of sexual excitement, and by emollient and astringent or refrigerant injections, according to the peculiarities of the case, will be sufficient to restore the health, even without strict reference to the succession of indications of cure mentioned above (§ 88).

90. In *severe cases*, especially in those of long duration, and in those where the above means fail of affording satisfactory relief, the indications of cure stated above should be adopted, more particularly if thickening or enlargement of the cervix or any other of the lesions described as consequences of chronic inflammation be present. For these the means enumerated for fulfilling the *first* indication should be prescribed. For this purpose, constant repose on a couch or sofa, avoiding very warm beds, and the upright or even the sitting posture, vaginal injections, hip-baths, local vascular depletions, and a recourse to caustics, are the means of cure now in general use. But, although the chief remedies, they are not the only ones; and in all cases they should be aided by constitutional and moral treatment, by a proper diet and regimen, if, indeed, the local remedies be not considered as being aids only to the constitutional means. These latter require to be so diversified, according to the temperament, habit of body, strength, and other peculiarities of the case, that a selection of them appropriately to these peculiarities must depend upon the judgment of the physician.

91. a. *Vaginal injections* are often of great service, whether *simple* or *medicated*. They wash away the secretion from the inflamed cervix, and prevent the stagnation of it in the vagina and around the cervix; an occurrence tending to increase irritation and morbid sensibility of the parts. The frequent injection of *cold water* only has not only a cleansing, but also a tonic and healing effect. In some cases the temperature of the water may be heightened somewhat above fifty degrees of Fahrenheit. But in most cases the temperature of spring water is best, the quantity injected, or the duration of the injection, being regulated by the physician.

92. *Medicated injections* are either emollient, astringent, or anodyne. Various emollient injections are of service in slighter cases, and when pain or irritation is experienced; and they may be made vehicles for anodynes. Milk and wa-

ter, decoction of marsh-mallows, linseed tea, &c., may be used, cold or tepid. When irritation is considerable, a small quantity of the bi-borate of soda, or of any of the anodynes, especially vinum opii, tincture of henbane, or tincture of belladonna, may then be added to the above. Injections also of the decoction of poppy-heads, either alone or with chamomile flowers, may be prescribed. Astringent injections are very commonly resorted to in this complaint, especially when the discharge is abundant. In this and the above cases, the means advised for the treatment of LEUCORRHOEA (see § 16, 17), and of that state of the disease especially which I have ascribed to "*inflammatory action of the mucous glands of the cervix and os uteri*" (§ 23, 24), are quite appropriate. Of the several astringent injections in common use, viz., sulphate of alumina, sulphate of zinc, acetate of lead, solution of nitrate of silver, decoction of oak bark, and solution of tannin, Dr. H. BENNET states that he prefers the first and the solution of nitrate of silver. The first three he uses in the proportion of a drachm to a pint of water, increasing or diminishing the strength according to circumstances. He, however, considers that injections are serviceable chiefly for cleansing the vagina, for diminishing uterine irritation, and for removing vaginal and vulvar inflammation; but that they are generally powerless to subdue confirmed inflammation of the substance of the cervix, or even of the membrane lining its cavity; for he believes that their inefficacy in inflammation of the cervical canal is partly owing to the fluid not reaching the region affected; and that in inflammation of the cervix, a remedy which is only applied to the surface can scarcely be expected to subdue the deep-seated disease. When injections are prescribed, due care should be taken that they are properly administered. The patient should be on her back, with the pelvis raised, and means be used for their retention for a time in the upper part of the vagina.

93. When marked irritability and acute sensibility characterize inflammatory action of the cervix, Dr. DEWEES recommends lukewarm flaxseed tea, to be thrown up by a female syringe of sufficient size three or four times a day, and to be retained there for some time by applying a cloth to the vulva. I have more frequently prescribed, especially for unmarried females, in order to remove the more painful symptoms, injections into the rectum, containing either the extract or the sirup of poppies, or compound tincture of camphor, or vinum opii, or tincture of henbane. In a case of remarkable severity which I attended with the late Dr. MOORE, a small quantity of tincture of belladonna was pressed from a piece of sponge contained in a syringe, when introduced as far as the cervix uteri, and always afforded immediate relief.

94. *b. Baths.*—Warm *hip-baths* at the temperature of 90° are occasionally of service. Dr. J. H. BENNET advises them at a temperature of 63° to 85° Fahrenheit, according to the season of the year and feelings of the patient. At this temperature they have a sedative effect, while at higher degrees he believes that they determine the circulation to the pelvis. In painful or difficult menstruation, a temperature of 94° to 98° is often decidedly beneficial. Dr. GOOCH states that he has found a partial steam-bath, used by drawing the flannel sack up to the præcordia, so as to enclose

the abdomen and extremities, these being exposed to the action of the steam for half an hour every day, preferable to the warm hip-bath. Entire warm baths are useful in winter, when only occasionally resorted to, and when they can be had in the patient's house or apartment. During summer a tepid bath at 65° or 70° is of service every second, or third, or fourth day. Cold and shower baths should be reserved for advanced convalescence, and are important means for fulfilling the second intention of cure.

95. *c. Vascular Depletions.*—These should be chiefly local; and, with all respect for those who cultivate this specialty, I cannot agree with them in the choice of situation from which the blood should be abstracted. The situation preferred by the more recent writers on diseases of the uterus is the inflamed cervix itself; but the several difficulties in the way of the general physician, if he be averse to the manipulation which this practice involves, and if he have due regard to the feelings of the patient, and even in some cases to sentiments of virgin purity, will induce him to choose other situations than this one from which blood may, in this disease, be abstracted with advantage, and to have recourse to other and various means by which the end in view may be accomplished. I know that in all cases where this and other appliances to the neck of the womb are resorted to by physicians who practise in this especial department the utmost attentions are paid by them to the modest feelings of the patient, and to all decent, and even delicate observances; but I should prefer having recourse, in the first place, to such means as cannot be objected to by the sensitive mind, or even by the captious; and leave such measures as may become matters of reproach to both the patient and physician, although most unjustly, to the necessities of the case—as a *dermier ressort* in practice. I may write under prejudice in favour of older modes of practice, for I have employed these and seen the benefits they afford, when judiciously employed and combined; but I nevertheless admit that the measures more recently had recourse to are often more quickly successful, and sometimes succeed after the others have failed.

96. Local abstractions of blood should be directed as near as possible to the seat of pain. Cupping is more serviceable than leeches, particularly when the pulse is full or firm, and the patient not reduced. In these cases, or when the patient is young and plethoric, or when the menstrual discharge has been scanty for some time previously, a general depletion will be advantageously premised, and more especially when the blood is taken from the feet when immersed in warm water. When pain is referred to the sacrum, cupping may be directed on this part. Leeches are generally most beneficial when applied to the vicinity of the anus, or the labia pudendæ, or to the inner parts of the tops of the thighs just below the vulva or groins. The quantity of blood that may be taken away should depend upon the habit of body, the state of the circulation, and on the severity and duration of the complaint. My objections to the application of leeches to the cervix uteri are, 1st, those already hinted at above, and particularly in respect of unmarried females; and, 2d, the risk of the application of them to this part being followed by an excessive determination of blood to the organ, or by ulceration of their bites, and consequently

increased irritation. It will, however, be admitted that these are contingencies which may seldom occur; nevertheless, they should not be hazarded.

97. The repetition of local depletion should necessarily depend upon the effect of the previous operation, and upon the circumstances just mentioned. In cases of long continuance, when the constitution is much enfeebled, even local depletion is but ill borne, and should seldom exceed from four to six ounces. In these its repetition is rarely attended with much advantage. But when the repetition seems required and gives relief, it should generally be to a smaller amount than the first, and be performed at a time when the return or increase of pain is anticipated. In this way it may be repeated thrice, or even more frequently, to the small amount now named. There are, however, instances where even a small local depletion aggravates the symptoms. These occur chiefly in weak, nervous, or anæmied females, and in cases of long standing, or where the leucorrhœal discharge has been long profuse. In this class of patients the *second indication* of cure (§ 88) should be immediately adopted.

98. Dr. HENRY BENNET remarks that the application of leeches to the cervix uteri, when often repeated, is more frequently injurious than beneficial, and that the consequences mentioned above then frequently result from them. I must, however, refer the reader to his work for many judicious observations respecting the local employment of leeches in this disease. Dr. WEST states that, "so long as acute symptoms are present, or whenever they reappear in the chronic stage of the disorder, local leeching generally affords more speedy and more decided relief than other remedial means. The leeches should be applied to the uterus itself; not above four in number at a time; nor is it in general expedient to repeat their application above once in a week or ten days. Another precaution consists in never leeching the womb within four or five days of a menstrual period; lest the regularity of that function be disturbed, either by being brought on prematurely or (which is much less frequent) by its occurrence being postponed for several days. The pain which is left behind after menstruation in some of these cases—in those especially in which the discharge is scanty—is, however, often very greatly relieved by the application of a few leeches as the period passes off." (*Lect.*, p. 140.)

99. *d. Cooling aperients* are generally required both at the commencement and during the course of treatment, owing to the state of the bowels and to the effects of narcotics taken from time to time. Those aperients which will operate copiously once, or twice at most, and without irritating the lower bowels, are the most eligible. Castor oil, the electuary or confection of senna, either alone or with sulphur and bi-tartrate of potash, will prove the most certain. In very chronic cases, or when the digestive organs and the system generally are much weakened, rhubarb and magnesia; or the compound infusions of gentian and senna, in equal parts, with tartrate of potash, tincture of henbane, and tincture of cardamoms, will be found of service.

100. *e. Narcotics or sedatives* are often required, not only in the injections, as advised above, but also in the medicines taken by the mouth, or ad-

ministered in enemata. They are most serviceable after a gentle action on the bowels has been produced. Camphor, in the dose of one or two grains, with the nitrate of potash and the extract either of henbane, or of hemlock, or of poppy, given in the form of pill twice or thrice daily, or about ten grains of either of these extracts, dissolved in water gruel and injected up the rectum, immediately after the bowels have acted, will frequently afford relief when much pain is experienced. Subsequently the bitter infusions may be prescribed with tincture of henbane, and small doses of nitrate of potash and bicarbonate of potash or of soda. These means also serve to diminish irritability of the bladder by which uterine inflammation is often attended. If deposits of the phosphates exist in the urine, small doses of hydrochloric acid, with tincture of henbane and extract of pareira, prescribed in the infusion of calumba, or of orange peel, generally are of service.

101. *f. External applications* of various kinds have been recommended, as the croton-oil liniment (one part of the oil to ten of simple camphor liniment), by Dr. WEST, to be applied over the sacrum by means of a sponge twice a day; in order to relieve the back-ache, plasters of opium or of belladonna, to the same situation, and with the same intention; and a small blister, or an anodyne liniment, applied over the part, when pain is urgent in either iliac region. Dr. OLDHAM advises the following in this latter situation:

No. 365. R Extracti Belladonnæ, ʒss. ; Tinct. Aconiti (Fleming's), ʒiv. ; Linimenti Saponis Comp., ʒjss. Misce. Fiat Linimentum.

In cases where pain either in the back, sacrum, or iliac regions is most severe, I have found more relief procured from an embrocation, frequently recommended in this work, consisting of equal parts of the compound camphor liniment, of the turpentine liniment, with variable proportions of sweet oil and cajuput oil, applied over the part on folds of flannel or spongipiline, than from any other application. Warm turpentine stupes are also very beneficial.

102. *B. When inflammation of the uterus is attended by granulations, excoriations, ulceration, and hypertrophy of the cervix*, additional means to those already mentioned are recommended, especially by recent writers on uterine diseases. Dr. HENRY BENNET states, that the solid nitrate of silver, or a strong solution, should be applied every three or four days to the inflamed mucous membrane covering the cervix, where there is neither ulceration nor hypertrophy of this part; and this treatment should be the first resorted to when the cavity of the cervix is inflamed, "carrying the caustic into the cervical cavity as far as it will pass." When ulceration and hypertrophy of the neck of the uterus are present, he adds that the means already advised seldom succeed in effecting a cure, unless the ulceration be recent, although they mitigate the severer symptoms; a relapse occurring in a short time. Repeated relapses, and a perpetuation of ulceration of the cervix and cervical canal, are the consequences of palliation merely, owing to the repeated determination of blood to the uterus during the menstrual periods. Should the disease not yield (and it seldom does) to the antiphlogistic means directed as above, the most efficacious treatment, he remarks, "indeed the only one that can be depended upon, is by direct stimulation of the dis-

eased and ulcerated surface, and to modify its vitality in such a manner as to induce a healthy action, and, finally, cicatrization. This end is obtained by the use of caustics of varied strength, according to the nature and extent of the disease, its chronicity, and the effects produced." "We must first subdue sub-acute inflammatory action by emollients, depletion, and astringents; and then modify, by direct stimulation, the diseased surface, so as to substitute healthy reparative inflammation for morbid ulcerative inflammation."

103. The last part to heal in an ulceration of the neck of the uterus is that which dips into the cervical cavity. Dr. BENNET therefore insists upon the necessity of separating the lips of the os with a bivalve speculum, in a good light, and of thus carefully exploring the state of the cervical canal before the disease is pronounced to be cured. Unless this precaution be used, the ulceration may be only partially cured, and the disease will return and extend over the cervix in a few months. The agents recommended for the cure of disease of the cervix—for chronic inflammation, excoriations, granulations, ulcerations, with or without enlargement, induration and deviations—are chiefly the more energetic caustics, which he enumerates in the order of their powers of cauterization: The solution of, and the solid nitrate of silver, the mineral acids, the acid nitrate of mercury, potassa fusa, potassa cum calce, and the actual cautery. It is obvious that a recourse to either of these requires both address and careful appliances. The nitrate of silver, acid nitrate of mercury, and potassa cum calce, are chiefly recommended by British writers on uterine diseases; these and the actual cautery also being much employed by French physicians. For very full directions for the use of these caustics, I must recommend the reader to the works of Dr. J. HENRY BENNET, Dr. SIMPSON, and of the other writers mentioned above; but as the directions given for the use of these means by Dr. WEST are more succinct, I shall give them nearly in his words; premising, however, that the able and experienced physicians now named generally have recourse to the more energetic of these caustics in the most severe and protracted cases, and when more or less hypertrophy of the cervix is associated with other lesions.

104. When the granulations on the os and cervix uteri become large, soft, very vascular, and bleed easily, the surface furnishing a copious glairy discharge, sexual intercourse being painful and often followed by bleeding, Dr. WEST then recommends "extensive scarifications, which may be followed by the daily application of powdered alum on a piece of cotton-wool, or by the introduction of a piece of cotton-wool soaked in a strong solution of alum. By means of a piece of thread tied to the cotton-wool, it can be removed by the patient herself in the course of a few hours, though it must always be introduced through the speculum. In the greater number of instances the state of the os uteri becomes so much improved in four or five days, that this mode of treatment may then be dispensed with, and the sedulous employment of strong astringent injections will usually suffice to complete the patient's cure. When this is not the case, but the morbid condition still continues, more powerful applications may be needed. The nitrate of silver is not in general suitable in these cases, for its application

is often followed by pain and also by bleeding. The acid nitrate of mercury, both in this instance and also whenever a strong caustic is required, has seemed the most useful application; and with moderate care its employment is unattended by risk. When it is used, however, the patient must lie on her back, and one of COXETER's bivalve speculums being introduced so as thoroughly to expose the os uteri and include the cervix, a little cotton-wool must be carefully disposed all round the edge of the speculum, so as to absorb any of the superfluous acid, and to prevent it from running down outside the speculum, and thus injuring the vagina. A brush can easily be extemporized by trimming a little piece of cotton-wool after it is placed in the holder, and the whole diseased surface may then be painted over with the caustic, which immediately forms upon it a white eschar. A piece of dry cotton-wool now pressed against the part will absorb any superfluous caustic; the little strips placed around the edges of the speculum may then be removed, and the speculum withdrawn." As an additional precaution, a piece of moistened cotton-wool may be introduced up to the os uteri, before the withdrawal of the speculum, whence it may be removed in the course of a few hours, by the patient. "It is seldom that either pain or bleeding follows this application; and at the end of a week the eschar will usually be separated; the surface will be found to have lost its fungous character, and cicatrization to be commencing at its edges. A zinc lotion of about five grains to the ounce, or the black wash employed as a vaginal injection twice a day, will now generally be sufficient; but sometimes the surface puts on an indolent character again, and it may then be expedient to touch it once or twice with the nitrate of silver, and I have occasionally found it necessary to repeat the application of the acid nitrate of mercury." (*Lect.*, p. 146.) Dr. HENRY BENNET employs, as escharotics, either the acid nitrate of mercury, or the potassa cum calce, fused in sticks of three different sizes, according to the peculiarities of the local lesion; and gives ample directions for the use of these and other caustics, appropriately to the circumstances of the disease. He, however, admits that cauterization of the cervix is an operation not without danger, and must not, therefore, be either injudiciously resorted to, or carelessly carried out. Although his own "practice has been hitherto free, or all but free, from serious accidents, the same immunity cannot always be expected. Indeed, I recently learned from M. GENDRIN that within the last few years he has had several cases of acute metritis and of abscess in the lateral ligaments, the evident and immediate result of deep cauterization. But he also tells me that he has seen the same results follow the use of the nitrate of silver and of injections; and I may mention that the two most severe instances of acute metritis that I have myself witnessed for some time in the unimpregnated womb occurred after the use of weak astringent vaginal injections." (*Op. cit.*, p. 426.) I believe, however, when vaginal injections are followed by those severe results, that the inflammation of the cervix, or the leucorrhœa, for which these means were used, was only a part of the existing lesion; and that endo-metritis, or a chronic metritis, had also existed at the same time, and was developed into the acute state by the injections.

105. *C. Treatment of Hypertrophy and Induration of the Cervix Uteri.*—These changes are the results of repeated congestion, or of inflammatory congestion and of nutritive hypertrophy. The continued existence, or repeated recurrence of inflammatory congestion, gives rise to increased development of the vessels, to the exudation of plastic lymph, and to the partial organization of this lymph, and to greatly increased size and density of this part of the uterus, often extending partially to the substance of the uterus itself, and associated with *chronic metritis* (§ 62, *et seq.*). This lesion is commonly attended by more or less prolapsi, and often with deviations. The enlarged cervix may, moreover, be excoriated, ulcerated, or covered by granular formations, owing to the alterations of its follicles. The *local means* of cure are those already recommended, aided by the constitutional treatment hereafter to be noticed (§ 106, *et seq.*). Dr. H. BENNET states that, "if hypertrophy resists the ordinary antiphlogistic means of treatment, it never withstands the melting influence of deep cauterization with potassa, or the actual cautery." Of the two he prefers the potassa, or potassa cum calce; Dr. WEST the acid nitrate of mercury. The actual cautery may therefore be dismissed. It should be clearly understood that these means are not intended to destroy the hypertrophied cervix, "but merely to set up an artificial eliminatory inflammation, by means of an eschar or issue, of limited extent, established in the centre of the hypertrophied region. I do not calculate in the remotest degree on the destruction of tissue to which the caustic or cautery gives rise, for diminishing the size of the hypertrophied cervix, but solely and entirely on the inflammation subsequently set up." An eschar of the size of a shilling will answer the purpose of reducing the hypertrophy. It may be necessary to apply the caustic several times. "The ulcerations occasioned by the deep application of potassa heal very rapidly, even when left to themselves. It is better, however, to touch them at intervals with the nitrate of silver, to prevent the granulations from becoming too luxuriant, and to favour the cicatrization, which usually takes place in from four to six weeks."

106. *D. Constitutional and general Treatment.*—The constitutional treatment of chronic inflammation of the cervix and os uteri, and its usual consequences, should not be overlooked, even while local means are being applied. Indeed, in many cases, this treatment should precede a recourse to local measures, these latter only following the failure of the former. In some of the more recent works upon this and other diseases of the uterus, too little importance is attached to the recognition of the causes of the existing malady, and upon the prevention and removal of these causes, which, when removed, the salutary efforts of nature would then of themselves often effect a cure. In this disease especially, as well as in the displacements and deviations of the uterus, sexual excitement and self-pollution are the most frequent causes, and these are usually allowed to continue, owing to the difficulty and delicacy of the subject, to ignorance of medical men of the great frequency of this vice, and to an equal ignorance of the immorality and injurious consequences of it on the part of those who indulge in it.

107. The constitutional treatment which I have adopted for many years, when uterine irritation, as it was then termed, or when chronic inflamma-

tory irritation, as more recently shown, was present, always was much modified, according to the features of the case. If *leucorrhœa* was its prominent character, the means advised when treating of this complaint were prescribed. If the *menstrual function* was disordered, the treatment recommended for the various forms of such disorder was had recourse to; and, whenever inflammatory irritation of the uterus was inferred, then means more or less antiphlogistic were advised, often conjoined with tonics, and with other remedies adapted to the peculiarities of the case. In a very large proportion of the cases of this complaint, the causes which have produced it, and the discharges which characterize it, as well as its exhausting nature and duration, have produced so much debility and irritability, and so extensive a range of sympathetic disorders—nervous, neuralgic, hysterical, cerebro-spinal, vascular, and anæmic—as to imperatively require constitutional treatment, however much the local means above described may be required or confided in. What this treatment should be, or how conjoined with regimen and local measures, must depend upon the acumen of the physician, and upon the appropriate use of each or of all in particular cases and circumstances. But in most cases the patient should recline on a cool hair couch, should sleep, if married, apart from her husband, on a hair mattress, and avoid very warm feather or down beds, all sources of sexual excitement, and whatever appears to aggravate her complaints. She should preserve an open state of the bowels by means of cooling aperients, or of these conjoined with tonics. The bicarbonates of the fixed alkalies may be taken with the nitrate of potash in bitter infusions, or the liquor ammoniæ acetatis with nitrate of potash, in similar vehicles. The terebinthinate embrocation already advised (§ 101) may be employed externally, and a cooling, and yet tonic or restorative, regimen and diet adopted, avoiding much animal food, and all heating and stimulating beverages, as well as coffee and strong tea. In a severe and tedious case, for which I was consulted by Mr. BARNWELL, the following pills proved of very great service:

No. 366. R Camphoræ rasæ, ℥j.; Potassæ Nitratis, ℥j.; Sodæ Sub-carb. exsic., ʒss.; Extr. Hyoscyami, ℥ij.; Syrupi papaveris, q. s. Misce. Fiat massa æqualis, quam divide in Pilulas xxx., quarum binas, ter in die capiat.

After these were taken for some time, they were replaced by the infusion of calumba, bicarbonate of soda, tincture of calumba, and tincture of hyoscyamus.

108. In the above manner, the *second indication* of cure may be initiated, and may thus advance to a more tonic and restorative or nutritious treatment, so as to restore the constitutional energies, and thereby the healthy state and functions of the uterus. This end can be attained only by medicinal and regiminal means, both of which, however, should be commenced with caution. In a few instances I have prescribed, with marked benefit, the *cod-liver oil*, on the surface of a tonic infusion, with one of the mineral acids, as the compound infusion of orange peel with sulphuric acid; or the compound infusion of roses, or the infusion of cinchona with hydrochloric ether or hydrochloric acid, or with both. In other cases, the tonic or bitter infusions or decoctions may be ordered with the alkaline carbonates, nitrate of potash, and tincture either of henbane or of some other anodyne. In cases which have been of long

duration, or have been caused by self-pollutions, or which are characterized by shattered health, by pallor of the countenance, cold extremities, and more or less anæmia, the milder preparations of iron, as the tincture of the muriate or of the acetate of iron, may be prescribed with the preparations of calumba or quassia. Dr. DAVIES states that he has given, in these cases, the phosphate of iron with much benefit. In some cases, especially where there is hypertrophy of the cervix uteri, the iodide of iron may be tried in the sirup of sarzæ; or the iodide of potash may be taken with either the bicarbonate of potash or the solution of potash in a tonic infusion, &c.

109. The *mineral waters*, natural or artificial, may likewise be resorted to, according to the peculiarities of the case. The Bath and Tunbridge waters, the Harrowgate waters, the waters of Seltzer, Geilnau, of Ems, of Vichy, of Pyrmont, &c., have been severally recommended, and found of some service. The *regimen* and *diet* of the patient are of much importance. If married, she should sleep apart from her husband; and whether married or unmarried, she ought to avoid all causes of excitement and irritation. She should enjoy the advantages of a cool and pure air. The *diet* ought, while febrile and inflammatory symptoms are present, to be light, cooling, and chiefly farinaceous; and animal food should be given in very small quantity, until convalescence is advanced, when it may be taken more liberally. The beverages may consist of toast-water, barley-water, or of lemonade, or of the imperial drink. Afterward, when recovery is far advancing, the Rhenish wines, or claret, or claret and water, &c., may be allowed. In most cases, coffee and tea are inappropriate. Cocoa, or cocoa-nibs, prepared in a simple manner, and dry-toast with little butter, should be preferred. Patients who have caused this complaint by self-pollutions have generally great appetites; and their indulgences in food and in their unnatural vice tend to perpetuate the disease, and to frustrate the treatment. For them, the diet should chiefly consist in a large proportion of vegetable and farinaceous substances, whereby the stomach may be filled, with as little excitement of the circulation as possible. The mind should always be occupied by useful pursuits, and, as much as may be, by agreeable employments.

110. *E. Treatment of Inflammation of the Cervix Uteri in the unmarried, during and after Pregnancy, and in advanced Life.*—A well-informed practitioner may apply what has been already adduced to these circumstances of life, but with due care and precaution. In *unmarried females*, the great difficulty of treatment is in the local or instrumental part; but a recourse to it will depend much upon the severity and other peculiarities of the case, and upon the results of constitutional treatment, which should be previously employed, the causes of the disease having been ascertained, and removed as far as possible. "The existence of *pregnancy*," Dr. H. BENNET states, "so far from being an obstacle to the local treatment of inflammatory and ulcerative disease of the uterine neck, is a strong reason why it should be adopted and carried out without delay, unless the patient have reached the latter period of her pregnancy. If so, as the child is viable, and it is rather difficult to bring the cervix fully into view, it is as well, unless the symptoms be urgent, merely to resort to astringent injections, and to reserve all instru-

mental treatment until after the confinement." In the early or first six months, the local treatment, Dr. B. states, must consist in astringent injections, and cauterization with the nitrate of silver or the acid nitrate of mercury, the potassa cum calce being much too powerful in these cases. If ulcerative disease of the cervix exist after an *abortion* or *confinement*, he never interferes until four or five weeks have elapsed, and he then cauterizes the diseased surface with the nitrate of silver. If blood be poured out from the ulcerated surface, the cauterization invariably stops it; and the case then falls into the general category. But it should be recollected that, during lactation, the mucous surface of the cervix and vagina presents a vivid red or congested hue, from sympathy with the mammae and nipples; hence this condition should not be mistaken for inflammation, and ought not to be interfered with by treatment. The disease of the cervix in females *past the menstruating age* is generally intractable, and requires the most powerful caustics, but having been removed, the cure is permanent.

111. ii. *TREATMENT OF ACUTE INFLAMMATION OF THE INTERNAL SURFACE AND BODY OF THE UTERUS.*—Although the treatment of *endometritis*, by local means, is supposed, especially by some French writers, to be appropriate to this state and seat of the disease, yet such means, however cautiously resorted to, cannot fail of being more or less dangerous. As this form of metritis frequently commences in the cervix or its cavity, extending to the cavity, and to some extent, in most instances, to the substance or body of the organ, and in some cases also to the broad ligaments, these circumstances should always be considered, and the treatment should be prompt and decided. If the patient be young, or strong, or plethoric, especially if the disease has followed the suppression of the catamenia, or of other evacuation or excretion, blood should be taken from the arm, or from a vein in the feet immersed in warm water, and cooling diaphoretics and aperients exhibited. The warm or tepid bath, or hip-bath, may follow the depletion; and, if the pain be severe, camphor, nitrate of potash, and extract of henbane, or extract of belladonna, or a minute dose of aconite, may be prescribed every four or five hours, or after longer intervals, if the belladonna or aconite be given. In the cases just described, local depletions—by leeches applied over the ovarian regions, or below the groins, or by cupping on the loins or sacrum—may be directed after the *blood-letting*, especially if this latter has not produced the desired amount of benefit; indeed, in most cases the local depletions will also be required. In milder cases, and in less robust or plethoric females, the local depletions, when resorted to with decision, will generally be sufficient, especially when the internal or general treatment is judicious. Their repetition may, in some cases, be required, but this, as well as the quantity of blood which should be taken, should depend upon the severity and other features of the case. After the local depletions a tepid bath, and subsequently the terebinthinated epithems and embrocations already advised, may be placed over the hypogastric region, the flannel on which the embrocation is sprinkled having been either warmed or wrung out of hot water.

112. These measures having been employed, time should be allowed for their operation, and for the subsidence of the disease. This latter ob-

ject will, however, be promoted by rest in the horizontal posture; by the avoidance of sexual excitement; by recourse to cooling diaphoretic medicines, especially the liquor ammoniæ acetatis, with small doses of the vinum or liquor antimonii tartarizati, and some anodyne or narcotic. The only aperients allowed should be cooling, and such as may not irritate the rectum: as the citrate or carbonate of magnesia; the phosphate of soda; the acetate or tartrate of potash, prescribed in emollient vehicles, or with either of the preparations of senna or rhubarb. Calomel, or calomel with opium, should not be given in metritis, as it is apt to aggravate the complaint by irritating the rectum; and medicines containing aloes should also be avoided.

113. The *regimen* and *diet* of the patient should be strictly antiphlogistic, and the beverages allowed ought to be demulcent, emollient, and slightly alkaline. As convalescence advances, the alkaline mineral waters of Vichy or Ems may be allowed. When the disease is neglected, or improperly treated, it may extend to the broad ligaments and ovaria, as shown above (§ 72, *et seq.*), or it may lapse into a chronic state; which state, however, may be primary, although it is much more frequently a consequence of chronic inflammation of the cervix, or of the cavity of this part, or of the body of the organ, and is most frequently partial or limited in its seat, as shown above (§ 64).

114. iii. THE TREATMENT OF CHRONIC METRITIS.—Chronic metritis, often commencing in the cervix, is also frequently kept up by the inflammation of this part and its consequences. In most cases, therefore, the disease of the cervix should be first and chiefly attacked, by the means already advised for the several morbid conditions of this part (§ 102, *et seq.*). The chief local means are, rest in the horizontal posture, emollient or astringent vaginal injections, the occasional application of leeches to the cervix, before or after menstruation, according to the period at which they appear most serviceable, and a recourse to anodynes when the sufferings of the patient are severe. These latter, or the narcotics already mentioned (§ 93); a recourse to belladonna, both locally and internally, or to chloroform, or to the hydrochloric ether, or hydrocyanic acid, &c.; the introduction of opiate or other anodyne injections or suppositories into the rectum or vagina; and the external embrocations and epithems already advised (§ 101), are the chief means by which we may hope to remedy this state of disease. In obstinate and protracted cases, M. GENDRIN and Dr. H. BENNET have had recourse to an issue formed above the pubes, keeping it open for some months. In a severe and prolonged case, which I attended with Mr. FLOCKTON, many years before the appearance of this recommendation, I directed an issue to be made below both groins, with the most complete success.

115. The enlargement, partial or general, of the cervix and body of the uterus, in protracted chronic metritis, suggests not merely the local measures noticed above for reducing this enlargement, and the other evils which usually attend it, but also such other general or constitutional means as are sometimes found of service in removing other states of enlargement, morbid deposition or growth. These means may not be of much avail in the disease now under consideration; but the most important of them may be so

employed and combined as to very considerably improve the general health, which is usually injured by the local malady, and to alleviate the sufferings of the patient. These means are, the bichloride of mercury, the preparations of iodine, the iodide of arsenic and mercury, the fixed alkalis and their salts, and the preparations of sarza, severally but separately conjoined with tonics, anodynes, or narcotics, &c. On these principal medicines I proceed to offer a few remarks, in respect to the treatment of chronic metritis and its complications, especially when characterized by enlargement of any part of the uterus.

116. The *bichloride of mercury* is beneficial or injurious, according to the manner of prescribing it. It may be of service even when the constitution has been very remarkably injured by this protracted malady. But it should in most instances, and in these especially, be prescribed either in the fluid extract of sarza, or in the compound tincture of cinchona, or in the decoction or in mixtures, consisting chiefly of all these, with or without some narcotic, as the tincture of conium, or of henbane, &c., or with a few drops of the tincture of opium, or with the compound tincture of camphor, if the medicine should have too relaxing an effect on the bowels. This substance, thus taken, in doses varying from the sixteenth to the eighth of a grain, has a very salutary tonic and alterative effect, even although the hypertrophy of the uterus may not be much, or even at all, reduced by it.

117. The preparations of *iodine* are of service only when given in small doses, and continued for a considerable time. The *iodide of potassium* I have, in these cases, prescribed in doses of one to two grains, thrice daily, with the bicarbonate of potash, or liquor potassæ, or BRANDISH'S alkaline solution, in a tonic infusion or decoction, or as I have prescribed the bichloride of mercury (§ 116). The *iodide of mercury and arsenic* is sometimes of service when extemporaneously prescribed in the compound fluid of sarsaparilla, or in any better infusion. The *iodide of iron* may also be given in the form of pill (see *Form.* 535), or in the sirup of sarsaparilla, but in moderate doses, and in cases evincing more or less anæmia, and when there is reason to suspect that the disease has been caused or prolonged by self-pollutions. In these cases, also, the carbonates of the *fixed alkalis*, the tartrates, the nitrates, &c., are of service, when taken in tonic or bitter infusions, and conjoined with *anodynes* or *narcotics*. I have had reason to believe that the combination of the *bicarbonate of soda* with these, in doses sufficient to preserve the bowels in an open state, without offending the stomach, has been of more service in reducing hypertrophy of the uterus, whether partial or general, than any other means.

118. Dr. H. BENNET states that, when all ordinary therapeutic agents fail to remove chronic inflammation and induration of the uterus, he has established, as a counter-irritant, an artificial ulceration or issue in the neck of the uterus itself, with potassa fusa, or potassa cum calce, independently of any disease of that region, and with very great benefit to the patient.

119. As the chronically inflamed and enlarged uterus often falls back upon the rectum, thereby causing constipation and painful defæcation, especially when the fæces are more or less solid, care should be taken to preserve the bowels in an open state. The means which I have usually

preferred are electuaries, composed of the bi-tartrate of potash, the bi-borate of soda, and the confection of senna, sometimes with sulphur, and with any suitable sirup; which may be taken every night. They have a deobstruent effect upon the uterus, while they preserve a lax state of the bowels. In cases where emaciation or anæmia are prominent, in addition to nutrients, restoratives, or tonics, as circumstances have suggested, I have prescribed the cod-liver oil, and more recently this oil containing some one of the preparations of iron, of iodine, or of mercury, &c.

120. iv. THE TREATMENT OF ENLARGED UTERUS hardly differs from that recommended for *chronic metritis* (§ 114, *et seq.*). Rest, attention to the secretions and excretions; cooling saline aperients and diaphoretics, local depletions, in moderate quantity, at intervals of about a fortnight; the preparations of iodine in small doses, with alkaline solutions or the bicarbonates; the bichloride of mercury in minute quantity, either alone or with the preparations of cinchona; the liquor potassæ with sarsaparilla; and more especially the avoidance of sexual excitement, and of all heating or stimulating beverages, and the recumbent posture, on a cool sofa, and on a hair mattress at night, are the means which will alone be of any service, if they be perseveringly adopted.

121. v. TREATMENT OF INFLAMMATION AND ABSCESS OF THE UTERINE APPENDAGES.—At an early stage the treatment of inflammation of the uterine appendages is the same as that advised for acute metritis (§ 111). But in order to prevent suppuration, which is very much more liable to occur in the former than in the latter, more prompt and more decidedly antiphlogistic measures are required, especially general and local blood-letting. If, however, these means fail in preventing the formation of *pus*, or in procuring the absorption of whatever may have already formed, the purulent collection will find its way to the exterior by the vagina, rectum, abdominal parietes, or bladder. In these circumstances we can only endeavour to control the symptoms, by means suitable for this purpose, to assist nature in throwing off the morbid formation, in the direction to which she points, to support the constitutional powers of the patient, in order that this end may be attained, and to palliate the more distressing symptoms which present themselves. The treatment advised for chronic metritis is suitable for this stage of the disease. If the abscess open into the urinary bladder, the means required will be suggested by the state of the urine. If this excretion continue acid, the carbonates of the alkalies, with demulcents, opiates, or other anodynes, will be most serviceable; and tonics, restoratives, the preparations of buchu, or pereira, &c., be also required. If the urine become ammoniacal, or even neutral, the mineral acids, with cinchona, quinine, or other tonics, opiates, &c., should be exhibited. If the abscess open in the rectum, or flexure of the colon, the consequent tenesmus, and other dysenteric symptoms, will subside after a short time, if, with restorative and anodyne medicines, amylaceous or mucilaginous injections, with opiates, be administered. The bursting of the abscess into the vagina terminates favourably if the constitutional powers be supported, and the unpleasant symptoms palliated, the vagina being occasionally washed by a lotion of tepid or of cold water. If the abscess point externally, tonics, with alkalies, and attention to

the excretions, are necessary; and as soon as fluctuation and redness of the tumid surface appear, an opening, made by the lancet, should not be delayed. Afterward, the powers of life should be duly supported; and the ingress of air into the cavity of the abscess carefully prevented, while the reaccumulations of matter should be prevented or moderated by gentle pressure; and whenever any collects, it should be discharged.

122. IV. INFLAMMATIONS OF THE UTERUS AND APPENDAGES OF A SPECIFIC NATURE.—Inflammation of the uterus may be caused by gonorrhœa or by syphilis—by gonorrhœa more frequently than is generally supposed, by syphilis very rarely.—i. I have seen several cases of GONORRHOËAL INFLAMMATION OF THE WOMB AND APPENDAGES, and in every case the disease was most severe; and whether extending to the os and cervix uteri from the vagina, or by possibility commencing in the former, owing to the direct contact of the morbid matter with that part, the inflammation had advanced along the canal of the cervix to the internal cavity of the uterus, and in three cases to the broad ligaments and ovaria—in one to both ovaria, and in another to the ovarium of the left side and pelvic peritoneum. Mr. ACTON, in his excellent work on "*Diseases of the Urinary and Generative Organs in both Sexes*," has treated this subject in a chapter on "Blennorrhagia of the vulva, urethra, vagina, uterus, and ovary," but he views the disease as in all respects the same as inflammation of those parts, occurring independently of a specific contagion. That it is the same as respects the inflammatory condition—that it is an acute form of inflammation, there can be no doubt; but that it is more severe, more disposed to extend to the uterine cavity and appendages, than common inflammation, whether acute or chronic, commencing in the cervix uteri and produced by other causes, would appear from the cases I have treated. All these cases were of married women, the gonorrhœal infection having been communicated by their husbands, and in all the infection was most manifest, the patients not being previously subject to any leucorrhœal discharge, and was followed by most severe symptoms of inflammation of the womb, and by the extension of the inflammation still farther, as stated above. On this subject Mr. ACTON remarks that, "a female suffering under uterine blennorrhagia may be seized with shivering and a feverish state of the system; vomiting may come on, together with pain referred to the iliac fossa, where more or less tension may be present (in no way resembling the superficial pain produced by peritonitis); but if the finger be carried up the *cul de sac* of the vagina, and the patient desired to turn upon the opposite side, pain of a most acute kind will be felt. The blennorrhagia may cease for the moment, one ovary may be attacked only, or both simultaneously, as in epididymitis; revulsion will explain the partial cessation of the discharge. Lastly, we believe that a great number of ovarian dropsies may result from a chronic inflammation of that organ, the consequence of such complications." (*Op. cit.*, p. 308.) I can fully confirm the correctness of this last remark by a recent case of ovarian dropsy, which occurred in the wife of a very eminent man, and was the ultimate lesion which followed gonorrhœa communicated by her husband. She was from the commencement, and is still, under my professional care.

123. i. SYPHILITIC ULCERATION OF THE CERVIX UTERI.—Both Dr. HENRY BENNET and Mr. ACTON agree in considering syphilitic ulceration of the cervix as a rare occurrence. The latter remarks that, in the vagina and os uteri, the circumstances favouring contagion do not often occur, for if the contagious pus of chancre reaches as far, it is generally deposited on a layer of mucus, which protects the membrane beneath. He concludes that "ulcerations of the neck of the uterus are, in ninety-nine times out of a hundred, merely simple affections, the result of acute or chronic inflammation, very intractable in ordinary treatment, and will persist an almost indefinite time, unless we employ local applications." True syphilitic ulcers of the cervix uteri are described by Mr. ACTON as differing from all other ulcers of this part. "They are small, covered with a chamois leather secretion, which it is difficult to remove; their edges are distinct; they look as if a portion of mucous membrane had been punched out of the os uteri, and inoculation has shown that they were true chancres, situated on this unusual position." (*Op. cit.*, p. 292.)

124. ii. The treatment of these specific diseases of the uterus is not different from that advised for the affections above described.—A. As respects gonorrhœal inflammation of the womb and its appendages, the means are the same as those advised for the more acute inflammations of these parts; the chief modifications consisting in a more prompt and decided use of these means, especially when the symptoms are very severe. In many cases, the inflammation of the vagina is so severe, and the swelling of both it and the vulva so great, as to prevent a recourse to many of the means already advised, especially at an early stage, injections of an emollient and anodyne kind being first prescribed, and sedatives, demulcents, refrigerants, and narcotics internally. In other respects, and as the disease continues or is prolonged, the remedies already recommended for inflammation of the uterus and its appendages, should be administered appropriately to the peculiarities and complications of individual cases.

125. B. The treatment of syphilitic ulceration of the cervix consists in the use of the acid nitrate of mercury locally, as directed above (§ 104), and in the employment of the constitutional means indicated by the existing state of the case, and by the appearance of any signs of VENEREAL CACHEXIA (see that article).

126. V. DISPLACEMENTS OF THE UTERUS.—The womb being suspended in a cavity more or less capacious, but liable to alterations in the extent of its capacity; its supports being not only yielding, but also admitting of considerable mobility; its manifest changes in size and position during pregnancy; and its movements during coition, and the venereal orgasm, are circumstances requiring consideration while endeavouring to describe and explain displacements of the uterus, as well as to remedy these evils. The causes of these disorders are often manifest, but in some cases they can only be inferred from insufficiently conclusive evidence.* It is not to be disputed

that an enlargement of the organ will favour its descent; that muscular efforts, especially lifting heavy weights, will have the same effect, even independently of enlargement, and particularly when the vagina and ligaments are relaxed by child-bearing, leucorrhœa, &c.; and that partial or general enlargement, the pressure of loaded adjoining viscera, too severe or prolonged exertion, especially during the menstrual period, falls on the back, hips, concussions of the trunk of the body, &c., will occasion either that or other forms of displacement.

127. It should not be overlooked that, in the great majority of instances of displacement of the womb, other lesions of the organ, either inflammatory or structural, are associated with the displacement. This circumstance is of no mean importance both in recognising the cause, conditions, and relations of displacement, and in regulating the treatment and regimen of the patient.

128. i. DESCENT OR PROLAPSE of the womb is the most common form of displacement, and proceeds from increased weight of the organ, or from impaired tone of its supports.—A. Dr. WEST has considered this lesion with reference to its grades, and divided it into the first, second, and third degrees of prolapse. "In the first degree the organ is merely lower than natural, but still preserves its proper direction, its axis corresponding with that of the pelvic brim, and this, even though it should be so low that its cervix rests upon the floor of the vagina. In prolapsus of the second degree, the uterus is situated with its fundus directed backward, its orifice forward, so that its long axis corresponds with the axis of the pelvic outlet. In prolapse of the third degree, or, as it is often termed, *procidentia* of the uterus, the organ lies more or less completely externally, hanging down beyond the vulva, though it generally admits of being replaced within the vagina, if not of being altogether restored to its natural position." It is obvious that a due recognition of the circumstances, both physical and pathological, favouring and causing this displacement, is of the greatest importance in preventing and removing the different grades and complications of it observed in practice. The womb is not merely suspended by the duplicatures of the peritoneum within which it is contained, but it is also poised upon the vagina, which, in the healthy virgin state especially, furnishes it very considerable support. The curved direction of the vagina, the connexion of the organ, appendages, and vagina with the adjoining viscera, with the pelvic and perineal fasciæ, &c., also aid in supporting the uterus in its situation.

129. These combined supports, however, may

prolapse." ("A Practical Treatise on Inflammatory Ulceration and Induration of the Neck of the Uterus." Lond., 8vo, p. 212, 1845.) When we consider, however, that the weight of a non-gravid womb seldom exceeds two ounces, and of that the vaginal cervix constitutes not more than one fifth part; and, moreover, that the gravid uterus at three or four months of gestation rarely descends, we may well doubt whether much can be justly attributed to this cause. Ninety per cent., at least, of these cases occur in females who have had children, and probably a still larger proportion, so that we must look to gestation and labour, and accidents connected with them, as the principal causes. Professor BEDFORD has very properly called attention to the fact, that both prolapsus and procidentia of the womb are often owing to mismanagement of the placenta, as pulling upon the cord before it is detached ("Clinical Lectures on the Diseases of Women and Children." N. Y., 8vo, 1855, p. 46, &c.), and some of the worst cases we have ever treated could be traced to this cause.]

[* Dr. J. H. BENNET, of London, was the first writer who attributed descent of the womb to an increase in its weight. "The uterus," he remarks, "is so slightly poised or suspended in the cavity of the pelvis, that the slightest modification in its volume gives rise to a change in its position. The inflammatory hypertrophy of the cervix increasing considerably the specific gravity of the inferior portion of the uterus, the entire organ descends,

severally be relaxed or overcome during the epochs of life following puberty. In the virgin and unmarried state, leucorrhœa, menorrhagia, anæmia, exhausting discharges, and frequent excitement of the venereal orgasm by masturbation, severally tend to relax the tone of the parts which support the womb in its natural position. During the sexual orgasm its mobility is manifested to the greatest natural extent, its descent often occurring in various degrees, without becoming greater than is consistent with the healthy function; but it is obvious that, when unnaturally produced, the healthy condition is at last exceeded, and that more or less displacement is apt to occur, especially as the same cause practised to excess tends remarkably to relax the tone of the parts upon which the healthy position of the organ depends. In the married state, as well as sometimes in the unmarried, although more remarkably and much more frequently in the former, enlargement and greater weight of the womb, and the stretching, relaxation, and other changes of the supporting parts consequent upon abortions, child-bearing, difficult labours, and puerperal diseases, very materially predispose to the descent and other displacements of this organ. If, in these circumstances, the erect posture be too early resumed after delivery or abortion, if falls or concussions of the trunk of the body be experienced, or if violent muscular efforts be made, as in lifting or carrying heavy weights, a greater or less descent, or hernia of the uterus is apt to take place. Aged and emaciated females, married or unmarried, are most frequently liable to this displacement, sometimes to its utmost extent, owing to the absorption of the adipose tissue adjoining the vagina and vulva, especially when the exciting causes just mentioned have occurred.

130. Descent of the uterus, even in its first and second degrees, is very commonly attended by some degree of retroversion; and this state is often, as well as the descent, increased by constipation of the bowels; the hardened fæces, in the efforts at defæcation, augmenting the extent of both states of displacement, by pressing upon the fundus of the uterus. Dr. West justly remarks that "the close connexion between the cervix uteri and the neck of the bladder is a temporary obstacle to the complete descent of the womb, while at the same time it favours the retroversion of the organ; but if at length this yields, the urine accumulating in the bladder distends its fundus and the vaginal anterior wall into a pouch which drags down the uterus in front just as the prolapse of the rectum drags it down behind; and the organ now soon comes to lie beyond the external parts; the case being thus converted into one of procidentia uteri, or of prolapse in the third degree." (*Lect.*, p. 156.)

131. This displacement of the uterus is, in the course of time, followed by still farther changes. The neck of the womb, being the first part protruded, and the most exposed to irritation, becomes more and more hypertrophied, and often excoriated; the enlargement being both in length and thickness. The protrusion of this part of the organ is partly due to inordinate growth, its thickness being sometimes equal to, or even greater than that of the wrist. The lips of the os uteri become enlarged with the rest of the organ, and the transverse opening formed in women who have had children is converted into a wide opening situated deeply between projecting lips, whose

surface is irritated, excoriated, vividly red or granulated, and covered by an albuminous secretion. The prolapse beyond the vulva may continue only in a partial state for years, the fundus and a portion of the organ remaining within the pelvis, while the neck and the lower part are external. In this state, the organ may still be replaced without difficulty, especially when the prolapse has followed soon after delivery at the full period, the pelvic floor being sufficiently yielding in most instances. In the course of a variable duration of time, a partial descent is often followed by a complete protrusion of the organ, "the vagina becoming inverted, and forming the outer walls of a tumour, at the lower part of which the womb is situated. So long as the procidentia is incomplete, this tumour is somewhat pyriform in shape, its base being directed upward; but afterward, as it increases in size, it assumes an oval form, owing to more or less of the bladder being drawn down into it in front, and of the rectum also, in many cases, behind. Its bulk is also farther swelled, in numerous instances, by the small intestines sinking down into the sac, and thus adding to its size until it equals or exceeds that of the adult head."

132. In these cases, the uterus itself forms only a comparatively small portion of the large external tumour. The susceptibility of the organ, and the disposition to hypertrophy, are much diminished by constant and complete prolapsus from the pelvic cavity. "The bulk of the tumour, and the difficulty of its replacement, depend chiefly upon two causes. Of these, the one consists in the enormous hypertrophy which the vaginal walls undergo. Not only does their mucous membrane lose its ordinary character and become covered by a layer of cuticle like that of the skin, to protect it from the various sources of irritation to which it now becomes exposed, but the walls themselves attain a thickness of as much as half an inch, and present a dense muscular structure. The other cause of the bulk of the tumour, and of the difficulty of replacing it, arises from the presence of the intestines in the sac, which seldom reside there long without inflammation of their peritoneal covering being set up; not of so acute a character, indeed, as to produce formidable symptoms, nor even as always to call for treatment, but matting their different coils to each other, and tying them firmly to the interior of the sac." This latter cause of difficulty in attempting to return a long procident uterus should not be overlooked, for, even though no intestines have descended into the external tumour itself, chronic peritoneal inflammation may agglutinate them to each other, or to the walls of the pelvic cavity, and thus oppose the replacement of the womb.

133. *B. The Symptoms of Prolapse of the Uterus.*—The symptoms may be severe in some cases, and hardly experienced in others. In the unmarried, and when occurring suddenly or rapidly, prolapse of the uterus is attended by much more severe or acute symptoms than when it occurs in married females after miscarriage or delivery, or when it takes place slowly. When it is caused in single females after prolonged dancing or riding on horseback, the symptoms are generally rapid and severe; and even in married females who have borne children, and have subjected themselves to these causes, the descent is usually rapid, and the symptoms are also severe, but the prolapse is generally greater than

in the single. The sensation most frequently experienced is that termed "bearing down," or of falling down of the pelvic viscera. This feeling is augmented by lifting weights, or by bodily exertion, and then it is often attended by a sharp pain. Defæcation is difficult and painful, and is followed by some degree of tenesmus. Pain in the direction of the vagina, when sitting down, especially on a hard seat, pain in the back and low in the sacrum, and a very frequent desire to pass water, are always experienced. Leucorrhœa is often complained of, and the catamenia are either profuse, prolonged, or too frequent. The digestive organs are soon after more or less disordered, the bowels are constipated, and the general health suffers; and as the prolapse becomes chronic or prolonged, the cervix and even the body of the uterus become hypertrophied.

134. External prolapse, or procidentia uteri, generally follows the internal prolapse, or that in which the uterus and cervix still remain within the external parts, and usually takes place gradually. It is favoured by emaciation or the absorption of the adipose substance in the vicinity of the vulva; and it occurs most frequently after a too early change of position after parturition or miscarriage, or too early exertion, or walking about, after these occurrences. In these circumstances especially, sudden, unusual, or great exertion, or straining at stool, or lifting weights, may occasion procidentia suddenly; and the symptoms may then be severe. As the cervix, the lower part, and the body of the organ, successively protrude—the former parts only occasionally at first—the pains, inconvenience, and distress increase, and ultimately the whole organ lies nearly always or constantly without the external parts. After the protrusion, the sensibilities of the uterus become blunted by the exposure, and the vaginal leucorrhœa subsides. But, as the procidentia increases, the relations of the uterus with the adjoining organs and parts are changed. The urinary bladder and urethra are more particularly implicated, occasioning dysuria, a frequent desire to empty the bladder, or incontinence of urine. The rectum is also affected so as to render defæcation difficult or painful; while the descent of the small intestines into the pelvic cavity, and the excoriations, thickening, irritation and ulcerations of the exposed parts, owing to exposure to the air, and to the dribbling of urine, and to other contingent occurrences, increase the sufferings of the patient. With the complete prolapsus, hypertrophy of the organ increases, more especially its cervix and the lips of the os tinæ, which, moreover, become ulcerated to a considerable extent, the cavity of the cervix being drawn apart, so as to become open or gaping, the ulcerations extending into it. In many cases of internal prolapse, pregnancy takes place; but this period is often one of considerable suffering. If the prolapse be slight, pregnancy generally cures it, as the uterus rises in the pelvis with the advance of gestation, especially if care be taken, and the patient remains in a recumbent position long after delivery. When the uterus is either partly or altogether external, impregnation rarely takes place. In the former case, the sufferings of the patient are greatly increased by impregnation; and miscarriage usually takes place, the organ being unable to rise into the pelvic and abdominal cavities. "In some few instances, how-

ever, pregnancy runs its course undisturbed, in spite of a great degree of prolapsus; and cases are on record in which the uterus has descended farther and farther, until a great portion of it hung down between the thighs; but the development of the fœtus has, nevertheless, gone on in this unnatural position; and others still stranger, in which coitus has been practised immediately through the os uteri, and impregnation and undisturbed gestation have followed in spite of the existence of irreducible procidentia." (WEST, *Lect.*, p. 172.)

135. *C. Treatment.*—The causes which tend to oppose the return of any long-existing procidentia of the uterus have been explained above (§ 132); and the same causes, although operating in a less degree in simple or internal prolapsus, often prevent the complete restoration of the womb to its normal position. The first object, in respect of treatment is, to ascertain the causes of prolapse, and the circumstances connected with its occurrence and progress; for the means of cure or of palliation must be directed accordingly. Carefully avoiding the causes of prolapse (§ 126, *et seq.*), the patient should strictly observe rest and the recumbent posture; preserve a gently open state of the bowels, and have recourse to astringent injections, and the cold hip-bath. When the womb is much enlarged, as well as prolapsed, the measures advised above for the enlargement (§ 115–120) should be adapted to the peculiarities of the case. It should be recollected that there is always a tendency to a return of the descent, even when the womb has regained its proper position, upon the recurrence of the menstrual period. If, therefore, due care and proper precautions be not taken on the accession and during the course of this period, the descent may return, and each return will be attended by an aggravation not only of the extent of the prolapse, but also of the enlargement of the organ, and of the profuse menstruation which generally attends it, especially if the patient be allowed to remain in an erect or sitting posture.

136. As respects a recourse to mechanical supports in order to preserve the uterus in situ, as well as regards a selection of those supports, I must refer the reader to directions contained in Dr. WEST's very able and instructive lectures, and be contented with a reference to the more general principles and directions he has there adduced: 1st. In cases of slight descent of the uterus, resulting from a general loss of tone in the parts, or from some temporary or accidental cause, as excessive fatigue, over-exertion; 2d. In cases where the descent of the womb is still comparatively recent, and is due to the persistence of puerperal hypertrophy, owing to imperfect involution of the organ (§ 69) after abortion or labour; 3d. In cases where uterine disease, of whatever kind, was the occasion of displacement of the organ, such disease being still in a stage requiring treatment. In these several circumstances, mechanical support of the uterus is not necessary or suitable. On the other hand, mechanical means of some kind or other are required, 1st. In all cases of external prolapse or procidentia; 2d. In cases of long-standing prolapse of the second degree, associated with much relaxation of the vagina, and consequent weakening of the uterine supports; 3d. In all cases of extensive laceration of the perineum, and for a similar reason in cases of prolapsus in the aged; 4th. In cases of less degrees of prolapse attended by extreme suffer-

ing; 5th. In all cases of considerable prolapse of the vagina, with or without descent of the rectum or bladder, and in all cases in which the uterine prolapse is secondary to any of those other forms of displacement. It is unnecessary here to describe the several kinds of support or contrivances which have been advised. They are either external or internal, according to the manner of their employment. They are well described in Dr. WEST's work just referred to, where very judicious directions are also given for their use.

[There is every shade of opinion in our profession in regard to the use of pessaries, from HEBERDEN, who says, "A prolapsus of the vagina or the womb is only to be relieved by a pessary" (*Commentaries*, chap. 102), to those who prescribe them altogether. Professor MEIGS is very decided in favour of pessaries, and says, "A man might as well treat fractures without the splint as these affections without some mechanical stay and support." (*Loc. cit.*, p. 144) After considerable experience in the treatment of this affection, we are satisfied that the time has not yet come for the abandonment of this instrument. If an evil, it is a necessary one, and the objections to its use are chiefly founded on its abuse or injudicious use; from its too large size, improper shape, or wearing too long without removal, &c. Certain are we that the operations proposed for its relief by DIEFFENBACH and MARSHALL HALL, viz., removing portions of the vaginal wall, and thus causing contraction of the canal, are altogether unjustifiable, and such as very few females will or ought to submit to. The severity of the remedy is disproportionate to the disease; besides, permanent relief may generally be afforded by safer and less painful means. Moreover, the contractedness of the vagina thus produced would, in child-bearing females, render labour difficult and dangerous. The glass or ivory pessary is regarded by many as the cleanest and best in common use in this country, and they maintain that it will accomplish whatever can be reasonably expected from such an instrument.

The *medicated pessaries*, recommended by HIPPOCRATES, are not to be lost sight of in the treatment of prolapsus of the womb. The *sachet* or small bag, made of soft linen, and filled with finely-powdered galls, to which a few grains of sulphate of quinine and alum are added, and to which a small bit of tape is attached at the lower end, and soaked for an hour or more in claret or astringent port-wine, often answers an excellent purpose in constringing and giving tone to the parts. It should be pressed and dried in a napkin, and dipped in sweet oil, when it can readily be introduced within the vagina as a medicated elyroid pessary. If carefully introduced, and this may be done by the patient, it may remain, with the aid of a napkin well adjusted, for several hours, and this may be practised daily for an indeterminate period. Such medicated sachets will be found very useful in all cases of relaxation and fall of the vagina, and also in many cases of leucorrhœa. The contents may be varied to suit the circumstances of the case, as varying proportions of oak bark, tannin, kino, opium, henbane, cubebs, Peruvian bark, &c. The sponge, which is sometimes employed, is objectionable, from its irritating nature and its uncleanness; the caoutchouc bottles are in every respect preferable. One should be selected with the neck entire; after stuffing it with finely-carded wool, the neck

is to be securely tied; it should then, after being well lubricated, be properly adjusted, with the cylindrical neck towards the vulva, which serves to keep it in place, and it may be worn for a long time without changing. Where there is much sensibility or irritability of the parts, such a pessary would be far preferable generally to one of wood, ivory, silver, or glass, were it as cleanly. A few years since, Dr. CLAY, of Manchester, England, presented us a pessary which, in some cases, we have found preferable to any other. It is gilt, and pear or globe-shaped, attached to a cylinder of elastic silver wire, covered with gum-elastic, which projects from the vulva, to which an elastic bandage is attached and fastened to a girdle of suspender-web around the body. This retains the uterus securely in place, and is worn without pain or inconvenience.]

137. These contrivances for the relief of prolapsus of the uterus or vagina are merely palliative, they bring about, however, a cure, in some cases by preventing any increase of the displacements, and by giving time for nature gradually to remove them, more especially in slight or recent cases. But in cases of long standing, and in those in which the descent is considerable or complete, there is much uncertainty in their results. Therefore operations have been devised for contracting the orifice of the vulva, and the prevention by such means of external prolapse. In cases of lacerated perineum, the restoration of this part by an operation is obviously the most successful mode of curing a prolapse, and it has been often successfully attempted. But in cases where the orifice of the vulva is relaxed, or is widened by the uterine descent, means have been taken by Dr. FRICKE, Mr. BROWN, M. GERARDIN, M. LANGIN, and Dr. KENNEDY, for its contraction, with various degrees of success. These means will readily suggest themselves to most medical men. A farther notice of them does not fall within the scope of this work.*

138. ii. ASCENT OF THE UTERUS.—This state of displacement deserves notice only in as far as it is of some importance as a symptom: 1st. Of advanced pregnancy, from the fourth to the eighth month; 2d. Of some cases of inflammation of the pelvic cellular tissue, or of the tissues between the folds of the broad ligaments; 3d. Of an advanced stage of inflammation or of dropsy of the ovaria; 4th. Of fibrous or other tumours of the uterus when they increase in size and draw the uterus upward; and, 5th. A great degree of contraction of the pelvis.

139. iii. OF OTHER DISPLACEMENTS AND DEVIATIONS OF THE UTERUS.—The displacements of

* B. F. BARKER, in a paper on "*Uterine Displacements*" (*New York Medical Gazette*, May, 1853), recommends for *prolapsus* a pessary made by cutting out a double thickness of patent lint of a triangular form, so that when rolled up it will form a cone of a proper size. A piece of tape is tied to it, half an inch from the apex, for the purpose of facilitating withdrawal. The pessary is to be soaked in a saturated solution of tannin. The patient placed on her back, the uterus is replaced, so that its axis corresponds with that of the superior strait; the cone is then introduced, apex first; but after it is in the vagina, it is turned so as to bring the base under the os tincæ. Dr. B. recommends to introduce a new one *twice in the twenty-four hours*. Where there is tenderness, he adds $\frac{ʒij}$. laudanum to the solution of tannin. The size of the pessary may be gradually lessened. The patient is advised to take exercise, and not keep the recumbent position. The tannin is supposed to relieve congestion of the cervix when present, while at the same time it gives tone to the vagina. General remedies, as iron, quinine, &c., may also be necessary.]

the uterus which consist of *versions* and *flexions*, or, strictly speaking, of *deviations of the body and neck of the organ* from their normal position, have only recently received due attention; and, although descent of the womb, in its several degrees, has been duly considered, owing to the prominent manner in which it is brought before those who have professed the study of the extensive class of female diseases, yet other deviations of the womb from its natural position have been, until lately, but imperfectly investigated by them, in the married and child-bearing states, and entirely neglected in unmarried females. This neglect has in great measure originated in imperfect knowledge or entire ignorance, 1st. Of the probability of the displacement being congenital; and, 2d. Of certain of the causes of these deviations, especially those causes which more frequently occur in unmarried than in married females, and to which I have sufficiently adverted already (see § 10, 22).

140. A. Dr. W. HUNTER first directed attention to *retroversion* of the uterus as sometimes taking place in the early months of pregnancy; but it was not recognised as occurring in the unimpregnated womb until cases of it in this state were published by Professor OSIANDER in 1808, and Professors SCHWEIGHAUSER, in 1817, and SCHMITT, in 1820, farther illustrated the history and symptoms of this displacement. More recently, Professor SIMPSON, of Edinburgh, and M. VELPEAU, have fully investigated the nature and signs of the several deviations of the unimpregnated uterus from the normal state. Not only may the fundus of the womb fall backward into the hollow of the sacrum or forward against the symphysis pubis, but it may also incline towards either side. Its body may, moreover, be bent upon the cervix, forming a new class of deviations, called *flexions*; and Dr. WEST states that there is reason for believing that *retroflexion* and *anteflexion* are of more frequent occurrence than the corresponding alterations in position of the whole of the organ, which are known as *retroversion* and *anteversion*. The tendency of the womb when at all enlarged, either in the early period of pregnancy, or by disease, is not only to sink below its natural position, but at the same time to fall back with its fundus towards the hollow of the sacrum; besides, enlargement of the organ, either from imperfect involution, or from disease, is generally most considerable at its posterior parietes, thereby causing a tendency to fall towards the heavier side. The distention of the bladder also, so frequently continued for a prolonged period, and a loaded and constipated state of the bowels, aid in producing this form of deviation, whether in the gravid or in the non-gravid uterus; while sudden efforts or violent exertions, falls, concussions of the trunk, will concur with these and other causes or circumstances, as with the catamenial period in the non-gravid, in producing this form of deviation, namely, *retroversion*. Previous delivery, miscarriages, difficult menstruation, congestion of the uterus, intemperate sexual indulgence, and increased determination of blood to the organ, will also predispose to, or even cause, this occurrence, as well as some other conditions hereafter to be noticed (§ 142, *et seq.*).

141. B. *Anteversion* of the non-impregnated uterus was, only a few years ago, considered to be a rare occurrence. I find in the notes of a

case which I saw, with Mr. HOYLAND, in 1843, that I remarked that one to have been only the fourth that I had seen, and that this case was most probably owing to adhesions of the fundus of the uterus, as the lady had been some considerable time previously the subject of pelvic peritonitis. Madame BOVIN had, however, many years previously pointed out attacks of circumscribed peritonitis as a not infrequent cause of abortion. Without such adhesions it is difficult to account for the occurrence of anteversion, owing to the relative position of parts; and there is much reason for inferring, with Dr. WEST, that many of the cases believed to be those of *anteversion* were actually cases of *anteflexion*, the fundus of the organ having been bent forward on its cervix. But even in this case the explanation of its occurrence is not easy. In married females, however, some allowance should be made for the mechanical effects of sexual intercourse in connexion with the venereal orgasm in the female.

142. C. As respects the deviations usually termed *version* and *flexion*, Dr. WEST remarks "that in the greater number of cases of alleged version of the womb, either forward or backward, the organ is really flexed or bent upon itself; and farther, that not unfrequently the two conditions coexist, the whole womb being thrown more forward or more backward than natural, while in addition the body of the organ is bent upon its cervix." As far as the symptoms are concerned to which they give rise, these varieties of deviation present but little difference.

143. As to the point of *flexion* of the uterus, whether backward or forward, Dr. WEST agrees with Professor VIRCHOW, of Berlin, in considering it to be the junction between the body and neck of the womb, or, in other words, the spot corresponding to the internal os uteri; and that the flexion is owing to the anatomical fact that, while the neck of the womb is firmly connected with the posterior and lower part of the bladder, its body is perfectly moveable. As to the comparative frequency of the two forms of deviation, Dr. WEST states that his notes furnish the particulars of twenty-six cases of retroversion and retroflexion, and of nine of anteversion and anteflexion. M. VALLEIX, however, gives thirty-five deviations of the uterus forward, and thirty-three backward; and Dr. MAYER, of Berlin, sixty-three cases of the former, and sixty-four of the latter. The frequency of adhesions, and of other indications of previous inflammation, as a cause of deviations of the uterus, is shown by the statement of Dr. WEST, that he met with these lesions of the womb, its appendages, and the vicinity, in twenty-two out of sixty-six cases, in which he examined the uteri of women who had died of some other than uterine disease.

144. Protracted flexion of the uterus may be expected to be followed by farther lesions. These are narrowing of its cavity, at the point of flexion especially, and atrophy of the parietes of the womb on the side towards which the flexion occurs, thereby rendering it permanent.

145. The cervix is very generally more or less diseased in all the forms of deviation of the uterus, presenting the several states of lesion described above as being seated in the cervix externally and internally—these being chiefly indicative of inflammatory irritation or action, granulations, excoriations, ulcerations, enlargement of the cervix,

and an open or gaping state of the os and cervical cavity, enlargement of the posterior lip of the cervix, &c. (see § 27, *et seq.*); these severally, or two or more of them jointly, being very frequent complications of deviations of the uterus from the normal state. That these lesions of the cervix are not always consequences of the deviations, my experience induces me to believe, and to infer that Dr. H. BENNET more correctly attributes the deviations to pre-existing disease of the cervix. It appears to me that those alterations of sensibility of the cervix associated with more or less irritation or chronic inflammatory action, and with the several consequences of sexual excitement, leucorrhœal discharges, disordered menstruation, and their numerous and ever-varying sympathetic affections, are more likely to give rise to deviations of the position of the uterus, and not only to the deviations already noticed, but also to others, consisting of obliquity of position, or to lateral deviations (which I believe to be the most frequent of any, and to be generally of temporary duration), when unconnected with disease of the ovaria and the broad ligaments, than that these deviations of the womb from its natural position should occasion disease of the cervix. It may be readily allowed that any pre-existing disease in this part may be aggravated by lesions of position; but that the former is a consequence of the latter, requires farther proof; and the positive evidence furnished of a different succession of lesions would require to be previously disproved.

146. *D. The symptoms of deviations of the uterus* have been subjects of contention even with those who have taken female diseases under their special protection. How, therefore, shall those who get only occasional glimpses of uterine diseases decide, when so very opposite views are entertained by the professors of this specialty? The former are, however, the judges in the cause; the latter are the partisans or advocates of their respective doctrines. Thus it is stated, by a very recent and able writer on these diseases, that "the symptoms are by some described as being both numerous and characteristic, and the appropriate treatment is by them alleged to be both simple, safe, and successful, while others deny that the mal-positions, taken by themselves, produce any symptoms, and assert that the proposed treatment, while attended by very considerable risk, is wholly inadequate to the removal of the evil which it is intended to cure. Each of these opinions, too, is maintained by men equal in the eminence of their position, in their practical experience, and in their good faith." (*Op. cit.*, p. 206.) This statement is borne out by the discussion on this subject reported in the "*Bulletin de l'Académie de Médecine*" for 1853-4 (vol. xix., p. 778-976), and is there fully and remarkably illustrated.

147. It is very obvious to the student of human nature, that, however well-informed individuals may be in their especial department, and however eminent in popular estimation, as long as occurrences, morbid actions, and their consequences, vary so as to give rise to modified or different signs, phenomena, or symptoms, and to develop modified or altered features or aspects, so long will the observers of these see and believe certain of them in preference to, or to the neglect of, the rest, and thus form one-sided views, which the very majesty of their position, in either professional or popular opinion, or both, will not admit of being impugned, and for which they will con-

tend with biased judgments, even in opposition to the most obvious truths. Now, as one of the professed judges in such matters, and having no preconceived opinions as regards them, I venture to state that the symptoms vary, in severity and number, with the causes—predisposing and exciting—with the sensibility and irritability of the sexual organs themselves, and of the constitution, with the existing deviation and its extent, with its several associations with disease of the cervix and its consequences, with the states of the natural and morbid uterine discharges, and with the several complications which deviations of the uterus present with the adjoining viscera. Hence it may be inferred that the slighter deviations which have taken place slowly or gradually in females evincing but little susceptibility or irritability, and which are not associated with marked disease of any part of the uterus, or of structures connected with it, may not occasion any disorder calculated to excite anxiety in the patient, or to require medical advice, and yet may exist for a long period, or may disappear altogether, from the efforts of nature or from changes in the female economy or in the constitution. But deviations of the uterus to a considerable extent, especially when occurring suddenly from well-recognised causes, and when associated with other uterine lesions, or with diseases of adjoining parts—and even when existing simply in susceptible, sensitive, or irritable females, married or unmarried, more especially in the latter when masturbation is suspected—then will very generally occasion symptoms which, if they do not prove, should at least induce the physician to ascertain its existence or non-existence by an examination. That the symptoms are often, however, more or less equivocal, or that they may frequently accompany other lesions of the womb, must be admitted, but a vaginal examination readily solves the difficulty, and evinces the true nature of the complaint. The symptoms usually present in uterine displacements or deviations are, excessive, painful, or difficult menstruation, leucorrhœal discharge, pain in the pelvis generally, and most severe in that part of the pelvis towards which the fundus uteri is turned or flexed, pain and difficulty in defæcation and micturition, constipation, frequent calls to pass urine, or sometimes retention of it, and sterility. According to the temperament and habit of body of the patient, various sympathetic disorders may be induced by uterine deviations, chiefly affections of the digestive organs, as nausea or retchings on the accession of the catamenia, hysterical symptoms, pain under or in the mammae or in the spine, neuralgic pains in the limbs, &c.

[The above remarks of our author explain very satisfactorily the differences of opinion on this question between Dr. BENNET on the one hand, and Drs. TYLER SMITH, WEST, and R. LEE on the other. Because we meet with some cases in which inflammatory lesions of the neck of the uterus, including ulceration, exist, without creating constitutional disturbance or any particular suffering, it by no means follows that it is so in all cases. In some women, as Dr. BENNET has remarked, the organic sensibility of the womb and its sympathetic connexion with the rest of the economy are so slight, that severe uterine disease, inflammatory or other, may exist for months or years, as in other organs, without producing much local discomfort or much general disturbance; but then these must be regarded as

exceptional cases. It would be wrong to infer from these that inflammatory lesions are of no pathological importance. The same remark will apply to uterine displacements, and indeed all affections of the uterine organs, and it is in accordance with what we observe in all other parts of the body. On one point we must, however, express a doubt, and that is, whether the slight increase of weight attending hypertrophy of the neck, or even body of the womb, is the principal cause of prolapsus, or any other displacement. It may co-operate with other causes, possibly, but in itself alone it can have no important influence.]

148. As respects this disputed question, Dr. WEST justly remarks that, although cases prove, on the one hand, that flexions of the womb do not of necessity give rise to any distress, and, on the other, that the removal of a flexion of the organ may not be followed by relief of the patient's sufferings, the fact still remains that displacement of the womb is in very many instances attended by various uterine ailments not experienced before its occurrence. Here, however, the question suggests itself, Are the sufferings of the patient due simply to the displacement, or to the morbid condition with which the displacement is associated, or to the two causes conjoined? Dr. WEST answers this question by stating that "there are circumstances which appear to favour the opinion that, in the majority of instances, the symptoms are due not to displacement alone, but to displacement accompanied by some other morbid state of the womb." This opinion is confirmatory of that previously given by Dr. H. BENNET, that the deviation is nearly always a consequence of chronic inflammation of the cervix, is associated with the cervical disease to which the sufferings of the patient are mainly due, unless in extreme cases of displacement. For some remarks on the diagnosis of versions and flexions of the uterus, and on the use of Dr. SIMPSON'S uterine sound for this purpose, I must refer the reader to Dr. WEST'S lectures, and to the other recent works on uterine disease. There can, however, be but little difficulty in the diagnosis between such deviations and tumours in the uterus, for which they can hardly be mistaken.

149. *E. The treatment of deviations of the uterus* has been a matter of dispute among modern authorities on uterine diseases. Certain of these contend that the lesions of the uterus to which the deviations are due, and to which the symptoms are chiefly owing, should be made the objects of treatment, while others attempt to restore the uterus to its right position, and to maintain it there by mechanical contrivances. SCHWEIGHAUSER, SCHMITT, OLDHAM, and others, have supported the former treatment, while Dr. SIMPSON, VELLEPEAU, KIWISCH, and VALLEIX have resorted to the latter. These contrivances have undergone various alterations in the hands of the several authorities who have had recourse to them. From what I have seen of cases in which they were employed,* and from the opinions of M. DUBOIS

and Professor SCANZONI, as stated by Dr. WEST, I believe that, although they may be successful in some cases, under the care of able and careful practitioners, they are attended by no small risk, as respects the uterus, its appendages, and peritoneum, and that the return of the displacement is very frequent after the mechanical contrivance is removed. At a recent discussion in the Academy of Medicine at Paris, "M. DUBOIS stated that he had himself treated upward of twenty cases by means of the uterine supporter, which in some instances was worn for several months, but that the displacement reproduced itself within a very short time after the removal of the instrument; and that he had made a similar observation in the case of many patients who, having been thus treated by M. VALLEIX and Dr. SIMPSON, had been dismissed by those gentlemen as cured."* Professor SCANZONI remarks that "the observation of fifty-six cases of flexion of the uterus during the past four years compels me to express my decided conviction that the mechanical treatment of this affection is either useless or positively mischievous." He concludes that, having quite discontinued the use of these mechanical contrivances, and contented himself with a recourse to cold vaginal injections, with the antiphlogistic treatment of any chronic uterine inflammation, and the application of caustic to any ulceration of the os uteri, and with the endeavour to remove the chlorotic symptoms which are seldom absent, he has been much better satisfied with the results of treatment than he was when he was seduced into the application of a variety of mechanical contrivances. (*Lect., &c.*, p. 225.)

150. It is obvious from the foregoing, as well as from my own limited experience, that attention to the improvement of the general health, to the removal of the local lesions of the uterus with which displacement is often associated, as they admit of removal by local and constitutional treatment, to alleviation of the more painful or distressing symptoms, and to the improvement of the secretions and excretions, are the true principles which should guide the physician in the management of these complaints. The means which are chiefly required are such as have already been recommended. If the catamenia be excessive, the sulphuric acid and sulphate of magnesia, or the supertartrate of potash, if the bowels be constipated; the sulphate of alum if this state do not exist, or the gallic acid, tannin, or the infusion of matico, may be prescribed internally, and conjoined with henbane, or with conium, or with the extract or tincture of belladonna, or of the Indian hemp, if pain be urgent. After the second or third day, if the discharge be excessive, cold enemata. The patients themselves were in favour of the treatment, but their general health appeared much impaired since they were my patients. I stated to the parents that I could not approve of the means employed for single females, that the contrivances could not be always applied, and that the complaint would return when they were relinquished. I therefore refused any farther interference in these cases.

[* In 1849 I had an opportunity, through the politeness of Professor SIMPSON, of observing, for some time, his treatment of uterine affections, especially of deviations of the uterus, by means of his *stem-pessary*; and it is due to him to state that, although I examined several cases in which this instrument had been worn, some for a period of a year or longer, there was no instance in which the wearer complained of its causing irritation, pain, or serious inconvenience. These results, so different from what I had been led to expect, satisfied me that the dangers from the use of this instrument have been greatly exaggerated.]

* In two of unmarried females who had previously consulted me for hysteria with leucorrhœa, the mechanical contrivance in question was resorted to by the physicians to whom they had subsequently confided their treatment. I was requested by the parents of these two young females to see them in consultation with the physicians then attending them, their parents having been dissatisfied with this treatment. The contrivances in use for them were shown me; their appliance and object were

mata may be administered twice daily; and in order to remove the anæmia and debility generally characterizing these cases, chalybeate preparations, variously combined, according to the circumstances of the case, should be given, and the diet and regimen strictly enforced.

[When we consider that the uterus has no fixed position in the pelvis, but is liable to be altered, both in its position and axis, by a variety of extraneous agencies—the state of the urinary bladder in front, the rectum behind, the intestine above, and the colon on either side, and consequently from a variety of morbid states incidental to these organs, it is liable to be deposed from its natural position, and to have its axis altered from its normal state—we shall be led to doubt the pathological importance and significance which are assigned by some to its displacement. Doubtless the same causes which give rise to abnormal states of the chylipoietic or abdominal viscera, simultaneously disturb the functions of the uterine and pelvic. We often discover uterine displacement where no uterine or constitutional disturbance is present; and we treat cases of retroversion, for example, and even prolapsus, successfully, by constitutional remedies, when there is considerable uterine and constitutional derangement. We are, therefore, disposed to believe that the uterine organs, in these cases, suffer in a secondary, rather than in a primary manner; and that, retroversion being a consequence of the more general derangement referred to, any treatment, to be successful, must be founded on the various antecedent conditions which gave rise to the uterine malady. If these remarks are founded in truth, then such mechanical remedies as the stem-pessary will be likely to do more harm than good; for the idea that the uterus is to maintain a fixed and undeviating position is opposed, as we have seen, to all correct physiological principles. We agree, then, with Dr. BENNET, that displacements of the uterus are constantly met with, but, except in extreme cases, they are in reality of secondary importance. They often exist in the healthy without being recognised or complained of; and they often remain after the removal of disease, without distress or inconvenience being experienced; while in those who suffer from uterine ailment, they generally coexist with decidedly inflammatory lesions. Their presence may generally be explained by these lesions; and they generally disappear by degrees, as the inflammatory lesions are cured and removed.

Prof. HODGE, of the University of Pennsylvania, has introduced a pessary for uterine displacements, which is regarded by some as superior to all others, on the ground that it restores and maintains the vagina in its normal proportions. This instrument consists of two lateral bars, curved to correspond with the walls of the vagina, united at the top by a triangular bar. This instrument is said to maintain the vagina in its original shape, and thus keeps the uterus *in situ*, pressing away from rather than against the womb. It has the advantage of not being liable to derangement, and readily permits the natural functions of all the pelvic organs to be performed without obstruction, while it is worn without annoyance, and can be introduced and removed with great facility. It is also believed to be well calculated to replace the womb when displaced in any way, although it seems more particularly adapted to cases of retroversion. Here

the posterior wall of the vagina is kept so distended by the back part of the pessary, that, instead of yielding, as before, it bears the fundus uteri upward and forward, throwing the cervix downward in the vagina, and keeping it there. Its advocates allege that its mere introduction alters the position of the uterus from retroversion to that of simple prolapsus in the first degree, and that it is by the distention of the posterior roof of the vagina to its normal dimensions that the organ is kept *in situ*, and not by any force exerted against it; thus avoiding the danger of local injury, while it corrects the displacement. When well adapted to the dimensions of the pelvis and vagina, it is said, it may be worn without annoyance for months, or even years. There is one inconvenience, however, attending its use in some cases, which may, nevertheless, probably be guarded against, viz., the fundus so pressing on the posterior bar of the pessary as to bear up the two lateral bars, and thus their anterior ends excite irritation under the pubic arch. If the fundus uteri be well thrown forward, this objection may be obviated. Perfect rest in bed for a few days, after the reposition of the organ by means of the uterine sound, is all that will generally be necessary to secure this result. The same instrument will serve also for prolapsus, flexions, and anteversions of the uterus—for the latter, made with the addition of a front bar, uniting the anterior ends of the lateral bars, thus forming a parallelogram—although it would seem best adapted to cases of retroversion. Proper perineal support will be necessary in addition, in bad cases. One great advantage this instrument undoubtedly possesses, viz., it allows the free application of injections, &c., to impart strength to the relaxed vaginal walls. This instrument is generally made of silver, and afterward gilded.

Dr. WEST, who has had great experience in the treatment of uterine diseases, remarks (*"Lectures on the Diseases of Women,"* 8vo, p. 413. Lond., 1856. Part I.), in regard to displacements and flexions of the womb, as follows: "Though I have tried the uterine supporter" (SIMPSON'S) "in a few cases, I have now for some time quite given up its employment, and content myself with a mode of treatment which, though it seems to promise less, yet almost always affords great relief—which, in a large number of cases, quite removes the patient's sufferings, and is not unfrequently followed by the complete rectification of the position of the womb. The principle, indeed, on which I act in the management of these cases amounts pretty much to this: that, to the best of my power, I take care of the general symptoms, and leave the misplacement to take care of itself." We are satisfied that, as a general rule, this is the proper course to take; at the same time, it must be conceded that there are exceptional cases in which a suitable pessary may be used with advantage, especially in retroversion, on the principle of supporting or distending the vagina upward behind the uterine neck.]

151. VI. INVERSION OF THE UTERUS—the turning of the organ inside out—is clearly impossible in the unimpregnated healthy womb. It is one of the most grievous and fatal accidents which can befall a female. My late friend, Dr. CROSSE, of Norwich, in his elaborate essay on Inversion of the Uterus, states that of 400 cases of inversion of which he had found mention, 350 were consequences of parturition. Of the remaining

50 cases, 40 were said to have occurred from the presence of a polypus in the interior of the womb, the accident taking place either spontaneously or from traction in attempting to remove the growth. Enlargement of the uterine cavity, associated with some cause exciting contraction of its fibres, are the conditions essential to inversion of the organ.

152. A. The symptoms of inversion of the uterus are sudden collapse or sinking, with abundant hæmorrhage, with disappearance of the tumour formed by the uterus in the abdomen, and the presence of a large spherical body either just within the vagina, or projecting beyond the external parts. My friend Dr. RADFORD has, however, shown that, except in cases where the placenta still partially adheres to the uterus, the hæmorrhage is not so formidable as might be anticipated; and that the shock to the system is in great degree independent of the loss of blood.

153. B. Inversion of the uterus is caused chiefly by the detachment of the placenta after delivery, owing to undue force or want of care; and, in rarer cases, by a spontaneous and unequal or irregular contraction of the uterus, either while throwing off the placenta, or even soon after, or upon the detachment of it, while the cervix and os uteri are at the same time comparatively relaxed. This explanation of spontaneous inversion of the womb was ably given by Dr. RADFORD, and confirmed by Dr. SIMPSON. The pressure of the bowels on the fundus caused by the action of the abdominal muscles during the detachment of the placenta may also favour this occurrence. A polypus or tumour firmly attached to the interior of the fundus uteri, having descended through the os uteri, may likewise excite irregular action and drag the fundus with it, thereby producing, with varying degrees of rapidity, inversion of the organ.

154. In most instances the inverted uterus becomes speedily firmly contracted; but in a few cases the uterus remains soft and flaccid, and even capable of replacement. The hæmorrhage often continues at short and uncertain intervals, and in very variable quantity from the period of the accident, but to this there are occasional exceptions. The consequences of inverted uterus tend with varying degrees of rapidity to the destruction of life—at least in the great majority of instances. Dr. CROSSE states "that in 72 out of 109 fatal cases, death took place in a few hours, in 8 within a week, and in 6 more within four weeks. The immediate danger, however, being surmounted, there follows during lactation an interval of comparative safety and of cessation of serious symptoms, which reappear when suckling is over. It appears that of the remaining twenty-three patients only one died at the fifth month, and then as the result of an operation which had an unsuccessful issue; one died at eight months, three at nine months, and the others at various periods of from one to twenty years."

155. C. The diagnosis of inversion may be overlooked or mistaken. The inverted uterus has even been torn away by ignorant persons who had believed it to be the placenta. Dr. CROSSE considered that the womb may be partially inverted spontaneously a short time after the detachment of the placenta, or depressed at its fundus. This may increase to *introversion*; but the partial inversion, although attended by much vital depression and hæmorrhage, will not occasion

any tumour in the vagina, nor a complete disappearance of that formed by the uterus in the abdomen. Introversion of the uterus may, however, soon pass into *complete inversion*. An inverted uterus may be mistaken for polypus, and a fatal issue result, as indeed it has resulted, from this error. The history of the case generally will assist the diagnosis, but polypus may complicate pregnancy, and may occasion both a tumour after delivery and hæmorrhage. The firm constriction of the os uteri upon the cervix of an inverted womb causes the part to assume the form of a pedicle, thereby rendering the diagnosis more difficult, unless an examination be made *per rectum*, when the uterus, if inverted, will not be found in its place, while, if the vaginal tumour be a polypus, it will be found in its proper place, and probably also somewhat enlarged. The uterine sound, as improved by Dr. SIMPSON, will also aid the diagnosis, if properly used.

156. D. The treatment of inverted uterus is attended by great difficulty. If the accident occur before the detachment of the placenta, the removal of this body should be effected before the replacement of the uterus be attempted. Dr. SIMPSON's accurate views as to the source of hæmorrhage in parturition show that fears of serious bleeding in consequence of the removal of the placenta in these cases need not be entertained. Two modes of returning the uterus when inverted after labour have been recommended. The one by pushing back or indenting the inverted fundus with the finger; the other by grasping the womb between the fingers, compressing it, and by pushing it upward into its proper situation. Either of these modes may succeed in recent cases occurring after delivery, while the organ is soft or flaccid, or as long after as it may remain in this lax state. In these cases, as well as in others, in which the replacement is attempted either when the organ is more firmly contracted, or when some time has elapsed from the occurrence of the accident, chloroform may be found of use in facilitating the operation, although in some cases where this substance has been employed no advantage was procured from it.

If the inverted womb cannot be replaced, immediately after the recurrence of the inversion, it will remain irreducible, and entail on the patient all the miseries and perils incidental to this state. The only means of averting these are by operations, which are attended by very serious hazards. The chief reasons which can be urged for such operations—the removal of the inverted organ by the knife or by ligature—are profuse hæmorrhages or discharges endangering the patient's life. Dr. WEST has given the following table of the results in 50 cases of inversion of the uterus after delivery, in which extirpation of the organ was performed.

	Cases.	Recovered.	Died.	Operation Abandoned.
Uterus removed by ligature.....	33	28	5	2
Uterus removed by the knife.....	4	3	1	
Uterus removed by knife and ligature	8	5	3	
	50	36	12	2

157. It is of importance to know the results of extirpation at different periods from the time at which the inversion occurred. If the operation be performed soon after the occurrence of the accident, it cannot be expected to be as successful

as at a remote period from the occurrence, as the organ will diminish in size, vascularity, and sensibility by the lapse of time. Accordingly we find that, of 21 cases thus operated upon within twelve months from the occurrence of the accident, 9 died, and 12 recovered; while of 25 cases in which the operation was not performed until one year, or much longer periods, had elapsed, 23 recovered, and only 2 died. Of the occurrence of inversion from a polypus, and of the various modes and appliances for extirpating the uterus, I must refer the reader to works on surgery, and to those enumerated in the BIBLIOGRAPHY and REFERENCES to this article.

158. VII. OF POLYPI OF THE UTERUS.—Polypi and tumours of the womb generally occur during the period of sexual activity, or, if they be developed at a somewhat later period, or soon after the climacteric period, they have generally originated some time previous to it. It is often very difficult to ascertain the *causes* which either *pre-dispose* to or *excite* their formation; but there is reason to infer that inordinate excitement or determination of blood to the uterus, with a disposition to hypertrophy of one or more of the tissues of the organ, are the chief causes of these lesions.

159. i. *Mucous polypi*, or excrescences from the folds of the *arbor vitæ*, are often met with, varying from a third of an inch to nearly an inch in length to about three or four lines in thickness: they are connected with the mucous or villous membrane of the canal of the cervix by a very slender and short pedicle. They are usually of a bright rose tint, are supplied with a delicate network of vessels, and consist of mucous membrane, with a small admixture of cellular tissue internally. They may spring from any part of the cervical canal; but they more frequently arise nearer to the external than to the internal os uteri. Although generally pediculated, they are sometimes sessile, and in rare cases they seem as hypertrophied folds of the *arbor vitæ*. These productions are either single or multiple, two or three existing in the same patient; and having been removed, they may be reproduced in a few months afterward. They may even coexist with fibrous tumours of the uterus. Dr. MONTGOMERY, of Dublin, believes them to be sometimes precursors of malignant disease; and this was observed in one case which was under my care. In rarer instances these polypi are much larger than now stated, and consist of a cellular or fibro-cellular tissue invested by mucous membrane; sometimes they reach the size of a fig, are flattened, and hang down beyond the os uteri into the vagina.

160. ii. *Follicular polypi*, or polypi from enlargement of the follicles of the cervix, are not unfrequently observed. They appear as *cysts*, of the size of a pea, imbedded between the folds of the *arbor vitæ*, and hardly projecting beyond the level of the canal. They are, however, sometimes much larger, are more or less numerous, and are distended by albuminous matter. When large and numerous, they cause the absorption of the cervical structure, and even occasion the bulging outward of the structure of the cervix.

161. iii. *Complex polypi*, consisting of mucous follicles, the mucous or villous surface, and fibro-cellular tissue of the cervical canal, are more frequently seen than either of the foregoing. These polypi are either pediculated, the pedicles being

sometimes of considerable length, more rarely very short, or appear as continuous tumours or growths from the inner surface of one or other of the lips of the os. When divided they are found to contain a tenacious, transparent, albuminous matter, identical with that secreted by the Nabothian glands. When small they consist chiefly of cysts filled with this matter. When they are much larger, and reach the size of the first joint of the thumb, these cysts or vesicles are not so distinct, but exist in the form of canals, arranged longitudinally, between which a fibro-cellular tissue enters more or less abundantly. Their surface often presents an uneven or tubulated appearance, is generally not very vascular, and is composed, according to VIRCHOW, of a dense cellular tissue, covered by a thick layer of tasselated epithelium.

162. iv. The *symptoms* indicating the existence of polypi generally appear gradually, and may with increasing severity continue months or even years before medical aid is required. There are usually at first leucorrhœal discharge, hæmorrhage, or both, followed by bearing down pains in most cases. When the polypi are very small, they may produce either very slight symptoms or no symptoms at all. Hæmorrhage is, however, very generally experienced, especially when the polypi occasion enlargement of the neck of the womb. The size of the polypus may not influence the hæmorrhage, a small one often causing more than a large one. Dr. WEST considers that the structure of the polypus influences the symptoms, and that those polypi which present the compound structure due to the enlargement of the Nabothian glands are always productive of profuse leucorrhœa; and their vascularity of surface being less, they are less frequently the occasion of hæmorrhage. The much rarer occurrence of follicular polypi is attended by a profuse albuminous discharge, and is not associated with profuse menorrhagia, unless in rare instances. The symptoms now mentioned should always suggest digital examinations, and if no polypus can be felt, examination by the speculum becomes requisite.

163. v. The *treatment* of polypi is thus described by Dr. WEST: "The smallest may be removed by laying hold of them with a pair of long forceps and twisting them off, while those which are somewhat larger, after being twisted to check the risk of bleeding, may be cut off by a pair of scissors. The bi-valve speculum should always be employed in doing this, and both forceps and scissors are made for the purpose, so constructed as to be readily worked within the speculum." For the sessile growths or tumours, noticed above (§ 159), he applies the acid nitrate of mercury, which destroys them, and arrests the bleeding. As respects the removal of larger polypi and the several means of accomplishing it, I must refer the reader to the work just quoted, or to the surgical works where this operation is fully described.

164. VIII. FIBROUS POLYPI OR TUMOURS WITHIN THE UTERUS are among the most serious organic diseases of the uterus, and the least amenable to treatment. They are uncertain in their rates of progress, being in some cases rapid and in others slow, and in rarer instances almost altogether cured by the efforts of nature, which either throws off the morbid structure from the organ in which it is seated, or stops its growth. These tumours vary much in structure and in their seat. When they arise from the internal surface of the uterus, or underneath the internal membrane, they are

generally considered as a form of polypus, and described as such—as *fibrous polypus* of the uterus. Dr. WEST considers them to be fibrous tumours, growing from the inner surface of the womb, or less frequently from either lip of the os uteri.

165. *A. Fibrous polypus of the uterus* is nearly identical with other fibrous tumours of the organ, and differs chiefly either in being developed immediately underneath the internal membrane, or in having more or less of the fibrous structure of the womb interwoven with or covering it. Fibrous polypus of the uterus is pediculated, and, growing from the interior of the womb, is more vascular than other tumours of the organ. The pedicle is composed of uterine fibres mingled with more or less dense cellular tissue. A layer of uterine substance is continued a short distance from the pedicle along the tumour, in some cases, or invests it in part or altogether in others. In addition, the polypus is always covered by the internal membrane of the uterus, which becomes firmer and denser than natural, both it and the fibres of the womb being developed with the growth of the tumour. These tumours are generally single, but they are sometimes double, very rarely more numerous. They are of very different sizes, and occasionally remarkably large. They may, in some instances, be enucleated from their coverings; in others their substance is intimately connected with their envelopes. The vascular supply of these tumours through their pedicles is generally small in proportion to their size and to the quantity of blood in their substance. This comparatively small supply of blood, the profuse hæmorrhages they occasion, and the arrest of the hæmorrhage by ligatures around their pedicles, have rendered it very difficult to determine the actual source of hæmorrhage. Dr. WEST seems to believe that it is rather from the irritated mucous membrane of the uterus than from the surface of the tumour itself that the bleeding flows; and a variety of considerations confirm this opinion.

166. These polypi being generally formed within the uterus, influence the organ in some respects, according to the situation whence they spring. If they arise low down, or in the cervical canal, the tumour soon grows beyond these limits, and, passing down into the vagina, may acquire a considerable size without disturbing the uterine functions. If they arise from some part high up, or near the fundus of the uterus, they often remain until they have acquired a great size, occasioning enlargement of the organ and thickening of its walls, as in pregnancy. But in many cases, before or soon after the tumour has reached the size of an orange, the os uteri gradually dilates, allows its passage through it, and embraces its pedicle. In some cases this result takes place without much suffering; but in others violent uterine action is excited by the tumour, which recurs at intervals, and resembles the pains of labour. The tumour, or polypus, is thereby extruded from the uterus into the vagina; and the irregular contractions of the uterus, especially when the polypus is firmly attached near the fundus, may drag down or invert the organs, as stated above (§ 151). Generally the polypus is detected soon after it has passed into the vagina; but if not detected, and when allowed to remain in this situation, it acquires a large size. I believe, however, that the largest tumours of this kind reach their full size within the uterus. In

a case which came before me, and in which Dr. LEE was consulted, two tumours were thrown off of the size of between two and three pounds each, immediately after passing the os uteri.

167. Fibrous polypi may present œdema of their substance, extravasation of blood into their structure; and having passed into the vagina, they may undergo ulceration, especially if air come in contact with them, or even sloughing. When they are detached spontaneously, or by means which produce firm contractions of the uterus, as in two cases where this was effected by the treatment which I adopted, their pedicles give way, and the whole mass (fibrous structure and envelopes) is thrown off.

168. *B. The symptoms* of fibrous polypi are nearly the same as mentioned above (§ 162)—leucorrhœa, hæmorrhage, and bearing down, [to which may be added enlargement of the uterus, and sympathetic irritations in bladder, rectum, and distant organs.] The hæmorrhage is at first experienced chiefly at the menstrual periods, which are prolonged, or return at shorter intervals, or are more abundant, approaching to flooding, leucorrhœa being present in the intervals. Bearing down is almost constant in some cases, or recurrent in others, with expulsive pains or efforts, when the tumour has far advanced. When these symptoms are present, a vaginal examination should not be delayed. If the polypus have not passed the os uteri, the *diagnosis* becomes very difficult. In these circumstances the uterine sound, as advised by Professor SIMPSON, or dilatation of the os uteri by the sponge tent, as recommended by the same eminent authority, becomes necessary.

169. *C. The treatment* of fibrous polypi has always hitherto been considered as entirely instrumental or surgical. In two cases which I treated, the means employed were strictly medical, and proved in both, within a few hours, successful, the tumours having been extruded through the os uteri by the action of the uterus, and entirely thrown off. In one of these cases the hæmorrhage was excessive. I prescribed immediately the bi-borate of soda in solution, and directed the dose, about six grains, to be repeated every hour or two. A tumour, about the size of a child's head, was soon after thrown off, six or seven doses of the borax having been taken, when vomiting was occasioned; but the hæmorrhage had very much abated a short time before the tumour came away. A day or two afterward hæmorrhage returned, a vaginal examination was made, the os uteri was found somewhat dilated, and another tumour was felt pressing upon the opening. I then requested Dr. LEE to see the patient with me, when the same medicine was given as before, and the second tumour was expelled in a few hours by the contractions of the uterus. The only other case of fibrous polypus of the womb which I have had an opportunity of treating was one of a single tumour of large size; much hæmorrhage had taken place, and I prescribed the infusion of *secale cornutum*, with as much of the bi-borate of soda as it would dissolve, to be given every hour or two, until eight ounces were taken. Soon after the whole was given the tumour was expelled.*

* *Galvanism* may often be employed with success to stimulate the uterus to expel the polypus, or moderate the attendant hæmorrhage, as suggested by Dr. RADFORD. Experiments made upon the gravid uteri of some of the

170. The operations advised for removing fibrous polypi are by ligature and by incision. Dr. R. LEE records 27 cases of the removal of fibrous polypi of the uterus; nine terminated fatally (WEST). Excision of the polypus has been dreaded in these cases, the risk of dangerous hæmorrhage from the operation having been considered great. VELPEAU, LISFRANC, DUPUYTREN, WEST, [SIMPSON,] and ARNOTT, however, greatly prefer excision to the ligature. VELPEAU found the hæmorrhage troublesome only in two of twenty cases on which he thus operated. "LISFRANC states that he met with but two out of 165 cases, and DUPUYTREN also but two out of nearly 200; while they all refer to instances of phlebitis, or of peritoneal inflammation leading to a fatal issue after the operation by ligature." Torsion and strangulation of the pedicle by compression have likewise been advised for removing fibrous polypi; but they are liable to the same objections as have been urged against the use of the ligature. It is unnecessary to refer farther to the mode of operating by excision, inasmuch as whoever is capable of undertaking the operation requires no directions respecting it, or, if he should, he will find them in Dr. WEST's work now quoted, or in any systematic work on surgery.

[If phlebitis and puerperal fever are liable to result from the use of the ligature in these cases, from consequent sloughing and suppuration, the same results are likely to happen from an empty or exsanguine state of the blood-vessels. We have not the necessary data for an exact calculation of the comparative dangers of each, but such as we have lead us to coincide in opinion with Professor SIMPSON, and prefer excision. It has been suggested that some modification of the *electric cautery* might be substituted for the knife, and thus avoid the risk of consecutive hæmorrhage; but whether it be practicable or not, we have no means of judging.]

171. I may here mention that fibrous polypi may coexist with *pregnancy*, and that, although remarkably small previously to impregnation, they may participate in the development of the uterus during this period. They do not, however, generally produce marked symptoms during pregnancy, nor interfere with its natural course. After the commencement of labour their injurious influence becomes manifest, either presenting a mechanical obstacle to the passage of the child, or giving rise to very serious consequences subsequently, by occasioning dangerous hæmorrhage, or other difficulties. They may also at this time lead to very serious mistakes as respects their diagnosis. The question as to their *treatment* at this time is of no small importance; for excision, however great the hæmorrhage, may be followed by phlebitis, or metritis, or pelvic peritonitis. Therefore, if the hæmorrhage cannot be controlled by opiates and astringents, the ergot or borax may be exhibited, at first singly, and, if they fail, afterward in combination.

172. IX. TUMOURS IN THE WALLS AND EXTERNAL SURFACE OF THE UTERUS.—i. *Description*.—a. These morbid growths are more or less intimately connected with the parietes of the womb, and are in many instances identified with the structure of

the organ. Several tumours are more frequently formed in the same case than one merely; but when thus multiple, "one or two generally outstrip the others in the rapidity of their development, the rate of which, as well as the nature of the symptoms, is greatly influenced by the situation that they occupy." However situated, or however large, uterine tumours are commonly firm, spherical in form, with nodulated surfaces, and their structure is sometimes interrupted by cavities containing fluid, and varies in density, elasticity, and succulency. They are thus well described by Dr. WEST: "On a section being made of any of these tumours, they present great similarity to each other, being composed of a dense grayish structure, intersected by numerous dead white bands and lines, which are almost invariably arranged according to a definite type or plan. In some instances these fibres have a concentric arrangement, while in others they have a wavy distribution, or are disposed around several different centres. Tumours of the first kind are usually remarkable for their hardness, and their small degree of vascularity; they are also contained within a remarkably distinct fibro-cellular investment, are imbedded in the uterine substance, and seldom attain a size exceeding that of a shelled walnut. The other varieties are more vascular, less firm, have a less complete capsule, may occupy all parts of the exterior or interior of the womb, and may grow to a very large size, so as to weigh twenty, forty, or even seventy pounds. Moreover, it happens sometimes that, in the course of their development, two or more tumours coalesce, at least apparently, so as to form a large growth, though on a section it will be seen that the different growths remain distinct from each other, separated by fibro-cellular septa, the remains of the more complete investment by which, when smaller, each was surrounded." (WEST's *Lectures*, &c., p. 267.) When these tumours are seated near to the internal surface of the uterus, or under the internal membrane, the fibres of the womb either passing over the surface of the tumour in some parts, or actually passing into it, they form the fibrous polypi, or internal tumours of the uterus already described (§ 164, *et seq.*). The vascularity of these tumours varies in different cases, and, like the tissues with which they are connected, they are resolved into gelatin by boiling.*

* The microscopic characters of fibrous tumours are somewhat various. In all we find a large portion of the mass consisting of tissue resembling the tendinous or fibrous, being composed of exceedingly slender, uniform, pellucid filaments, undulating or crooked, more or less perfectly developed, and variously arranged; and this occurs in all parts of the tumour, both in the more homogenous basis-substance, as well as in the intersecting bands, the microscopic difference consisting only in the less or more regular arrangement of the fibrous structure or appearance of the tissue. But in different specimens, or even in different parts of the same, the tissue appears more or less perfectly formed; so that, while in some distinct filaments or undulating fasciculi may be dissected out, in others there is rather a fibrous appearance than a fibrous structure. Nuclei or cytodisks are also commonly strewn through the substance of the tumour, the less abundantly in proportion to the fibrous character of the tissue. There are also other elementary tissues mingled in fibrous tumours, as smooth or organic muscular fibres, and these are sometimes so abundant as to justify the name of muscular tumours, as described by VOGEL; and the mingling of the muscular fibres in imitation of the uterus is usual, if not constant. In some specimens elastic fibres may be found intermingled with the more abundant fibrous tissue, thus imitating the structure of fascia. As a general rule, the characters of fibrous tumours are modified towards an imitation of tissues in or

lower animals prove very conclusively the power of this agent in producing uterine contraction. These experiments also prove that the influence is greater when one pole is applied to the upper part of the spine, and the other to the uterus, than when both poles are applied to the uterus itself.]

173. These growths may be developed in any part of the walls of the uterus. Sometimes they are formed "immediately beneath the peritoneum covering the uterus, or the first half inch or inch of the ovarian ligament or Fallopian tubes," and are limited to the fundus, or upper part of the body of the uterus, more frequently on its posterior than on its anterior surface. They there generally remain of a small size, and hardly exceed that of a pea or bean; seldom projecting farther than one half of their bulk. In other cases they either grow outward or inward, from the thickness of the uterine parietes, being apparently only attached to them by a thick pedicle, into which some uterine fibres enter. The tumours which grow outward from the uterine walls sometimes attain the size of a large orange, or even a greater bulk; they, unlike the tumours which grow into the cavity of the womb, receive no investment of fibres from the substance of the organ, and are often present in considerable number. Dr. WEST mentions as many as twelve projecting from the external surface, the interior of the organ being free from disease. Wherever may be their origins, these growths tend as they increase in size, with few exceptions, to become pediculated; these exceptions being the firm, slightly vascular tumour, with concentric arrangement of fibres, which remains imbedded in the uterine walls, without projecting either externally or internally. In rare cases, also, the more vascular, elastic, and succulent fibrous tumour is developed in the uterine walls, attaining the size of the foetal head, producing very great enlargement of the organ, and retaining a spherical form. It may be imbedded in the substance of the womb, without projecting more in one direction than in another.

[There is good reason to believe, from the investigations of Dr. BRISTOWE (*Report of the London Path. Soc.* for 1853), that all so-called fibrous tumours of the uterus, at least in their earlier stages, before degeneration has taken place in them, are essentially muscular tumours—not simply fibrous tumours with a greater or less quantity of muscular fibre mixed up with them, but developments of true and undoubted muscular tissue. Their most usual position, according to Dr. R. LEE's analysis of 74 cases, is the sub-mucous, viz., those projecting into the cavity of the womb; and the pedicles of these are generally situated just below the openings of the Fallopian tubes. The next position in which they are most abundant is the posterior wall and fundus of the uterus; they are rarely situated in the anterior wall, and still more rarely in the cervix uteri.]

If we examine fibroid tumours of the uterus under the microscope, we discover elongated nuclei imbedded in an amorphous stroma, while the fibrous appearance is scarcely perceptible; in fact, from the analogy they present to the genuine uterine tissue, in the unimpregnated state, they would seem to be homologous rather than heterologous productions. We have already stated that Dr. BRISTOWE regards them as *true muscular tissue*. They are generally but scantily supplied with blood-vessels, and the hæmorrhage to which they give rise is not owing to a laceration of their vessels, but to the irritation and congestion they induce in the superincumbent mu-

near which they are placed, and their chemical qualities are also probably similar.]

ous membrane, which, from the same cause, may ulcerate and slough. In pregnancy, they cause hæmorrhage by preventing the normal development of the organ; hence they are apt to cause miscarriages. As a general rule, however, they produce sterility. Fibrous tumours have not been observed before puberty. Dr. R. LEE states that they are most frequent in virgins, and that they exist in 20 out of 100 middle-aged women.]

174. The influence exerted by these tumours on the womb depends more upon their situation than upon their bulk. When they are seated externally to the womb, and grow into the peritoneal cavity, they often acquire an enormous size, and the womb is much elongated, and even drawn upward into the pelvis, but seldom increased in bulk. If, however, a small tumour be developed in the walls, or within the organ, more or less increase of size will be observed. These tumours reach the greatest size when they are single and attached to the external surface of the uterus. WALTER has described one which weighed seventy-four pounds.

175. *b. The ultimate changes* which uterine tumours undergo are interesting, and often tend, under the influence of vital resistance, to a more or less salutary issue. 1st. When the tumour is externally attached to the uterus, its pedicle may become ultimately so attenuated as to be detached nearly or altogether from the womb, especially if it had formed previously adhesions to the adjoining peritoneum; such cases are, however, very rare. 2d. When the tumour is developed internally, or passes into the cavity of the organ, it undergoes the changes and their results already described (§ 166, *et seq.*). 3d. The tumour is sometimes softened, the more liquid parts are absorbed, and either a calcareous substance is deposited, or remains after the other elements are removed; that the former or actual deposit of calcareous matter takes place is evinced by the quantity of the calcareous matter or deposit. This change takes place both in small and in large tumours, and most frequently in those attached to the outer surface of the uterus; but it may also, but rarely, occur in those which are developed internally. Fibrous tumours of the womb were formerly believed to sometimes degenerate into cancer. This change is now considered never to occur. That a tumour, developed in the walls, or attached to either surface of the uterus, may coexist with cancer of the cervix, is possible, and the coincidence has been observed in rare cases.

[Fibrous tumours not unfrequently contain *cysts*, especially those whose texture is not dense; and this may be owing to softening and liquefaction of part of the tumour, with effusion of fluid in the affected part, or to an accumulation of fluid in the interspaces of the intersecting bands. In other cases, where the cysts are of smaller size, and have smooth and polished internal surfaces, it is more probable that their production depends, as PAGER states, on a process of cyst-formation, as in the breast and other organs. Some fibrous tumours are thickly beset with numerous well-defined and lined cysts; in others there is only one large cyst, or one vastly predominating in size over all the others, when it may and has been mistaken for ovarian cyst, and the contents discharged by tapping (*Lond. Med. Gaz.*, vol. 37, p. 1022). Sometimes fibrous tumours undergo a *calcareous degeneration*, consisting in an amorphous and disorderly deposit of salts of lime and other bases,

in combination with, or in the place of the fibrous tissue, denoting a loss of formative power in the tumour. Fibrous tumours also undergo sometimes a softening process, with increased vascularity and congestion, and become œdematous; and then, as their tissue loosens, become very soft, or even diffuent, or else break up, and appear shreddy and flocculent. In this state the outer and less softened part of the tumour may burst, or they may separate or slough. BAYLE states that fibrous tumours exist in 20 per cent. of women who die after 35 years of age.]

176. c. The frequency of tumours of the uterus has been very differently stated by writers; but they seem to be, with the probable exception of cancer, the most common of organic diseases of this organ. Mr POLLOCK states that of 583 cases in which the uterus was examined at St. George's Hospital, 265 were diseased, and in 39 of them fibrous tumours existed, and in 38 cancer was found. The statistics of the malady are very unsatisfactory. In 70 cases, in which Dr. WEST examined the uterus of women who died after puberty of other than uterine diseases, 7 presented fibrous tumours of the organ. From these and other observations made by MALGAIGNE, BRAUN, CHIARI, and others, tumours of the uterus are observed chiefly between the ages of twenty-four and sixty; and most frequently from thirty to fifty.

177. ii. The Symptoms.—Tumours of the uterus are very often not manifested until they reach a large size; and they exist even many years without producing any inconvenience, or being suspected until they are detected after death. The growths from the exterior surface of the womb frequently occasion no symptoms but those produced by them when they reach a great bulk, or when they disorder the sensibility or functions of adjoining parts. But those which are imbedded in the walls of the organ, disturb either the functions or the sympathetic relations of the womb, although their size may be small. It has been already shown that the growths or polypi which occupy the cavity of the uterus, occasion abundant hæmorrhage and other phenomena. (§ 162, 168.) When these tumours are formed after the cessation of the catamenia, the severity of the symptoms they occasion is much less than at an earlier epoch; and when they are developed in single women, the symptoms generally become much more severe after marriage, and they often either occasion sterility, or, if impregnation takes place, abortion. If pregnancy take place in these cases, the puerperal states, as well as abortions, are attended by much greater danger than in the healthy state of the uterus. The symptoms of uterine tumours are most commonly slight at their commencement, and slowly increase in severity. They sometimes, however, are sudden, more especially the uterine hæmorrhages, which recur after intervals, and are more and more severe; but, unless when caused by internal growths, are not followed by leucorrhœa or any offensive discharge. Dysuria, or retention of urine, sometimes suddenly occurs. As the tumour enlarges, pain in the region of the uterus, bearing down, and sense of discomfort in the pelvis, are felt, with frequent calls to pass urine. The character of the pain is somewhat peculiar; it is rather a dull, aching, or gnawing, but constant pain, seldom preventing sexual intercourse; yet sometimes attended by throbbings, or a sense of heat or burn-

ing, or with intense neuralgic pains such as have been already described (§ 7, *et seq.*). When these symptoms are present, the abdomen, especially towards the pelvis, should be carefully examined; and if any tumour be detected, the diagnosis between a uterine and an ovarian tumour should be made.

178. iii. This diagnosis is extremely difficult, and cannot be attempted without a careful examination, first of the abdomen, and next per vaginam, and in both situations. Tumour of the uterus, when so large as to be felt on examining the abdomen, is always firm, frequently nodulated or uneven, seldom mesial, and generally inclining to either side. On examining per vaginam, the tumour, if uterine, rarely draws the uterus upward, unless it be attached near the fundus. It is most frequently seated in the posterior parietes, and is, more especially in these cases, accessible to examination. It is then found to be firm, sometimes uneven, carrying the cervix towards the symphysis pubis, and often more or less retroverting the organ, and often displacing it somewhat from the mesial line. The os uteri is generally small, circular, and healthy; or somewhat hard, or enlarged, or turgid. If the tumour be intra-uterine, or be imbedded in the walls, the uterus will be found larger, heavier, and less moveable than natural, and if it be seated low in the womb, the cervix uteri will not be unlike the form assumed in pregnancy, not unfrequently disappearing, and its lips being thinned. Dr. WEST remarks that an enlarged, heavy, and somewhat hard uterus, coupled with causeless recurrence and frequent return of uterine hæmorrhage, while the os and cervix uteri are healthy, and I might add absence of pain, or but slight pain during coition, are almost always pathognomonic of fibrous deposit in the uterine substance.

179. Tumour of the uterus must be large to be mistaken for tumour of the ovary. The former is always slowly developed, and rarely rises out of the pelvic cavity; the latter much more rapidly increases in bulk, and when large rises out of the pelvis. The one is hard, and non-fluctuating; the other is softer, and obscurely, if not more manifestly, fluctuating. The ovarian tumour generally attains a much greater bulk than the uterine, is at first more inclined to either side, and is seldom attended by hæmorrhage during its growth; or by retention of urine when largely developed. The cervix uteri is sometimes drawn upward, but is seldom altered; while large uterine tumours are uneven, nodulated, solid, are attended by alteration of the lower segment of the uterus, and by the absence of, or difficulty of finding, the cervix and os uteri, and not unfrequently by retention of urine.

180. The hæmorrhage attending tumours of the uterus may be mistaken for abortion. The patient not unfrequently encourages the opinion of pregnancy from a desire of being in this state, and care should be had not to be thus misled; but to question the patient as to the history of the case, and to examine locally with care and with reference to contingent diseases of the uterus and of its appendages. The frequent recurrence of hæmorrhage, the absence or character of pain, and the state of the cervix and os uteri, will generally guide the diagnosis in these cases.

181. Fibrous tumour of the posterior uterine wall may be mistaken for retroverted uterus, with which, however, it is often associated. It is, nev-

ertheless, of importance to ascertain the nature of the lesion, although but little may be done as regards its treatment. In these cases, a recourse to the uterine sound, when it can be introduced, may aid the diagnosis; but in most cases a diagnosis is most difficult, and sometimes impossible. It is also very difficult to distinguish between cancer of the body of the womb and fibrous tumour of the organ, but this will be noticed hereafter (§ 199, *et seq.*)

182 The occurrence of hæmorrhages, the non-development of the lips of the uterus, and the history of the case, will prevent uterine tumours from being mistaken for pregnancy; for which the expansion of the lower segment of the uterus, and sometimes a sound resembling the uterine souffle, attending the former, may render the diagnosis between it and pregnancy difficult, more especially as the latter may take place during the existence of an uterine tumour. In these, and many other cases of tumour of the uterus, difficulties of diagnosis which need not be more particularly noticed will occur, and which the acumen of the physician will readily overcome.

[We have found the *uterine sound* of Dr. SIMPSON of very great value in forming a diagnosis in cases of fibrous tumours of the uterus. By it we readily learn if the cavity of the uterus be elongated; and if this be so, and the uterus be found enlarged, heavy, and somewhat hard, connected with the causeless occurrence and frequent return of uterine hæmorrhage, while the os and cervix are healthy, we may very safely conclude that there is a fibrous deposit in the uterine substance. *Reasoning by exclusion* is here of the highest importance, where the question is between uterine and ovarian enlargements—between fibrous tumours and pregnancy, or fibrous tumours complicated with pregnancy; and the use of the sound is often indispensable in order to furnish us the necessary data. Much may be learned from the previous history of the case, and from the equal or unequal density of the tumour. In one case of Prof. SIMPSON's, which we were requested to examine for the purpose of forming a diagnosis, and which had baffled several physicians, the employment of the uterine sound led at once to the detection of an immense fibrous tumour in the walls of the uterus, which had elongated its cavity to an extent of 8 or 10 inches.]

183. iv. The *prognosis* of uterine tumours is not very unfavourable to the duration of life, at least for several, if not for many years, unless they are very large, or are productive of very serious symptoms, or are associated with pregnancy. In this latter state the abortion they generally occasion, or parturition at a natural period, is often attended by more or less danger. When the tumour is intra-uterine, constituting the fibrous polypus above described (§ 164, *et seq.*), a cure is then generally accomplished. But the other states of the malady do not admit of cure, and not always of palliation, although this latter should always be attempted, inasmuch as it is often to be attained, and nature, in rare cases, seems to effect a cure in such circumstances, especially when the disease occurs at an advanced period of life—the cessation of the menses tending to favour this result. The prognosis may also be somewhat more favourable when these lesions occur in an unmarried female, or in a widow, than when they affect a married female during the epoch of sexual activity.

184. v. *Treatment*.—Although the treatment of tumours of the uterus is chiefly palliative, yet more active means should not be neglected, with the view of promoting the gradual absorption of the morbid deposit. The patient should avoid sexual excitement; if married, she ought to sleep apart from her husband, and be as physically and mentally tranquil as circumstances may permit her to be. Walking much, or standing long, more especially riding on horseback, or even in a carriage, should be altogether avoided; and the recumbent posture adopted as long as possible, and without any intermissions during the existence of uterine hæmorrhage. The bowels ought to be kept gently open by cooling laxatives, and more particularly by such as neither irritate the larger bowels, nor sympathetically excite the uterus. With this intention the carbonates, the tartrates, or the acetates, or the phosphates of the fixed alkalies may be prescribed, either alone or with the infusion of senna or rhubarb, or with the extract of taraxacum. Hæmorrhages are among the more urgent symptoms for which palliation is requisite. These generally at first occur as an excessive menstruation, and recur with each period; and ultimately they often appear intercurrently, or between each period. The means which I have advised above (§ 169) for arresting the hæmorrhage and expelling the tumour when seated within the womb, might prove of doubtful benefit, or even injurious, if prescribed when the tumour is not thus situated, or when seated as described in this chapter. Therefore the recumbent posture, undeviatingly observed, and astringents and refrigerants taken from the commencement of the hæmorrhage, are indispensable.

185. Where there is either pain or tenderness in the lower part of the abdomen on the accession of this discharge, a few leeches may be applied on this part; or a small cupping over the sacrum be ordered; or dry-cupping on this situation may be substituted for it, when the abstraction of blood appears injudicious; but in these cases the modern fashion of applying leeches to the uterus itself should not be followed. The turpentine embrocation may be afterward applied over the hypogastrium. Sedatives and refrigerants should be given with astringents; and if the pain be urgent, narcotics and the other means advised for neuralgia of the uterus (§ 14–17) may be added. The nitrate of potass may be thus prescribed with the liquor ammoniæ acetatis, with the acid in excess, and with the spirit of nitric ether and tincture of henbane; or the hydrochlorate of ammonia with hydrochloric acid, and hydrochloric ether, may be taken in the infusion of cinchona, or simple infusion of roses, in different circumstances of the disease. If the hæmorrhage be excessive, the more energetic anti-hæmorrhagic remedies, as the infusion or tincture of matico, gallic acid, tannin, the spirits of turpentine, the extract of logwood, &c., may be had recourse to. When the patient is anæmic, or when there is a more continued draining of blood, the muriated tincture of iron, with an additional quantity of the acid, will be given with benefit, with the compound tincture of camphor, or with the infusions of calumba or quassia.

186. I have had reason to believe that a judicious recourse to the iodides has not unfrequently been productive of some benefit. The iodide of potassium should generally be preferred, and be conjoined with the solution of potass, or with

Brandish's alkaline solution, or with either of the carbonates; but it ought always to be prescribed in small doses, and be long persisted in. In other, or in anæmic cases, the iodide of iron may be given in sirup of sarza. The bromides of magnesium and of potassium have been considered as being equal, if not superior, to the iodides, but chiefly from the circumstance of their presence in certain mineral springs, as those of Kreuznach, which have been much employed, both internally and as baths and hip-baths daily, in cases of uterine enlargements and tumours, and with apparent benefit in many cases. These waters may be had in this country. M. VELPEAU suggested an operation consisting of the enucleation of fibrous tumours of the uterine parietes by an incision through the os uteri or the lower segment of the womb. M. AMUSSAT performed this operation in 1840, and it has been subsequently resorted to by others—by BÉRARD, BOYER, SIMPSON, and others; and with success by my friend Dr. PANCOAST of Philadelphia, by Mr. TEALE of Leeds, M. AMUSSAT, in two cases, and by M. MAISONNEUVE; but as the number of unsuccessful cases is much greater than that of the successful, and as their details are by no means encouraging, the hæmorrhage and other consequences being alarming, this operation should not be recommended.

187. X. TUBERCULAR DEGENERATION of the internal surface of the uterus is sometimes met with, in the form of a dirty yellow matter, closely resembling the substance of a tubercular bronchial gland at an early stage of softening. This matter is about an eighth of an inch in thickness, extends over the whole internal surface, but rarely into the cavity of the cervix, and more frequently into the Fallopian tubes, which it more or less distends, and is sometimes associated with tubercular degeneration of the ovaries. I observed this association in a young lady who died of consumption at nineteen years of age, and who had never menstruated. ROKITSKY thinks that it never occurs primarily in the cervical canal. Upon scraping off this deposit from the internal uterine surface, it is found that the whole of the internal membrane is removed and replaced by it, and that it is closely applied to the proper structure of the organ, which, with its cavity, is more or less enlarged. At an earlier stage the internal membrane is seen to be opaque, more vascular than natural, and to present small yellow spots, which are found to be distinct tubercular deposits when examined by the microscope. This subject has been investigated by LOUIS, KIWSCH, and GEIL, the last of whom has furnished Dr. WEST with a table, according to which it appears that in 68 cases this lesion has been observed at all ages, from 10 years to 80; but most frequently from 20 to 50 years of age; and, according to the appearances in 45 cases, the uterus alone was affected only in 1 case; the uterus and tubes in 12; the uterus, tubes, and peritoneum in 19 cases; and the tubes alone in 8 cases.*

188. The symptoms of uterine tuberculosis are amenorrhœa, or dysmenorrhœa, often associated with leucorrhœa—very common phenomena of tubercular phthisis, of which this uterine lesion is

generally secondary, or, if not secondary in very young subjects, at least coexistent with tubercular deposits in the lungs and other organs or parts.

189. XI. FATTY FORMATIONS have been deposited in the cavity of the uterus in very rare instances, and have been thrown off by the contractions of the organ when they had reached a large size. Dr. WEST refers to two instances, recorded by Drs. BUSCH and SEEGER, where this product was expelled from females of the ages of fifty and fifty-three. In one the tumour was the size of the fist, and was composed of fatty matter closely resembling cholesteroline. In the other case the tumour was the size of a child's head, was connected by a broad pedicle with the whole margin of the os uteri. It was removed by ligature; and the patient, who had suffered from menorrhagia for a year previously, recovered. The tumour weighed three pounds and a half, was said to have been an ordinary fatty tumour, having an investment of dense cellular tissue, septa of which dipped into its substance.

190. XII. CANCER OF THE WOMB.—Of CANCER and of SCIRRHUS and other TUMOURS, as well as FUNGO-HÆMATOID, and of other malignant diseases, full notice has been taken under their respective heads. I shall now only briefly notice the malignant lesions which are found in the uterus, and the treatment which has been advised for them. Before the chronic inflammatory states of the cervix uteri were investigated and their consequences shown, more especially by the writings of Dr. HENRY BENNET, several of these consequences were viewed as incipient cancer of this part of the organ; and the mistake was the more readily made as cancer uteri in most cases commences in this part, and often resembles the changes, more especially hypertrophy, hardening, pain, &c., which result from protracted inflammatory irritation. The profession is much indebted to the writings of Dr. H. BENNET, and more recently of Dr. WEST, for the researches they contain into the diagnosis of malignant diseases of the womb by the former, and into the pathology and treatment of them by the latter physician; and I would advise the reader not to be content with the brief view I shall now take of these maladies, but to peruse the more copious details, furnished by these able writers, not only of these but also of other diseases of the uterus.

191. I have defined CANCER, when treating of this malady generally; but much confusion has existed in consequence of the want of precision in the use of this term; for some pathologists have employed it as representing the *genus* of malignant alterations of structure, commencing or manifesting themselves locally; while others have limited it to the carcinomatous state or variety of the genus. The generic definition of cancer given by MÜLLER is as follows: "Those growths may be termed cancerous which destroy the natural structure of all tissues, which are constitutional from the very commencement, or become so in the natural process of their development, and which, when once they have infected the constitution, if extirpated, invariably return, and conduct the person who is affected by them to inevitable destruction." To this definition no objection can be offered, inasmuch as it comprises all the varieties of morbid structure usually denominated malignant or cancerous. Much confusion, however, has arisen from the different terms by which these have severally been denominated, the

[* That this is a rare affection appears from the fact that, among 200 phthisical females, LOUIS only met with three who furnished examples of tuberculous disease of the uterus. When the affection has been accompanied by a discharge, the vagina often presents spots of ulceration, exhibiting a relation analogous to that of the trachea in pulmonary phthisis.]

desire of originating a name, rather than of conveying a precise idea of the thing named, and of adopting foreign terms, being among the *ludibria* to which modern medical writers expose themselves. Cancerous diseases of the uterus, notwithstanding the microscopic researches of those anatomists who have dignified themselves by the name of Histologists, have not as yet been distinguished by any determinate character, by which they can be undoubtedly known under the microscope, as far as the describers of these characters or appearances have furnished us with the means; and this failure of microscopic diagnosis is most remarkably manifest in respect of those lesions of structure which have been viewed as cancerous by some, and which have been as stoutly denied to be such by others, and which are considered by the latter as separate and specific forms of disease, especially epithelial cancer, melanosis, lupus, &c.*

192. i. Forms.—Although no form of cancer is peculiar to the uterus, yet they do not all occur with any thing approaching to the same frequency. On this subject Dr. WEST remarks: "Fungoid or medullary carcinoma is by far the most common; next in frequency may be classed the epithelial varieties of the disease, if indeed it be not more correct, as some men of high authority

believe, to refer them to a separate category distinct from genuine cancer. Next to them, but divided by an interval which widens in exact proportion as fresh evidence is brought to bear on the subject, may be classed scirrhus or hard cancer; while almost as rare, or perhaps even more uncommon, stands the colloid or alveolar variety of the disease." (*Op. cit.*, p. 336.) ROKITANSKY says also that fibrous or scirrhous cancer of the uterus is of extreme rarity, while medullary carcinoma occurs with the greatest frequency. This opinion accords with those of Mr. PAGET and Dr. WEST. But Professor KIWISCH states that scirrhus or hard cancer occurs in about three in every ten cases of cancer of the womb; and he remarks, that with the softening of fibrous or scirrhous cancer the characters of this growth gradually disappear, and, becoming more vascular, the mass is more easily broken down, and contains a brainlike substance, the ulcer which forms presenting the same character as those which are observed in medullary cancer. Dr. WEST states, that of 120 cases of uterine cancer, the disease appeared, from an examination during life, to be medullary in 108, epithelial in ten, and colloid in two; and of 120 cases, the disease occupied the *body of the uterus* only in two.

193. A. It is fully shown that the cervix, or the part of the womb which projects into the vagina, is that in which cancerous disease commences, and that the exceptions to this are very few. The mode of its commencement, however, varies in the different forms. The *medullary* form begins with a morbid deposit in the substance of the cervix, enlarging or thickening it more than elongating. The lips of the os are enlarged, hard, and tense, and, at the same time, irregular, nodulated, and wide or gaping. When the cervix is incised, the structure is occupied by a white, firm, and semi-transparent matter, which seems infiltrated in parts, and has displaced the structure in others. This deposit is more abundant near the internal or mucous surface than near the external. Softening of the diseased part soon takes place, death of the mucous covering follows, and an ulcer, with ragged and uneven surface, and with raised, irregular, hard edges, supervenes, and is covered by a dirty sanies. As the disease proceeds, the lips and cervix are altogether destroyed, and the eroded parts are covered by a soft, dirty white, and often offensive substance. The carcinomatous ulceration may commence either in the softening of the morbid deposit, extending externally or superficially, or in erosion of the surface, the consequent ulceration proceeding more deeply; but the formation of the open sore takes place sooner or later, and advances with very different degrees of celerity; foul granulations and fungous growths spring forth; a fetid pus, mixed with a fetid, greenish-brown, or sanguineous fluid, or bloody debris, or with more or less abundant hæmorrhages, marking the progress and destruction of the lower segment and upper portion of the vagina. In the more retarded cases, cancerous deposits take place in the substance, in the cavity, or on the external surface, and even in the close vicinity, of the organ; and ultimately the disease invades more or less the whole body of the uterus, often extending to the ligaments and ovaries, and sometimes forming malignant polypi within the cavity. Cancerous tumours also form on the uterine peritoneal surface.

* Under the article "*Scirrhus and other Tumours*" will be found the histological characters of true cancer, as laid down by BENNET, and to that article the reader is particularly referred. Before referring to the views of PAGET, it may be well to recall the following opinions of VOGEL, as contained in his "*Pathological Anatomy*" (Am. ed., p. 166): "Carcinomatous structures are distinguished from the preceding class, the slightly organized epigeneses" (tubercles and scrofulous deposits and tubercles), "by a higher degree of organization; they not only show a more highly developed cellular structure, but frequently also fibres, vessels, and granulations enter into their composition. They are not, however, strictly limited from the former class; for, although the tumour, as a whole, can be easily distinguished from one of the former class, it frequently contains particular portions which cannot be distinguished with certainty from tubercular deposition. *Neither is there any strict limit between these and certain forms of non-malignant tumour, namely, fibrous tumour; and cases frequently occur in which it cannot with certainty be determined whether a tumour belongs to the carcinomatous or fibrous group, i. e., whether it be malignant or non-malignant.* The malignancy depends here, as in the former class, on softening and a disintegration of the elements, commencing with the cellular structures, but gradually proceeding to the fibrous parts, and the elemental tissues of the affected organ. The anatomical and histological relations of carcinomatous tumour exhibit the greatest variety; indeed, even in the same tumour, different parts often present very different characters. Their characters farther vary with their stage of development. These tumours are sometimes soft, resembling cerebral substance; sometimes firm, like lard; and sometimes hard, like cartilage. Sometimes they are highly vascular, and of a reddish tint; sometimes pale; sometimes they are distinctly separated from the adjacent parts, while in other cases there is no line of demarcation between them and the surrounding tissues" (p. 266).

We are indebted to Mr. PAGET for a very full and accurate description of the various forms of the true cancer-cell ("*Surg. Pathol.*," Am. ed.), and he very truly observes that "the experienced microscopist will very rarely fail in the diagnosis of a cancer by its minute structures; but he only discriminates them as specific modifications of the nucleus, nucleated cell, endogenous cells, and other forms, of which the types are in natural parts" (excretory gland-cells and epidermal cells). He finds among them no new type-forms. Still, this pathologist admits (*Loc. cit.*, p. 654) that there are cancerous tumours which are not composed of the true cancer structures, and remarks that we should do right "to choose modes of life rather than structures for determining the affinities of morbid products, and for arranging them under generic names. As of all tumours, so especially of cancers, the true nature is to be apprehended only by studying them as living things."]

194. *B.* The *scirrhus* variety of cancer uteri is described by ROKITANSKY as very rarely affecting the uterus, the most common form being the medullary, either by itself or complicated with the former. Fibrous or scirrhus cancer always commences in the cervix, its primary occurrence in the body of the uterus being extremely rare. When closely examined, it appears to consist of dense, whitish, retiform fibres, differing from the healthy texture, and in their minute meshes a pale reddish yellow or grayish translucent substance is deposited. This morbid growth invades the uterine structure, and furnishes no marked boundaries. It is various in extent, and accumulating at certain points, gives rise to irregular, nodulated elevations and indurations, and enlargement of the cervix, or portio vaginalis uteri.

195. Cancerous degeneration of the uterus in either of these forms is generally confined for a considerable time to the vaginal portion; but the disorganization often extends with more or less activity not only to the body and fundus of the organ, but also downward involving the vagina, thus associating with it vaginal cancer. It may even extend in other directions, and thus invade the rectum, the bladder, the cellular and adipose tissues of the pelvis, and at last the ovaries and the peritoneum, cancerous growths either forming upon it, or perforating it chiefly in the state of medullary masses. The destructive process, when extending to the vagina, predominates on either the anterior or on the posterior wall; sometimes to both equally, and occasionally almost to the external orifice. In these cases it often involves the parietes of the bladder and rectum, producing in the most advanced states communications between their cavities, and the most distressing conditions, consisting of a large fungoid cavity, occupying the vagina, the uterine cavity, opening into the cavities of the bladder and rectum, and closed superiorly by the parts agglutinated around the fundus, by the medium of adhesions between the peritoneum covering the adjoining viscera. The formation of these adhesions increases the distressing symptoms of the last stage of the malady.

196. Cancer of the uterus is generally a primary malady, and continues for a long time, if not throughout, the only cancerous affection of the body. It is, however, sometimes developed concurrently with, or consecutively upon mammary or ovarian cancer; or it may be accompanied with or followed by degeneration of the structures just mentioned and of the lymphatic glands. It more rarely becomes associated with cancer of the stomach, or liver; more frequently with that of the mammae and peritoneum, and occasionally with a universal cancerous deposit, or with mollities ossium. Uterine cancer seldom terminates fatally without extending to the upper portion of the vagina. It is commonly allowed that cancer uteri is confined to the part it commences in for a considerable period, and for a longer time than cancer of any other organ. M. LEBERT states that secondary deposits in other parts occurred only in a third of forty-five cases of uterine cancer. Professor KIWISCH found the disease present in the bladder in 42 per cent. of his cases of uterine cancer. But in this, as well as in other diseases, statistics cannot be depended upon, and for reasons I have stated in other places.

197. *C.* *Epithelial cancer, or Cauliflower excrescence* of the os uteri, and which is doubted by some

to be cancerous, is of very rare occurrence.* It presents a cauliform appearance, or, according to ROKITANSKY, the appearance of a confervoid growth, consisting of lenticular, pale-red, transparent, and tolerably hard bodies, strung together like the beads of a rosary, projecting on the orifice of the uterus into the vagina, and bleeding on the slightest touch. The only case in which I have seen it came only once before me in consultation, and it then seemed to me as a fungoid form of cancer; and, from the local changes, the bleeding upon examination, and the cachectic and anæmic appearance of the patient, as undoubtedly a variety of carcinoma or cancer. The case observed by ROKITANSKY is stated by him to have grown from an evidently cancerous base of the medullary variety. Dr. J. CLARKE and Sir C. M. CLARKE, who first described this malady, have viewed it as less formidable, and have stated that it is sometimes curable. It is not improbable that the medullary form of cancer of the cervix may present fungoid or confervoid growths, of a cauliflower appearance; and that an intractable but non-cancerous ulcer of the os uteri may give rise to large fungoid granulations, bleeding on the slightest touch, and both lesions may be thus confounded, the former, however, not admitting of cure, the latter in rare cases. Both these lesions are attended by frequent, exhausting, and dangerous hæmorrhages. These morbid growths

[* According to PAGET, only a part of the cases to which the name of "*Cauliflower Excrescence*" has been ascribed have been *epithelial* cancers; of the rest, some were medullary cancers, and some, perhaps, simple, non-cancerous, warty, or papillary growths. VISCHOW, LEBERT, and PAGET, agree in opinion that there are three different kinds of papillary tumours at the os uteri—the *simple*, the *canceroid*, and the *cancerous* (that is, the *epithelial cancerous* and the *medullary cancerous*); the first two forms together constitute the cauliflower growth. This begins as a simple papillary tumour, and at a later period passes into canceroid (*epithelial cancer*). At first, one sees only on the surface papillary or villous growths, which consist of very thick layers of peripheral flat, and interior cylindrical, epithelial cells, and a very fine interior cylinder, formed of an extremely little connective tissue with large vessels. The outer layer contains cells of all sizes and stages of development, some of them forming great parent structures with endogenous corpuscles. The vessels are, for the most part, colossal, very thin-walled capillaries, which form either simple loops at the apices of the villi, between the epithelial layers, or towards the surface develop new loops in constantly increasing number, or, lastly, present a reticulate branching. At the beginning of the disease, the villi are simple and close-pressed, so that the surface appears only granulated; it becomes cauliflower-like by the branching of the papillæ, which at last grow out to fringes an inch long, and may present almost the appearance of an hydatid mole. After the process has existed for some time on the surface, the canceroid alveoli begin to form deep between the layers of the muscular and the connective tissues of the organ. In the early stages of the disease, the cavities may be simply filled with epithelial structures; there may be, however, alveoli, on whose walls new, papillary, branching growths may be seated—a kind of proliferous, arborescent formation. Such is the description of the cauliflower excrescence by VISCHOW, endorsed by LEBERT and PAGET; and, as the last writer remarks, illustrates the usual history of the most exuberant epithelial cancers, the "*simple, papillary tumour*" being an excessive papillary outgrowth of epithelial cancer; the later stage of the same, when it passes into canceroid, being the usual extension of such a cancer into deeper parts—a continuous growth of the same thing in a new direction, inasmuch as papillary structures, composed of epithelial cells with blood-vessels, and a little connective tissue, are the essential characters of the epithelial cancerous outgrowths. Dr. PAGET, indeed, remarks that he believes the same composition has never been seen in any papillary or warty growths that did not, if time were allowed, proceed to the formation of epithelial structures in the deeper parts, and thence through the usual progress of malignant disease.]

consist, microscopically, of "hypertrophied papillæ, composed of epithelial cells, richly supplied in their interior with large and delicate vessels, and covered by a thickened layer of epithelium. The enormous looped capillaries of the cauliflower excrescence explain the abundant hæmorrhages, and the profuse serous discharges which attend it; while the absence of that solid structure which is found in other forms of epithelial cancer accounts for the favourable results that have followed its extirpation."*

198. *D. Corroding ulcer* of the os and cervix uteri, first described by Dr. J. CLARKE, begins in the mucous membrane, and involves the whole circumference of the os, utterly destroying both it and the subjacent parts. It differs from cancer in the absence of thickening, hardness, or deposit of heterologous matter, and in its prolonged existence—sometimes for several years without being attended by any dangerous symptoms. It appears to be analogous to lupus, and is more strictly a rodent form of ulcer than a variety of cancer.

[The corroding ulcer of the uterus is a very rare, as well as dangerous form of uterine disease. According to ASHWELL, for one case of it, we meet with 90 or 100 of cancer of the organ. It generally attacks women of spare and lymphatic temperament, and rarely before the age of forty. It may go on from one to five years before it prove fatal; but its progress may be greatly retarded by the use of caustics. The fatal result is at length brought on by repeated hæmorrhage, or by the prostrating effects of the disease. The speculum will usually be necessary to form an accurate diagnosis between it and cancer. Its progress is slower than that of the latter disease, while the pain, discharge, and other inconveniences are generally less. Occasionally, the discharge is very offensive and acrid. The pain and weakness in the back and loins are usually constant and distressing, though sometimes no pain is experienced. The patient gradually emaciates, the discharge increases, with gastric derangement, diarrhœa, or constipation, and in some instances fatal peritonitis results. The disease, in the present state of our knowledge, must be regarded as the result of inflammation of a specific kind. The leading marks of distinction between it and cancer are briefly pointed out by our author. But besides the absence of carcinomatous or other deposit, when examined through the speculum, the surface of the ulcer will be seen to be red, rough, and granular, with a distinct line marking its extent. In cancer, the new deposits and carcinomatous growths tend to fill up the pelvic cavity; in this disease, corrosive action tends to enlarge the cavity. The prognosis in this affection is, in nearly all cases, unfavourable. The general principles of treatment are the same as in cancer uteri.]

[* It is the opinion of Professor SIMPSON that cauliflower excrescence, in the earlier part of its progress, is a morbid tissue, but not necessarily of a malignant or carcinomatous character. His chief reasons for this opinion are, its appearing sometimes before the twentieth year; its occasional shrinking and almost total disappearance upon the application of a ligature, or after death; the apparent absence of diseased deposits in the neighbouring tissues and parts upon the dead body; the frequent slowness of its general progress during life; and, lastly, the alleged restriction, and even complete removal of the tumour, in some instances, by the use of astringent applications and other means. Mr. PAGET, however, has conclusively shown that this affection, in every stage of its progress, is generally but a form of epithelial cancer, and consequently malignant, especially in its later stages.]

The nitrate of silver acts very beneficially, by relieving and lessening the quantity and fetor of the discharge. As palliatives, the narcotic sedatives are to be used freely, both locally and generally. The excision of the cervix has been recommended as the most appropriate remedy, especially in the early stage of the disease; but, however much it may promise, there are few patients who will be found willing to submit to it. In some cases, doubtless, it would be justifiable. (For a very full and accurate account of the *Rodent Ulcer*, see "*Lectures on Surgical Pathology*," p. 588. By JAMES PAGET, Philadelphia; 8vo, 1854.) It will suffice to state it is of irregular shape, generally tending towards oval and circular; the base deeply and unequally excavated, not warty, nodular, nor granulated; in these respects, contrasting with cancerous growths. It is also comparatively dry and glossy, yielding, for its extent, little ichor or other discharge, and has commonly a dull reddish-yellow tint. Its border is slightly, if at all, elevated; the adjacent skin appears quite healthy; the base and border feel alike tough and hard, as if bounded by a layer of indurated tissue about a line in thickness. In corroding ulcer, we see more destruction; in cancerous, we see destruction with more than commensurate growth; with the microscope we see no structure resembling epithelial or any other form of cancer.]

199. ii. SYMPTOMS OF CANCER UTERI.—The symptoms which are most constantly observed in cancer uteri—namely, pain, hæmorrhage, and vaginal discharge—may attend other lesions of the organ; but in all cases where they, or even any two of them, are present, a careful vaginal examination ought to be made.—*a. Pain*, accompanied with hæmorrhage or leucorrhœa, is a very frequent, but not a constant, symptom. It varies much in character and intensity, both at the commencement and in the course of the malady; and very often, when the hæmorrhage is profuse, but little pain, or merely a backache, is felt. At an early stage the pain is generally not severe, nor is it always referred to the uterus, but more commonly to the loins. The organ is seldom tender to the touch, and sexual intercourse is not often productive of suffering. The pain, as the disease advances, is referred to one or other of the iliac regions, and either comes on, or is exacerbated in paroxysms, and a lancinating pain referred to the uterus occurs suddenly and at intervals. Menorrhagia may be either attended, or not attended, by pain. In many cases it is, when very profuse, followed by severe pain. With the progress of the malady the pain generally becomes more severe; but towards the close, when the cachexia and anæmia are most remarkable, the sufferings of the patient generally abate more or less. But before this ultimate stage appears, pain in the uterus is added to that in the back and hypogastrium, and to the other distressing symptoms experienced. The pain is, in some cases, described as burning, darting, cutting, &c.; and it is generally aggravated into intolerable paroxysms, especially towards or during the night, stabbing or lancinating pains recurring after short but irregular intervals. When an attack of hæmorrhage supervenes on severe pain, some degree of relief is sometimes afforded for a short period. As the disorganization extends to the bladder, the vagina, or rectum, or even to them all more or less, the sufferings of the patient are accordingly in-

creased; and when utero-vesical fistula is formed, the distress is farther aggravated, and rendered still more harassing. In a very few cases, however, the disease runs its course entirely, or almost entirely, without pain. But it is not so rare for pain to be absent through a great part of the course of the malady, and appear only at a far-advanced period. The absence of pain throughout the disease, or until an advanced stage, occurs chiefly in the epithelial and medullary forms of cancer uteri.

200. *b. Hæmorrhage* is the next symptom in importance, but is not always a sign of the commencement of the ulcerative stage of cancer uteri; for it is, in a very large proportion of the cases, the earliest sign, preceding, and unattended by, either pain or watery, offensive leucorrhœa, for a longer or shorter time. The occurrence of hæmorrhage, whether with or without pain, without any sufficient cause, should always induce to a vaginal examination. The bleeding may not be profuse, but continuous and prolonged, or resemble the ordinary menstrual period, excepting only its non-occurrence at the proper period, or its frequent recurrence. It sometimes assumes this character in females past the catamenial epoch of life, and in whom the menses had ceased for a longer or shorter time. When it thus appears, the existence of the malady should be suspected. When cancer uteri commences at an early period of life, the hæmorrhage most frequently occurs at the menstrual periods, or a day or two after their cessation; but menstruation is generally irregular during the course of the disease, being either too early, or passing over a period, the next being excessive. With the progress of the malady, pain is generally added to hæmorrhage. The source of this discharge appears to be chiefly the internal surface of the cervix and body of the womb; for the hæmorrhage may be excessive before ulceration has taken place, and even when this has undoubtedly supervened, the bleeding may still proceed from the surface of these parts, rather than the ulcerated part; for in many cases this discharge has been the least where the ulceration has been the greatest, and proceeded the farthest. The paroxysmal expulsive pains often attending the hæmorrhage are usually due to the efforts of the womb to expel coagula formed within it.

201. *c. The leucorrhœal discharges* differ in the forms and stages of cancer uteri. A mucous or muco-puriform discharge is frequent at an early period, and is then generally not offensive. But as the malady advances, it is commonly more or less offensive, and it becomes more watery, or appears as a dirty and very offensive sanies. An offensive discharge may accompany any of the chief organic lesions of the uterus; but, although it may exist in these, it seldom occurs in so marked a manner as in cancer. The continuance, the quantity, offensiveness, and other conditions of the discharge depend upon a variety of circumstances—upon the stage and form of the malady, upon the extent to which ulceration has advanced, upon the retention or non-retention of the morbid fluid, upon the frequency of its removal by injections, hæmorrhages, &c. In a few instances, an offensive discharge has preceded either the pain, or the hæmorrhage, or both, although much more rarely; and, still more rarely, this has existed for so long a period, and has given rise to so little suffering or cause of com-

plaint otherwise, that when at last recourse to medical aid has been had, the cervix uteri has been destroyed, and the finger has passed into the cavity of the organ.

202. These symptoms, the most severe which attend cancer uteri—the pain, the hæmorrhage, and the offensive leucorrhœa—cannot undoubtedly prove the existence of the malady. They may individually, or even conjointly, attend other organic lesions of the uterus. But viewing them severally and in connexion with the evidence furnished by a vaginal examination, and with the constitutional symptoms characterizing the course and the advanced stage of the malady (see *art. CANCER*, § 20, *et seq.*), especially the cancerous cachexia, the existence of cancer uteri cannot be mistaken. The remarkable disorder of the digestive organs, the impaired assimilation, and the waste of the red globules of the blood, and even also of the tissues, and the consequent cachectic or cancerous anæmia; the frequent recurrence of disorder of the bowels, more especially of diarrhœa, with both abdominal and hypogastric pains; the distress often caused by defæcation, and more particularly by the state of the urinary organs, and by the urinary discharges, are all indicative of the nature of the malady.

203. Cancer uteri does not prevent a female from becoming pregnant at an early stage of the malady; but the process of parturition, and the changes in the uterine organs and in the female economy that follow, generally accelerate, often with great rapidity, its course. Parturition, owing to the effect of this act upon the diseased parts, especially the cervix, often is accompanied by dangerous hæmorrhage, or followed by severe or fatal inflammation. In some of these cases, both mother and child have died before delivery has been accomplished; generally the process is difficult and prolonged. In some cases, gestation is also prolonged beyond the natural period, and, in rare instances, death has occurred without the efforts of the uterus having been sufficient to expel the fœtus.

204. Dr WEST has given, in his interesting lectures, a table of the result of seventy-four cases of cancer of the cervix uteri *complicating labour*; and of these 41 died soon after labour, and 33 recovered for a time from the effects of this process. Of 72 children, it is stated that 47 were dead-born, and 25 born alive. He found that the average duration of 17 cases of cancer uteri, which he carefully observed, was 15 months; and that of 39 cases, as given by LEBERT, was 16 months. It is thus apparent that cancer uteri is more rapid in its progress than cancer in other organs. The average duration of all forms of cancer is stated by this writer to be 18 months, and of cancer of the mamma and of the testis, the most prolonged, not to exceed three years and a half.

205. *iii. THE PROGNOSIS* of cancer uteri may be inferred from what I have stated above, and in the article *CANCER* (§ 20–22). ROKITSKY remarks that “cases of spontaneous recovery from uterine cancer are of extreme rarity, but they do occur; the carcinoma and the cancerous ulceration are then limited to the cervix, the internal orifice forming the boundary. The loss of substance heals with a funnel-shaped cicatrix.” (*Op. cit.*, p. 303.) In a case, the progress of which was constantly observed by me, recovery took place while a diet and regimen, hereafter to be no-

ticed, was strictly observed. The cicatrix, which was formed low in the vagina, was shaped as ROKITANSKY has described it—not more than half an inch of the vagina above the urethra having been left uncontracted.*

206. iv. CAUSES OF CANCER UTERI.—These are the same as have been stated respecting cancer in general. But there are certain particulars which require notice with reference to this malady, when originating, as it commonly does, in the neck of the womb. The mortality of cancer in females is nearly three times greater in London than in males, and more than double the number of the deaths from cancer in males throughout England; the excess in females being evidently due to the frequency of cancer of the womb and of the breast among them. According to TANCHOU, the deaths from cancer of the womb, stated in the Mortuary Registers of Paris, as compared with those from cancer of the breast, were as 2½ of the former to 1 of the latter.

207. Age manifestly predisposes to cancer; but this disease appears to occur at an earlier period in the uterus than in the mamma; for in the latter it is rare at the age of thirty, whereas it is not so rare at this age in the former situation. Cancer uteri increases in frequency with the advance in life, as Dr. WALSH has shown: but in order to render the increase more manifest, the number of cases at a given age should be calculated with reference to the number of females supposed to exist at the same progressive periods of life. The inference deducible from this fact is, that the occurrence of cancer is in some degree favoured by the depression or exhaustion of vital power taking place from the progress of age, as well as from other causes of vital depression.

* Mrs. C—, at the age of 36, first complained of symptoms indicating an early stage of cancer uteri. The disease advanced, and several medical men were consulted at her own or my suggestion. The cervix had become much affected, and the disease extended far down the vagina with distressing irritability of the bladder. At this time she found Dr. LAMBE's work on "*A peculiar Regimen, &c., in the Treatment of Cancer, &c.*," in my library. He was consulted in her case, and he recommended her to remove to a dry and healthy locality in the vicinity of London, to strictly observe a vegetable diet, to drink only distilled water, and use only distilled water in cooking and for infusing tea or other substances. These injunctions were observed without any deviation, and under his supervision. In the course of a few weeks amendment was very apparent, and in somewhat less than twelve months a cicatrix, as situated and described above, was formed. The patient continued this regimen for nine or ten years, and enjoyed excellent health. After this period she began to partake of fish, the flesh of chickens or rabbits, &c. She afterward ventured farther upon animal food, and occasionally took a glass of old wine. Five or six years more elapsed, when she complained of the right mamma, and when examined the disease was commencing in it; but no complaint was made of the parts in the vicinity of the first disease. The diet was now altered, but the malady proceeded slowly; and having been unusually prolonged, extended inward, affected the pleura; and ultimately the vaginal cicatrix was attacked, and she ultimately sunk, more than twenty years from the commencement of the malady in the cervix, and after an interval of nearly fifteen years of good health.

[In the American edition of Dr. LAMBE's work, on "*Water and Vegetable Diet in Chronic Diseases*" (12mo. New York, 1859), there is the history of another remarkable case of cancer uteri, attended with an acrimonious and offensive discharge, where the pain, discharge, &c., were subdued, and the general health and comfort of the patient greatly improved by the use of a strictly vegetable diet, without medicine, except opium. The disease, at the time of the report, had been controlled for the space of twenty-five months, without making any perceptible progress, while the ulcerative process had been wholly superseded.]

Dr. WEST has given a table of the ages of 426 cases of cancer uteri, collected from various sources:

	Actual Number.	In the proportion of 1 to 10,000 of the whole population existing at the respective ages.
Between 25 and 30 years	25 or	1 in 134
" 30 " 40 "	112 "	1 " 21
" 40 " 50 "	178 "	1 " 9.7
" 50 " 60 "	71 "	1 " 16.6
" 60 " 70 "	35 "	1 " 23.6
Above 70 "	5 "	1 " 108

From these data it would appear that, although cancer uteri becomes more frequent as life advances up to fifty or sixty, it diminishes considerably in frequency from these ages; and from this table, as well as from other sources of information, it cannot be inferred that the actual cessation of the catamenia has any influence in favouring the occurrence of this malady in the uterus. Dr. WEST justly remarks that the state of the uterine functions previously to the appearance of cancer is not without interest; and he adds that, in 108 cases, this matter was made the subject of special inquiry. In 94 cases these functions were in all respects natural from their complete establishment to the commencement of the disease; and in 14 they were either habitually or frequently unnatural, being painful, postponing, or irregular. Out of 116 married women affected with cancer uteri, only 7 were sterile. The hereditary predisposition to cancer has been well established, as shown in the article on CANCER (§ 23). Mr. PAGET found that this malady in all situations was hereditary in the proportion of one to 6.1; Mr. LEBERT, in the ratio of one to 7.2; and Dr. WEST in 1 to 6.2. The proportion of hereditary cases is very probably higher than here stated, as it is difficult to ascertain from the patients the nature of the disease which caused the death of either, or of both parents.*

208. v. TREATMENT OF CANCER UTERI is necessarily confined to palliating the suffering of the patient, and to attempts at delaying the approach of death. The symptoms which more especially require mitigation are *hemorrhage*, *pain*, and the *offensive discharge*. The means which should be resorted to for the first and second of these have been fully described in the articles HÆMORRHAGE, NEURALGIA, and CANCER; but there are a few topics connected with the treatment of cancer affecting the uterus, and of the effects of this malady, which require farther consideration.

209. a. *Hæmorrhage* is among the earliest and most alarming symptoms of cancer uteri. The obvious intention is to abate it when severe or too frequent, and to prevent its recurrence altogether, or before the catamenial period. The various means usually employed for *hemorrhage from the uterus* have been detailed (see art. HÆMORRHAGE, § 263-273); but there are a few of these which require a more particular notice at this place. The *gallic acid*, in doses of six to eight grains of every four or five hours, have been often found of decided service in arresting the hæmorrhage. The infusion of *matéo*, used as an

* I have noticed the question "Is Cancer contagious?" when treating of SCIRRHUS AND OTHER TUMOURS (§ 79, 80), and have referred to cases, one of which was under the care of the late Mr. MAYO and myself, in which cancer of the glans penis in the husband communicated the disease to the cervix of the uterus. I have there stated my reasons for inferring that the disease may thus be communicated to the wife by the husband.

injection into the vagina, is also very efficacious. Dr. West states that, in some cases of medullary and of epithelial cancer, when the hæmorrhage is excessive, or prolonged, the morbid tissue may be broken down with the finger, and the tincture of the *sesquichloride of iron* injected into the midst of it. The extravasated blood is thereby coagulated, and the vessels destroyed, the whole mass thus treated sloughing away. Kiwisch, who first resorted to this practice, remarks that it is not attended by much pain or serious constitutional disturbance. He also advises a recourse to the actual cautery, where the surface is too firm to be broken down. In one case, after other means had failed, I recommended the injection of the spirits of turpentine, in the manner in which the tincture of the muriate of iron has just been advised, the same medicine being given frequently by the mouth in small doses; and the hæmorrhage was for the time arrested. It is obvious that sexual intercourse is liable to occasion an attack of hæmorrhage, and that it should therefore be strictly forbidden whenever cancer uteri is suspected.

210. *b. Pain* is often so excessive as to require energetic means of relief; but, as long as it is not acute, the gentler remedies only should be employed. The pain is sometimes brought on, or aggravated by an irritable state of the bladder, or by the condition of the urine, and not unfrequently by neglect of the functions of the bowels. Therefore the states of both the urinary and fæcal evacuations should receive due attention. The former may be corrected, and the irritable condition of the bladder mitigated by the exhibition of the solution or the bi-carbonate of potash with tincture of henbane, or by the mineral waters of Ems or of Vichy. If the urine abound in the phosphates, the means I have advised for this condition, when treating of the morbid states of the URINE (§ 90, *et seq.*), especially the hydrochloric acid taken in the decoction of pareira, or in the infusion of buchu, may be prescribed. The bowels may be regulated by means of the gentle cooling aperients ordered above (§ 184).

211. When the pain becomes so severe as to require anodynes, then plasters of opium or belladonna may be applied over the sacrum or above the pubes; and chloroform may be tried as an epithem, by means of spongio-piline. Internally the pilula saponis cum opio, or tincture of opium, may be given at night; and if these occasion neither headache nor sickness in the morning, they may be continued without increasing the dose. The preparations of morphia, unless conjoined with aromatic stimulants, often cause unpleasant depression. The black drop and Battley's sedative solution are often preferred to other opiates, but they are efficacious chiefly in their more powerful narcotic effects, the subsequent distressing sickness, &c., being not less complained of. Henbane and conium are often employed. The former, without alleviating pain, or with slight alleviation only, often affects the head, occasioning restlessness and headache. I have, however, found the two conjoined with camphor—three grains each of camphor and of the extracts of henbane and conium, being more or less of service. Dr. West says that after henbane he generally makes trial of the Indian hemp; for, although it is an uncertain remedy, it does not disorder the stomach, or occasion headache. But I have not always found it so pleasant in its ulti-

mate effects. In severe paroxysms of pain, the inspiration of the vapour of chloroform has been resorted to; but the relief has been only very temporary. I have in a few cases directed the application of the tincture of belladonna to the diseased part, in the manner advised and resorted to by the late Dr. Moore (§ 15), with very marked relief. Taken internally, belladonna seldom affords much relief, unless in large doses, which are usually followed by much depression, unless they are conjoined with aromatic stimulants; and these latter often fail in correcting the evil.

212. *c. The discharges*, owing to their great excess, or their very offensive odour, require, besides the usual attention to cleanliness, the means which have been advised for the more severe cases of LEUCORRŒA, more especially the infusion of matico, or tannin; the decoctions of oak-bark, of buchu, of cedar-bark, or of pomegranate-bark, &c. Weak acid lotions, and various other astringents, have also been recommended. Dr. West mentions the use of an injection of ℥j. of sulphate of iron, and ℥ij. of the extract of conium to a pint of water; and he adds that a solution of ℥j. * to 3ss. of nitrate of silver to an ℥j. of water, injected immediately into the diseased structure, has the effect of hastening the separation of the slough and of destroying the bad odour. I have most frequently employed, for these purposes, the chloride of lime, or creasote, or both, in injections, consisting chiefly of mucilaginous fluids, in quantity and frequency according to the progress and urgency of the case. When the disease was very far advanced, and the use of these appeared likely to occasion inflammation of the peritoneum or adjoining parts, I have preferred to have recourse to powdered carbon, with tincture of belladonna, or extract of henbane, mixed in any mucilaginous fluid, as a vaginal injection. It has generally the effect of deodorizing the discharge and soothing the pain.

213. *d. The complication of pregnancy* with cancer uteri must be treated according to the peculiarities of each case, but its treatment cannot be entered upon at this place. It is fully considered in Dr. West's work, already referred to, where the reader will also find the results of extirpation of the uterus and of its cervix very sat-

[* Dr. Ashwell strongly recommends a strong solution of nitrate of silver (80 grs. to ℥j. of water), applied through a speculum, with a hair pencil, or tow fastened to the end of a piece of cane, smearing carefully the affected parts. It rarely produces much pain, being quickly decomposed by contact with the fleshy cervix. The eschar is usually detached about the third or fourth day, being thrown off in shreddy films, when the abraded surface will have acquired a redder and healthier aspect. The caustic should be early repeated, and if, after the fresh eschar, there is still farther topical improvement, the treatment should be persevered in; and Dr. A. thinks that a "hopeful prognosis may be given," as often after these renewed applications, extending over many weeks, and aided by the black wash or oxide of zinc, he has "healed abrasions and commencing ulcerations of the os and cervix." We think it very doubtful, however, whether these were cases of true cancerous disease. From considerable experience in the treatment of this disease, we prefer very much the nitrate of silver to any other local application. The other caustics, as *corrosive sublimate*, *chloride of zinc*, *arsenic*, *nitrate of mercury*, &c., are apt to cause heat, pain, tension, and inflammation, and some of them cause dangerous constitutional effects from absorption. However beneficial the actual cautery may have proved in such affections, the prejudice against it in this country will effectually preclude its employment. The practitioner need not be cautioned in regard to the danger of a hasty diagnosis, few ulcerations or hardenings of the cervix uteri being malignant, although attended with hæmorrhage and other doubtful symptoms.]

isfactorily discussed. To this work, and to surgical writings on this subject, I must refer the reader.

214. *c.* The constitutional treatment of cancer uteri, or the means most appropriate to the existing cancerous cachexia, is not different from what I have advised in the articles on CANCER (see § 27, 44), and on SCIRRHOUS GROWTHS (§ 113, *et seq.*). The chief objects proposed are to promote the digestive and assimilating processes, and to support constitutional power, and vital resistance to the progress of the malady. Subordinately to, and forming a part of these, may be mentioned, due attention to the secreting and excreting functions, and the alleviation of the more distressing symptoms. The anæmia attending the advanced stages of the malady should also claim our attention; and chalybeate preparations, and chalybeate mineral waters, ought to be conjoined with such other means as the circumstances of each case will suggest.

215. *f.* In respect of diet and regimen, little need be added to what has been already stated in the places just now referred to. A digestible and nourishing food, in moderate quantity, and a temperate and dry air, are generally beneficial. It has been questioned whether much, or even any, animal food be of service, or rather, whether it be not detrimental in this malady. This matter has been fully and ably discussed by my late friend, Dr. LAMBE, a very learned physician, and an original thinker and observer. He imputed this malady, as well as scrofula, gout, consumption, and some other chronic diseases, to the use of animal food and to impure water; and advised vegetable food of all kinds in sufficient abundance, and distilled water for all purposes of internal use, and exercise in a dry and open air, to be resorted to for the cure of this as well as of those diseases. He did not believe that, when cancer was far advanced, this diet could then effect a cure, but he recommended it to be tried; and, at the same time, all fermented and distilled liquors, or other beverages than distilled water, to be relinquished. This diet and regimen were employed with apparent success, as long as it was strictly adhered to, by a married female, whose case I have briefly noticed in a note at p. 1407, § 205.

[Some farther remarks in regard to cancer uteri may not be out of place. Although it is generally conceded that confirmed carcinoma of the uterus is incurable either by surgical or medical remedies, yet we agree with ASHWELL, BOUILLAUD, and BRESCHET, that much may be done by a very early, well-sustained, and persevering prophylactic management. It is undoubtedly true, as stated by ASHWELL, that scirrhus or hard tumours of the womb are sometimes cured or become innocuous by altered nutrition, the indurated masses being deprived of their softer cellular tissue, and being converted into cartilaginous, cretaceous, or calcareous concretions. It may, however, be objected that such cases were not true carcinoma; and those who take the ground that cancer is never cured will, of course, assume that such was the fact. But this is a point which yet remains to be established by farther observations. Admitting that in these instances the disease was true carcinoma, it yet remains to be proved how far remedial measures had any thing to do in the cure or recovery. Our views on these points will be in accordance with

our pathology. If, with BOUILLAUD, we regard cancer merely as the result of inflammatory induration, or, with BRESCHET and BICHAT, as resulting from some error in the "organic sensibility," we shall, *a priori*, come to the conclusion that it is a curable disease; and this opinion will not be abandoned until multiplied and uniformly unfortunate experience brings us to a contrary conclusion. We are, however, unwilling, from other considerations, to admit that cancer is always an incurable disease. Facts do not warrant such a conclusion. It has been truly remarked, that no malady can be cured by those who are determined to regard it as incurable. Diseases so regarded must be left, as cancer generally is, to quacks and quackery—to those who promise any thing and every thing for money. It is not long since tubercular disease of the lungs was regarded as incurable, and this class of patients were assigned to the tender mercies of empirics. Cancer is sometimes said to be hereditary, but in all cases it is a declaration of the impression of long-standing and injurious influences. Some of the secretory or excretory organs are at fault. There have been some serious errors in diet and general hygienic measures. The treatment is to be based on a most careful investigation of all the functions of animal and organic life, and the influence exerted upon them by the previous habits, mode of life, food and drinks, &c., of the patient. The late Dr. TWITCHELL, of New Hampshire, was cured of an epithelial cancer of the face by confining himself strictly to a diet of bread and milk. We have seen true carcinoma of the breast remain dormant for years by allaying the fears of the patient, and by a course of strict dieting and attention to the excretory organs. A tumour having all the characters of true carcinoma will, under such management, not unfrequently become absorbed, and its elements, doubtless, eliminated from the system. At first, we see the tumour become loosened as to its subjacent connexions, a tucked-in nipple resumes its natural appearance; it loses its characteristic stony hardness by a process of gradual absorption, until at length no vestige of the disease remains. We have witnessed a case in point recently in a near relative. PAGET has truly observed that a cancer adds a new element of disease to those that were already in progress, and that if we assume a constant process of nutrition in cancers, it cannot but be that the blood will be affected both by what they take from it and by what it derives from them in the process of nutritive absorption. What returns to the blood must necessarily be morbid, and exert a very injurious influence upon it, even if incapable of being developed into cancer. Hence the importance of its early and thorough elimination by an active condition of the liver, kidneys, and skin, together with the alimentary canal, the greatest and most important emunctory of the whole body. Here we have the secondary poisoning of the blood superadded to the original cancerous cachexia; and no wonder that, with the cancerous material circulating in the blood of every organ, the disease returns after the original tumour has been removed. After the disease has progressed to the stage of ulceration, with pain, hæmorrhage, discharge, hectic, with a poisoned condition of all the circulating fluids, and a general cachectic state, with a despairing state of the mind, the situation of the

patient may well be regarded as hopeless, although the local disease be removed. But even here the case is by no means to be abandoned. Here come in the palliatives described by our author, which are of great service in alleviating the sufferings of the patient. But many facts go to show, as PAGET remarks, that "not only the progress of the peculiar constitutional part of the disease is nearly independent of the local part, but also that the constitutional part generally contributes most to the fatal issue" (p. 667). And again (p. 525), "The removal of the local disease makes no material difference in the average duration of life." If so, then our remedies must be general, and not merely local. ROKITANSKY has observed that spontaneous natural processes of healing often occur in even medullary cancer, one of the most fatal of all cancerous affections; and PAGET admits that "a medullary cancer may gradually decrease, becoming harder, as if by shriveling and condensing, and at length may completely disappear. I have seen," he remarks, "the same happen after partial removal of cancers." He also speaks at length of the degeneration of cancers, so as to be incapable of increase, or, to use a term of ROKITANSKY, applied to the same structures, "obsolete." WALSH states that "we need not wholly despair, after the removal of encephaloid;" and that "M. VELLEPEAU has excised well-marked specimens of this species, and seen the patients in perfect health two, four, six, and in one case ten years afterward." Sir ASTLEY COOPER thinks that scirrhous does not return in one fourth of the cases of removal; Dr. J. C. WARREN, that one case in three is cured; and Mr. TRAVERS states that "recovery generally ensues when the disease is removed before the supervention of pain." Professor MEIGS remarks ("Females and their Diseases," Phil., 1848, p. 274) that he has seen "a cancerous mamma as hard as cartilage ulcerated, and firmly adherent, that was totally removed by absorption in a long paraplegia." The results of Dr. GROSS's investigations in regard to the curability of cancer are, however, more unfavourable (*Trans. of Am. Medical Association*, 1854).

But in considering the question of the curability of cancer, whether of the uterus or any other organ, we are to remember that "it is an organ," as SIMON expresses it, "for excretory purposes" ("General Pathology," 8vo. Phil., 1852), and that this eliminative effort has its root in some peculiar condition of the general system, called cancerous cachexia, the essence of which we by no means understand. Why it is that the blood sets about constructing an organ, so to speak, for the appropriation and discharge of its own blastema; why the secretory and excretory organs are not adequate for the elimination of those products which result from the disintegration of the tissues, and, indeed, whether, by the influence of secretory and excretory stimulants, alteratives, and a regular diet, such products may be wholly eliminated, are questions which, for the present, must remain undecided, and probably will remain so until we fully understand the chemistry of cancerous bodies and of the whole body, together with those natural changes which take place in the progressive and regressive metamorphoses of the blastema of the blood. We believe, with SIMON (*Loc. cit.*), that the more the nucleated fibrous material abounds in a cancerous tumour, the less

malignant it may be regarded, and the less likely to return if removed by the knife; for all pathologists agree in the opinion that fibrous transformation, so far as it extends, illustrates the operation of common, not of specific developmental influences in the part, just as, on the other hand, the compound granular corpuscles constituting the yellow softening material in cancerous growth represent, as VIRCHOW maintains, the degeneration of cells, and, consequently, a retrogressive tendency in the effusion where they occur. If we assume that the unknown albuminiform material of cancer requires a special cell-growth for its elimination, and cannot avail itself of any known cells for its removal, then our prognosis must necessarily be unfavourable as regards a cure; but as cancer-cells have their analogues in the normal cells of other tissues (as the excretory gland cells and epidermal cells), we may reasonably conclude that, under the influence of special stimulants and proper ingesta, the latter may perform the function vicariously assumed by the former.

If cancer, then, is to be treated successfully, the treatment must be founded on the pathology above indicated, viz., that the disease is a local manifestation of certain specific morbid states of the blood; that it is both a constitutional and local disease, specific in the sense that it depends on some peculiar material in the blood, different from all others, normal or abnormal, and presenting structures, to some extent at least, specific and peculiar, both in form and mode of life; and the cancerous diathesis or cachexia, as consisting in the accumulation of such materials in the blood, while accidental circumstances determine its localization.

SIMON has truly remarked that all cancerous diseases have a chronic period of latency, during which their cachexia acquires intensity from accumulation, till at length it suffices to establish the local vent; and we may argue farther, that the disease can be again reduced to this state of latency and to the accompanying difficulties of evolution, if all such local conditions be removed as favoured the first localization of its products. We have no rule by which to measure the intensity of the constitutional cachexia, but after the disease has reached a certain point, there are signs which speak infallibly to the experienced eye—the pale and anxious countenance, with a slightly leaden hue; the pinched features, with slightly livid lips and nostrils; the constant hectic, increasing emaciation, frequent pulse, acrid and offensive discharge, and severe pains. All these speak a language not to be mistaken; and if to them be added nausea and weakness of digestion, a tickling cough, stitches in the side, a faltering pulse, cadaverous and anxious expression, we may safely predict a speedily fatal result.

Cancer of the uterus is, as a general rule, very slow in its development, and the symptoms of the incipient stage are not strongly marked, indeed, they are so slight as scarcely to call attention. Were the physician called at this period, he would probably find the muciparous glands in the interior of the cervix hard, and of the size of small shot, and somewhat painful on pressure; the os may be hard and fissured, and the cervix enlarged and indurated, and of a deep flesh colour, both within and externally. At this period we have found the whole uterus enlarged, and

having a more solid feel. At a still later period, a careful examination will disclose, probably, a knotted and indurated state of the vagina, and the mucous membrane thickened where it is attached to the cervix; the uterus may be more fixed, as if consolidated with the neighbouring organs; and there may be softening, abrasion, or commencing ulceration. But a long time may elapse before the disease has reached this stage. If the female be married, she will have for some time previously complained of pain in sexual intercourse, followed, perhaps, by a discharge of blood, while she labours under irritability of bladder, uneasiness in the central pelvic region, and a failure of general health. The prophylactic treatment of cancer uteri is the same as for all other chronic affections—attention to all those hygienic measures which tend to invigorate the general health. ASHWELL, however, recommends rest in a recumbent posture as absolutely indispensable to a cure; but it is evident there are many cases where the enforcement of such a rule would be very inexpedient, as it would tend to impair digestion, lessen secretory and excretory action, and increase general irritability.

The diet should be very simple and unstimulating; for the most part, milk and vegetables. MACILWAIN (*"The General Nature and Treatment of Tumours,"* 8vo. London, 1845) thinks the diminution of carbon, in the interdiction of grease, sugar, and alcohol, very important. The same writer recommends *aperients* combined with *narcotics*, as blue-pill and colocynth, with opium or henbane. Dr. MONTGOMERY recommends an *alterative course of mercury* in the early stage.* Our countryman, Professor DEWEES, recommends the occasional abstraction of a few ounces of blood, especially if the catamenia have ceased; and if there is severe throbbing pain just above the sacrum, he enjoins losing six or eight ounces of blood by cups or leeches. *Purging*, Dr. D. thinks, is never to be omitted; "for there is no one remedy," he remarks, "that is of such decided efficacy in this disease." The salines are preferable, as *sulph. mag.*, *tart. pot.* and *soda*, *sup. tart. pot.*, *phosph. soda*, &c.; or equal parts of *sulphur* and *magnesia*, or *crem. tartar* and *sul-*

phur, or *rhubarb* and *aloës*, *castor oil*, or *magnesia*. The use of purging in this affection, according to Dr. D., is to solicit large serous discharges from the intestines, with a view to relieve the engorged state of the pelvic viscera, and at the same time not to weaken the system too much by its excess. Care must also be taken not to cause *mucous* discharges, and to observe closely the effects produced. Great attention, too, according to Professor DEWEES, is to be paid to *diet*, the blandest food, as milk and vegetables, only to be allowed, as bread, rice, Indian or rye mush, or unbolted wheat-flour mush; the fruits of the season; tapioca, oatmeal gruel, sago, arrow-root, &c. "The influence of this course of diet," says Dr. D., "is much more efficient than we might at first be willing to admit; but the fact is unquestionable, that it almost immediately relieves pain after it has been adopted." All kinds of alcoholic drinks are to be forbidden, as well as spices and other condiments. Great care is to be observed in regard to *cleanliness*; the acrid and offensive discharges are to be regularly removed by injections of tepid water, flax-seed tea, or the hip-bath; and *carbonic acid gas*, *lime*, *pyroligneous acid*, or *chloride of lime* or *soda*, are to be employed for the correction of the fetor by their chemical effects. The use of carbonic acid gas, which has been recently recommended as a new remedy for the relief of neuralgia and other painful affections of the uterus, was introduced by Dr. DEWEES in the same cases, and especially for carcinomatous affections of this organ. "We have enabled several patients," he remarks, "to derive much comfort, as well as temporary relief, from the extrication of this gas within the cavity of the vagina, by means of a flexible tube of a sufficient length and size, attached to the mouth of a bottle, in which there is mixed diluted sulphuric acid and the carbonate of lime. This may be introduced into the vagina several times in the twenty-four hours. In two or three instances this substance has relieved the severity of pain whenever it was employed, as well as diminished the offensiveness of the discharge." (*"A Treatise on the Diseases of Females,"* 8vo. Phil., 1833, p. 264.) Dr. D. also regards *rest*, i. e., a horizontal position, without intervening exercise, as a *sine qua non* in the cure of this disease. The pain is to be relieved by "morphia or denarcotized laudanum;" and when rejected by the stomach, it must be given by enema. If vegetable food disagrees, or is not sufficiently nutritive, it is to be exchanged for animal, and the gastric acids are to be neutralized by the alkalies. Sometimes the sulphuric or nitro-muriatic acid fulfils this indication best. We refer to the work above mentioned for the details of the treatment advised by Dr. D., as we are satisfied that little, if any, improvement has been made upon it since.

In the early stages of cancer uteri, we think we have observed good effects from the topical use of *iodine* to the cervix by the speculum, in the form of the compound ointment, as follows: *R. Iodine*, ʒss.; *iodide of potassium*, ʒj.; *alcohol*, ʒj.; *lard*, ʒij. The friction should be persevered in for several minutes; or the *comp. tinct. of iodine* may be applied by means of a sponge. By the persevering use of this means such indurations have, in several instances, been entirely removed. The *nitrate of silver*, in the form of the saturated solution, will be preferable to the iodine in cases

[* Dr. MACKENZIE (*London Lancet*, 1856) has published an able paper, in which he traces uterine to *hepatic disease*, in three ways: 1st, through the medium of the direct sympathy subsisting between the uterus and liver; 2d, through the derangement of the assimilative processes which invariably results from chronic hepatic disturbance; and, 3d, through the debility of the nervous system which sooner or later inevitably follows upon long-continued derangement of any important organ of the body. To the first of this series of causes he attributes many uterine affections of a variable and casual character, such as hystericalgia, leucorrhœa, and menstrual irregularity; to the second, many functional and structural lesions of the uterus, of a more fixed and persistent character, such as congestive and inflammatory conditions, indurations, hypertrophies, fibrous growths, certain forms of leucorrhœa, and rheumatic hystericalgia, to which cancer might be added; to the third, a predisposition to uterine disease generally, the precise character and nature of which would vary with the nature of the exciting and other occasional causes. The treatment of these cases, admitting this pathology to be correct, he says, should be conducted with reference to three indications: 1st, to restore the tone and functional activity of the liver by the persevering employment of small, undeblilitating doses of mercury, keeping strictly within the tonic and stimulating range of the remedy; 2d, to improve the assimilative functions generally by careful attention to dietetic and hygienic measures, together with various therapeutical means; 3d, to restore the tone and vigour of the nervous system, which has been impaired by the long continuance of hepatic derangement. These views are well worthy of consideration.]

where the lining membrane of the os, or around its margin, is tender and red, or where the same parts are softened or ulcerated, or where ulceration is dreaded, or the discharges are copious and fetid. It not only changes the unhealthy condition of the parts, but affords marked relief to the pain. If the case be beyond the reach of art, life may be prolonged and comparative comfort afforded by the frequent employment of these local applications, in connexion with anodyne and demulcent injections, and the proper regulation of hygienic means. We have in some instances seen the best effects from a pill of rhubarb, iron, and quinine; and in two cases, FOWLER'S solution of arsenic seemed to arrest the disease. It is better, however, to treat the disease on general principles than to trust to any supposed specifics. It must, however, be acknowledged that, as yet, cancer of the uterus must be ranked among the *opprobria medicorum*.

Excision of the neck of the uterus has been repeatedly practised, both in this country and Europe, for cancer of this organ; and Dr SIMPSON is an advocate for the operation under the following circumstances: 1st, great morbid hypertrophy, by elongation of the vaginal portion of the cervix uteri; 2d, corroding ulcer, when limited to the lips of the cervix, and pathologically identical with the form of lupus or malignant ulcer, so well known on the face; 3d, circumscribed and local forms of carcinomatous disease, or excrescence of the lips and lower segment of the cervix uteri. Few, however, will coincide in the opinion that simple hypertrophy of the cervix either justifies or requires so severe an operation, and the generally insidious and irregular progress of corroding ulcer seldom renders it amenable to operative treatment. We would rather say that excision of the cervix should be confined to cases of epithelial cancer, in which we know that a removal of the entire diseased part often effects a permanent cure; for it is of these that M. PAGET remarks that, "among all the cancers, they present the general or constitutional features of malignant disease in the least intense form. They commence at the latest average period of life; they appear to be most dependent on local conditions; they are least prone to multiplication in internal organs and they are associated with the least evident diathesis or cachexia." In one case, Dr SIMPSON has operated successfully, conception having taken place within ten days after the operation. The conclusions of ASHWELL are doubtless correct, viz., 1st, that the operation is an easy one; 2d, that excessive and dangerous bleeding is not a necessary accompaniment; 3d, that in some instances, for the time over which subsequent observation has extended, cancerous ulceration of the cervix uteri has been cured by it. The dangers are, hæmorrhage, uterine or peritoneal inflammation, malignant ulceration of the excised surface, or of any portion of the diseased structure which may have been left behind. We can scarcely conceive of any circumstances which would justify the extirpation of the entire uterus for a cancerous affection of the organ.]

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VACCINATION.—**SYNON.**—*Vaccinia* (from *Vacca*, a cow), *Variola vaccina*; *Variola vaccina*; *Vaccine*, *vaccination*, Fr. *Kuhpocken*, *Schutzblattern*, Germ. *Vaccina*, *Vaccinazione*, Ital. *Vaccine*, *Cow-pox*.

CLASSIF.—III. CLASS, III. ORDER (Author in Preface, &c.).

1. **DEFIN.**—*Variola vaccina*—a vesicular disease developed in the human subject by inoculation of cow-pox, or of the lymph from the variolous vesicles affecting the cow.

2. **I. HISTORY OF.**—It would appear from ancient Sanscrit writings, that vaccine inoculation had been practised in India from the earliest ages, and that the preservative influence of vaccination was known, and had recourse to, in different parts of the East. Mr BRUCE, Consul at Bushire, states that vaccination was well known in Persia for many ages. HUMBOLDT found among the inhabitants of the Cordilleras of the Andes the belief that the eruption on the udder of the cow preserved them from small-pox. These indications of the practice of vaccinations were, however, unknown at the time when EDWARD JENNER, a general practitioner in Berkeley, observed the protective influence of the vaccine disease from the natural and inoculated small-pox, and when he submitted this influence to the tests of experiment and practical observation. In 1775

Dr. JENNER remarked, that a number of persons in Gloucestershire could not be inoculated with small-pox; and, having become aware that there was a popular belief that persons who had caught the cow-pox, from milking the cows, were not subject to small-pox, he was induced to investigate the grounds for this belief. In the course of his researches, and after encountering numerous difficulties and opposing opinions, which would have discouraged all but those who possessed a determined will and powerful genius, he found that the cow was subject to a variety of eruptions on the teats, all of which had received indiscriminately the name of cow-pox. He learned to distinguish between these, and ascertained that one only was possessed of a specific protective power over the human body. This he called the *true* cow-pox, the others the *spurious*. He next ascertained that the true cow-pox underwent progressive changes; and that it was only at one period of its progress, or in the acme of eruption, when it was endowed with specific or preventive, or anti-variola properties. During the investigation of this branch of the subject, Dr. JENNER was struck with the brilliant idea that it might be practicable to propagate the disease by inoculation, first from the cow, and successively from one human being to another. It was not, however, until 1796 that he was enabled to take the decisive step of inoculating for the cow-pox, upon the success of which his grand scheme mainly rested. An opportunity of testing his ideas by satisfactory experiments was not afforded him until that year, when cow-pock matter in an active state was found, and parents were met with possessing sufficient confidence to submit their children to the important trial. On the 14th of May, 1796, James Phipps was vaccinated with matter taken from the hands of Sarah Nelmes. He passed through the disorder in a satisfactory manner, and was tested by variolous inoculation on the first of July following. The small-pox inoculation took no effect. JENNER now prepared to communicate the result of his long investigations concerning cow-pox, but delayed his work in the hope of furnishing additional proofs of the success of vaccination. These he was enabled to procure; and in June, 1798, he published, in London, his original essay, entitled, "An Enquiry into the Causes and Effects of the Variolæ Vaccinæ; a Disease discovered in some of the Western Counties of England, particularly Gloucestershire, and known by the name of the Cow-pox." This work deserves a particular notice. In it Dr. JENNER states his belief that this disorder does not originate in the cow, but is communicated to this animal from the horse, where it appears on the heels, and is known by the name of the *grease*; the hands of farm-servants and milkers being the medium of communication. He next suggests that the small-pox itself may have been originally morbid matter of the same kind, which circumstances had changed and aggravated into a contagious and malignant form. He afterward states his conviction that cow-pox inoculation leaves the constitution forever after secure from the infection of small-pox; and he concludes by enumerating four classes of persons to whom cow-pox inoculation holds out the prospect of great benefit: 1st. Those who, from family predisposition, may be presumed likely to take small-pox unfavourably; 2d. Persons of a scrofulous diathesis; 3d. Those who, from idiosyncrasy,

resist small-pox inoculation in early life; and, 4th. Those who are labouring under chronic forms of disease, in which counter-irritation is desirable.*

3. At the end of July, Mr. CLINE made the first experiment with cow-pox in London, which succeeded perfectly; and soon afterward recourse was had to vaccination in many places. In his second publication, dated April, 1799, Dr. JENNER judiciously recommended calmness and mod-

* Some vaccine virus was forwarded by GEO. PEARSON, of London, to Dr. DAVID HOSACK, of New York, in the year 1797; but the discovery was not announced in the United States till 1799, in the Medical Repository of New York. In July, 1800, Dr. B. WATERHOUSE, of Cambridge, Massachusetts, first successfully practised vaccination in this country on four of his own children. Dr. VALENTINE SEAMAN was conspicuously active in introducing the practice into the city of New York. He obtained the virus from Dr. WATERHOUSE, and with it vaccinated his own son and many others. From this time forward the practice became general.

An act was passed in Massachusetts, in 1810, providing that "it shall be the duty of every town to choose persons to superintend the inoculation of the inhabitants with the cow-pox." This law was repealed in 1836, and the Revised Statutes provide "that each town may make provision for the inoculation of the inhabitants." This change, as Mr. SHATTUCK states ("Report of the Sanitary Commission of Massachusetts," Boston, 1850, p. 180), leaving it optional with the towns to do or not to do it, has probably caused the loss of many lives. Under the operation of the old law, many towns were accustomed, once in five or more years, to have a general vaccination of the inhabitants; but this custom, it is stated, has been generally discontinued, and the inhabitants are left liable to the disease from every fresh exposure. The same remark will apply to most of the States, and even large cities that have independent boards of health. Boston has provided that no child shall be admitted into the public schools without a certificate from some physician that it has been vaccinated. It also, as well as New York and most of our cities, provided for the gratuitous vaccination of the poor; but the means provided are very inadequate to the end proposed. It is not yet safe exactly to presume on the intelligence of the lower classes in our large cities; and as long as this is the case, compulsory measures will be necessary. Not only cities, but all towns and villages, however scattered the population, should have local boards of health, acting under a general State law, empowered, among other things, to provide for and enforce, if necessary, a general vaccination of the inhabitants as often, at least, as once in five years.

Strange, indeed, it is, that no police or sanitary regulations exist regarding the spread of small-pox in many, if not all our large cities. In New York city, a small-pox hospital has been provided on Blackwell's Island for the poor who may be attacked with small-pox; but removal thither is not made compulsory, nor are the sick from this disease placed under any quarantine whatever. So in Boston. Since the laws relating to small-pox in Massachusetts were repealed in 1837, no more restraint has been laid upon persons sick with this than any other disease, and the consequence is, it is rarely, if ever, absent from the large cities. During more than 20 years prior to 1837, the disease caused but 37 deaths in Boston only, and most of these were at Rainsford's Island; very few cases ever occurred in the city. But during the 12 years ending Dec. 31, 1849, since the repeal, it caused the deaths of 533 persons; and in the first six months of 1850, 146 died with it. There can be no doubt whatever that the prevalence of this disease in our large cities might be nearly, if not altogether, prevented. They should be divided into small districts, a health-warden appointed for each, who is a medical man, whose duty it should be to visit every family, whether invited or not, and to vaccinate or revaccinate every person, if necessary or expedient. By this plan the disease would soon disappear. If a case of small-pox should occur, means should be taken for its isolation, or removal to a small-pox hospital, or to a safe position out of the city. The 600 lives which are annually lost in New York city by this disease might in this way be saved, as well as the expense imposed on the city for the support of small-pox widows and orphans. In the present state of our knowledge on this subject, it is safe to say that every State, city, or town, which does not interpose its legal authority to exterminate the disease, incurs the responsibility of permitting the destruction of the lives and health of its citizens.]

eration in researches into the efficacy of cow-pox inoculation; but in 1800 he expressed his conviction that the cow-pox is capable of extirpating small-pox from the earth; and in his fourth publication, May, 1801, he again expressed the same sanguine opinion. The commencement of this century was remarkable for the progress of vaccination. In 1801 upward of six thousand persons had been vaccinated, and the greater part had been tested with small-pox. In 1800, 1801, and 1802, vaccination was introduced into France, Germany, Italy, Spain, and the East Indies. In 1802, Parliament voted Dr. JENNER a reward of £10,000 for the discovery, and in 1807, the additional sum of £20,000; and in 1808 vaccination was taken under the protection of Government.

4. In 1809, Mr. BROWN, of Musselburgh, published the opinion that the prophylactic virtue of cow-pox diminished as the time from vaccination increased. In 1818 and '19, an epidemic small-pox pervaded Scotland, and many vaccinated persons passed through a mild form of variola. The term "modified small-pox" was now adopted. Dr. MONRO, in 1818, published a volume on "*the different kinds of small-pox, and especially on that which sometimes follows vaccination*;" and in 1820, "*An Account of the Varioloid Epidemic*" was published by Mr. THOMSON, of Edinburgh. Between this date and 1823, when I wrote on the subject, as well as subsequently to the latter year, some very remarkable cases came before me in both public and private practice, occurring in the same and in different families, proving the impairment of the protective influence of vaccination with the growth of the body, and the lapse of time, until it entirely ceased, at least in many cases, after puberty, when vaccination was performed in infancy.

5. In 1825 the Bills of Mortality announced 1300 deaths by small-pox, among whom were several persons who had been vaccinated. Small-pox was epidemic in France in 1826 and '27, and in the northern parts of Italy in 1829; and in consequence of the numbers of the vaccinated who had been attacked by small-pox more or less modified or unmodified, the practice of revaccination commenced in Prussia and the German States, and was subsequently encouraged by their governments. This practice has more recently been voluntarily adopted by many in this country.

In 1833-4, small-pox prevailed epidemically in Ceylon, when a considerable number of the vaccinated died; and it made great devastations in Hindostan on several occasions, both prior and subsequent to this date, and many of the vaccinated have been carried off by it. Dr. GREGORY states that the admissions into the Small-Pox Hospital, in 1838, more than doubled the average number received annually, prior to the discovery of vaccination, and that two fifths of the admissions consisted of persons who had been vaccinated. Many had the disease severely, and more than twenty of the number died. Recently Parliament has legislated on vaccination and small-pox, but in a way which is neither satisfactory to our profession nor beneficial to the community.

6. Having now stated, from the history and certain of the results of vaccination, what has been urged against it, and having, when treating of small-pox and variolous inoculation, noticed what appeared in favour of the latter (*see* SMALL-POX, § 104-114), it now becomes a duty to ad-

vert to the evidence which opposes what has been advanced both at this place and in that referred to. The facts evincing the failure of vaccination in many cases, and of the impairment of the protective influence of it with the growth of the body, and with the course of time, are here stated, with no disfavour to the practice of vaccination, but with a due regard to what appeared to be the truth as respects the results of this practice. When treating of variolous inoculation, I took occasion to compare the results of it with vaccination more especially as observed in Eastern and inter-tropical countries. Much of the difference and of the difficulty in this matter must be attributed to imperfect, careless, or abortive vaccination, and to the influence of small-pox, when prevailing as a severe or malignant epidemic, on persons thus imperfectly protected.

7. Among the more recent evidence in favour of the protective influence of vaccination, there is none which seems to deserve more attention than that which has been furnished by Dr. BALFOUR. His deductions have been founded on the returns of the Army, the Navy, and the Royal Military Asylum. But although these appear very favourable, they are actually not so much so as a mere glance at the tables he has given might evince; for he adds up the aggregate numbers of the several years to which he refers, and places these numbers opposite to the number of cases of small-pox. It should be premised that soldiers are all protected by vaccination, or by small-pox. Thus, from the returns forwarded annually to the Army Medical Board, during eight years, from the 1st of April, 1844, to the 31st of March, 1851, inclusive, he constructs the following table of cases of, and deaths from, small-pox, out of the aggregate strength, or rather the strength multiplied by the years:

Among troops serving in	Aggregate strength.	Cases of Small-pox.	Deaths by Small-pox.	Annual ratio per 100 of strength.	
				Cases.	Deaths.
The United Kingdom.....	251,507	557	56	2.188	.220
Temperate Colonies.....	557,112	160	29	.287	.052
Tropical Colonies.....	314,131	28	8	.089	.025
Total.....	1,125,840	745	93	.662	.083

8. This table is, however, fallacious, as the aggregate here given is not the actual number of different individuals, for the much larger proportion, if not the great majority, of the average number of troops in these eight years (140,730), are actually the same individuals enumerated again and again, or even for several years, unless the discharges and deaths have been remarkably great; while the number of cases and of deaths are the total amount furnished during the eight years from among the individuals actually serving; for it cannot be shown that during these eight years the army was formed of 1,125,840 different persons.

9. The fallacy now pointed out exists in the other tables, more especially in that giving the results as respects the Navy, and from it no correct inference can be drawn. His Report, however, of vaccination of the boys of the Royal Military Asylum is a much more important document, and this I adduce. "Of 5774 boys taken on the strength of the establishment from its opening in August, 1803, to the 31st of December last

(1851), 1950 are recorded as having marks of small-pox, 3636 marks of vaccination, and 188 no satisfactory mark of either. The last having been all vaccinated on admission, there were 1950 protected by previous small-pox, and 3824 by vaccination."

	Number over whom observations extend.	Of whom subsequently		Ratio per 1000.	
		Had Small-pox.	Died of Small-pox.	Cases.	Deaths.
Boys with marks of small-pox.....	1950	12	4	6.15	2.05
Boys with marks of vaccination.....	3824	27	..	7.06	0.00

It must be presumed that the boys leave the asylum when they reach puberty or manhood, or before this latter epoch. The results subsequently are not known, and cannot well be ascertained; and let it be remembered, that the liability to small-pox, modified or otherwise, then becomes greatest. Nor should it be overlooked that exposure to the infection of small-pox cannot be as great in garrisons and in an asylum as in the general community. Besides, when a case of small-pox occurs in either garrisons or in an asylum, it is removed to the infirmary, or other places of seclusion; whereas among the public, with few exceptions, a case, whenever it occurs, becomes a focus of infection, from which the disease spreads in all directions among the unprotected.*

10. There can be no doubt that vaccination, satisfactorily performed, with recent lymph of a proper description—the vesicles having regularly matured, without hindrance or accident, and with a sufficient number of punctures—is a most valuable protection from small-pox; and if this protection be not afforded during the whole life of the individual vaccinated, in some cases; it at least, in all, is a protection for many years, the variolous disease, when caught subsequently, notwithstanding this protection, being, with few exceptions, a comparatively mild disease—these exceptions, especially when they are fatal, still admitting of doubts as to the proper performance of vaccination, and as to the efficacy of the lymph or matter employed. It cannot, however, be denied that the protection from small-pox furnished by vaccination to persons who have been vaccinated in infancy, and have grown up, is not so fully manifested when small-pox is epidemic, as at other times; nor does it appear to be as com-

plete when vaccinated persons migrate to warm climates, and are there exposed to small-pox infection, as when they remain in temperate countries; but this requires farther inquiry.*

11. II. OF THE COW-POX IN THE COW.—This disease is not of frequent occurrence. It appears as an epidemic, and rarely or never unless where cattle are collected together in herds. It then breaks out at irregular periods, and from causes unknown. Dr. JENNER's experiments concerning it were often interrupted by its complete disappearance. Dr. JENNER at first considered that cow-pox in the cow was generally a local disorder confined to the udder; and such it has appeared to be in some, if not in many instances. Subsequent observations, however, have shown that it is really a febrile constitutional disease, accompanied with eruption, although the febrile symptoms are often not very manifest. True cow-pox shows itself on the nipple of the cow, in the form of irregular pustules, or more strictly as vesicles passing into a pustular state. At their first appearance they are commonly of a pale-blue colour, or rather of a hue approaching to livid, and surrounded by an erythematous or erysipelatous inflammation. They sometimes degenerate into phagedenic ulcers. The animal appears indisposed, and the secretion of milk is much lessened. The cow is subject to other pustular sores on the nipples, which are of the nature of common inflammatory sores, and possess no specific quality. They do not present any bluish or livid tint, or any erysipelatous redness around them. They desiccate quickly, and create no apparent constitutional disorder in the animal. Such a complaint is frequent among cows in the spring, when the calf is suckling. It was called by Dr. JENNER the spurious cow-pox.

12. *Casual cow-pox in man* is caught by milkers of affected cows, and appears on the hands and wrists in the form of inflamed spots, which go on to suppuration, forming pustules of a circular form, having elevated edges and depressed centres, and are of a colour inclining to blue. After a time absorption takes place, and swellings appear in the axilla. Fever succeeds with headache, sometimes with vomiting, and in some cases with delirium. The febrile symptoms decline in three or four days; but the sores on the hands often remain, very painful and difficult to heal for a considerable time. No eruption on the skin follows the decline of the febrile symptoms.

13. III. INOCULATED COW-POX.—i. *Regular Cow-pox*.—When vaccination has been successfully performed on a healthy child, the puncture may be felt slightly elevated on the second day; and on the third, and even on the second, a slight efflorescence may be distinctly seen, by the aid of the microscope, surrounding the inflamed

[* The above admissions cover about the whole ground claimed by the strongest advocates for vaccination. During a dispensary practice of several years among the poor of New York city, where 500 deaths annually occur from small-pox, I rarely met the disease among those unprotected by vaccination, while it was very common among others; and where it did occur among the former, it was rarely, if ever, attended with any danger. I might also appeal to my own personal experience to prove that the influence of the vaccine disease is not wholly lost at puberty; for having been vaccinated in early childhood, I took the varioloid at the age of 26, from attending a small-pox patient, and had the disease in its very mildest form, not more than half a dozen pustules appearing, and the constitutional symptoms very light. As our author concedes that the vaccine disease "is a protection for many years;" and as all concede that it protects till about the age of puberty, and that revaccination at that period restores to the constitution that exemption from small-pox which it previously enjoyed, while we have a powerful argument in favour of revaccination, we lose none of our admiration and appreciation of that great discovery, whose unspeakable value and importance time and experience only tend to confirm and establish.]

[* In the 26th volume of the *American Journal of Medical Sciences* I have described an epidemic varioloid disease, which occurred in the town of Gorham, New York, which, from the great variety in the character of the eruptions, gave rise to a warm and angry controversy among the neighbouring practitioners, some contending that the disease was small-pox, others that it was vari-cella. A majority of those attacked had been vaccinated in early infancy, and, in general, the disease assumed a milder form in proportion to the recency of the vaccination. The eruption, in different cases, had all the specific characters of *varicella*, *varioloid*, *confuent* and *distinct small-pox*, *pemphigus*, *purpura*, *erysipelas*, and even other forms of cutaneous disease. (See additions to art. "Small-pox," p. 898.)]

point. On the fifth day a distinct vesicle is formed, having an elevated edge and a depressed centre. On the eighth day it appears distended, with a clear lymph. The vesicle on this, its day of greatest perfection, is circular, and either pearl-coloured or slightly yellow. In its form and structure it resembles the pustule of small-pox. Its margin is turgid, firm, shining and wheel-shaped. It is composed of a number of cells, by the walls and floors of which the specific matter of the disease is secreted. On the evening of the eighth day, an inflamed ring begins to form around the base of the vesicle, which continues to increase during the two following days. This areola, or ring, is circular, its diameter extending from one to three inches. When at its height, on the tenth day, there is considerable hardness and swelling of the subjacent cellular tissue. On the eleventh day the areola begins to subside, leaving, as it fades, two or three concentric circles of a bluish tint. The vesicle has previously burst, and its surface acquired a brown colour. The lymph which remains becomes opaque and gradually concretes; so that about the end of the second week the vesicle is converted into a hard, round scab, of a reddish-brown colour. This scab contracts, dries, blackens, and about the twenty-first day falls off, leaving a cicatrix, which is permanent in after life, is circular, somewhat depressed, striated, and indented with six, eight, or ten minute pits, corresponding to the number of cells of which the vesicle has been composed.

14. Slight constitutional disturbance is observed about the seventh or eighth day, or sometimes a little earlier. The child is hot, restless, or feverish, and the bowels slightly disordered; but this subsides in two or three days. A few children, however, present no sign of constitutional disorder, which is not by any means essential to the success of the vaccine process. About the tenth day a papulous eruption, of a lichenous character, sometimes appears on the extremities, occasionally extending to the trunk of the body. It continues for about a week, or even lasts after the scab has fallen off. This vaccine lichen is met with chiefly in children of a full habit, where numerous vesicles had been raised on the arm, which discharge freely. It is an accidental occurrence, which, like the constitutional irritation, indicates a full effect of vaccination on the system; neither the one nor the other, however, being deemed requisite to ensure such effect.

15. In adults, vaccination exhibits the same succession of phenomena as in infants. The vesicles, however, are thinner and more easily ruptured. The lymph is usually of a yellowish tinge, and the areola is more extensive. The glands of the axilla frequently swell, which is rarely observed in children; and constitutional irritation is more frequent and greater. Secondary lichen is less frequent and less marked. Dr. HEIM, of Ludwigsburg, considers that the adult lymph is more energetic than infantile lymph, but this requires farther investigation.

16. ii. *The irregular or anomalous Vaccine Vesicle.*—The above normal course of the vaccine vesicle is liable to be disturbed in various ways, and by various causes. Imperfect vaccination presents no uniform sign, but exhibits different appearances in different cases, such as pustules, ulcerations, scabs, and irregular vesicles. The

irregular vesicle is attended at its commencement by urgent itching; provoking scratching or rubbing, to which the subsequent appearances are unjustly attributed. The vesicle throws out a premature efflorescence, and advances too rapidly; so that on the fifth day it has attained its height, when it will be found raised on a hard inflamed base. "It is acuminate, or conoidal, and gives the appearance of a common festering sore produced by a thorn." It is generally of a straw colour, and contains some opaque matter or pus, instead of a clear transparent lymph. The scab produced by it is small, of an amber colour, and drops off by the tenth day.

[We believe that too little attention is paid to these irregularities and anomalies. Where the vesicle has been broken, so that the characteristic marks of the disease are wanting, where the local inflammation is very severe and results in the formation of pus, where there is a papular eruption over the body of the child, where, especially, the operation is followed immediately, or, in a day or two, by a pustule, without a previous vesicle, irregular in shape, yellow in colour, acuminate, easily broken, and terminating in a soft, yellowish, ragged-looking crust, falling off on the fifth, sixth, or seventh day, no confidence should be placed in the genuineness of the disease, and revaccination should be performed at an early period. Too much caution cannot be observed in this regard. We believe that the spurious forms of cow-pox are by no means uncommon in this country, and that to this cause must chiefly be attributed the loss of confidence in this prophylactic, and the still-lurking preference of some for inoculation over vaccination. These irregular forms, it is true, are very common in cases of revaccination; but this only proves that the influence of the former vaccination is still experienced, and that the system is still protected from small-pox. There are *two kinds* of spurious vesicles; the *first* bears a strong resemblance to the true in many respects; its edges are commonly elevated, its contents nearly limpid, and it continues the usual time; but it commences with a creeping scab of a pale-brown or amber colour, making a long, slow progress, sometimes unattended by any efflorescence; the vesicle is more transparent, and the pellicle is generally thinner and easily torn. The *second kind* appears early and increases rapidly; is elevated in the centre, and globular, with more or less the appearance of a common phlegmon, and when punctured, there issues opaque fluid, resembling what is produced in any other festering sore. It is more easily ruptured; at the sixth or seventh day, it generally runs into a perfectly purulent state. The areola is irregular or notched, resembling a large blotch; has a fiery or livid aspect; is not shaded off into the surrounding skin; seems rather to be under than upon its surface, while, at the same time, it is less extensive, nor is the hardness around it so evident; a ragged scab prematurely covers the vesicle, or, when the black crust should form, a yellowish sore appears, drying and breaking out again, with an oozing from under it.

Imperfect vesicles are, in general, smaller and more globular than the true kine-pock; they have not the turgid, convex margin, but a somewhat punctured base appearing to slope off into the surrounding skin; they have not a cellular structure; the contents are not a clear transparent

lymph, but a straw-coloured, opaque, or purulent fluid; the areola not defined, nor of so vivid a rose tint, but ragged and diffuse, appearing about the seventh or eighth day, or earlier; on the fifth or sixth, of a dark red colour, with less hardness than the true areola, and disappearing sooner; the succeeding crust is smaller, of a light-brown or amber colour, irregular and friable, forms earlier, separates sooner, and leaves an indistinct and not pitted cicatrix.*]

17. The causes of this abortive or irregular vesicle are not well ascertained. Sometimes the bad quality of the lymph employed may occasion the irregular vesicle, three or four children, or more, vaccinated from the same source, exhibiting the same irregular appearances. Dr. GREGORY supposed that it might arise from the influence of weather or season, as he observed it in many more cases on the approach of winter than in the spring or summer. Some believe that this irregularity arises from the use of lymph taken at too late a period of the disease. But although lymph taken after the tenth day will often fail to reproduce vaccinia, yet when it does succeed, the vesicle goes regularly through its course, and is perfectly effective in preserving from small-pox. Besides, the scabs of cow-pox, moistened with a little lukewarm water, will often produce the disease in all its purity.

18. Irregularity of the vaccine vesicle is sometimes attributable to a bad habit of body. "The proof is, that one child only out of many vaccinated with the same lymph, shall show the anomalous form of cow-pox. It is a singular but very important fact, that an imperfect vesicle, the offspring of a perfect one, degenerated by some peculiarity of habit in the individual vaccinated, shall sometimes reappear in all its original purity and perfection, when transplanted into a healthy, well-disposed subject."

19. In some instances the specific inflammation, or areola, is very severe, extends from the shoulder to the elbow, or even invades the trunk, requiring recourse to cold lotions, active purgatives, and febrifuges. The vesicle, instead of scabbing in the natural way, is converted into an ulcer, discharging freely. The inflammation thus arising is, however, only temporary; and, if it have commenced at its proper period, it does not appear to weaken, or in any degree to interfere with the protective virtue of the vaccination. The vesicle about the fifth or sixth day occasionally becomes scaly; a species of psoriasis taking the place of the areola. In a few other cases true erysipelas supervenes. These anomalies deprive the cow-pox operation of all claim to protective influence. A much more frequent and successful anomaly is retarded cow-pox; the advance of the vesicle being without any apparent cause suspended. The areola does not form before the tenth or twelfth, but ultimately the process is completed, the success of the vaccination being in no degree prejudiced.

20. iii. *Complications of Cow-pox.*—A child is sometimes vaccinated after having been infected by measles or scarlatina, and before their respective eruptions have appeared. In such cases the cow-pox is generally retarded. In a case recorded by Dr. GREGORY, it was retarded sixteen days while the measles ran their course. Genuine chicken-pox (*varicella lymphatica*) will run its course along with cow-pox, without interfering

with any of its phenomena. The modifications which cow-pox undergoes when small-pox invades the system about the same time, are interesting. When vaccination is performed during the incubative stage of casual small-pox, this latter being yet latent, the vaccine vesicle either does not advance, or advances tardily and imperfectly. Sometimes, however, cow-pox and casual small-pox may be seen running their full course in the same person at the same time. In no case, however, does the cow-pox so inserted modify the course of the small-pox. When the variolous and vaccine fluids are inoculated on the same day each disease occasionally proceeds, preserving its original character. In some cases, however, they mutually restrain and modify each other. The vaccine vesicle in these is smaller than usual and irregular in its progress, while the variolous pustules which follow are of the kind termed *variola verrucosa*, or commonly swine-pock, stone-pock, or horn-pock (see *art. CHICKEN-POX*, § 2, *et seq.*); are hard and shining, surrounded by little inflammation, and suppurate imperfectly; the little matter they contain being absorbed, leaving the cuticle hard and elevated for some days afterward. The eruption on the extremities does not pustulate, but is papulous, minute, and terminates by desquamation. Although the eruption be modified in most cases, there is generally considerable disturbance of the constitution under the joint influence of the variolous and vaccine poisons.

21. When vaccination precedes variolous inoculation by a period not exceeding four days, both diseases advance locally. "Sometimes an eruption of small-pox papulæ follows. At other times the variolous fever is slight, and unaccompanied by eruption. Under these circumstances, matter taken from the primary vesicles shall sometimes communicate cow-pock and small-pox respectively; but more commonly the variolous poison predominates, and contaminates the lymph of the vaccine vesicle." Variolous inoculation at any period not exceeding a week from the date of vaccination will take effect and be followed by a pustule: after that time no effect is produced. Dr. WOODVILLE on several occasions inoculated with a mixture of variolous and vaccine matter. The result was not to be depended upon, but in general pure small-pox succeeded. When small-pox inoculation precedes by three or four days the insertion of vaccine lymph, the vaccination advances, but after the tenth day the fluid in the vaccine vesicle becomes purulent, and in that state will communicate small-pox. Those who have undergone variolous inoculation in early life are generally unsuceptible of cow-pox. Vaccination, however, in such circumstances produces a certain degree of effect, the disorder manifesting itself in an imperfect and modified form. The fluid in the resulting vesicles cannot be trusted to for producing the genuine cow-pox.

22. iv. *Recurrent Cow-pox.*—When cow-pox has completed its regular course, the constitution is left, for a very considerable time at least, unsuceptible of the same disorder. But this law does not obtain if the revaccination is performed at very short or at very distant intervals: (a) At a very short interval, or on the fourth, fifth, or sixth day after a regular primary vaccination, the vesicles of the second vaccination are accelerated in their course, so as to overtake the first crop, and the whole mature and scab together. The

* See Labatt on Cow-pox, p. 90.

second crop of vesicles, however, is not more than one fourth the normal size, and the areola is equally contracted. Mr. BRYCE (*On Cow-pox*, Edin., 1802) ingeniously availed himself of this circumstance, and, by testing by revaccination on the fifth day, he endeavoured to ascertain the full influence and actual security of vaccination. The plan, well known as BRYCE's test, has been extensively adopted. To obtain this test in greatest perfection, he advises the revaccination to be performed at the end of the fifth or beginning of the sixth day; and if no acceleration of the second crop of vesicles be observed, it is to be concluded that no constitutional effect has resulted from the first vaccination. The second is then to be regarded as the primary affection, which, in its turn, is to be tested by a third vaccination, and so on until we are satisfied that the constitutional effect has been fully produced. Dr. GREGORY adds, that "some persons have claimed for this suggestion the highest honour, and have even considered Dr. JENNER's discovery as incomplete without it. Dr. JENNER, however, never laid much stress upon it. In doubtful cases it is a prudent practice, but it has been extolled far beyond its real merits. It shows whether or not constitutional influence has been exerted by the primary vesicle, but it does not determine what has been the degree of such influence—in other words, it does not show whether the constitutional effect has been complete or otherwise."

23. (b) Revaccination at distant intervals from the date of primary vaccination, is deserving of notice. Dr. JENNER, in his original essays, stated that the human body, after a time, had the susceptibility of cow-pox renewed. Dr. GREGORY describes four different effects of revaccination at distant intervals: 1st. In many cases, especially if the interval from the primary to the secondary vaccination has not exceeded five years, the skin appears completely insensible to the vaccine matter; 2d. At intervals exceeding ten years, the virus irritates locally. In three, or at farthest four days from insertion, an areola of irregular shape appears around a minute, itching, acuminated, and angry vesicle. The glands of the axilla frequently swell; and in particular habits of body, especially in adult females, irritative fever is superinduced. A scab forms on the eighth day, which soon falls off, leaving no permanent cicatrix; 3d. In other cases, a vesicle forms more gradually, without either local or constitutional irritation; a slight areola succeeds, and the vesicle yields, on the seventh day, a considerable quantity of thin lymph; but this lymph is incapable of propagating the disease; 4th. In this set of cases, the second vaccination runs a perfectly regular course. A circular areola forms on the eighth day, and the lymph propagates a genuine cow-pox.

24. IV. NATURE OF VACCINIA.—*The Identity of Vaccine and Variolous Disease.*—When Dr. JENNER announced vaccination as an antidote to small-pox, he was strongly impressed with the idea of the common origin of human and epizootic maladies; and, conformably with this idea, he viewed small-pox as the most remarkable malady which equally affects man and the higher animals; and that this malady, in its less malignant forms, assumes the form of cow-pox, chicken-pox, and swine-pox. This, however, had been long a vulgar opinion, and is somewhat analogous to the view I stated when treating of scarlet

fever, which, I remarked, had appeared within the last three hundred years, and was derived from a similar disease in the horse. JENNER believed not only that small-pox and cow-pox were essentially the same disease, but that the former was a malignant variety of the latter, the parental malady being the cow-pox. This opinion was expressed by the term *variola vaccina*, the name he gave cow-pox, when first introduced to the notice of the scientific community. The researches of Mr. CEELY have more recently confirmed the intimate connexion Dr. JENNER contended for between cow-pox and small-pox; inasmuch as he has shown that the inoculation of the cow with variolous matter produces in that animal the true vaccine or cow-pox; and that inoculation of the human subject with the vaccine matter thus generated in the cow from variolous inoculation propagates genuine cow-pox in man. He has farther adduced some facts, which, however, require farther investigation, but which appear to prove the origin of the cow-pox, or vaccinia, in the infection of the cow by small-pox when occurring epidemically or sporadically in human subjects. Among other observations, Mr. CEELY states that he went to examine some cows affected with cow-pox; and that their proprietor, Mr. POLLARD, "at the same time, expressed his conviction that his cows had been infected from human small-pox effluvia, to which he considered they had been exposed."

25. The above facts, although scanty as they are, go to prove the following: 1st. That cow-pox originates in small-pox infection or contagion caught by the cow; 2d. That the infection of the cow by small-pox gives rise to vaccinia—an eruption which resembles the pustule of small-pox, but which cannot communicate small-pox, although it propagates itself as true vaccinia; 3d. That, unlike, or differing from, variola or small-pox, vaccinia is not communicated, at least from the cow to man, or from one human subject to another, by an effluvia or emanation proceeding from the affected at any stage of its course; 4th. That, like variolous inoculation, vaccination is capable, when properly conducted, of protecting from small-pox, with few exceptions, and at least for a considerable time; 5th. That the amount of evidence favours the opinion that vaccinia is a modification of variola, the modification proceeding from the virus of the latter having infected the cow, and occasioned the vaccine eruption; 6th. That the amount of evidence also favours the inference that vaccination protects, at least in many instances, from small-pox only for an indefinite time, and that the length of that time is indeterminate or indeterminable; 7th. That the duration of the protection may depend upon climate and various unascertained circumstances, and that there is reason to infer that, in such cases and circumstances where the protection fails after several or many years, the impairment of the protective influence is gradual, and progressive with the duration of time.

26. From the foregoing it will be seen that, while I believe, with Dr. JENNER, in the intimate connexion of variola with vaccinia, and with chicken-pox and swine-pox, yet we have no proof that variola has sprung from cow-pox; the evidence being in favour rather of cow-pox, and the other kinds of pox being varieties or species of small-pox, arising out of the passage of this latter malady through the higher of the lower animals—more conclusively of the passage of the variolous

morbid poison through the cow, as respects vaccinia.

27. Such appears to be the relation subsisting between cow-pox in the human subject and in the cow and small-pox; it may next be inquired what connexion exists between *vaccinia* in the cow and the *grease* in horses. Dr. JENNER believed that they were both identical, and that cow-pox never occurs in dairy districts, except where there is access to horses; he thereby denied the spontaneous origin of the disease in the cow. Later observations have, however, proved not only the identity of cow-pox and grease, but have shown, at the same time, first, that cow-pox does originate in the cow without access to horses; and, secondly, that cow-pox is communicable to man from the horse without the intervention of the cow, and with nearly equal facility as from the cow itself. Dr. GREGORY states that this branch of the theory of vaccination has been investigated with great diligence by Dr. LOY, of Whitby, Dr. SACCO, of Milan, and Dr. DE CARRO, of Vienna. The last-named author states, "that the matter in use at Vienna from 1799 to 1825 was partly British vaccine, and partly originated from the grease of a horse at Milan without the intervention of the cow. The effect was so similar in every respect that they were soon mixed; that is to say, that after several generations, and in the hands of innumerable practitioners, it was impossible to distinguish what was vaccine, and what was equine." "The whole British settlements," he adds, "were *equinated*; for the first liquid drop sent thither was the second generation of Milanese equine, or greasy matter, transplanted at Vienna." It cannot be inferred that the grease in horses was the origin of variola; and there is as little evidence of the grease having caused vaccinia in the cow, as there is of the latter having produced the former. It is, therefore, by no means improbable that both vaccinia and grease, being capable of communicating and propagating an identical affection, viz., that commonly called cow-pox, to human subjects in endless succession, are variola modified in its manifestations and properties by its passage through these two species of animals. The grease of horses, being proved, or admitted, conformably with the above evidence, to communicate and propagate an affection in every respect identical with vaccinia, the same inferences which I have deduced respecting this latter, apply also to it, if, indeed, this branch of the subject of vaccination be not viewed as still requiring farther investigation, more especially as respects the protective influence of the affection propagated from the grease in horses.

[If the researches of Dr. GEORGE GREGORY ("Med. Chir. Trans.," vol. iv., N. S.) are to be relied on, the morbid secretions of the cow, which possess the power of protecting the human system against the assaults of small-pox, may be produced in that animal in *four different modes*. 1st. They are generated spontaneously in the cow, under certain circumstances of soil, season, and locality, and are often met with in cows soon after parturition, in the spring season, and when feeding upon young grass; but they arise also spontaneously from other and less known causes, and the disorder spreads like other epizootic maladies. It was this form of vaccine disease JENNER chiefly studied.

2d. The very same malady, developing the very

same morbid secretion, is often observed to spread *by contagion*, that is, by the application of the diseased secretion, thus generated, to the teats of healthy cows, differently circumstanced, by the hands of the milker.

3d. The same morbid secretion, possessed of the same qualities, is often generated in the teats of the cow by the application to them of the matter formed by the heel of the horse, when affected with the disorder called "*the grease*." This *greasy matter* may also be transplanted to man directly, without the intervention of the cow, proving that the anti-variola property does not depend on any peculiar change which the virus undergoes in passing through that animal.

4th. The same morbid secretion may be excited artificially in the cow by applying to the teats, or the mucous surfaces of the vagina, vaccine lymph from the arm of a child, even though twenty years had elapsed since that lymph had been humanized or assimilated to the human constitution.

5th. To these four modes of exciting a morbid secretion in the cow, called *vaccinia*, Mr. CERLY has added a *fifth*, by showing that the same object may be attained by applying to the mucous surfaces of the cow the matter of human small-pox. The vessels of the part are excited to the production of a fluid or humour, identical in all its properties with that which arises from a constitutional and febrile disturbance of the cow's system from contagion, from the matter of *grease*, or the long-humanized vaccine virus.

Dr. GREGORY supposes that other modes of exciting this morbid secretion in the cow exist, which may yet be discovered, and that we are not justified in concluding that the last mode mentioned is the most important, or as affording the true clue to the mystery of vaccine protection. This writer also contends that, as *vaccinia* is non-contagious, and febrile disturbance is not essential to its perfect development, the *vaccine* is probably a poison *sui generis*, and its relation to variola still hypothetical; that the real and intimate nature of the protection it affords is still unknown to us; and that a thorough knowledge of its anti-variola powers must be derived not from analogy, but from an extended and careful observation of facts, continued through a long series of years.]

28. V. PROTECTIVE INFLUENCE OF COW-POX.—This subject has occasioned much discussion during the last quarter of a century, and more especially during the last few years; and the amount of protection which cow-pox affords against small-pox has been often entertained, but as yet by no means satisfactorily ascertained.—*a*. There are various circumstances which render it most difficult to determine this question; for the idiosyncrasy of some individuals seems to oppose infection by the vaccine virus, either for a time or through life; and, if such an insusceptibility of the disease be admitted, it may be farther inferred that in others, the insusceptibility being less, the vaccine infection may be incomplete, and the protection afforded be proportionately imperfect. It may be conceded that, where the disposition in the constitution to receive the vaccine infection is either wanting or incomplete, the protection must be equally deficient; and hence, to estimate the protective influence of vaccination, it must be considered that the process has not been duly completed, and that no protective influence can be claimed from it, unless the vaccine vesicles and the local phenomena proceed regularly, and leave

a cicatrix, as described above. But, independently of the indisposition of the constitution to receive the vaccine disease, or of the disposition to receive it imperfectly, the health of the individual, and the state of the season or weather, may render vaccine infection either abortive or incomplete. It has been proved that attempts to vaccinate have often failed in hot countries, and in the warm localities of temperate climates, during hot and dry states of the atmosphere; and a similar temporary insusceptibility to small-pox inoculation, during the same state of atmosphere, has been observed. The impaired health of a person also may render him insusceptible of vaccination, until his health is restored; and various unascertained circumstances may have the same effect, either permanently or for a time. It may be inferred, all things being considered, that, where an insusceptibility to vaccination exists, an equal indisposition to small-pox may be expected; but, as a rule, there may be many exceptions to this, and it would be unwise to confide in it.

29. *b.* Besides circumstances more immediately connected with the individual, there are others depending upon the virus itself. The vaccine lymph may be deteriorated by long-keeping, or by a warm and humid, or a very warm and dry atmosphere, if it be even for a short time exposed to these states of the air. It may also be either inert, or imperfect in its operation and constitutional as well as local effects, owing to its having been taken from the vaccine vesicles at a too early, or a too late stage of the process of maturation, as already noticed (§ 17); or even to its having been too long kept, or to its insufficient protection from the action of the atmosphere. The manner in which the inoculation of cow-pox is performed—or the efficient or imperfect operation of inoculation—may in some way also affect the results. The number of the incisions or punctures, and the actual deposit of the virus within the sphere of the action of the absorbents or veins, may not merely produce either a full and satisfactory effect, or no effect at all, but also an imperfect or an insufficiently protective effect.

30. *c.* *Imperfect vaccination* has been referred to a variety of causes. It has been very generally supposed that the vaccine virus becomes deteriorated by its passage through numerous human bodies, or that the protective influence is weakened by the length of time, and the long succession of subjects through whom it has been perpetuated, from its direct inoculation from the cow. Of this, however, there appears to be insufficient proof. It has been remarked, that persons who have been vaccinated by Dr. JENNER himself, before deterioration could possibly have commenced, have nevertheless been attacked by small-pox in after-life. A recent writer remarks, that, "so far from believing in any deterioration of virus from successive inoculation, there is reason to believe that, by a careful selection of well-predisposed children, the pock may even be restored from an imperfect to a perfect state, and by proper care, therefore, may be retained indefinitely in that condition. If children are successively vaccinated from each other, all of whom are from various causes ill disposed to take on the perfect disease, the virus may unquestionably degenerate, and at length wear out altogether. In tropical countries, and in confined localities, such an occurrence certainly takes place, but this is very different from

the notion of a virus deteriorated by the mere influence of time."

31. *d.* *Imperfect vaccination*, as a cause of failure of protection from small-pox, was much insisted on by Dr. JENNER. Vaccination is said to be imperfect when any considerable deviation from the ordinary course of the vaccine vesicles takes place. The deviations from perfect vaccination are imputed to one or more of the following causes: 1st. To spurious matter, or matter taken from the arm at an improper period of the process; 2d. To an insufficient number of vaccine vesicles; 3d. To preoccupation of the skin by some disease, in which a fluid is exuded capable of conversion into a scab, such as tetter, scald-head, ringworm, erysipelas, &c.; 4th. To robbing the vesicle incautiously of its contents, particularly when one only has come to maturity; 5th. External violence done to the vesicle, as rubbing or scratching it, especially during its early stages. That causes may, and often do, interfere with the success of the vaccine process, cannot be doubted; but the influence imputed to them cannot be determined; for it has been proved, by very few instances, it should be admitted, that vaccination, which, according to all indications, should have been considered perfect, has afforded only imperfect or only temporary security; while, on the other hand, cases in which one or other of the above causes has interrupted the regular process, have notwithstanding afforded perfect security. The instances in which single vesicles have preserved from small-pox, both casually and by inoculation, Dr. GREGORY states to be so numerous that no reliance can be placed on the notion which would connect the security of the individual with the number of maturing vesicles. A case of small-pox after vaccination will sometimes occur in a member of a family, all of whom have been vaccinated in the same manner, by the same practitioner, and having similar marks on the arm, and equally exposed to contagion, that one alone having become infected. It should also be recollected that vaccination under the same circumstances, especially of the members of the same family, may, upon exposure to small-pox infection, be followed by this malady, in its various grades of modification, according to the time that has elapsed from vaccination. It has even been ascertained that persons have caught small-pox after having been subjected to BRUCE's test of the perfect constitutional affection of the original vaccination. It should, however, be recollected that these are merely exceptions to the general rule of protection; and as exceptions have attracted greater attention than those which prove the rule.

32. *e.* *The presumed decadence of vaccine influence and protection* has been believed by many from an early period of the history of vaccination. Dr. JENNER, in his third publication, in 1800, remarked that there were some "who suppose that the security from small-pox, obtained through cow-pox, will be of a temporary nature only. This supposition is refuted not only by analogy with the habits of diseases of a similar nature, but by incontrovertible facts, which appear in great numbers against it." That analogy may be considered opposed to this supposition may be allowed, although the analogy is neither very close nor very conclusive; but the facts opposed to it were certainly neither strong nor very manifest, inasmuch as time, the necessary element of

their manifestation, had not then elapsed. That Dr. JENNER was, however, convinced, or at least most sanguine in this matter, is shown in his petition to Parliament, where he states that his discovery had the "beneficial effect of rendering, through life, the person inoculated with it perfectly secure from the infection of small-pox." He rested his arguments as to the permanency of the protection of vaccination upon his belief, which subsequent researches have proved to be well founded, in the identity of vaccinia and variola; but, even granting the identity, a very marked modification of the former from the latter, by the passage of the poison through the body of the cow, must be admitted, the result being a conversion of a frequently malignant and generally severe malady, into a mild disorder. Are we, therefore, from the mere admission of identity thus modified, to infer protection by means of the milder form of disorder? May it not be as justly inferred, that whatever protection is actually afforded by the milder form of the disease may possibly be sometimes overcome by the contagion of the more severe malady? and that the protection of the former, being weaker or milder than that furnished by the latter, may not be so enduring, especially in some constitutions and circumstances, and more particularly if the process of vaccination has not been perfect or complete in all respects.*

33. It was admitted by Dr. JENNER, Dr. WILLAN, and others, who believed in the permanency of vaccine protection, that, when the vaccine process has been imperfectly gone through, and when, from some peculiarity of constitution, the system receives only a portion of, or is insufficiently imbued with, that protective influence which cow-pox is capable of imparting, then "small-pox would recur, and thus the degree in which its phenomena were modified was proportioned to the degree of perfection which the vaccine vesicle assumed during its development."†

34. This partial protection from small-pox, admitted in the circumstances just stated, has, however, been extended by many to the more perfect processes of vaccination; and there are many medical men and others who believe that the protection is complete only for seven, or ten, or fourteen, or twenty-one years; but that the small-pox caught after vaccination is modified in proportion to the shortness of the time which has elapsed from vaccination; and that, after the longest of these periods, little or no modification is observed. This opinion has manifestly been pushed too far; for it cannot be correctly inferred that these facts,

which have undoubtedly been often observed, especially in certain families and persons, in whom peculiarity of constitution, irregularities or imperfections in the vaccine process and other circumstances, tending to account for the imperfect or non-permanent protection, by any means prove that such imperfect protection exists in all cases, or even in a very large minority of cases. The circumstances which secure the desired protection, or which weaken it, or even destroy it altogether, are as yet not known with sufficient precision, and are such as admit of very different opinions, being undetermined on this very important matter. It need only be inferred that the vaccine process should be studied, so as to secure its perfection as far as possible, and in this state that it should be generally practised with the belief that, although not an undoubted, or an universal, or always a permanent protection from small-pox, it nevertheless proves a permanent protection in the great majority of instances, and that, where the protection fails, it renders in the vast majority the small-pox a comparatively mild disease.

35. It has been attempted to calculate the proportion of the vaccinated who take small-pox. On this topic it is impossible to arrive at any approximation to the true result. The degree of severity of a small-pox epidemic, occurring in a community containing many vaccinated persons, may be expected to influence the result. Dr. CROSSE, in his account of the variolous epidemic of Norwich, in 1819, stated "that of the vaccinated, not more than one in twenty will be in any way affected by the most intimate exposure to small-pox contagion; and less than one in fifty will have the disease in a form answering to the generally received descriptions of modified small-pox." These calculations may have been justified by the epidemic in 1819; but they cannot be viewed as applicable to other circumstances, and more especially to later periods in the history of vaccination and of small-pox prevalence. This is one of the many instances in which statistics cannot be confided in when applied to disease.

[Owing to the large number of unvaccinated immigrants into the city of New-York, and perhaps other causes, the number of deaths from small-pox in this city has been for several years gradually on the increase. The following are the number of fatal cases of this disease for the corresponding years, taken from the city inspector's reports:]

Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.
1804	103	1813	2	1822	00	1831	224	1839	68	1847	53
1805	6	1814	2	1823	18	1832	8	1840	232	1848	544
1806	48	1815	94	1824	394	1833	25	1841	200	1849	326
1807	59	1816	197	1825	40	1834	233	1842	181	1850	231
1808	6	1817	14	1826	58	1835	358	1843	117	1851	562
1809	66	1818	1	1827	149	1836	173	1844	21	1852	47
1810	4	1819	00	1828	93	1837	164	1845	425	1853	656
1811	117	1820	00	1829	16	1838	91	1846	146	1854	
1812	21	1821	00	1830	176						

Perhaps this increase in the number of deaths by small-pox out of proportion to the increase of population may be owing more to some general epidemic or atmospheric, or other cause, than the failure in the protective powers of vaccinia, inasmuch as we find also a great and corresponding increase in the number of deaths from scarlet fever in the same city, as follows:

[* For this reason, laws against inoculation exist in most of the New England and Middle States, and ought to exist in all.]

[† When we consider the numerous causes which modify the vaccine process, and may cause a failure in the vaccinating process, we shall not be surprised at the frequent occurrence of small-pox, or varioloid, among the vaccinated. Among the causes which modify the protective powers of vaccinia, Dr. GREGORY enumerates *puberty, change of climate, a severe attack of fever, and an epidemic constitution of the season*. Among the former may be reckoned, as most common, the employment of virus before it has undergone sufficient elaboration, the absence of constitutional affection from rupture of the vesicle, and certain individual idiosyncrasies. There is no reason whatever for supposing that vaccine virus deteriorates by passing through numerous human bodies; for the vaccine vesicle of JENNER is the true vaccine vesicle of to-day, and the distinctive signs by which its incubation and progress are marked are the same now as they were then.]

Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.	Year.	No. of Deaths.
1827	4	1832	221	1837	57	1842	4	1847	142	1852	613		
18	11	1833	179	1838	25	1843	228	1848	93	1853	454		
1829	183	1834	418	1839	153	1844	227	1849	266	1854			
1830	246	1835	174	1840	3	1845	63	1850	311	1855			
1831	258	1836	202	1841	36	1846	114	1851	627	1856			

36. VI. SMALL-POX AFTER VACCINATION.—I have adverted to this topic when treating of SMALL-POX (§ 38), but I may make a few remarks respecting it which were then omitted. Variola, as it occurs after vaccination, is generally a mild disease. The pustules are usually small, hard, and tuberculated, few of them maturing perfectly. Yet the small quantity of matter they do contain commonly produces small-pox in others; and the exhalation from the affected also communicates the disease.* This modified state of variola is not usually followed by pits or scars. Cases of much greater severity do, however, occur, and even assume the worst of confluent forms, or terminate fatally, as I have observed on several occasions. In some instances, a fatal termination may be imputed to the accompanying or secondary fever of small-pox attacking a delicate or scrofulous frame—or persons advanced in life, of a plethoric habit, or affected by some visceral disease—or those predisposed to, or actually labouring under, pulmonary or other maladies. In such case the physician perceives the true source of the fatal result, while the friends of the patient impute the event to small-pox. Soon after vaccination was introduced, cases of failure were imputed to imperfections in the vaccine process in these cases; and not unfrequently the varioloid disease which followed was so slight as to induce doubts of its nature; and very probably there were sometimes grounds for entertaining the skepticism. But with the lapse of time, facts, proving the failure of the protective influence, became more numerous, and were observed most frequently among adults. Dr. GREGORY, who was for many years physician to the small-pox hospital, states that "very few children have been received into the hospital under such circumstances (after vaccination); and those few have invariably had a mild disease, more allied to chicken-pox

than to small-pox: whereas all the severe cases, and the greater proportion of the mild ones, have occurred in adults, in whom an interval varying from 10 to 30 years (the average eighteen) had elapsed since the date of vaccination."

[Dr. STEWART (*Ed. Med. and Surg. Jour.*, 1840) maintains, 1st. That vaccination affords an imperfect protection from small-pox at all periods of life; 2d. That the protection becomes more imperfect as the individual advances in life; 3d. That at the age of puberty the influence of vaccination (provided it has been had recourse to in infancy) nearly ceases—at any rate, in the majority of cases, at the age of 20, vaccination, he thinks, ceases to exert any protective influence whatever. These conclusions, it is stated, are confirmed by Dr. GREGORY, of the London small-pox hospital, in a letter to the author.

The benefits, however, of vaccination in protecting against attacks of small-pox will be very manifest when we look at the record of orphan asylums, and other institutions for the receptancy of children, where the greatest care is bestowed on vaccination. In the orphan asylum of Charleston, S. C., which in 1829 contained 150 children, not a single case of small-pox or varioloid occurred during the prevalence of that disease, though no additional restriction was imposed upon their intercourse with the citizens. (*Am. Jour. Med. Sci.*, Nov., 1831.)

Over one thousand children were received into the different orphan asylums of Philadelphia up to 1841, and of the whole *one* only died of small-pox, although 65 cases of the disease occurred. Ten of these had no cicatrix, including the one that died, and probably had never been vaccinated.

Of several thousand children received in the different orphan asylums of New York since their foundation, no deaths have occurred from small-pox, although the varioloid has broken out at different times, in a light form, in several of them. The same is true of the New York House of Refuge, which had received 2657 children up to the year 1845.

Baltimore presents the like return, out of 3500 children that have been inmates of the Almshouse and different orphan asylums of that city. Thus we have an aggregate of over 11,000 children under 14 in these different institutions, and but *one* death from small-pox. Thus 5856 children were received into the New York Almshouse, from Nov. 1st, 1834, to May 1st, 1843, and though the varioloid prevailed extensively in that institution during that period, there were but *eight* deaths from it among the whole number; total, 16,000 children vaccinated, 8 deaths. Compare this with the mortuary statistics of Glasgow in former times. From Sept., 1671, to April, 1672, there were 800 deaths from small-pox in that city, with a population of 13,000. At the present time, with a population of over 250,000, the cases of this disease which prove mortal do not amount annually to one sixteenth part of the number which then occurred in one third of the time, among a population about one twentieth as large as at present.

During the prevalence of a most malignant and fatal small-pox in Philadelphia, in 1827, but *one* well-ascertained death from that disease was discovered to have occurred among 80,000 vaccinated persons. According to Drs. MITCHELL and BELL (*Report to Med. Soc. of Phil.*), of 248 cases of variola and varioloid treated at the small-pox hospital of that city, 155 were unprotected, of

[* The late Dr. FORRY found a higher ratio of successful vaccinations among those who had previously had small-pox than among those who had been simply vaccinated. Thus, of those who had been vaccinated, there were 141 successful, and 364 unsuccessful cases; 55 imperfect. Of 74 who had had small-pox previously, 29 were successful vaccinations, and 45 failures. Of 52 who had not been vaccinated, 25 were successful, and 27 failures. Total, 686. Thus he found that the successful vaccinations among those who had had small-pox amounted to 1 in every 2½, while in the revaccinations this ratio is only 1 in 4. So, also, Dr. JOHN DAVY (*Malta Statistics*) shows that, although the influence of vaccination in preventing small-pox was less than that of small-pox itself in preventing a second attack, yet of those attacked by small-pox after having been vaccinated, the mortality was only 4.2 per cent., while the cases of recurrent small-pox gave a mortality as high as 9.3 per cent. So, also, at the small-pox hospital of Philadelphia, in 1823, '24, Drs. MITCHELL and BELL report but a single death out of 64 vaccinated; 3 died out of 9 who had been inoculated with variola; 3 died out of 7 who had had small-pox before; and of 155 wholly unprotected, 85 died. So of 14,470 persons who were attacked with small-pox while it prevailed as an epidemic in France, in 1840, 1688 died; out of 24 cases of recurrent small-pox, 3 died; while out of 403 persons attacked subsequent to vaccination, but 6 cases proved fatal! proving that, while small-pox has a mortality among the unprotected of 1 in 8½, the varioloid affection is generally mild, seldom destroying more than 1 in 100.]

whom 85 died; 64 were vaccinated, of whom only one died; 9 were inoculated, of whom 3 died; 7 who had had small-pox before, of whom 3 died; and of the 13 whose condition was unknown, none died.]

37. VII. OPERATIVE MEASURES.—*A. The performance of vaccination*, although a simple, is a nice operation, requiring much attention to several circumstances. Care should be taken to avoid a failure, as it often causes a delay, or a neglect of the repetition of the operation. Failures arise chiefly, 1st. From the selection of the lymph; 2d. From the mode of operating; and, 3d. From the constitution or state of health of the individual operated upon.—*a.* The vaccine lymph should be recent, if it can be obtained in this state. It should be perfectly clear and limpid, and the earlier it is taken from the vesicle the better. Lymph may be taken with every prospect of success after the fifth day, and up to the eighth and ninth days. That taken on the tenth day should not be confided in. When vesicles are too often or too roughly opened, on the seventh or eighth day, the serum of the blood may commingle with the lymph, and impair, or even altogether destroy, the efficacy of the latter. A vesicle should always be treated gently.—*b.* The lancet used in the operation ought to be clean and sharp. A vaccinating lancet should have a broad shoulder, as well as a sharp point, to enable it to retain an adequate portion of virus. The skin should be kept tense during the operation, and six or eight punctures be made at convenient distances from each other, and to a slight depth. Provided that a genuine lymph of due intensity comes in contact with the absorbing surface of the cutis vera, it matters not whether much or little blood flows from the punctures. The quantity of blood that escapes depends more upon the child's habit of body than on the operator. A plethoric child generally bleeds freely when vaccinated, but generally exhibits the most perfect appearances as to the effect.—*c.* The child operated upon should be in perfect health. Vaccination ought to be delayed during the existence of any disease—at the period of dentition—when the skin is affected by any eruption—or when the digestive canal is disordered—unless some pressing occasion should require it. The best age for vaccinating is between the third and fifth month after birth, before dentition has commenced.

38. *B. Preservation of Vaccine Lymph*.—Fresh lymph should always be preferred when it can be obtained; but there is often no other resource than preserved lymph. Being liable to spontaneous decomposition, as well as to other changes too slight or delicate to admit of demonstration, unless in its effects after inoculation, and either impairing or destroying its efficiency, great difficulty has been experienced in preserving it, and more especially in transmitting it to tropical climates in an active state. Dr. G. GREGORY states the following to be modes of preserving lymph which are now adopted: 1. It may be preserved fluid for several days between two pieces of glass, about an inch square, which fit each other accurately. When dry, the lymph will often, if carefully moistened by the breath, propagate the disease. 2. Vaccine lymph may be preserved on ivory points, shaped like the teeth of a comb. These should be twice dipped in the fluid of the vesicle, and allowed to dry slowly. They should be retained, when used, in the wound or puncture

for about half a minute. They are considered very effectual. 3. The lymph may be kept in a fluid state in capillary tubes, having a bulb at one end. They admit of being hermetically sealed. But to prevent spontaneous decomposition the lymph should be collected in minute quantities only. 4. Mr. BRYCE, in 1802, stated that vaccine scabs may be used for communicating the disease, and it has been ascertained that this is the most certain mode of transmitting cow-pox to warm climates. When about to be used they ought to be rubbed to a powder, and moistened with a little tepid water. When thus reduced to the consistence of thin mucilage, they form an artificial lymph. Punctures should be numerous where the lymph is employed. 5. Dr. JENNER occasionally used dossils of lint, saturated with the fluid of an eighth-day vesicle. These he placed between glasses, one surface of which had a small central cavity; the glasses being tied together, their edges sealed, and the whole covered with sheet lead. Preserved in this manner vaccine lymph will retain its fluidity and efficiency for a considerable time.

39. VIII. REVACCINATION.—The phenomena presented by revaccination after comparatively short intervals have been noticed (§ 23). It, however, becomes necessary to take a brief survey of the practice of this measure after long intervals, with the view of affording a complete protection against small-pox. It having been believed by many medical men, and it having become the popular belief, in several countries, that vaccination, however completely performed, is weakened in its protective influence by the lapse of time, or growth of the frame, a recourse to revaccination has been had, in some countries to a great extent. Dr. GOLDSON, in 1804, first announced this doctrine, but assigned the remarkably short period of three or four years for the decadence of protection. In France, MM. CAILLOT, BOULU, BERLAN, GENOUIL, and others both in this and in other countries, supported this opinion, but assigned much longer periods for this occurrence, the time assigned by them varying in the opinions of each from ten to twenty-four years, but they all agreed in believing that the loss of protective power was gradual and progressive. M. P. DUBOIS endeavoured, in 1825, to refute this doctrine as a general inference, although he admitted the facts upon which the opinions of these physicians were founded. The epidemic prevalence of small-pox soon afterward in France, Germany, and Denmark, confirmed, by the numbers of vaccinated attacked, the opinion that vaccination lost, after the lapse of a number of years, its powers of protection from that malady. From this period—about 1829—revaccination began to be practised on the Continent, and on great numbers in Germany, Sweden, Denmark, Prussia, and in France. In 1833, it was adopted in the Prussian army, and was performed on 48,047 persons, and was successful in 15,269. In 1834, 16,673 successful cases were obtained in 44,454 operations. In 1835, 15,315 were successful in 39,192 revaccinations. In 1836, in 42,124 revaccinations, 18,136 fully succeeded, and 9040 presented an irregular form of the eruption. Of 14,048 persons, in whom revaccination failed, 1569 were successful on the repetition of the operation for the second time. In 1839, 41,481 soldiers of the Prussian army were revaccinated; of this number, the cicatrices of the first vaccination were distinct in 33,225,

imperfectly distinct in 5889, and not detected in 2367. Revaccination succeeded in 19,249, and was imperfect in 8534. Similar results have been obtained from revaccination in several of the German states, in Hanover, &c., between the years 1835 and 1842. In France, revaccination has not been much practised, and in England still less.* During the reign of LOUIS PHILIPPE, the Royal Academy of Medicine of Paris was consulted respecting the propriety of having recourse to revaccination. This body were opposed to this measure, as they believed that it would weaken confidence in vaccination. M. DEZEIMERIS protested against this decision, and was successively followed by MM. FIARD, HARDY, PRESSAT, and others, who published memoirs on the subject in the French journals. M. VILLARET, in 1843, practised revaccination in 401 soldiers of the 7th regiment of dragoons; it was successful in 307; and in 153, who had formerly had *small-pox*, the operation fully succeeded in 97. In a second series of 447 persons, who presented perfect vaccine cicatrices, 402 had cow-pox a second time; and of 123 persons marked by *small-pox*, 89 presented a successful vaccination. MM. BOSQUET, FIARD, GUERSANT, and BLACHE, who, in 1828, expressed their belief in the permanent security furnished by cow-pox inoculation, have subsequently altered their opinions, and have practised revaccination in numerous cases; and have strenuously advised this measure as the only certain means of preventing *small-pox*, by sustaining the prophylactic influence of vaccinia.

[Dr. WENDT, in Copenhagen, revaccinated 3964 persons, of which 2756 were successful, and 1208 failures. Dr. AGGEUS, of Silesia, revaccinated 962, of which 822 were successful, 72 failures, and 68 spurious or imperfect. The Vaccine Committee of France, in 1839, revaccinated 6652, of which 718 were successful, and 1283 spurious or non-successful. In 1840, the same committee found 270 successful out of 2214 cases of revaccination, 1717 failures, 227 spurious or imperfect. M. VILLENEUVE, the same year, found 223 successful out of 2199 cases of revaccination, and 1976 failures. The late Dr. FORRY, of New York, vaccinated 560 soldiers at Fort Wood, in 1840, of which 141 were successful, 364 failures, 55 spurious or imperfect. Dr. KIRKBRIDE, of Philadelphia, revaccinated 209 in 1840; 44 successful, 165 failures. We copy the following Tables from Dr. FORRY's "*Prize Essay on the Protective Powers of Vaccinia*" (N. Y. Jour. Med., Sept., 1844).

These statistics contain the results of revaccination in the Prussian army, the Vaccine Committee of France, and all other known authentic sources,

Year.	Number Vaccinated.	CICATRICES IN THOSE REVACCINATED.			
		Of these had perfect cicatrices.	Imperfect cicatrices.	No cicatrices.	Revaccination successful in
1834	44,454	33,634	7,184	3,686	18,136
1836	42,124	32,635	6,543	2,946	15,315
1837	47,258	37,199	6,908	3,056	21,308
1838	42,041	33,819	5,645	2,571	19,117
1841	44,941	36,182	6,193	2,567	13,523
Total.	220,818	173,569	32,418	24,832	87,399

RESULTS OF A SERIES OF REVACCINATIONS.

Year.	Failures in first revaccinations.	Second revaccination.	Successful.	Total successful first and second revaccination.
1834	15,488	4,530	866	19,002
1836	14,048	14,048	1569	16,884
1837	15,393	15,393	2243	23,551
1838	14,252	14,252	2306	21,423
1841	13,523	13,523	2154	15,777
Totals	72,704	61,746	9238	96,637

and it is believed that they afford conclusive evidence of the necessity and importance of revaccination, under all possible circumstances. It is worthy of note that, prior to the order for revaccination in the Prussian army, it was not unusual for the different barracks to be a prey to varioloid disease; but now the whole army, notwithstanding its repeated exposure to similar causes productive of the disease, enjoys an almost entire immunity.]

40. In 1845 the Academy of Sciences of Paris published a Report, containing the following conclusions: 1. The protective influence of vaccination is complete as regards the great majority of the vaccinated, and temporary as respects a small number only; and in these latter it is almost absolute up to the period of puberty. 2. *Small-pox* rarely attacks the vaccinated before the age of ten or twelve; and it is from this age to thirty or thirty-five that they are chiefly exposed. 3. That in addition to its preservative influence, vaccination endows the constitution with an influence which renders the symptoms of *small-pox* much milder and of shorter duration. 4. Cow-pox, directly or recently derived from the cow, is attended by a much more intense local phenomenon, and by a more certain and permanent effect than that which has passed through a great number of human subjects, this intensity of local action subsiding after many successive vaccinations. 5. The preservative influence of vaccination appears not to be intimately connected with the intensity of its local effects; nevertheless, in order to preserve the properties of vaccinia unimpaired, it is prudent to renew it as frequently as possible from the cow. 6. Revaccination is the only means we possess of distinguishing the complete success of vaccinia from the less complete grades of protection. 7. Revaccination, however, is not certain evidence that the vaccinated in whom it had succeeded would have been destined to contract *small-pox*, but merely that it was probably among those that this latter malady was most likely to appear, if they became exposed to its infection. In ordinary times revaccination may be practised after fourteen years; during epidemic *small-pox* it may be practised after a shorter period.

41. It would appear from the circumstance of so many persons having presented the regular vaccinia after *small-pox* (§ 39), as stated above, that the complete development of the local action after revaccination cannot justly be viewed as a certain proof that the successfully vaccinated could have been infected with *small-pox*, although they might have been infected if they had been exposed

[* M. VILLENEUVE, chairman of the committee on vaccination of the Royal Academy of Medicine, Paris, after examining the reports of 41 departments of France in relation to vaccination and revaccination, deduced from them the following conclusions in 1840: The whole number vaccinated for the first time was 30,413; in 560 of these it was unsuccessful. The number of revaccinations was 2199; of these, 1976 were unsuccessful. Of those who had been already vaccinated, 365 had the varioloid, and 6 died. Thus it appears that the proportion of cases in which vaccination does not succeed is only one in 54½, while others who have investigated the subject place it as high as ¼ or 1-10. Of the 2199 revaccinations performed in persons of different ages and sexes, who had been successfully vaccinated at some previous time, 223 were successful. So the proportion of successful cases was as 1-13 or 1-14. In 365 cases of varioloid occurring after well-established vaccination, the proportion of deaths was only 1-45 or 1-46, while the sporadic *small-pox* kills ½ to 1-10; and when the disease is epidemic, ½, or even more, perish. (*Annales d'Hygiène.*)]

to the more concentrated sources of infection. Nor can successful revaccination, nor its failure, be viewed as absolutely indicating a state of constitution which shall resist the infection of small-pox on all occasions, more especially when this malady is present in an epidemic form, although it may resist this infection on nearly all occasions, or with very few exceptions; these exceptions, however, being a mild or modified small-pox, in the great majority of instances.

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Dr. B. also recommends that all children of phlegmatic parents, and all persons of phlegmatic habit, should be revaccinated, or have a second insertion, and repeated till a full impression be made on the system.)—*George Haynard*, Remarks on Vaccination, in *Bost. Med. and Surg. Journal*, vol. i., p. 177, 305, 496 (1828).—*W. Channing*, on Revaccination, in *Ibid.*, vol. i., p. 279.—*Thomas Henderson*, on Revaccination, in *Ibid.*, vol. i., p. 401.—*Chandler Robbins*, on Vaccination as a Preventive of Varioloid, in *Ibid.*, vol. i., p. 21; and on Revaccination, in *Ibid.*, p. 225, 267, 369, 385, 449.—*J. Southworth*, Hooping-cough and Vaccination, in *Boston Med. and Surg. Journ.*, vol. xxvi., p. 61.—*N. Williams*, The Method of Practice in the Small-pox, with Observations on the Way of Inoculation, 8vo, p. 16. Bost., 1752.—*J. H. Flint*, on Small-pox, *Bost. Jour.*, vol. xxi., p. 354. (Dr. F. maintains that the small-pox of the present day is as distinct from the small-pox described by SYDENHAM and the earlier writers as chicken-pox is from varioloid; that it corresponds to the anomalous small-pox of SYDENHAM.)—*J. H. Coggeshall*, in *Ibid.*, vol. xxi., p. 324. (From considerable experience as vaccinator at the Health Office, Boston, Dr. C. derives the following conclusions: 1st, that every individual is susceptible of the kine-pox; 2d, that revaccination is not necessary before puberty; 3d, that the system undergoes a change at puberty, and that revaccination is then necessary; 4th, that vaccination is a sure preventive of small-pox; 5th, that revaccination is a sure preventive of the varioloid; 6th, that the third vaccination is inert; 7th, that the system is susceptible of varioloid after puberty, whenever the individual is exposed to small-pox without revaccination; 8th, that revaccination is not necessary if the first operation was performed since puberty; 9th, that those who disregard vaccination are always liable to small-pox whenever exposed to that disease; 10th, that if every individual were vaccinated before puberty, and revaccinated after that period, there would be no such disease existing as small-pox or varioloid.)—*John D. Fisher*, Description of the Distinct, Confluent, and Inoculated Small-pox, Varioloid Disease, Cow-pox, and Chicken-pox, fol., p. 73: 13 col'd plates. Boston, 1829; and *Trans. of Am. Medical Association*, vol. iii.—*William Brown*, on the Influence of Vaccination in Counteracting the Effects of Small-pox Contagion, in *Am. Journ. of Med. Sciences*, vol. xv., 1834.—*S. Forry*, Essay on the Protective Powers of Vaccinia (Boylston Prize Essay for 1844); also, in *N. York Journ. of Medicine*, vol. iii., p. 151; and in *Am. Journ. of Med.*

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1. VAGINA AND VULVA—DISEASES OF THE.—Affections of the vagina and vulva are as frequently surgical as strictly medical. As, however, certain of them require internal or constitutional means, either altogether or chiefly, in their treatment, they may be viewed as belonging to the latter category, although I can see no just reason for separating the two departments of practice, or for assigning them more to the one than to the other.

2. I. The VAGINA is liable to several congenital alterations, or vices of conformation. The chief of these are: 1st. Its opening in an abnormal situation; 2d. Its separation by a partition into two canals; 3d. Its imperforation; 4th. Its constriction; and, 5th. Its entire absence. As to either of these, I can add nothing to what will be

found in the many excellent recent works on surgical pathology. The last of these conditions is of great importance as respects the diagnosis, and the results proceeding from it. It may become the subject of medical investigation as respects especially the retention of the catamenia, and the propriety of an operation, on this account, after due deliberation. The absence of the vagina may be only partial; but even in this case, and when the exact state is ascertained, the question as to the propriety of attempting an operation for the establishment of the canal should not be entertained, unless there be a pressing occasion for having recourse to it, as it may compromise the life of the patient. But what occasions may suggest recourse to a surgical operation in such cases? These are: 1st. Excessive uterine distention from an accumulation of the menstrual fluid; 2d. The supervention of metritis, or peritonitis, or both; and, 3d. Contamination of the circulation from the absorption of a portion of the retained and altered blood from the uterus. This operation has been, therefore, performed successfully by CABARET, VENTURA, DESGRANGES, DELPECH, WILLAUME, JEFFERSON, and COSTE; but unsuccessfully by LANGENBECK, MACFARLANE, and FRETAU (VELPEAU, *Médecine Opératoire*, t. iv., p. 356). The accumulated menstrual fluid may be discharged, in the urgent circumstances just stated, by puncture either by the rectum or by the bladder.

3. The diseases and organic lesions to which the VAGINA is liable, are inflammations, ulcers, constrictions, or contractions and obliteration, tumours of various kind, polypi, fistulae, cancer, prolapsus, wounds, laceration, hernia, and the impaction of foreign bodies. Several of these belong more to the province of the surgeon than to the physician, or rather require surgical, in addition to medical means.

4. I. INFLAMMATION OF THE VAGINA.—SYNON.—*Vaginitis*, *Vaginite*, Fr.

CLASSIF.—III. CLASS, V. ORDER (Author in Preface).

5. DEFINIT.—Heat, soreness, or pain, in the course of the vagina, sometimes attended by increase of pain, or by uneasiness upon sitting down on a hard seat; and always by pain and tenderness on vaginal examination, and by a whitish or a muco-purulent discharge, with slight febrile disturbance, increased or returning at night.

6. Inflammations of the vagina rarely occur, unless in connexion with inflammation of the vulva, or with inflammation of the neck of the uterus; most commonly with both, unless it be caused by violence, by excessive sexual indulgence, by irritating injections, and by foreign bodies, as pessaries, &c., lodged in the vagina. It commonly presents an acute or sub-acute form, whether simple or thus complicated; but it is also often chronic, especially when it is associated with disease of the neck or body of the uterus, and in many cases which are commonly viewed as simply those of leucorrhœa. In these chronic and sub-acute cases the mucous follicles of the vagina, and often also of the cervix and vulva, are more or less implicated—either partially or chiefly.

7. A. Acute vaginitis rarely occurs in a simple or sthenic form, unless when it is specific, or gonorrhœal. In rare cases, also, it is asthenic or diffusive, owing to the occasions about to be mentioned. Acute sthenic vaginitis, and the sub-

acute states, are most frequently consequences of the causes just stated, or of sitting on cold or damp seats, especially during, or soon after, the menstrual period. In these circumstances, it has been termed, by some physicians, *vaginal catarrh*, or catarrhal inflammation of the vagina, especially in its slighter or sub-acute state. In this state, it is not unfrequently met with in pregnancy, and, in rare instances, as a complication of hæmorrhoids. In these simpler forms, vaginitis is attended by a copious whitish, or grayish, or nearly colourless mucous discharge, which soon passes into a muco-purulent and yellowish matter, especially when retained for some time in the vagina; there are also soreness and tenderness in the course of the vagina, sometimes with frequent micturition and slight dysuria. I have met with several cases, in public and private practice, of this form of vaginitis, as a sequela of measles, but much more frequently of scarlet fever, especially in children among the lower classes.

8. B. Acute and sub-acute vaginitis is often mistaken for gonorrhœal vaginitis, or the *blennorrhagia* of French pathologists, especially of M. RICORD and his disciples; and it is generally very difficult to distinguish between the simple and specific forms of the disease. Generally, however, the latter, or gonorrhœal, is attended by characteristic signs referable to the vulva; by itching, smarting, or stinging in this situation; by frequent painful micturition, by inflammation and swelling of the labia nymphae and urethra; pain and soreness being greatly increased when sitting. The local signs and febrile symptoms are more acute, and the swelling, tenderness, and intolerance of an examination are greater, than in the non-specific states of vaginitis, and the discharge more copious and more completely purulent. In all the cases of gonorrhœal vaginitis which I have seen the disease extended to the uterus, and in three to the ovaria. In this form of the disease, the history of the case, especially with reference to the affection of the vulva, and the probability of its being caused by an impure connexion, will much assist the diagnosis. In most of the cases which I have seen, the disease was communicated by the husbands of the females affected, the fact of this having been the cause having been acknowledged by the former. In some instances, much difficulty has occurred in the diagnosis, especially when vaginitis has been produced soon after marriage, in consequence of excessive sexual indulgence, and of the states of both the male and female organs previously, and even of the constitution and habit of body of the female. A similar difficulty is sometimes met with in the vaginitis, follicular or mucous, which occasionally appears during pregnancy. In both these circumstances, the discharge may infect the husband, in such a manner as to be distinguished with great difficulty, or not at all, from gonorrhœa in the male. The urethritis thus produced on rare occasions is somewhat different from the specific disease, as far as my observation of a few cases enables me to state. The earlier signs referable to the opening of the urethra, and the distressing chordee characterizing, are either wanting, or are slight in the simple urethritis; while micturition is neither so painful nor so difficult as in the specific disease. The inflammation, however, of the former is more disposed to extend to the mucous surface of the

urinary bladder, and less disposed to affect the testicles, than that of the latter malady.

9. *C. Asthenic vaginitis*, or diffusive inflammation of the vagina, has been hitherto unrecognized. I have referred to two instances of its occurrence associated with adynamic dysentery in married females, when treating of *metritis* (see art. UTERUS, § 54), the inflammation having extended from the vulva to the vagina and uterus; and having been produced by the septic and infectious exhalations evolved, during a long continuance of warm weather, from full, open privies. In these cases the vaginal discharge was muco-purulent, streaked and discoloured with blood, and rusty, at times of a brownish, or greenish brown hue, and very abundant, with remarkable swelling and tenderness of the parts, and with the symptoms accompanying acute metritis (see UTERUS, § 55, *et seq.*). The pulse was rapid, weak, small, and compressible; the vital prostration and the other symptoms of adynamia being so marked as to require powerful tonics and restoratives. Recovery ultimately took place, but after a very protracted illness. This form of vaginitis may be complicated with asthenic dysentery, as observed in the cases now referred to.

10. *D. Phlegmonous inflammation* may attack the connecting cellular tissue of the vagina, especially that between the vagina and rectum, and occasion a small abscess, which may open either into the vagina or into the rectum. Inflammation also of some portion of the pelvic cellular tissue, or of the cellular tissue connecting the uterine appendages (see UTERUS, § 122, *et seq.*), may extend in this direction, and open into the vagina, occasioning more or less inflammation of this part or of the rectum, or even a fistulous communication between the vagina and rectum. When the inflammatory action is limited to the cellular tissue of the vagina and its immediate vicinity, and occasions only a small abscess between the vagina and rectum, the opening into either part is generally followed by quick recovery, unless the constitution be in fault, and then ulceration, or a fistulous communication between the vagina and rectum, may result.

11. *E. Consequences of Vaginitis.*—*a. Contraction and obliteration* of the vaginal canal is seldom observed, the latter especially. Either of these lesions may, however, occur after inflammations caused by injuries, wounds, lacerations, ulcerations produced by pessaries, foreign bodies, and irritating injections; but contractions in various grades and extent are much more frequent than obliteration, which is a very rare occurrence. Injuries or lacerations during delivery are the most frequent causes of these lesions. The injection of irritants and stimulants to provoke abortion has in a very few instances been recorded as a cause of both contraction and obliteration of the vaginal canal. These changes may occur in any part of the canal, but most frequently in the part next to the vulva, unless when they are caused by malignant disease, and then they generally commence in the cervix uteri, and extend to the portion of the vagina adjoining, and progressively to more or less of this canal. In the article UTERUS (§ 205) I have mentioned a case where nearly the whole of the vagina was obliterated by cicatrization consequent upon a rare instance of the spontaneous cure of malignant disease of the cervix uteri and vagina. Similar occurrences have been noticed by ROKITANSKY.

12. *b. Chronic inflammation*, limited or more or less extended, sometimes either follows the acute and subacute states of vaginitis, or occurs primarily, but much more frequently as a consequence of the irritation caused by morbid secretions from the cervix uteri, or from the internal surface of the cervix or body of the uterus, and it is often complicated with inflammation of the cervix. This form of the disease may occur either in the puerperal or in the non-puerperal states, and it may, moreover, be complicated with, and then be masked by, the uterine disease, or by inflammation of the vulva, or by the leucorrhœal discharge, with which it is attended, both in its simple and complicated forms. Chronic inflammatory irritation, thus originating and related, may be followed by organic changes of an important nature, especially when it more particularly affects the mucous follicles, or extends to the connecting cellular tissue. In such cases *ulcerations*, and even *perforations*, of the vagina are not very rare occurrences. The ulceration may be *common*, *scrofulous*, *syphilitic*, or *cancerous*. The first of these usually occurs in consequence of inflammation, chiefly of the phlegmonous character noticed above (§ 10, *et seq.*), and commences either in the mucous follicles or in the connecting cellular tissue. In these follicles scrofulous ulcerations may also commence, or be chiefly seated. These latter have been well described by Dr. CARSWELL; and Dr. HOOPER states that these ulcerations assume the character of scrofula in other parts. "The sides of the ulcerations are tumid; solid puriform depositions are found about them in the cellular structure between the membranes; and there are perhaps fistulous communications with the urinary bladder, rectum, or psoas muscle." Common and scrofulous ulceration may be developed either primarily or consecutively in the lacunæ and glandular bodies with which the lower part of the vagina is so abundantly supplied. When these glands are primarily affected, there is generally an abundant milk or cream-like discharge from the vagina, constituting a form of leucorrhœa, and depending upon chronic irritation or inflammation of them. This state of morbid action when prolonged, especially in cachectic or scrofulous constitutions, may go on to ulceration, or even to fistulous perforations. Disease of these glands, and chronic inflammation of the vaginal surface, may also be developed or perpetuated by the morbid secretions from an inflamed or otherwise diseased cervix uteri, or internal surface of the uterus, or of its cervix. The most extensive ulcerations and perforations with fistulous communications with adjoining parts are produced by pessaries or other foreign bodies lodged in the vagina. SYPHILITIC and CANCEROUS ulceration of the vagina are noticed in the articles on Cancer of the UTERUS and on VENEREAL DISEASES.

13. *Complications of Vaginitis.*—Acute or chronic vaginitis may be associated with inflammation of the cervix uteri, or with vulvitis, or urethritis, or even with two or all of these. It is chiefly in girls under twenty that the complication with vulvitis is observed. In some instances of this complication an abscess forms in the labia majora, especially when inflammation of the vagina and vulva is severe; and when the inflammation extends to the subjacent cellular tissue of cachectic habits, phagedæna of the parts may supervene. Gonorrhœal vaginitis is generally associated with urethritis and vulvitis, and often also

with sympathetic bubo, this latter being the consequence of inflammation of the lymphatic vessels and glands. Vaginitis is, in some cases, complicated with endo-metritis, and more rarely also with inflammation of the uterine appendages, especially when it is of a specific kind, as noticed above (§ 8, 9). In this complication the inflammation may originate either in the uterus or in the vagina, and extend to the other parts. Vaginitis may also occur during pregnancy, and disappear after parturition.

14. ii. TREATMENT.—The treatment of the non-specific or common states of inflammation of the vagina is generally simple, and is locally and constitutionally antiphlogistic. In severe attacks, leeches should be applied to the upper parts of the insides of the thighs, or to the groins or perineum, and the bleeding be promoted by warm fomentations, &c. Tepid or warm baths, general or local; cold, tepid, or warm injections into the vagina; cooling aperients, and cooling diaphoretics, and an antiphlogistic regimen, are the chief means of treatment, especially in the more acute cases, and in the early stage. Aperients which irritate or excite the large bowels should be avoided; and those injections, alvine and vaginal, which produce a cooling and an emollient effect, not only on the large bowels, but also on the vagina, should be selected. The injection of cold or tepid water into the vagina washes away the morbid secretion, which by remaining even for a short time, and accumulating in this part, increases or perpetuates the inflammatory irritation. Several medicated injections, either emollient, astringent, or anodyne, may also be prescribed. When the irritation, tenderness, or pain, is considerable, milk-and-water, linseed tea, decoction of marsh-mallows, either tepid or cold, may be administered, with a little sirup of poppies, and with either a small quantity of the nitrate of potash or of the biborate of soda. If the inflammation be severe, the emollient injections may contain either these in somewhat larger quantity, or a small quantity of the hydro-chlorate of ammonia. Or instead of those the decoction of poppy-heads may be employed, with the saline substances just mentioned, or simple water with the acetate of lead and a few drops of laudanum.

15. When the more acute and severe symptoms have subsided, then the more energetic astringents may be prescribed, such as the sulphate of alumina, the sulphate of zinc, acetate of lead, solution of the nitrate of silver, decoction of oak-bark, and solution of tannin. Dr. H. BENNET states that the first three he generally uses in the proportion of a drachm to a pint of water, increasing or diminishing the strength according to circumstances; and after much experience he concludes that alum is the most efficacious of all these agents, with the exception of nitrate of silver. In order that injections may be efficacious, they should be administered abundantly, frequently, and with such appliances as may allow them to remain for some time in the vagina.

16. For gonorrhœal vaginitis, the antiphlogistic treatment advised for the early stage of common or simple vaginitis should be energetically prescribed, and cooling diaphoretics and aperients, with demulcents, emollients, and diluents, freely used. The irritation of the urinary bladder and urethra, and the associated vulvitis, will be most surely allayed by these means, aided by fomentations, warm local and general baths, and by the

emollient and anodyne injections advised above (§ 14). The patient should partake freely of mucilaginous diluents containing the nitrate of potash or of soda, and the carbonates of the fixed alkalis, with very small doses of camphor. After the acute symptoms have been subdued, the more astringent injections mentioned above may be resorted to. If gonorrhœal rheumatism should occur, which is seldom observed in females, the treatment for that species of rheumatism, advised in the article RHEUMATISM (§ 163), should be directed. Gonorrhœal vaginitis extending to the cervix uteri, or occasioning endo-metritis, requires the means advised for this complication in the article UTERUS (§ 124).

17. *Asthenic vaginitis*, in the form which I noticed above, as having fallen under my observation, requires a frequent recourse to vaginal injections. Those which I prescribed consisted of alum, or of sulphate of zinc, with a little camphor and laudanum; the decoction of cinchona, with the compound tincture of cinchona, nitrate of potash, and bicarbonate of potash, being taken internally; and full doses of DOVER'S powder at night; lime-water, or potash-water, with milk, being the beverage generally allowed.

18. As regards *other lesions* implicating the vagina, especially *ulcers, fistulae, lacerations, or extensive ruptures, wounds, hernia, polypi, tumours* of various kinds, *foreign bodies* lodged in the vagina, *prolapsus* of the vagina, and *cancer* of the vagina (see art. UTERUS, § 190 *et seq.*). I must refer the reader to surgical works, or to the article VAGINA, by MM. DESORMEAUX and P. DUBOIS, in the second edition of the *Dictionnaire de Médecine*, where these lesions are very ably described.

19. II. THE VULVA is liable to diseases which are either local or constitutional. The latter requires internal or constitutional treatment chiefly, and sometimes local means also; the former seldom receives permanent benefit from local appliances, without having recourse at the same time to general or internal medication. The affections of this part, as well as of several others, show that no distinction should be made respecting those which are commonly called medical and those which are usually termed surgical; although I am obliged, by the scope and limits of this work, to observe this distinction to a considerable extent. Diseases of the vulva are of frequent occurrence at all ages, and in all classes of society. They often assume serious characters, owing to concealment, neglect, or delicacy of feeling, more especially in childhood, or in early or mature age. They most frequently proceed from want of due cleanliness, from infection, from eruptive and other fevers, from diseases of the uterus and appendages, and from masturbation. The puerperal states have also some influence in causing them. They may occur primarily or consecutively; and in either case they may be simple, or complicated with whatever disorder they may induce, or be induced by.

20. I. INFLAMMATIONS OF THE VULVA.—*Vulvitis*. CLASSIF.—III. CLASS, V. ORDER. (Author.)

21. DEFINIT.—*Pain, soreness, and tenderness of the vulva, frequently with swelling, painful micturition, and more or less symptomatic fever.*

22. *Vulvitis* may assume every grade of severity, from the slightest pruritus and inflammatory irritation, to erythema, to phlegmonous, diffusive erysipelatous, and to ulcerative or gangrenous in-

inflammations, simple, or complicated. I shall briefly notice these, as well as other forms of disease of the vulva which fall under the category of inflammatory, either sthenic or asthenic, and offer some remarks on these varieties of vulvitis which have fallen under my observation at the Infirmary for Children and in private practice, and commence with the slightest or least inflammatory in appearance, and proceed to the more violent and dangerous.

23. *A. CATARRHAL VULVITIS.*—This form of the disease is usually slight, unless it be neglected or aggravated by neglect of cleanliness. It is not unfrequent in children; and in grown-up females it occurs as a form of leucorrhœa, or as a symptom of disease of the neck or body of the uterus. In infants and children especially, it assumes a catarrhal appearance, the discharge being at first chiefly mucous, and afterward muco-purulent; the surface of the vulva being slightly red and swollen; but neither very irritable nor excoriated, unless neglected. It is most frequently caused by cold, by sitting on cold or damp seats, by general debility, and the irritation of ascarides in the rectum, or by disorder of the digestive organs. It is sometimes a sequela of low and eruptive fevers in childhood, especially of scarlet fever; and if it be overlooked, or continue long, it may give rise, especially if aggravated by filth and an improper regimen, to one or other of the more serious forms of vulvitis about to be described.

24. *B. IRRITABLE VULVITIS.*—As observed in some states of the disease of the uterus, so in some affections of the vulva, the inflammatory appearances are either slight or not very remarkable; yet the pain and tenderness are very great, or even acute. Sensibility is so morbid as not to admit of the slightest touch; and in married females sexual intercourse cannot be endured. On examination, the parts are slightly red, or rose-colored, and covered in parts by a whitish exudation, especially about the entrance of the vagina; in some cases there is also slight swelling or fullness of the labia. The patient complains of a sense of heat, or lancinating pains of the parts, of smarting, painful micturition, and of inability of walking. This complaint is sometimes caused by the state of the menstrual discharge, and is most frequently met with in young persons about the age of puberty, or shortly before or after the first appearance of the catamenia, in females after marriage and during their first pregnancy, and in widows, but less frequently in these last. It is sometimes associated with one or other of the forms of hysteria, or with spinal irritation.

25. *C. PRURIGINOUS VULVITIS.*—*Pruritus* of the vulva is often a very distressing disorder. The itching or pruritus of the parts is sometimes such as cannot be endured without resorting to friction in some way or other to allay it. There is generally a sense of heat, but seldom much pain, tenderness, or soreness of the parts, unless what may be caused by the frictions resorted to. Nor is there much redness or swelling, unless such as may be referred to the same cause. But there is obviously more or less vascular erythsm of the parts, or of others in their vicinity, sometimes with increased secretion from the surface or interior of the labia and orifice of the vagina, or even a more copious discharge, owing to the frictions resorted to. This disorder is not unfrequent previously to or after puberty, and often is attended by inordinate sexual desire, amounting in some instances to

nymphomania, and frequently suggesting masturbation, which, although it may assuage the irritation for a time, generally tends to perpetuate or aggravate the disorder. *Pruritus vulvæ* is also a frequent consequence of pregnancy, especially of the first pregnancy, in young plethoric habits and sanguineous temperaments, of the discharges after parturition, and of morbid states of the catamenia. In both girls and married females it is often caused by the state of the secretions from the follicles of the vulva and vagina, especially when they are allowed to accumulate and irritate, owing to their alteration by the oxygen of the atmosphere, the sensitive mucous and erectile tissues of these parts. It is also at all ages sometimes symptomatic of worms, especially of ascarides in the rectum.

26. *D. ECZEMATOUS VULVITIS.*—An eruption of an eczematous character (see *art. ECZEMA*, § 9) is sometimes met with on the internal or external surface of the labia vulvæ, and is either dry or humid, and occasionally extends to the adjoining parts of the thighs. It generally presents a copper-coloured redness, is liable to recur at intervals, and often continues for an indefinitely prolonged time. It is attended by a sense of heat or burning, with a stinging itching. It seldom occurs in young females, but is very common after 35 or 40 years of age, and especially after the cessation of the catamenia; and in those it may continue for years, particularly in females of a full habit of body, or who are corpulent. It is not necessarily connected with any venereal infection or with leucorrhœa, although this latter may be associated with it.

27. *E. ERYTHEMATOUS VULVITIS.*—The internal surfaces of the labia are not unfrequently slightly swollen, diffusely red, painful and smarting, and intolerant of touch. It presents no appearance of phlyctena, is smooth or shining, the surface being hot, with a sense of more or less of painful heat. It soon becomes covered by an exudation of a whitish or ichorous lymph; and in some cases which I have seen at the Infirmary for Children, the labia have become adherent, and so firmly adherent as to require surgical aid in separating them. This form of vulvitis is not uncommon in children of all ages, especially in those of a very full habit of body, and in these, as well as in corpulent females advanced in life, is owing to the acrimony of the secretions from the parts in their vicinity, to the state of the menstrual discharge, or of the lochia, and to the neglect of cleanliness. In many cases the discharges from the vagina, and cervix and os uteri, occasion or perpetuate the inflammation of the vulva. Although a comparatively slight disease, the neglect of it may be followed by more serious results; such as phlegmonous or suppurative inflammation, by inflammation of the lymphatics, or even, in rare instances, in young children, by adhesions of the labia.

28. *F. ERYSIPELATOUS VULVITIS.*—This form of vulvitis generally resembles the erythematous at its commencement; but owing to the state of the secretions producing it, or the habit of body of the patient, or to both, it is soon characterized by great swelling, and a disposition to terminate in suppuration, or sphacelation of the more superficial parts. It is attended by a quick pulse, and by more or less severe constitutional disturbance. This often becomes a serious disease, and goes on to *diffuse phlegmon*, or phlegmonous erysipelas. In the most unfavourable cases, particularly in

cachectic habits, it is liable to occasion gangrene of the integuments, extending even to the adjoining parts. It results most frequently from the same causes as the foregoing varieties of vulvitis acting on cachectic habits of body, and during morbid conditions of the circulating fluids.

29. *G. PELLICULAR VULVITIS*.—Since M. BRETONNEAU described inflammation of mucous surfaces with the exudation of lymph—forming a false membrane over the inflamed surface—a form of disease which he termed *diphtheritis*—inflammation of the vulva with the formation of a false membrane—*Vulvitis diphtherique*, of French pathologists, has been occasionally observed in circumstances similar to those which occasion this form of inflammation in the cavities of the mouth, pharynx, &c., or when this disease of the mucous surfaces is endemic or epidemic. This form of vulvitis differs from all others in the rapid formation of a false membrane on the inflamed, but very slightly swollen, surface. As it is observed in the mouth and pharynx, so it is found to extend to the adjoining canals, advancing up the vagina to the neck of the uterus, or into the urethra. This state of the disease is obviously the result of constitutional disorder, in which the circulating fluids are in some degree, although not always demonstratively, affected. It is most frequently observed in girls or young females, at certain seasons or localities of a cold and humid description; and the febrile disturbance attending it presents an asthenic, rather than a sthenic character.

30. *H. PHLEGMONOUS VULVITIS*.—Inflammation of a phlegmonous form may commence either in the cellular tissue beneath or connecting the mucous and cutaneous structures, or in the more deep-seated mucous follicles of the vulva, or at the commencement of the vagina. It has been assigned to one or other of these seats exclusively by various pathologists; and it may very possibly originate in either, although most probably in the mucous follicles, in consequence of obstruction in their ducts. This affection generally appears with heat and tension of the parts, followed by a dull and sometimes a severe pain, and affects chiefly, or more frequently, the lower halves of the substance of the labia majora. Pain, and a sense of weight, tension, and fulness, extend to the perinæum, and more or less febrile disturbance is developed, which may, in the course of two or three days, assume a severe inflammatory character. The bowels are confined, and the urine scanty, high-coloured, and passed with pain. The whole vulva becomes hot, and one or other of the labia is thickened and swollen, the inflammation and tumefaction extending near to the perinæum. In the course of five, six, or seven days, an abscess commences in the centre of the inflamed tissues; and although it cannot be perceived externally, it may be felt by firmly grasping between the fingers of one hand the swollen labium. A tumour the size of an egg, or smaller, will then be found in the midst of the tumid structure; and if the abscess be at all advanced, fluctuation will be perceived by a finger of the other hand.

31. *Abscess of the vulva* occurs only on one side at the same time, and very rarely attacks both in succession. It is observed chiefly in young females, and especially in the recently married, and very rarely at a greater age than 40 years. M. VELPEAU met with a case in a female aged 44. I was consulted in a case of a lady who admitted

her age to be 45. This distinguished physician states that it is commonly a result of excessive coition, of disproportion between the sexual organs, or of the introduction of a foreign body into the vagina; that it may also arise from neglect of cleanliness, from irritation of any kind, whether externally and mechanically, or internally and pathologically; and that in 18 cases out of 20 it occurs in girls who have prematurely had sexual intercourse, in prostitutes, and in young females who have indulged in excessive venereal pleasures or in masturbation. It is sometimes a consequence of leucorrhœa and of gonorrhœa, and of any violence or irritation to which the vulva has been subjected.

32. The *course* of abscess of the vulva is generally rapid; but owing to the structure of the parts, and to the circumstance of females being aware of the cause of the complaint, medical advice is deferred as long as possible; and the history of the early symptoms and changes is not obtained until the abscess has either burst or is ripe for opening. When left to itself, it generally bursts from the seventh to the twelfth or thirteenth day; when it has acquired a size varying from that of a nut to that of a hen's egg. It rarely exceeds this latter size. Phlegmonous vulvitis very rarely *terminates* in resolution, and seldom in sphacelation or gangrene, and then only in cachectic habits of body. When abscess of the vulva opens spontaneously, it is generally by a perforation in the direction of the vaginal surface of the labium. In some instances more than one perforation is observed when the abscess has been large. A fistulous communication may even form, and, in rare cases, extend to the rectum, or by the side of the vagina to or around the urethra. In most cases, however, the abscess is discharged and healed in the course of a week or two. But if sexual intercourse take place during this period, the abscess may be reproduced, owing to the injury or irritation of the cicatrix, and of the tender parietes of the former abscess, and to the greater susceptibility of the parts. Hence abscess of the vulva may be reproduced several times in the same female. M. VELPEAU has seen it thus recur six, eight, or ten times in the course of a few years.

33. *I. ULCERATIVE OR ASTHENIC VULVITIS*.—*Noma, Phagedenic ulceration of the labia vulvæ, Gangrene of the vulva, Gangrenous inflammation of the vulva.* VELPEAU.—This form of vulvitis is observed chiefly in children from about the period of weaning to the ninth or tenth year of age. It was first described by Mr. KINDER WOOD, and occurs chiefly in ill or insufficiently fed children, in those who live in low, unhealthy, or crowded localities or apartments; or who are the subjects of low, adynamic, or gastric forms of fever; and in delicate, cachectic, and anæmic habits of body, especially in large manufacturing or other cities and towns. The disease may be preceded, as well as attended, by loss of appetite, nausea, thirst, and other febrile symptoms of an adynamic character. The pulse is quick, small, or weak; the countenance and general surface pale or sallow, and the tongue is pale and covered by a dirty-looking or clayey coating or fur. The patient first complains, locally, of painful or scalding micturition, or cries or struggles violently when voiding the urine. The labia vulvæ are inflamed and enlarged, and their surfaces are of a purple or livid-red tint, the inflammation extending over the clitoris, nymphæ,

and hymen, and even into the urethra. A thin exudation may at this early period be observed covering these parts, which may proceed from the irritation having extended to the lower part of the vagina. Twenty-four hours hardly elapse until a number of small vesications appear within the labia, as well as externally, and soon afterward burst, quickly spread into each other, and form large ulcers. In other cases the inflamed surface passes into the ulcerated state without any manifest vesication. The thin exudation mixes with the secretion from the ulcerations; the resulting discharge is dark-coloured, sanious or ichorous, copious, very offensive, and irritating to the tissues, and rapidly extends the disease to the perinæum and anus, and to the thighs contiguous to the labia.

34. The constitutional symptoms are now most seriously adynamic. The pulse is rapid, irritable, and compressible; the face and general surface are white or blanched; the bowels torpid, and the stools offensive. The patient lies constantly on her back, with the knees bent and wide apart; and the distressing pain caused by micturition prevents her from using any effort to void the urine. The ulcerations vary in appearance and depth. In some cases they are foul and deep, in others they are superficial, and their bottoms present small red granulations; their states varying with the severity, constitutional tendency, and the treatment of individual cases.

35. The terminations of the disease also depend much upon the circumstances just now stated. When the ulceration is fully established, the swelling of the labia vulvæ diminishes, and the redness disappears with the extension of the ulceration, which is deep, foul, and spreading, in states of the system manifestly adynamic and cachectic, and of the circulation not only apæmic, but also contaminated. The secretion from the ulcerated surface extinguishes the vitality in succession of the tissues with which it is in contact, until the external organs are progressively destroyed. As the process of destruction advances, the face becomes more blanched, the pulse remarkably rapid and small, the appetite lost, the bowels loose, the stools offensive; emaciation and anæmia being remarkable, and the discharge from the ulcerated surface most offensive; and the patient expires in the course of a few days, the duration of the disease varying much with the circumstances and treatment of individual cases.

36. If, however, this affection be seen early, and be judiciously treated, the ulcerations become clean and heal. Yet, after they heal, a yellowish discharge often continues for a considerable time from the vagina and affected parts; and causes, where due precautions are neglected, a recurrence of the malady. In most cases, owing chiefly to the extent of the constitutional disturbance—to the low grade of vitality, and to the contamination and insufficiency of the blood—the recovery of the patient is generally protracted, and is rarely of less duration than eight or nine weeks. When the ulceration is large and deep, the patient very rarely recovers, although the most decided means to arrest its progress be employed.

37. The nature and morbid relations of this most dangerous form of vulvitis are manifest from the above. It has been viewed by M. VELPEAU as a gangrenous inflammation of the vulva; but the destruction of tissues quickly following

the vesications on the inflamed, swollen, and livid parts is not altogether similar to true gangrene, but rather to that of phagedænic or rapidly destructive ulceration. It resembles in most respects *cancrum oris*, or that form of stomatitis which I have described by the name of *stomatitis phagedænica* (see art. STOMATITIS, § 24, *et seq.*). The causes of both maladies are the same—they are both consequent, in rare instances, on low fevers, continued, remittent, and exanthematous, more especially on scarlet fever—and they are both arrested when admitting of this termination by the same or similar means.

38. K. GONORRHEAL VULVITIS.—*Specific Vulvitis*.—This form of the disease, if not always, is generally attended by more or less irritation of the urethra. The following is nearly the description of the disease by M. RICORD, as quoted in Mr. ACTON'S able work. This complaint may affect the epithelium of the mucous surface only, or the vulvar glands also, these glands, according to M. MOULINIER, being regarded as the organ secreting the venereal virus. At first the patient complains of an unusual sensation in the vulva, with a desire for sexual intercourse. This is soon followed by itching, heat, redness, and swelling. The normal moisture of the parts is much augmented; but it soon becomes increased and irritating, and aggravates the inflammation. The discharge rapidly assumes a muco-purulent state, owing to the affection of the mucous follicles. As the inflammation extends more deeply, the swelling increases; and it may then become phlegmonous (§ 30, *et seq.*), or be attended by œdema. If the nymphæ become inflamed, they may be so enlarged as to protrude beyond the labia. Abscess may follow the swelling, or the inflammation may extend to the vulvar glands, and occasion small abscesses. Owing to the extension of the morbid action to the urethra, and to the state of parts now described, the urine is voided frequently, and produces much scalding and smarting. Patients who have been subject to leucorrhœa readily distinguish the difference between the discharge and other symptoms now experienced, and those to which they have been subject. With very exaggerated sensibility of the vulva, the scalding on passing urine becomes very severe, and in some cases retention of urine occurs. The inflammation may even extend along the urethra to the neck of the bladder, producing very painful and constant desire of micturition. The existence of urethritis in these cases may be ascertained, if the patient has not recently passed water, by introducing the finger into the vagina, and then pressing the urethra from behind forward; if muco-pus be in the urethra, it will be at once evident. *Syphilitic ulceration* of the vulva is noticed under the head of VENEREAL DISEASES.

39. L. CONSEQUENCES OF VULVITIS.—These are, as partially noticed above, œdema, abscess, ulceration, and molecular gangrene, sphacelation, extension of the inflammation to the vagina and cervix uteri, or to the urethra and neck of the bladder, or to the lymphatics and lymphatic glands. (Edema vulvæ, although sometimes caused by inflammation, is more frequently a consequence of organic disease of the heart, or of the kidneys, or of other internal organs; and it is thus generally associated with anasarca. It may also occur during the advanced stage of pregnancy, or even after parturition; in the former circumstances

often rendering delivery more serious or complicated, and in the latter increasing the amount of suffering, and delaying recovery. Inflammation of the lymphatics and their glands rarely occurs in the course of vulvitis, but chiefly of the phlegmonous, ulcerative, and specific forms. It is seldom detected until pain and swelling are experienced in the inguinal glands, and then irregular streaks of redness may be perceived in the external parts, with irregular hardness or swelling of the labia, extending superficially to the groins.

40. ii. TREATMENT.—A. *The treatment of catarrhal vulvitis* (§ 23) consists chiefly of frequent ablutions with weak solutions of alum or sulphate of zinc, or with camphor-water, or seawater, &c. If the parts present much inflammatory irritation, the local means advised for the *irritable* and *erythematous* states of the complaint may be directed, and the treatment be in other respects the same. In most cases, and especially when connected with debility, or occurring as a sequela of fevers, &c., then warm salt-water bathing, followed by tepid or cold salt-water bathing, or warm salt-water hip-baths; tonics internally, chalybeates, due attention to the digestive, assimilating, and excreting functions, and change of air, &c., will be found of very great service.

41. B. *Irritable vulvitis* (§ 24), *Pruriginous vulvitis* (§ 25), and *Erythematous vulvitis* (§ 27), are so closely allied states of inflammation, and so generally affect only or chiefly the epithelial mucous surface, as to require the same or very similar means of cure. At first emollient or demulcent lotions, containing a sedative or narcotic tincture, or solution, in small quantities; or weak solutions of the acetates of lead, or of the nitrate of potash, or hydrochlorate of ammonia, in the decoction of poppies; or a saturated solution of the bichloride of potash, in camphor-water, or in the decoction of marsh-mallows; or cooling pomades, as cold cream, &c., may be prescribed. In the more obstinate or severe cases, pomades containing the oxyde of zinc, or the chloride of mercury, &c.; or lotions with a small quantity of the nitrate of silver, or bichloride of mercury, or of the sulphate of zinc. Or demulcent applications, containing camphor, with one or other of the substances just mentioned, may be resorted to. As these several forms of vulvitis are often symptomatic of disease of some adjoining organ, more especially of inflammatory irritation of the neck of the uterus, of leucorrhœa, of the irritation of worms in the rectum, of gravel or calculi in the bladder, &c., these morbid relations of the forms of vulvitis now being considered should not be overlooked; and the treatment ought to be directed more especially to the cure of the complaint of which they are severally a symptom merely, but a symptom which also requires removal.

42. C. *Eczematous vulvitis*, or eczema of the vulva, may be treated by similar means to those now recommended, or by the local and constitutional remedies mentioned in the article ECZEMA (see § 16, *et seq.*).

43. D. *Erysipelatous vulvitis* is often a serious disease (§ 20), and arises from the same, or nearly the same, causes as those producing the erythematous variety. In most of the cases of the former, however, the constitution is more in fault, especially the circulating fluids, than in the latter. The treatment, therefore, of this form should be more energetic, and be directed chiefly with the objects of depurating the blood, and support-

ing vital power and resistance. The former intention will be fulfilled by the exhibition of a smart emetic at an early stage, followed by a mercurial purge, and by saline aperients and depurants. After the prima via has been sufficiently evacuated, tonics should be conjoined with the alkaline carbonates, and such local means resorted to as the state of the parts may suggest. If diffusive phlegmon, or abscess, or gangrene supervene, the constitutional treatment should be energetic, and the local measures the same as advised for the phlegmonous and phagedænic forms of the disease (§ 45, 46), especially scarifications and incisions, which, when practised before supuration or sphacelation commences, often prevent those serious consequences of the malady.

44. E. *Pellicular vulvitis* is generally most successfully treated by applying to the affected surfaces powdered alum, or calomel, or borax, with mucilage or honey, or strong solutions of the nitrate of silver, or of the chlorides, &c. Having arrested this form of the disease by these means, emollient or detergents lotions, hip-baths, and the remedies advised for the milder varieties of vulvitis may then be prescribed (§ 40, 41). The constitutional treatment should depend upon the peculiarities and circumstances of the case. But generally this form of the disease is not benefited, but it may be injured, by vascular depletions; while saline aperients, and alkaline, saline, and other depurants of the blood, conjoined with tonics, are beneficial. The treatment of this variety of the disease is in most respects the same as I have advised for *pseudo-membranous Stomatitis* (see § 14, 15).

45. F. *Phlegmonous vulvitis* (§ 30, *et seq.*) may, when left to itself, especially in cachectic habits of body, occasion serious destruction of parts, sinuses and fistulous openings and communications with adjoining organs, or prolonged ulcerations. To prevent these consequences: 1st. The patient should be kept in bed, or on a couch, in a cool temperature, with the thighs wide apart; 2d. A considerable number of leeches should be applied between the labium and thigh, or upon the perinæum; 3d. To cover the phlegmon, twice or thrice daily, with mercurial ointment previously to applying linseed poultices; 4th. To direct a warm bath every second day, or a hip-bath every evening or night (VELPEAU). The abscess may spontaneously open, when thus treated, from the fifth to the eighteenth day; but it is generally more beneficial to open the abscess as soon as matter is formed, than to wait for a spontaneous discharge, which may take place in an undesirable situation, or after the abscess has occasioned more or less serious alterations, such results being not uncommon in unhealthy constitutions. The question as to the situation in which artificial opening of abscess of the vulva should be made has been decided by M. VELPEAU in favour of the external surface of the affected labium, and in the lower or posterior part of the swelling or abscess, for reasons he has assigned in the article referred to in the BIBLIOGRAPHY.

46. G. *Phagedænic ulceration of the vulva* (§ 33, *et seq.*) is the result of a molecular loss of vitality of the tissues poisoned by the contact of the irritating and contaminating fluid into which the dead molecules are resolved. It is identical in its nature with *phagedænic stomatitis*, as already stated; and the local as well as the constitutional treatment is in every respect the same as I have

advised for that dangerous malady. (See art. STOMATITIS, § 31-33.)

47. *H. Gonorrhæal vulvitis* (§ 38) is treated as follows by M. RICORD and Mr. ACTON. In the commencement a soothing plan should be employed, and separation of the surfaces attempted, followed by lotions of nitrate of silver, in the proportion of ʒj. to ʒij. of distilled water, and by warm baths. If the inflammation has gained the deeper tissues, the soothing plan should be adopted, or leeches should be applied to the groins. If a phlegmonous condition of parts occurs, depletions should be chiefly relied on; and the moment that an abscess is formed an opening should be made into it, in order to prevent the pus from burrowing through the cellular tissue. When urethritis is much complained of, cubebs and the balsams, with demulcents, are then required. Afterward, balsams and lotions of the solution of the nitrate of silver should be prescribed.

48. *I. The consequences* of the several forms of vulvitis must be treated with reference not only to their actual states, but also to the circumstances, features, and complications of individual cases. General therapeutical principles will guide the physician in respect of these as well as of other morbid conditions, recollecting, however, as respects the most of them, that strict attention to ablutions by suitable means; to the digestive, assimilative, depurating, and excreting functions; and to the promotion of constitutional power, and of vital resistance to the extension of disease, are the surest principles of successful practice.

49. *III. STRUCTURAL AND OTHER LESIONS OF THE VULVA.*—These consist chiefly of *hypertrophy of the nymphæ*, of *tumours of the clitoris*, *thrombus* or *effusion of blood* in the labia after *injuries* or *parturition*, *fistula*, *cancer*, *hernia*, *elephantiasis* of the vulva or of the nymphæ, *tumours* or *cysts*—*erectile*, *sebaceous*, *follicular*, or others—the growth of *hair within the vulva*, &c. These concern the surgeon rather than the physician, and require no remarks from me. The only exception may be made in regard of *hypertrophy of the nymphæ*, which may take place to so great an extent as to require their extirpation. In unmarried females, advanced in age, this change has undoubtedly proceeded from masturbation. But in very young females, to whom this vice could not be imputed, and also in children, the nymphæ are sometimes so greatly developed as to protrude far below the labia majora. Of this state of parts I have seen several instances. In one case which came before me, the very enlarged and prolonged nymphæ were extirpated. The hæmorrhage was very considerable, but recovery was complete. The clitoris may be enlarged as well as the nymphæ; and in such cases the enlargement is probably owing to masturbation. These parts have been observed by LARREY, GILBERT, CLOT-BEY, TALRICH, and others, to have been the seats of elephantiasis; the tumours which resulted having been as large as a child's head. M. VELPEAU has referred to several cases of this nature, which, however, are not rare in Egypt and other parts of Africa.

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VEINS, DISEASES OF.—1. This order of circulating vessels has not received that share of attention and research which it deserves in several states of disease, either implicating it more especially, or affecting the frame generally, and changing more or less not merely the blood circulating in it, but the whole mass of blood supplying all the organs and tissues of the body. Hence alterations of these vessels should not be viewed with reference to themselves only, and as

local changes merely, but with a due recognition of the effects produced by them on the blood, and, through the blood, upon the whole frame. Even this apparently comprehensive view is not sufficient, it is only one aspect in which this subject should be studied—one side of the object—for another presents itself to the experienced and searching eye, viz., the many noxious agents, and the numerous local changes and structural lesions affecting primarily the several tissues and organs, frequently altering either the blood in these parts, or the veins originating in them, or even both, successively contaminating the blood and circulating systems, and ultimately altering the vital cohesion and the ultimate organization of all parts of the living body.

2. It would be impossible, even were it necessary, to consider the diseases of veins, especially in connexion with those of the blood, with that amplitude which I might desire or others expect. This subject can be viewed only in its more practical and important relations, at this place. The full consideration which I have bestowed on the several matters and topics intimately connected with diseases of the blood and circulating organs and vessels, and on the treatment of them under their respective heads, in the early parts of the work, prevents me from attempting more at this place than to notice what has not already come under discussion.

3. It is chiefly to JOHN HUNTER that we are indebted for the earliest and best information respecting diseases of the veins, and especially as to the treatment most appropriate to inflammation of them. Since his time the researches and works of BAILLIE, HODGSON, CRUVEILHIER, MECKEL, BRESCHET, DAVIS, DANCE, LEE, GENDRIN, RIBES, ARNOTT, and others, have tended most essentially to advance our knowledge of these important subjects. Diseases of the veins resemble those of the *lymphatics* and *arteries* (see those articles) in some respects, and differ from them in others, particularly as regards the constitutional symptoms. The veins never exhibit an alteration in all respects similar to aneurism, because their coats yield equally to pressure, and are not subject to the forcible impetus of the blood; besides, their inner coats are more susceptible of dilatation without rupture than those of the arteries; they are, however, more subject to inflammation and varicose dilatation than the latter vessels.

4. Ossific formations, which are so often met with in arteries, are seldom found in veins. The difference of texture is not sufficient to account for this; for, as M. ANDRAL remarks, the structure of the pulmonary artery is the same as that of the aorta, and the right side of the heart is organized precisely as the left; and yet ossifications are much more frequent in the aorta and left side of the heart than in the pulmonary artery and right side. The more abundant supply of ganglionic nerves to the arteries than to the veins may, perhaps, tend to create a difference as to the nature and frequency of diseases of these two orders of vessels. The constitution of the blood, and peculiarities of the circulation in each, may also contribute to diversify their maladies. The circumstance of the blood being oftener coagulated and organized in the veins than in the arteries may be chiefly imputed to this latter cause, and to the more frequent occurrence of inflammation in the former vessels. Pus is more com-

monly found in the veins than in the arteries; this is owing to three causes: 1st, to the greater frequency of inflammation of veins; 2d, to the circumstance of this morbid secretion being carried into the veins by absorption; and, 3d, to the probable metamorphosis or alteration of the pus-globules before they reach the arterial circulation. Perhaps the second and third causes are the most influential.

5. The constitutional effects of diseases of the veins, and the consequences of inflammation of them, differ very considerably from those which characterize the maladies of the other orders of vessels composing the vascular system, but the differences are chiefly apparent in acute inflammations of these vessels, as will be observed upon referring to what has been stated respecting these diseases.

6. I. INFLAMMATION OF VEINS—SYNON. *Phlebitis* (from φλεψ, a vein) *Aderentzündung Blutaderentzündung*, Germ. *Phlébite*, Fr.

CLASSIF.—III. CLASS, I. ORDER (Author in Preface).

7. DEFINIT.—*Tenderness, tension, acute pain, and a knotted, cord-like swelling or hardness in the course of a vein or veins, sometimes with discoloration, when the veins are superficial, extending both to and from the centre of circulation, with symptomatic fever, which often passes into an adynamic state, with indications of contamination of the blood, or purulent formations in the viscera or other parts.*

8. The *pathological anatomy* of phlebitis will be more fully shown in the sequel; but it may be stated at this place that inflammation of veins occasions, 1st. The formation of coagula adhering, by means of the lymph exuded from the inflamed surface, to the internal membrane of the vessel; 2d. The secretion of pus, which may be surrounded by a false membrane, or by coagulated lymph, or be contained in coagula adhering to the internal surface of the vessel; 3d. The secretion of pus, which is not surrounded either by plastic lymph, or by a coagulum, but which has a free access to the current of circulation; and, 4th. The secretion of an ichorous or sanious fluid from the inflamed inner membrane, which rapidly mingles with and contaminates the blood, and generally produces rapid and fatal changes of the structures. Instead, therefore, of viewing phlebitis, as heretofore, to consist of only two principal forms, viz., the *adhesive* and the *suppurative*, the latter being either confined or free, I would add a *third*, the *ichorous or poisonous*.

9. *Inflammation of veins* is of the greatest importance as respects both the local lesions and the consequent contamination of the blood. It is much more frequently seen than inflammation of arteries. Its seat is the cellular tissue of the vein, and the circular fibrous coat, in as far as the latter exhibits any degree of redness or vascularity; and its products are deposited in both these, and in the non-vascular or internal lining membrane extending into the canal of the vessel. It more frequently is *acute* than *chronic*, the former being distinguished by an exudation on the inner surface of the vessel. When phlebitis—inflammation of the coats of the vessel—is the primary disease, the changes of the blood, and other alterations within the inflamed vein, are consequences of this inflammation, these changes being secondary. But when the blood in a vein is coagulated, or is otherwise remarkably altered or pois-

oned, it may, in such a state, irritate the internal membrane of the vein, inflame it, or all the coats of the vessel, the phlebitis being thus consecutive or secondary. The disease may be seated in a single vein, or extended to several, or even to many, whether it be thus primary or consecutive.

10. JOHN HUNTER first demonstrated the pathological changes and the consecutive phenomena of phlebitis. Many years afterward, SASSE, B. TRAVERS, ABERNETHY, HODGSON, and BRESCHE directed their attention to this disease; and more recently RIBES, ARNOTT, DANCE, DAVIS, R. LEE, MARÉCHAL, BOUILLAUD, CRUVEILHIER, VELPEAU, BLANDIN, ROKITANSKY, and others, have contributed facts and opinions respecting it. Nevertheless the subject is by no means exhausted; for there still remain various topics connected with it, both pathologically and therapeutically, requiring farther elucidation and confirmation.

11. i. THE CAUSES OF PHLEBITIS.—Inflammations of the veins are much more frequent in the male than in the female sex, if phlebitis consequent upon parturition be excluded from the account, and in ages from fifteen years to fifty. This greater frequency in males, and in the active periods of life, is probably owing to a greater exposure to injuries and other exciting causes in this sex and age. These causes are numerous, but they chiefly consist of external injuries of various kinds, more especially punctures, lacerations, abrasions, fractures, and contusions; punctures or divisions of veins, particularly with blunt, ragged, foul or poisoned instruments; wounds, punctures or injuries in anatomical dissections or during post-mortem inspections; cuts or scratches when preparing or dressing animal food, especially game, &c.; operations, &c., when performed in foul wards of hospitals, or in low, impure, and ill-ventilated localities or apartments; fractures, compound or comminuted, in similar circumstances; ligatures or surgical operations on veins; the application of caustics or local irritants; the existence of ulcerated or tubercular cavities, or of abscesses or malignant formations, with which veins communicate, or into which either of these morbid matters pass; and the imbibition of morbid matters by veins or sinuses, from cavities in which morbid secretions, fluids, or deposits accumulate, as the cavities of the uterus and cervix uteri, or from ulcerated cavities in the lungs, liver, &c., or from necrosed bones or sphacelated structures, or from purulent matter lodged under the flaps formed in amputations.

[* Inflammation of veins is more common after surgical operations than is generally supposed. We have known several fatal cases, not only from venæsection in the arm, but also ligature of varicose veins in the leg and the testicle, and where every precaution was used to guard against consecutive accidents. Such cases may be found in all our medical journals and works on surgery; in some cases the fatal inflammation has resulted from incision, in others from excision or ligature. Mr. TRAVERS and Sir ASTLEY COOPER have recorded several such instances. In regard to inflammation from phlebotomy, Mr. ABERNETHY imputes it to moving the arm soon after bleeding. Dr. THOMSON, of Edinburgh, ascribes it chiefly to the dulness of the lancet. Other good authorities believe that the latter is not sufficient to cause the disease, unless there be present a peculiar irritability of constitution. Much, however, must be owing to atmospheric conditions, as we find phlebitis far more common at some seasons than at others. This is true both as regards traumatic as well as other kinds of phlebitis. Punctured wounds, if the instrument be charged with some putrid or irritating matter, are very apt to produce inflammation of deep-seated veins; and instances have occurred where such a result has followed from using a lancet previously employed for vaccination, and not thoroughly cleaned.]

These last, venæsections, and punctured or other wounds, are the most common exciting causes of phlebitis.

12. In hospitals, especially during the prevalence of hospital gangrene or erysipelas, either within them or in their vicinity; in camps or barracks, prisons or crowded vessels, especially transports; and in low, damp, crowded, and imperfectly ventilated situations, and in localities exposed to noxious exhalations, particularly in malarious states of the air, or when erysipelas is prevalent in them, and when the more common exciting causes are of frequent occurrence, phlebitis may then assume an endemic or epidemic prevalence. In these circumstances and seasons, venæsection and other operations involving veins can seldom be performed without the risk of producing the asthenic, or most dangerous form of phlebitis (§ 21, *et seq.*); and, indeed, these operations, especially venæsection, should be on such occasions avoided as much as possible.

13. Phlebitis is sometimes not only caused by, but often also associated with, organic lesions of internal organs, especially with ulcerations of the intestines, with abscesses in the liver, kidneys, lungs, brain, ears, &c.; and is occasionally detected in the mesenteric, the portal, and the pulmonary veins, and even in the veins and sinuses within the cranium, upon dissection. It is, however, most frequently associated with uterine diseases, and with inflammations and abscesses of the uterine ligaments; the iliac, spermatic, and other veins, having become consecutively inflamed, as stated in the articles on diseases of the PUERPERAL STATES, and of the UTERUS.

14. ii. SYMPTOMS.—A. The symptoms of *sthenic phlebitis* may be divided into two stages, namely, 1st. Those which are local, and characterize the local limitation of the malady; 2d. Those which indicate the contamination of the blood, and general infection of the frame. 1st. *The local signs* are generally very manifest when any of the more superficial veins are attacked; but they are very equivocal when the deep-seated and internal veins are implicated. Phlebitis usually commences with sharp or severe, sometimes violent, pain in a part, or in the course, of a vein. If the vessel be superficial, it will be found hard, tense, as if stretched, forming under the skin a cylindrical or knotted cord. At the same time the skin sometimes presents a reddish line or more extensive erythematous blush, or even an erysipelatous appearance. If the vessel is more deeply seated, tension and hardness may be felt in the situation or course of the pain. Congestion or engorgement of the capillaries of the cellular tissue adjoining or surrounding the inflamed vein are afterward observed; and if several veins, or a large trunk is affected, this tissue, and the parts below or distal to the seat of disease, become œdematous, or very remarkably swollen. With the local lesion, the constitution sympathizes more or less remarkably, the general symptoms varying with the severity and extent of the inflammation, and with the temperament and habit of body of the patient; but quickness of pulse, heat of skin, headache, loss of appetite, thirst, and impaired secretion and excretion, with other symptoms of inflammatory fever, are commonly observed.

15. In favourable states of the constitution, and when judiciously and early treated, the disease may not proceed farther. The coagulum

formed in the inflamed veins adheres to the parietes of their canals; a collateral circulation is established, and the inflamed veins no longer permit the circulation of blood through them. In some cases the inflammatory exudation on the internal surface of the vessel, or the coagula formed on its sides by means of this exudation, leave a central canal, allowing a partial circulation of blood along it. In other instances the inflamed veins secrete pus, which may be so abundant as to give rise to fluctuation, or other indications of its presence in the sub-cutaneous cord, which is felt when the vein is superficial; and, if an artificial issue is not given to it, the matter makes its way into the adjoining cellular tissue, and forms an abscess, which follows the usual course. When the local lesion does not terminate in either of these ways; and when the morbid exudation, or purulent matter furnished by the inflamed vessel, is carried into the blood, the system becomes generally infected, owing to the contamination of the blood thus produced, and the second period or stage of the malady is developed—or the state of *pyæmia*.

16. 2d. This stage of phlebitis, or that of *vascular infection*, may take place rapidly, or not until after a few days, the rapidity of its occurrence depending upon the nature of the exciting cause and the constitution of the patient. It usually commences with chills or rigors, followed by hot skin and other symptoms of fever, and by perspiration. These paroxysms of chills, fever, and sweats generally return at irregular intervals, assuming a remitting form; but in some instances they are periodic. With these exacerbations, anxiety, distress, or slight or occasional wandering delirium appear; and these are followed by more continued delirium, which is generally low or muttering, rarely lively or excited. The tongue, previously furred, now becomes dry or encrusted, is trembling, or imperfectly protruded; the teeth and lips are fuliginous; the countenance is sunk, dusky or pale, and lurid, and the symptoms assume a typhoid or adynamic character. The pulse is small, very frequent, and soft. These phenomena are observed in nearly all the cases at this stage; and others are less constantly present, especially retchings and vomitings; diarrhœa, the stools being dark and very offensive, the urine turbid and fetid or ammoniacal, and the surface dark or dusky, or slightly jaundiced.

17. During this stage, and often at an early period of it, secondary abscesses form in some internal organ, with indications of oppression, tenderness, or distress, referred especially to the regions in which the affected organ is seated. In some cases the larger joints become extremely painful and swollen, from the formation of pus within their capsules. Purulent deposits, without any very manifest indication of pre-existing inflammation, sometimes form not only in the internal viscera, or in the joints, but also in the intramuscular tissues, and even in the brain, occasioning profound coma. If this stage continue even for a few days, extensive bed-sores and sphacelations occur in the situations on which the weight of the body chiefly rests; and, the sensibility of the urinary bladder being in great measure lost, the urine becomes ammoniacal, or the functions of the kidneys much impaired, contamination of the circulation is farther increased, and its consequences accelerated, death generally

ensuing with a celerity according to the extent and rapidity of these changes.

18. The *extension* of the inflammation is generally in the direction of the heart, or of the current of circulation; but a fatal result often takes place before the inflammation reaches the vena cava, or even the larger venous trunks, owing to contamination of the blood by the exudation, or purulent matter, from the inflamed parts. In some cases, however, the disease pursues a different course, and extends to the smaller ramifications. Mr. ABERNETHY met with a case of phlebitis after blood-letting at the bend of the arm, in which the veins were affected down to the hand. This more unusual course is very probably occasioned by the complete obstruction of the part of the vein first affected by a coagulum or exudation of lymph. It may also be partly the result of the state of constitutional power. It is not infrequent in puerperal phlebitis, the cause of which is chiefly the imbibition of sanious matters from the internal surface of the uterus, aided by shock and vital depression, and by the predisposition produced by an impure air.

19. iii. OF THE DIFFERENT PATHOLOGICAL CONDITIONS OBSERVED IN PHLEBITIS.—The several pathological states constituting the different varieties of inflammation of veins have not been sufficiently investigated and demonstrated by pathologists; and most writers have described two varieties only, namely, 1st, the *adhesive* or common; and, 2d, the *suppurative*; and, while they have viewed the former as merely a local disease, they have considered the latter as productive of vascular contamination and general infection.—a. Of these varieties it may, however, be remarked, that, although the *adhesive* is characterized chiefly by an exudation of lymph more or less adhesive and concrete, on the internal surface of the inflamed vein, and often no farther affecting the blood than causing the formation of a clot within or near the inflamed part, yet it is attended by more or less sympathetic febrile disturbance; and that the coagulum thus formed may be productive of much consecutive disease of the vein, if the local and constitutional treatment be not judiciously managed. Even after the exudation of lymph, or the formation of a coagulum, by means of which the extension of the inflammation and contamination of the blood are prevented, if constitutional power and vital resistance be much reduced, the coagulum thus formed may irritate the internal surface of the vessel, and either perpetuate or rekindle the inflammatory action.

20. b. The *suppurative* variety of phlebitis is generally productive of contamination of the blood and of most dangerous constitutional disease. Nevertheless, instances are occasionally observed in which the purulent matter at first formed, mingling with the blood in the vessel, causes its coagulation, and the coagulum thus formed arrests the circulation and the extension of the inflammation in the direction of the heart, and either allows the morbid action to subside, or favours the extension of it to the more external coats of the vessel and to the surrounding cellular tissue, occasioning abscesses in the course of the inflamed vein, and prolonging the disease. In these cases little or no contamination of the general mass of blood takes place, unless the constitutional powers and vital resistance to the extension of the local disease be much impaired,

either by the continuance and amount of the local lesion, or by an injudicious or a too lowering treatment.

[We find the law of symmetry prevailing in the present as in the other diseases; thus in the viscera, as well as in the superficial tissues, abscesses, resulting from phlebitis, are constantly met with at points most closely corresponding with one another on the two sides of the body.]

21. *c. Asthenic, or diffusive, or poisoned phlebitis*, has not hitherto been described as a very important variety, although it is the most dangerous of any form which the disease assumes. It occurs in all the circumstances, and arises from all the causes, which occasion the other forms of phlebitis. But it more especially proceeds from causes superadded to these, more especially from those which depress the vital energies and infect the system. It is generally the result of two classes of causes: 1st, those which depress the constitutional powers, and produce more or less of general cachexia before the vein is injured or wounded; and, 2d, those which lower or exhaust the energy of the body, and either prevent the depuration, or favour the contamination of the blood during or after the infliction of the injury or the other exciting causes of the phlebitis. The first class comprises malaria of all kinds; the foul air of crowded wards; or that produced from the discharges or exuviae of the sick or of others; improper or insufficient food, &c.; the second includes those already mentioned, when they come into operation during and after the infliction of the injury, or subsequently to the other exciting causes of the disease, violent shocks to the vitality of the frame, poisoned wounds, abrasions, &c., infectious emanations from erysipelatous or gangrenous sores, or morbid discharges; the absorption of purulent, putrid, sanious, or diseased matters from sphacelated, necrosed, or otherwise altered structures, or of decomposed blood, or vitiated secretions and excretions.

22. (a) This variety of phlebitis is characterized by the rapidity, severity, and the fatal tendency of the local and constitutional symptoms, and the marked depression of vital power, and the contamination of the circulating fluids, by which they are attended. Organic nervous energy is remarkably impaired, and all the manifestations of life more or less lowered. The functions of the brain are early disturbed, and the pulse becomes rapid, soft, open, and compressible; the surface of the body soon losing its vital appearance, and becoming livid, dusky, and sallow, sometimes dry and harsh, and ultimately clammy and cold. Delirium occurs early, and passes into stupor or coma. Locally, œdema, cellular infiltration, great tenderness on pressure, boggy swellings, and diminished temperature of the affected limb, are often remarked; and if the injured or affected vein be exposed, as when the disease follows venæsection in the circumstances just alluded to, the wound is gaping, union of the divided tissues not having taken place, and an ichorous or a sanious fluid exudes from the part, or slight hæmorrhage occurs on examination. In addition to the above more constant phenomena, others are observed, arising out of the varying combination of the predisposing and exciting causes, and the state of the patient. These are chiefly a tympanitic state of the abdomen, retchings or vomitings, diarrhœa, the evac-

uations being offensive and unnatural; the rapid occurrence of bed-sores; offensive or ammoniacal states of the urine, severe pains and swellings in the joints or extremities; congestions or puriform infiltrations of internal viscera, with tenderness and oppression referred to the regions corresponding with the affected organ, &c.

23. When *uterine phlebitis* takes place, it may assume either of the forms above described, and owing to such forms, and to the circumstances in which they severally appear, the different varieties of puerperal fever are developed; the more malignant kinds of these fevers being the results of the ichorous and sanious fluids imbibed from the interior of the uterus by the uterine sinuses and veins, or of the morbid exudation from the asthenically inflamed veins of the uterus and its appendages, and of the consequent contamination of the blood, aided by the vital shock of parturition, and by the foul or infectious air in crowded or ill-ventilated lying-in hospitals or wards. (See *art. PUERPERAL DISEASES*.)*

24. iv. The *appearances* observed in dissection of fatal cases of phlebitis, as respects the *veins*, are described in the sequel (§ 57, *et seq.*); those which regard the frame generally are fully given under the head *PUERPERAL DISEASES* (§ 221, *et seq.*), and are nearly the same as those observed after *putro adynamic fever* (§ 513, *et seq.*); and those which are found when phlebitis occasions *consecutive and diffusive abscess* are described in the *art. ABSCESS* (§ 27, *et seq.*)†

[* When the inflammation has been so violent as to occasion very decided changes of structure in the coats of the vein, the usual result is its complete obliteration. In consequence of this, extensive anastomoses often form, the activity of the vasa vasorum becomes conspicuous, and continues till the venous coats are reduced to a homogeneous lardaceous tissue. By their agency, also, the product of inflammation obstructing the vein is very gradually assimilated and absorbed. Meanwhile the walls of the vessel become more and more thickened, contracting in folds or wrinkles upon the narrowing canal, until at length the whole vessel is converted into a thin cellulofibrous cord. The obliteration of the foetal vessels is brought about by an analogous process, the only difference being that in this the process is purely a physiological one, there being simply a slender plug of coagulated blood to surmount, instead of the more heterogeneous products of inflammation. The obliteration of the vein is sometimes only partial, the plastic substance only blocking up part of the venous channel. The obliteration may be permanent, or only temporary, for a plug which closes up a large venous trunk will often be resolved and melted down in the sanguineous current, and that too without exciting any constitutional symptoms from absorption.]

† In the following case, by M. L. HENRISSÉ, as quoted by Mr. ARNOTT, some of the most remarkable secondary effects of phlebitis are described. "Gasper Goldinger, subject for the last six weeks to epilepsy, was bled twice from the arm on the 1st of November, 1806; on the 5th, from the foot; and on the 10th and 13th, from the jugular vein. On the 16th, he was again bled from the arm (the right), which on the following day felt painful; some redness and tension were observed round the aperture; 15th, arm very painful and swollen from the shoulder to below the elbow; edges of the puncture red; face and skin of the body of a yellowish colour, pulse feeble and frequent; 19th and 20th, fever more intense; tongue, dry and coated; great pain in the arm; 21st and 22d, lies supine; prostration of strength; heat of skin; tongue dry; pain in the right side of the chest; respiration short; 23d, tension of the arm diminished, some pus flowed from the wound made in bleeding; respiration short. Died at night, seven days after the receipt of the wound in the vein.

"Dissection.—The wound in the cephalic open; the vein filled with pus through the whole length, *i. e.*, from where it terminates in the axillary to the bend of the elbow, where it divides into the medial cephalic and superficial radial; the latter of which contained pus for two inches below its origin. The coats of the vein were much thickened, indurated, and red. In the interfibrillar cellular tissue of the pectoral muscle of the right side was

25. v. The DURATION of phlebitis is very variable. It is often very short in the asthenic and puerperal states, and may, when accelerated or exacerbated by the foul air in lying-in wards, not exceed 48 hours, although more frequently it continues several days, or even longer. Phlebitis consequent upon venæsection is rarely of less duration than three or four days. The suppurative form of the disease generally continues from ten to twenty-one days, and the adhesive form much longer, or several weeks; but the duration of each of the varieties of the disease varies much according to the causes, the treatment, and the constitution of the patient.

26. vi. SEATS OF PHLEBITIS.—Inflammation may attack several veins, or only one vein, or small part of a vein. It generally extends to the whole circumference of a vein, and is very rarely limited to one side of the vessel. The veins most frequently inflamed are those of the extremities, after wounds and injuries; next, those of the uterine organs and appendages, especially in the puerperal states, and the pulmonary veins. The veins least frequently affected are the ramifications of the portal and hepatic veins; the sinuses and veins of the dura mater; the vena cava, and the veins of the spine, and of the spongy structure of bones. Phlebitis of the umbilical cord, or inflammation of the umbilical vein in newborn infants, is not a rare occurrence. Several recent pathologists, more especially MM. RIBES and CRUVEILHIER, have supposed that the venous capillaries may be the seats of inflammation, and have ascribed erysipelas to phlebitis of the most minute of these vessels.

27. (a) *Inflammation of the veins of the arm* is most frequently consequent upon venæsection, and especially when this operation is repeated. It may, however, occur after amputations, fractures, punctured or other wounds, &c. It commences with pain in or near the seat of incision or puncture, extending upward. If adhesion has not taken place, the margins separate, swell, suppurate, and the pus formed in the vein escapes externally, especially if pressure be made on the vein from above downward. If the incision through the integuments has closed, the margins swell, and the cicatrix opens. The inflammation may extend from the seat of injury to the axilla, to the jugular, to the superior cava, or even to the right auricle. In this case death generally soon ensues, although instances of recovery have been recorded. The disease may also extend along the veins below the seat of injury, especially when the circulation in the vein is obstructed by lymph, coagula, &c. Phlebitis in this situation may present either of the forms described above.

28. (b) *The veins of the lower extremities, and the iliac veins*, or either separately, may be inflamed; the former from the same causes as occasion phlebitis in the arm, the latter most frequently as a consequence of the puerperal state, or of the cancer of the uterus, and of tubercular

a quantity of thick greenish pus. Eight or ten ounces of yellowish opaque serosity were contained in the right sac of the pleura. The lung of this side was unadherent, that of the left was adherent over its whole surface by a delicate false membrane. Both lungs presented a number of hepatized portions, varying in size from that of a nut to that of a large walnut, gorged with fluid, which in some of them was puriform. The arachnoid membrane was opaque, thickened, and indurated, effusion of fluid between it and the pia mater, and into the texture of the latter. Some yellowish serum in the ventricles."

disease. Inflammation of the iliac veins is most frequently manifested in the form of *phlegmasia alba dolens* (see this Art.), although phlebitis is not the only pathological lesion of this disease. M. TOULMOUCHE contends that the much more frequent occurrence of the malady in the left thigh than in the right is owing to the accumulation of feces in the sigmoid flexure of the colon, and to the consequent pressure made on the iliac vein, to the retardation of the circulation through it, and to coagulation of blood in it. (*Gaz. Méd.*, Avril, 1844.)

29. (c) *Inflammation of the vena porta* has been observed by MM. RIBES, BOUILLAUD, DANCE, and FREY, and they, as well as others, have ascribed redness of the internal surface of the ramifications of the vena porta, and of the hepatic veins, to inflammation; but it is not improbable that this appearance is more frequently owing to cadaveric imbibition of the colouring matter of the blood. True inflammation of the vena porta is a very rare occurrence; it is attended by a sense of weight and of pain in the right hypochondrium, greatly increased on pressure; by regular or irregular rigors; by extension of pain to the right shoulder; by jaundice, more or less developed; by nausea, vomitings, and sometimes singultus; by diarrhœa, more or less bilious, and ultimately by the usual indications of purulent infection of the blood. These symptoms are, however, in most respects the same as those accompanying acute abscess of the liver.

30. (d) *The sinuses of the dura mater* are not unfrequently inflamed, consecutively on injuries to the cranium, membranes, and substance of the brain, on inflammation of these parts, on inflammation of the ear, on caries of the temporal or other bones of the cranium. They may also become inflamed in the advanced course of erysipelas of the scalp, and of other maladies and lesions, as I have fully described many years since. (See art. BRAIN, Sect., *Inflammation of Sinuses of the Dura Mater, and of the Vessels of the Brain*, § 37, et seq., vol. i., p. 208, 9.)

31. (e) *The umbilical vein* has been found inflamed in recently born children, by MM. SASSE, BRESCHET, DUPLAY, TROUSSEAU, and others; and has been referred to ligature of the cord. It has been observed associated with erysipelas, with peritonitis, and with enteritis. The veins of bones have also been noticed by M. GERDY. *Uterine phlebitis* has been considered in the article on PUERPERAL DISEASES. (See § 189–197.)

32. (f) *Inflammation of the vena cava* is met with only consecutively upon inflammation of the uterine iliac or other veins. M. BÉRARD has found inflammation of the vena cava extending as high as the confluence of the renal veins in cases of *phlegmasia dolens*: cases of inflammation of the cava have been observed and described by TRAVERS, HODGSON, DANCE, and others. The symptoms indicating extension of inflammation and of its consequences to this vessel are rather inferential than positive. These consequences are the exudation of lymph, the formation of pus, or of coagula, or of all these, and more or less obstruction of the circulation along the vena cava. If there be observed consecutively upon phlebitis of either lower extremity acute or rapidly developed œdema, or dropsy of both the extremities, especially during the puerperal state, or at an advanced stage of fever, or at an early period after the subsidence of fever; and if, after the

occurrence of œdema of both extremities, indications of the development, in the surface of the trunk, of a supplemental venous circulation, it may be inferred with much probability that inflammation and its consequences have extended to the vena cava.

33. *Obliteration* has been observed by HALLER, WILSON, BAILLIE, CLINE, REYNAUD, the writers already named, and by others, to follow inflammation and obstruction of the vena cava. The cases which have been recorded of this remarkable lesion have presented extensive anastomoses, not only between deep-seated veins, but also between the principal superficial veins of the trunk, these latter appearing uncommonly enlarged, and anastomosing with each other. This very great development and free anastomoses of the superficial veins of the trunk have followed gradually upon the dropsical or œdematous state of both extremities; but in some cases, especially those under consideration, and of most marked enlargement and anastomoses of the superficial veins, the œdematous state of the lower extremities gradually diminishes. The particular veins by which the supplemental circulation is carried on are in some respects different in different cases, according to the seat of obstruction or obliteration of the cava, and to the trunks of veins, from which the inflammation extended.

34. vii. *THE DIAGNOSIS.*—Phlebitis may be mistaken, at an early period of its course, for lymphangitis, or the latter may be mistaken for the former. But the large cylindrical cords, wreathing in diverse forms, appearing when the superficial veins are inflamed, and the œdema of the distal or more remote parts, cannot be readily mistaken for the reddish, painful, small, straight, and knotted lines passing in the direction of, and enlarging, the lymphatic glands, above the seat of the complaint. In neuritis and neuralgia the pain is more acute or pungent than in phlebitis, and the appearances observed in phlebitis are not present, especially the œdema of the parts below the seat of pain, &c. When the consecutive or contaminating effects of phlebitis supervene, the low fever, the dusky, sallow, and discoloured skin, the diarrhœa, the rapid weak pulse, delirium, &c., although assuming the form of adynamic fever, may be distinguished from this latter by the antecedent local symptoms, by the causes, and by the whole history of the case.

35. viii. *THE PROGNOSIS.*—The danger of phlebitis is always considerable, because, although it is by no means imminent as long as the disease is merely local, yet infection and contamination of the blood, on which great danger depends, may unexpectedly and suddenly supervene. The symptoms described above (§ 16, *et seq.*) as indicating this contamination of the blood, and more especially those which attend consecutive or diffuse abscess in the lungs, liver, or other organs, are always those of extreme danger. Cases presenting signs of internal consecutive abscess are irremediable.

36. ix. *PATHOLOGICAL INFERENCES.*—(a) The liability to phlebitis as a consequence of the operation of any of the exciting causes, or even without any other cause than that which favours this liability, is great in proportion to the amount of hæmorrhage, or of vascular depletion, which has been the result of the injury or incision of a vein. —(b) Persons addicted to the abuse of intoxicating liquors or of tobacco are more liable to this

malady than others; and the liability extends to those who are weakened or anæmic by pre-existing disease, or who are of an unhealthy or cachectic habit of body.—(c) In the circumstances now stated, and in convalescents from, and even in the advanced stages of, exanthematous and adynamic fevers; in the course of acute rheumatism, of pulmonary consumption, and of diseases of the womb and its appendages, blood may coagulate in some situations in the veins, owing either to its remora, or to its altered state, or to defective vital power in such situations, and may inflame the inner coats of the vein in which it coagulates.—(d) The passage, or imbibition of purulent, ichorous, sanious, putrid, or tubercular matter into a vein or venous capillary may either coagulate the blood as it circulates onward in a venous trunk, and in consequence of this coagulation inflame the vein; or the morbid matter may irritate, inflame, or poison the internal surface of the vein, the inflammatory exudation from the inner coats of the vein coagulating the blood in it, or, failing in this, contaminating the blood circulating through it. It must be difficult to determine the exact sequence of results, and probably either or all may supervene.—(e) The morbid alterations in the veins may extend far along the veins from the seat of injury, as that produced by blood-letting, or even to the vena cava, or to the heart itself; and they may proceed also in an opposite direction, or beyond the injured part, although rarely to any considerable distance; the fatal issue, however, is not owing to this extension, although aided by it, but is chiefly the result of the contamination of the blood, and of the effects produced by this contamination on the organs and tissues of the frame.—(f) Consecutive diffuse abscess in the viscera, suppuration of joints, &c., are not occasioned by the transmission and deposition of purulent or other morbid matters from inflamed veins, or absorbed from primary seats of suppuration, caries, or other disease, but are the consequences of acute asthenic inflammations of those viscera or joints caused by the thus poisoned or contaminated blood.—(g) The sequence of morbid phenomena, or the succession of alterations from the commencement of irritation and inflammation in the vein until the disorganization consequent upon the diffusive suppurations ultimately produced in the viscera or joints, is accelerated by means which lower vital power and diminish the amount of blood circulating in the body.*

37. II. *TREATMENT OF PHLEBITIS.*—The concluding one of the above inferences will indicate the principles which, in my opinion, should guide our practice in phlebitis. The following circumstance may have had some influence in directing my attention and influencing my views regarding this important subject. When in London for a short time, in August, 1815, I had occasion to converse with a well-known public man of that time, who informed me that he had been, about thirty-five years previously, a patient of JOHN

* The above inferences formed the conclusion of a paper read before the Medical Society of London in 1823, and were arrived at after an observation of many cases of phlebitis in France and Germany during 1815 and 1816, and during 1819 and 1820, and after duly considering the treatment which was there generally adopted. These inferences, as well as the treatment which I have recommended in consonance with them, have always been given in my lectures on Practical Medicine, from 1824 until 1842, when I ceased to lecture.

HUNTER, he having suffered an attack of inflammation of the veins after venesection, which had been twice repeated, to a large amount, for pneumonia; and that the inflammation supervened on the last blood-letting. But it was not only the occurrence of the phlebitis after the last depletion which made the impression on my mind, but chiefly the treatment which he informed me had been prescribed by JOHN HUNTER in his case. This consisted, as he stated, of preparations of bark conjoined with other medicines, and of a very liberal allowance of port-wine—upward of a bottle daily—until he recovered. This treatment was altogether so different from what was generally taught in lectures and surgical works, that I continued to reflect upon it, and to contrast it with the means of cure which I afterward saw adopted on the Continent and in this country for this disease, and which are still recommended in surgical and medical works. When it is considered that a very large proportion of the diseases of the puerperal state, and most of the fatal cases of amputation, proceed from inflammation of veins, and from the imbibition of purulent or sanious matters by the veins into the blood, inflaming the veins and contaminating the circulating fluids, or, in other words, producing effects to which the term *pyæmia* has recently been applied, but with little regard to pathological accuracy, the importance of determining the true intentions and principles of cure for this malady must be apparent. Upon what rational grounds can we advise, as very generally advised, large local and general depletions, and a strictly antiphlogistic regimen for a disease which is frequently a consequence of such depletion and regimen? Upon what therapeutical principles can means be recommended for the prevention or cure of phlebitis that tend to promote the imbibition, or absorption, and the circulation of morbid or poisonous fluids in the blood, to prevent the formation of a healthy lymph whereby the extension of the disease may be arrested, and to prostrate the vital resistance opposed by the constitution to the contamination, not only of the blood, but also of the soft solids!—and to the production of all these effects the means usually advised for phlebitis most certainly tend. With what rational intention are means prescribed to arrest the extension of inflammation of the veins and the contamination of the blood that actually and incontrovertibly favour both these results, and that have a more certain tendency to accelerate, if not to cause, a fatal issue than the natural course of the disease itself? The operation of the means of cure in this disease require to be studied and ascertained with as great care as should be devoted to the pathological changes and the consecutive alterations which constitute the nature, and occasion the imminent danger of the malady. An empirical treatment of phlebitis more frequently increases than diminishes the danger; and such empiricism, whether in phlebitis or in any other disease, being the result of ignorance, increases the number of fatal cases, and generates and perpetuates in the mind of the practitioner who is

thus imperfectly informed a skepticism in which he takes refuge, and under which he attempts to conceal his ignorance and to debase his vocation. The skeptic in medicine is ignorant not only of the nature and procession of morbid phenomena, but also of the operation of remedial agents. He is incapable of forming rational views, and is quite impotent as to their accomplishment. He therefore decries what he feels himself incapable of performing, and instead of relinquishing his efforts, he endeavours to impute his failures to the imperfections, if not to the total inefficacy of the science; and by continuing his practice, and by thereby perpetuating his want of success, he persists in furnishing evidence, not only of his own incompetency, but also of the insincerity of his professions; he at once admits that he practices a lie; that he professes to perform what he has no hopes of performing; that he may delude, but that he can not cure.* But, leaving the medical skeptic to luxuriate in his practice and in his belief, and advising him to reconcile the former with the latter, if this be possible in any other way than by relinquishing the one in favour of the other, I proceed to consider those indications and means of treating phlebitis which extensive opportunities of observation disclosed; opportunities, however, in which I was then an observer only, not an actor, and which furnished more numerous proofs of a practice which ought to have been carefully avoided, than evidence of any resulting benefit.

38. 1. A VIEW OF THE TREATMENT which has been advised for phlebitis may, not without some advantages, precede the consideration of the means which I have long believed to be the most appropriate to this malady. Former writers have generally advised very opposite means for the different stages of the disease, for the local affection, and for the general infection of the frame consequent upon it. Thus we find, in one of the ablest treatises on diseases of veins (in *Dict. de Méd.*, 2d ed.) which have recently appeared, it is recommended to have recourse to general blood-letting, to the application of leeches in great numbers, and more or less frequently repeated according to the strength of the patient; to emollient fomentations; to refrigerants; to the application of ice, or to cold effusion to the seat of in-

[* These remarks of our author furnish a very satisfactory explanation of the abandonment of rational medicine by some practitioners, and their adoption of homoeopathy, hydropathy, and other forms of empiricism. Their ignorance of the true principles of medical science, and consequent want of success in the treatment of disease, gradually renders them skeptical in regard to the efficacy of the science; and they fly to visionary systems which promise greater certainty, and require no industry, no grasp of mind, or extent of knowledge to comprehend or apply. They do not seem to understand the causes of their failure, and hence attribute to the imperfections of the science what is solely due to their own ignorance and folly. There is no profession, no study, which requires such high order of intellect, such well-balanced powers of mind, such rare judgment and nice discrimination, such close observation and unerring logic as medicine, and yet every man who finds himself incompetent to gain a living in any other calling feels fully competent, without preparatory training, preliminary study, or close application, to assume the responsibilities of a practitioner of the healing art; and our free republican institutions, in their jealousy of encroachment on individual rights or pursuits, give free license to every ignoramus to experiment on the lives and health of the public. When the true objects of government shall be better understood, homoeopathic and other empirics will meet no greater toleration than those who, under a less respectable garb, take a still shorter cut to reach the pockets of the community.]

* "Les premiers accidents inflammatoires que l'on observe sur le trajet d'une veine seront immédiatement combattus par les antiphlogistiques les plus énergétiques: Saignées; applications de sangsues en grand nombre, et plus ou moins répétées, suivant la force des sujets; fomentations émollientes, tels sont les moyens qu'il convient de mettre d'abord en usage." (*Art. VÈRE, Inflammation*, in *Dict. de Méd.*, 2d ed.)

flammation, in the first or local period of the disease; and, in order to second the effects of this rigidly antiphlogistic treatment, the application of large quantities of mercurial ointment, so as to rapidly affect the salivary glands.*

39. M. PASQUIER and others have had recourse to the application of narcotics locally, in the form of the decoction of poppy-heads, containing the watery extract of opium, or to similar applications, placed along the course of the inflamed veins, and frequently renewed, so as to be always wet. M. BONNET, of Lyons, has had recourse to a very opposite treatment, viz., to the application of the actual cautery to the part where the vein is wounded, in order to prevent the absorption of pus from the inflamed vein. But the cases which he has adduced in support of his practice are too few and inconclusive to found upon them so novel a plan of cure.

40. The local treatment advised by JOHN HUNTER, and advocated by ABERNETHY, REIL, VELPEAU, and others, had for its object to prevent the extension of the inflammation towards the heart, by enabling the constitution to throw out coagulable lymph at the inflamed part, by means of which the blood might be coagulated or the vein obstructed. Compression of the vein above the seat of inflammation was likewise advised with this intention. These measures often were successful, but they often also failed. The remedies prescribed, however, with this view, were not always appropriate to the period of the disease, or to the constitution and habit of body of the patient, and were often resorted to at a too advanced stage, when the blood had already become contaminated, and when means calculated to neutralize or to counteract the contamination, and to depurate the blood, were required. M. BRESCHET attacked this very rational indication, or method, of arresting the extension of the inflammation, by contending that it was most difficult to obtain an adhesive form of phlebitis by medical treatment. But the supporters of JOHN HUNTER's doctrine had more extended views than the mere development of the adhesive form of the disease by enabling the constitution to throw out coagulable lymph. They knew, or at least hoped, that the lymph effused would favour the coagulation of blood in the inflamed veins, whereby the circulation in these veins would be entirely obstructed, and the extension of the inflammation, as well as the contamination of the blood, would be either delayed or prevented, as they also knew that the best means of limiting inflammation in any surface, more especially in that of circulating vessels, were those which supported or developed constitutional power and vital resistance to the impression of injurious agents.

41. If the views as to the treatment of the local stage or changes in phlebitis were thus diverse, those proposed for the second stage, or that of vascular infection and contamination, were no less so. The young pathologists of Paris in this matter displayed their accustomed ingenuity; but beyond this quality no farther praise can be awarded them. Some, relying upon the experiments of MM. LEURET and HAMONT, who stated that the injurious effects of pus injected into the veins of animals were delayed or prevented by repeated

blood-lettings, proposed this mode of evacuating the morbid matters contaminating the blood; but they failed in showing how these matters could be removed with the blood which was taken away, without leaving the same proportion in the blood which was left in the body. The fate of those who were thus treated may be readily predicated. Then was proposed the opposite system; namely, to engorge the patient with diluents, by means of which the poisonous materials may be diluted, their action rendered less injurious, and their elimination promoted by means of the skin and kidneys. M. PIORRY, the apostle of this doctrine, in his memoir on "pyohémie," or pyæmia, adduced some evidence in its support. The due promotion of all the depurating functions, not only those now named, but also those of the intestines and liver, by suitable means, and by appropriate combinations, are important remedies for the second stage of this malady, but in most cases more even than these are required.

42. Some writers have supposed that the morbid materials which have passed into the blood may be neutralized by disinfectant or similar agents, such as the chlorides; and in certain forms they may be of service, and may with some reason be resorted to. But upon what rational grounds can repeated emetics, or antimonials, or mercurials be advised, unless upon the pure empiricism which is based on imputed but very doubtful success? Other writers have dreaded the prostration of vital power, and its consequences, in the second stage of phlebitis, and have had recourse to tonics, especially to the preparations of cinchona, to wine, and various restoratives. The propriety of the practice cannot be doubted, especially if adopted at a sufficiently early period, and if conjoined with means appropriate to existing pathological states and to the circumstances of individual cases.

43. ii. TREATMENT ADVISED BY THE AUTHOR.—A question, preliminary to entertaining the subject of treating phlebitis, suggests itself, namely, *Is there any plan by which the disease may be prevented?* Phlebitis is most frequently a consequence of amputations and similar operations, and of operations on the veins themselves. Of these latter venæsection is the most common efficient cause. From long and diversified observation, I am convinced that, when phlebitis follows venæsection, this operation ought not to have been performed, the states of the constitution and of the circulation actually not requiring it; and that this has more especially been the case when it has been repeated more than once, or when the vascular depletion has been carried too far. Most of the fatal cases of amputation result from phlebitis and its consequences. Now what are the circumstances which favour the occurrence of phlebitis after amputations? These are chiefly, 1st. The shock given to the constitution by the operation; 2d. The anæmied state of the system and the exhaustion of vital power in many cases at the time when the operation is performed; 3d. The collection of purulent matter under the flaps, and bathing the surface of the stump, and the mouths of divided veins; 4th. The state of the atmosphere in hospitals, wards, and places in which the operation is performed and the patient is confined; 5th. The treatment immediately after the operation; and, 6th. The means used to produce insensibility. Each of these requires a few remarks.

[* The late Prof. PRYSC advised the use of blisters over the vein affected, to prevent the extension of the inflammation; and the practice has been generally and very successfully adopted in this country.]

44. (a) The shock produced by the operation, especially when great or prolonged, is not only the result of reduced vital power, but also the cause of coagulation of blood in the veins and of the injurious action of the coagulated blood on the coats of the vein (see *art. SHOCK*). Hence the more severe and prolonged the shock the more likely are these effects to be produced.

45. (b) Many cases require amputation, under unfavourable circumstances, and in others it is so long delayed, owing to the fears of the patient, until these circumstances are developed. When the constitutional power and vital resistance of the patient to disease are reduced, and the blood altered by impaired depuration and imperfect sanguification—when organic nervous energy is depressed, and the blood diminished in quantity, in crisis, or in red globules, or impaired in quality—then a predisposition to phlebitis, when the veins are implicated in surgical operations, is thereby produced.

46. (c) The collection of purulent matter under the flaps, often favoured by the union of the integuments, acts most injuriously on the internal coats of the veins; and it may even be partially absorbed by the mouths of the veins in the surface of the stump, thereby producing pyæmia and its usual results. These effects are the more likely to occur in cases where vital power is greatly reduced, or where the quantity of the blood is much diminished and the quality much impaired, and where the patient breathes a close or contaminated atmosphere.

47. (d) The injurious influence of a foul air in cases where veins are implicated in surgical operations is sufficiently manifest; and the frequency of phlebitis and pyæmia in hospitals, both civil and military, from this cause, is often greater than is supposed. I witnessed this influence and its effects in numerous instances soon after the Peace of 1815, both in France and Germany; and in many more neither the cause nor the effect was recognised. The treatment also in these circumstances, and immediately after operations implicating veins, was often injurious and calculated to occasion the mischief which it was intended to prevent. At the period now alluded to, notwithstanding the writings of JOHN HUNTER, phlebitis and its consequences were but imperfectly understood. It was not until a few more years had elapsed that the pathology of the disease was fully investigated, and up to a very recent period, and even to the present time, neither the prevention nor the treatment of phlebitis has been satisfactorily illustrated. It has been a much too general practice to have recourse to a too strictly antiphlogistic treatment and regimen after amputations, thereby aiding other causes in producing phlebitis and pyæmia. The extent to which such treatment, however, should be carried, or how far its opposite should be adopted, as well as the means by which constitutional power may be promoted, and vital resistance to the invasion and extension of phlebitis be upheld, must depend upon the circumstances of individual cases and the acumen and experience of the physician.

48. (e) The means used to produce anæsthesia during surgical operations, not improbably may favour the occurrence of phlebitis and pyæmia. This topic requires careful examination. A recourse to those means has its advantages and disadvantages. The former are, the greater readi-

ness of the patient to submit to an operation at a time when it is most likely to be successful, and the feeling in the mind of the surgeon that he is not inflicting suffering. The latter are, the depressing influence of anæsthetics on vital power, the extinction of that amount of pain in operations, which, when not too long protracted, tends to develop a salutary reaction, and to favour the prevention of injurious changes after the operation; and, more especially, the alterations produced in the constitution of the blood by the passage of the anæsthetic vapour into it. These disadvantages were urged by me on several occasions immediately after the discovery of the means of producing complete anæsthesia, and subsequent observation has confirmed my opinion respecting them.*

49. From the above it will be inferred that the avoidance, as far as may be, of the several circumstances which favour the production of phlebitis is of great importance; that all operations implicating veins should be performed in as healthy a state of the system as may be possible; that vital power and resistance should be supported, and not depressed; that all contaminating influences should be avoided; that the healthy constitution of the blood ought to be studied before and after such operations, and nothing done to alter it; and that the confidence of the patient in a successful result should be upheld, and roused or increased when depressed. Conformably with these propositions, it will be manifest that a pure, dry, and temperate atmosphere; perfect repose of a limb or a part in which a vein has been injured or wounded; protection of a wound in a vein from the access of the atmosphere; and a healthy discharge of the digestive and depurating functions, and physical and mental quietude, are among the most essential means of preventing phlebitis, and of counteracting or neutralizing many of its causes.

50. I. TREATMENT OF THE FIRST OR LOCAL PERIOD OF PHLEBITIS.—This should vary with the causes of the inflammation, with the symptoms complained of, with the habit of body of the patient, with the presumed extent to which the disease has advanced, and with the situation of the inflamed vein. The causes and seat of the inflammation equally forbid general depletion; and, unless in very plethoric or robust subjects, even local depletions are seldom required. Pain and tenderness are rarely removed by them, even in these subjects, and never in persons otherwise circumstanced. Fomentations, especially those usually applied, sometimes assuage the pain, but they favour the extension of the inflammation along the vein, and prevent or diminish the chance of procuring the occlusion of the vein by

[* The experience of surgeons in the United States does not coincide with that of Dr. COPLAND in regard to the influence of anæsthetics in favouring phlebitis. On the contrary, it is believed that the mortality from severe operations has been much diminished in consequence of their introduction and employment. The depression of the vital forces, as well as the changes produced in the blood through their influence, is but temporary; while the patient is wholly exempted from the violent effects of the shock, which of itself is far more dangerous and depressing to the vital powers than any of the anæsthetic agents. We have carefully watched the secondary effects of both chloroform and ether in every variety of subject, and under every mode of administration and quantity, and we have never yet seen an instance where we thought the reparative process was interfered with, or the cure retarded by their use. Theoretical considerations may possibly lead to such a conclusion, but it will not be confirmed by observation or experiment.]

the production of coagulable lymph in the inflamed part. The *chief objects*, as to the local affection, are, to diminish inflammation and its usual products in the part; to render these products as little injurious as possible by causing occlusion of the vein, and by these means to prevent the contamination of the blood and the supervention of the second stage of the disease by the usual exudations which take place into an inflamed vein. The means which are most to be depended upon for the fulfilment of these intentions are generally those which also remove the more distressing local symptoms; and, while they thus act, they tend equally to promote the *three objects* now proposed. The local as well as the constitutional means may be varied to meet the exigencies of particular cases, and the circumstances just alluded to; but even while the disease is still local, internal remedies should be prescribed, as well as local applications. These latter have been, for the cases which have come under my care, since the commencement of my practice, either one or other of the *liniments* prescribed in the APPENDIX (see Form. 295, 296, 297, 300, 307, 311), applied in the form of an *embrocation* over the seat of the phlebitis, by means of two or three folds of flannel or of spongio-piline; or an epithem of spirits of turpentine, or the embrocation prescribed at p. 1257, of the third volume, applied in the way now stated, the access of air to the wounded vein being assiduously prevented.

51. While either of these embrocations is being applied, internal means should be prescribed with due reference to the state of vital power and vascular action, and to existing morbid sensibility and irritability. Care, however, should be had that the medicines prescribed are not such as may occasion vomiting or excessive action of the bowels, as either or both will promote the passage of the products of inflammation into the blood, or render these products more likely to pass into the circulation. The medicines prescribed internally during this period should have for their main objects to prevent the extension of inflammation along the veins, and to assuage pain and irritability: the former of these can be attained only by developing vital power and resistance; and the means best calculated to attain this end may be conjoined with those which affect the latter object. With these intentions I have not unfrequently prescribed the following, varying the individual substances with the varying circumstances of individual cases.

No. 367. R Quinæ Sulphatis; Ferri Sulphatis; Camphoræ, ss , gr. xij.; Pilulæ Galbani comp., ℥ij .; Extr. Opil, gr. vj. (vel Extr. Hyoscyami, gr. xvij.); Pulv. Capsici, gr. xij.; Bals. Peruvian, q. s. M. Contunde bene et divide massam in Pilulas xxx., quarum binæ sumantur 4tis vel 6tis horis.

No. 368. R Ferri Sulphatis; Quinæ Sulphatis, ss , gr. xv.; Camphoræ, gr. xij.; Extr. Hyoscyami, ss .; Extr. Aloës purif., gr. xij. (vel Pilulæ Aloës cum Myrrha, ℥ij .); Pulv. Capsici, gr. xij.; Olei Cajuputi, q. s. Misce et contunde bene. Divide massam in Pilulas xxx. Capiat æger ij. 4tis vel 6tis horis.

No. 369. R Liqueoris Ammoniac Acet., ℥j .; Spiritus Ætheris Nitrici, ss .; Ammoniac Sesquicarbon., ss (vel Spirit. Ammoniac Aromat. ℥jss .); Tinct. Cinchonæ comp., vj .; Tinct. Serpentariæ, ℥jss .; Tinct. Capsici, ss .; Infusi Cascariillæ (vel Decocti Cinchonæ) ad ℥vij . Misce. Cochlearia ij. vel iij. larga sumantur quartis vel sextis horis.

No. 370. R Olei Terebinthinæ, ℥jss .; Spiritus Ætheris Sulphurici comp. (vel Ætheris Hydrochlorici), ss .; Tinct. Camphoræ comp., ss .; Olei Cajuputi, ss .; Pulv. Tragacanth. comp., ℥ij .; Pulv. Glycyrrh., ℥ij .; Syrupi Rosæ et Syrupi Tolutani, ss , ℥ij .; Infusi Cascariillæ (vel Infusi

Cinchonæ) ad ℥vij . Misce. Capiat æger Cochlearia ij. vel iij. larga 4tis vel 5tis horis.

No. 371. R Potassæ Bicarbon., ℥ij .; Ammoniac Carbonatis, ss .; Tinct. Cinchonæ comp., vj .; Tinct. Serpentariæ, ℥ij .; Tinct. Capsici, ss , ad ℥j .; Infusi (vel Decocti) Cinchonæ ad ℥vij . Fiat mist. ejus cochlearia ij. vel iij. larga sumantur ter quaterve in die.

52. An apparently high or tumultuous vascular action, or an open, broad or even bounding state of the pulse, should not deter from a recourse to these or similar means; for these phenomena will much more readily subside under the influence of these than of those of an opposite nature; for vascular action is often the greatest and the most tumultuous when vital power is most deficient, especially when any part of the vascular system is inflamed. By developing and increasing vital power by suitable means, in these circumstances, we more readily overcome or appease morbidly increased vascular action. Although it is not desirable to produce much action on the bowels, still the depurating functions should neither be impaired nor arrested. Hence the remedies may be combined as in No. 368, in order to prevent this result; or equal parts of castor-oil and oil of turpentine may be taken on the surface of an aromatic water, or these substances, in larger quantity, may be administered in an enema.

53. During the local limitation or period of the disease the system sympathizes with the local morbid action, occasioning much febrile disorder, which, although the above means may not for some time either diminish or increase, will not pass into that adynamic condition which readily supervenes upon a lowering treatment of phlebitis, owing to the effects of such treatment upon the local morbid action and to the passage of the inflammatory products into the blood. If, however, notwithstanding the means, local and constitutional, now advised, the inflammation of the vein either extends, or produces a puriform fluid, or in cachectic habits of body an ichorous or sanious exudation, which readily passes into and commingles with, and contaminates the blood, the most strenuous efforts should be made to support vital power and resistance, to counteract or neutralize the injurious action of the contaminating materials, and to remove them from the circulation by means of the depurating organs.

54. In this, the *second or contaminating* period of the disease, the treatment will necessarily vary with the states of the several depurating functions—of those of the skin, bowels, and kidneys. The excretions from these must be frequently examined, and the means of cure prescribed appropriately to their several conditions. If the urine presents an acid reaction, the mixture No. 371, last advised, may be continued, with or without the addition of the chlorate of potass or nitrate of potass, or both. If the urine be neutral or alkaline, or contain the phosphates in excess, then the nitro-muriatic acids may be given instead of these and of the alkalies contained in that prescription. If the skin be dry, or parched, or hot, the mixture No. 369 will generally increase the cutaneous functions, especially if promoted by suitable diluents (§ 56). When it is manifest that neither the hepatic nor the intestinal functions are sufficiently discharged, then the pills already prescribed may be given; or pills containing a full dose of calomel and camphor may precede either them, or the castor-oil and turpentine draught and enema above recommended (§ 52).

If the bowels become inordinately relaxed, the tonics already mentioned or others may be conjoined with astringents, small and frequent doses of creasote, absorbents and antacids, and with tincture of opium, or with compound tincture of camphor; or with any of the several remedies advised for DIARRHŒA or DYSENTERY (see those articles), according to the features of the case. It should not, however, be overlooked that relaxation of the bowels is a mode of vascular depuration, especially when the hepatic functions are duly performed, and that this relaxation should not be arrested unless it increase, or reduce the patient; but be moderated only, constitutional power being duly supported by the means already prescribed, aided by suitable nourishment, and by a sufficient supply of wine, at regular intervals.

55. In these and similar cases, evincing not only great depression of vital power, but also more or less deficiency in the quantity and quality of the blood, the quinine, or the decoction of cinchona, chalybeate preparations, and other restoratives, may be given in increased or more frequent doses; and wherever pain, oppression, or uneasiness may be manifested, the embrocations advised above should be applied and renewed from time to time. In these and analogous states the tonics will be advantageously conjoined with camphor, ammonia, aromatics, &c., and with opium in moderate doses.

56. The diet, regimen, and beverages prescribed for the patient ought to be restorative, and calculated to promote nervous power. Rich wines, brisk, bottled malt liquors, or bitter ales; soda-water or Seltzer-water with wine; the alkaline and chalybeate mineral waters; spruce-beer and weak tar-water; Carara or lime-water with warm milk, &c., are the beverages which will be found most beneficial. Free ventilation, and a warm, dry, and pure air, are also most important aids of medical treatment. In most respects the treatment of the second stage of phlebitis is the same as that which is most efficacious for consecutive abscesses (see art. ABSCESS, § 62, et seq.), for the effects of absorption of morbid matter from diseased organs and structures (see ABSORPTION, § 15, et seq.), for inflammation of the LYMPHATICS (§ 17, et seq.), and for the consequences of animal or food Poisons (§ 427-456).

II. STRUCTURAL LESIONS OF VEINS.—CLASSIF.

—IV. CLASS, III. ORDER (Author in Preface.)

57. a. Inflammation of veins occasions redness, or a reddish-brown or violet tint of their coats. But similar changes, usually however of a more uniform character, are often produced in these vessels after death, by the imbibition of the colouring matter of the blood. Indeed, this is the most frequent source of the different shades of colour observed in the veins, these shades varying with the state of the blood, and with the period after death at which the examination had been made. The redness proceeding from this source is much more frequently met with in the veins than in the arteries, evidently owing to the constant presence of blood in the former after death. This change, however, differs in pervading all the coats of the veins, whereas it is generally confined to the inner membrane of the arteries. Redness, therefore, unaccompanied with other changes, cannot be considered as a proof of disease.

57*. The veins, like other parts of the body, present alterations arising from the secretion of coagulable lymph or albumen. This plastic and organizable matter, in which a number of morbid formations originate, is frequently found in the veins, either extended into membranes or accumulated in amorphous masses. It is always to be viewed, particularly when connected with redness or vascular injection, as a result of the inflammatory act. The experiments which M. GENDRIN instituted upon the veins, as well as upon the arteries, have illustrated this point.

58. b. Coagulated lymph is found, 1st, in the interior of the veins; 2d, between their coats; and, 3d, on their external surface. When this is considerable, or obliterates the canal of the vessel, it generally becomes partially organized, and is changed to cellular tissue, if the life of the patient continue for some time. When the lymph is secreted in smaller quantity, so as not to interrupt the circulation in the vessel, it generally presents the form of a firm albuminous layer, without any trace of organization; but in some instances, as pointed out by RIBES, GENDRIN, and ANDRAL, it forms a delicate membrane, and presents evident traces of organization, being traversed by minute vessels. The surface of the vessel opposed to those membranes is sometimes, most commonly in the more recent cases, of a deep red colour; but in other cases, particularly those of older date, it is perfectly colourless. The coagulated albumen thus formed in the interior of the vein may constitute small patches merely, or small circumscribed masses, or a complete continuous layer extending through the whole of one or several vessels. The polypous concretions described by REIL (*Fieberlehre*, bk. ii., p. 215-297) belong to the second of those varieties.

59. c. Purulent matter is frequently found in veins. M. ANDRAL states that coagulable lymph may gradually lose its physical characters, and be insensibly transformed into pus. That this may happen previously to the coagulation of the lymph, is possible; but we have no satisfactory proof of its occurrence, and least of all, after the coagulation of this fluid has taken place. Indeed, it must not be supposed that the purulent matter formed in the veins is generally, or even frequently, produced in this manner. When it is found in the veins, it evidently does not proceed from a transformation of the plastic matter already noticed, but from a modification of the morbid action of the extreme vessels which secreted that matter, and from a change in the vital condition and cohesion of the internal membrane of the vessel; this membrane being somewhat softened, and frequently tumefied or thickened. When the purulent matter is formed from the vein itself, it is found, 1st, in the cavity of the vessel; 2d, infiltrated between its coats; and, 3d, surrounding.

60. The purulent matter formed in the interior of the veins is, however, more frequently conveyed there from some other part with the blood, than secreted by an inflamed vein. When detected in a vein, it is either pure, or mixed with the blood or with coagula. When pus is found connected with coagula, it has been, in some cases, external to them, and in others contained in them. This latter phenomenon has led to some speculation on the part of certain pathologists. M. ANDRAL believes that pus contained

within a coagulum has been formed there in consequence of some peculiar modification of the blood itself. But this is merely a supposition, and is opposed by the consideration that the blood-globule can hardly be changed to a pus-globule, either during or after the coagulation of the blood. It is much more probable that the pus, whether poured into the vessel from its inflamed internal surface, or conveyed from a distant part with the blood, but particularly when it proceeds from the former source, is first formed, the blood coagulating around it, owing to some obstruction to the circulation in the vessel, or to the effect produced by the morbid secretion on the fibrin of the blood favouring its coagulation.

61. The irritation and inflammation producing suppuration of veins arise from various causes. These are stated when treating of inflammation of these vessels (§ 6, *et seq.*), where I have shown that inflammation originating in a part of a vein may be propagated both toward the heart and in the course of the smaller branches. The connexion of redness, thickening, softening, &c., of the coats of veins, with the formation of purulent matter in them, has been fully illustrated by the researches of RIBES, DAVIS, VELPEAU, GENDRIN, LOUIS, ARNOTT, LEE, TONNELLÉ, and DANCE; and similar appearances have repeatedly come before me in the examination of fatal cases of puerperal diseases. But pus is often formed in the veins without any change of structure of their parietes, particularly in those veins which arise in parts in a state of suppuration. I have observed in several cases, in which the uterus of puerperal patients contained purulent matter either in its cavity or in its sinuses, the uterine veins, and some of the veins into which they run, nearly filled with this matter. Similar appearances have been noticed by DANCE, LOUIS, and others. ABERCROMBIE and TONNELLÉ have found pus in the sinuses of the dura mater, in cases of caries of the bones of the head, &c. Pus has often been found in the veins near diseased joints, suppurating fractures, and unhealthy stumps, by RIBES, VELPEAU, and others. BLANCHARD long ago found pus in the vena cava, in a case of abscess of the liver. M. GENDRIN found pus in the veins in the vicinity of ulcers in the intestines. M. ANDRAL has met with similar appearances. I have stated in the article DYSENTERY, that abscess of the liver sometimes complicating that disease not unfrequently proceeds from the absorption of pus from the ulcerated intestines into the veins, which, circulating into the vena porta, excites diffusive or asthenic inflammatory action, rapidly followed by the formation of purulent matter in the substance of the liver. This view is confirmed by the researches of M. RIBES, who has demonstrated that the villi of the intestines are principally composed of minute branches of veins. M. ANDRAL found, on the examination of a case of diseased intestines and liver, the vena porta and its branches lined with a false membrane. When purulent matter is formed in a part, and afterward conveyed into the veins, as in the instances now alluded to, their coats are in some cases apparently sound, and in others inflamed or softened, or their interior is lined with a false membrane, &c. In the latter cases, either the inflammatory action has extended itself to the veins from the part primarily diseased, or the morbid secretions which have passed into them have

irritated and inflamed their internal membrane, at the same time that they have induced serious changes in the blood and system generally.

62. In asthenic or cachectic states of phlebitis, or when the cause is of a poisonous or septic character, the exudation from the interior of the inflamed vein is neither plastic nor purulent, and is so entirely of an ichorous and liquid nature as to mingle readily with the current of the circulation, and to rapidly contaminate and poison the blood and the soft tissues, and to destroy life. In such cases discolouring of the inner surface, and softening and thickening of the coats of the vessel affected, with an altered appearance of the blood—a dark, semi-coagulated or uncoagulated condition of this fluid. In these cases the blood is rarely, or if at all, coagulated, or very imperfectly coagulated in the diseased vein or veins, there is no plastic exudation on the internal surface, and no trace of pus in the vessel. The injurious operation of this ichorous exudation is accelerated by the circumstance of its failing to produce coagulation of blood in the vein; for when the exudation is plastic or purulent a coagulum is generally formed by these latter exudations; and this coagulum often prevents the extension of the inflammation and contamination of the blood and its consequences, while the ichorous and more liquid exudation hastens both these most dangerous or fatal results.

62*. Thus the morbid states of veins may originate either in themselves or in the parts in which the veins commence; but, whether they be thus primary or consecutive affections, they exercise a powerful influence on the system, and on distinct organs, both through the medium of the blood and by continuity of tissue. 1st. Purulent matter secreted from an inflamed vein, or conveyed into the veins from an adjoining part, may mix with the blood, occasion febrile symptoms of an adynamic character, generally with colligative perspirations or diarrhoea, and be thus eliminated from the circulation nearly as fast as it passes into it, by the several emunctories. 2d. This matter, when once carried into the circulation, may be secreted from it into the parenchyma of some organ, the cavity of some joint, or even into cellular or muscular parts. 3d. Purulent matter circulating in the vessels, whether the pus-globules be metamorphosed or no, during their circulation, may induce inflammatory irritation, or such a state of the capillaries of an organ or part previously disposed to disease, as will be rapidly followed by the formation of purulent matter in such part, or by disorganization. 4th. Inflammatory irritation excited in the internal membrane of a vein, more especially in the asthenic forms, may extend in every direction to other veins, especially in that of the heart, and thus implicate other organs or parts. This diffusive form of phlebitis generally occurs in debilitated or unhealthy states of the frame, or when the disease is consecutive on other maladies, or caused by septic or poisonous agents. 5th. Inflammatory disease of the internal surface of the veins will give rise to a secretion varying with the state of the vital powers of the system, and this secretion carried along, and mixing with, the circulating current, will remarkably influence those powers, and depress or otherwise modify them. 6th. Inflammation attacking all the coats of a vein is more likely to occur in a healthy body than that confined to the inner surface, and is more com-

monly productive of an effusion of coagulable lymph, which tends to limit the inflammation, to prevent the admixture of the products of inflammation with the blood, and thus to preserve the blood from contamination. 7th. This sthenic form of inflammation most frequently occasions obstruction and obliteration of veins; and, if the obliteration be seated in large veins, serious local and general effects may result, owing to the mechanical obstacle thereby presented to the circulation.

[Analogy justifies the assumption that pus is secreted by the coats of the veins. VOGEL has fully demonstrated the transition of epithelium cells into pus-globules. SCHWANN having originally shown that all organic bodies are developed out of nucleated cells, HENLE followed up the observation, and proved that from these primary cells either normal or pathological forms may spring: consequently, inflammation would give rise to pus-globules. To apply these views to the formation of purulent matter within the veins: the cells of the epithelium lining separate from the internal membrane of the vein, so as to give a dull appearance to the inner surface of the vessel, and render it more susceptible of a morbid tinge from imbibition. The passing blood-corpuscles next assume a spheroid, or a gibbous appearance, advance with a slow revolving movement, or cling to one another, parting with their serum and with their pigment. The lining membrane of the vessel generates new, imperfect epithelium cells which mingle with the altered blood, and, finally, actual pus-globules, which, when congregated in sufficient number, completely arrest the current of blood, and affect the blood-corpuscles in the manner above mentioned. The simultaneous effusion of both fibrin and albumen now serves to complete the formation of a plug, which differs in its external character according to its more or less rapid development, and to the varying proportion of its constituent parts. Supposing suppurative phlebitis has now commenced, or is commencing, the plug, thus formed, grows softer towards its centre; it assumes a grayish, yellowish-white, dotted appearance, and finally exhibits a straw colour, and a semi-fluid consistency. Its laminated structure becomes more and more indistinct, and it is finally resolved into pus, which is usually confined within a fibrinous layer more or less thin, and rarely found loose within the vein. But the contents of the veins being unceasingly propelled towards the heart, the more or less solid products of inflammation are necessarily conveyed beyond the original site of inflammation. For this reason it would be premature were we at once to conclude, in examining a body, that the part of a vein at which we might happen to find a pus-coagulum must be the true seat of the disease. That seat is frequently remote, and difficult to discover: thus between a purulent coagulum in the inferior vena cava, and a gangrenous spot or a varicose ulcer on the leg, the whole extent of the iliac and crural veins, together with their deep-seated branches, shall be found perfectly healthy, while one or more branches of the saphena vein above bear all the evidence of intense inflammation. But since pus, by mingling with the blood, causes its coagulation, a decided hinderance is thereby offered, in the majority of instances, to the product of inflammation passing along with the venous current. The pus becomes isolated by the coagulation of blood both above

and below the place of its formation, and is thus cut off from the remainder of the blood. This has been called by some pathologists the *sequestration* of veins. Under such circumstances, the pus may be gradually removed by the process of absorption, the vein in the mean time becoming obliterated; or it may make for itself an outlet through the parietes of the vein. Then abscesses, varying in size and number, according to the amount of inflammation, form beneath the skin, or between the muscles, and the patient is thus protected against the dangerous consequences of a general infection of the circulating fluid. Is not such the origin frequently of the cold, deep-seated abscesses so often met with after injuries, and in vitiated constitutions? When pus has thus formed within an inflamed vein, its coats begin to undergo a change; their colour inclines to a grayish white; they become softened and thickened; and can no longer be distinguished from each other, forming with the surrounding textures a nearly uniform membranous layer of a lardaceous character and aspect. Soon after, a turbid, puriform fluid is often found deposited at intervals in the cellular tissue; in some instances, where the suppuration is active in the vicinity of the vein, the latter traverses the purulent channel for a considerable space, denuded in its entire circumference. Here the membranes of the vein gradually soften, and at length melt down, until no farther vestige of their texture is discernible within the common centre of suppuration.

If this process of *sequestration* does not take place, or but imperfectly, and the pus, or softened fibrin, passes at once into the general circulation, then all those phenomena ensue described by our author, the disease perhaps first assuming the type of an irregular intermittent, and subsequently of a typhoid or putrid and malignant character.

The morbid condition of the blood hence resulting leads to organic changes in every part of the body; all being referrible to stagnation of the circulating fluid, and are divisible into such as occasion a stagnation and interruption of the sanguineous current in the central portions of the vascular system, and into such as have their seat in the capillary system.

According to HASSE, the first series of changes consist in the formation of pus, and in coagulation of blood within the large venous or arterial trunks—even in the heart itself. The product of inflammation, whether pus or fibrin, follows the course of the blood towards the heart, but, advancing more slowly than the uncontaminated blood, accumulates, invests itself again and again with fresh layers of coagulum, and ends by entirely closing up the cavities of individual vascular trunks, and especially where a large quantity of blood has to pass within a brief space of time, and in which, therefore, the pus-globules and the fibrinous particles accumulate the more rapidly.

The pulmonary artery and its branches are most frequently the seat of this coagulation of the blood consequent on phlebitis, the plug which forms here perfectly resembling that of the adhesive inflammation of vessels. It is of a pale-brown colour, with here and there a yellowish spot, composed of concentric layers, and attached more or less closely to the walls of the vessel. These concrete masses, which have been observed in uterine phlebitis, and phlebitis consequent on uterine carcinoma, spread to the minutest extremities of the pulmonary artery, generally of one side only, and

causing death as soon, at least, as the main trunk becomes obstructed. In other cases similar coagulation occurs in the right cavities of the heart, in the form of *polypi* of the heart, as they have been called; which are of a grayish or pale violet colour, and having a stratiform and fibrinous structure. Internally they are sometimes found considerably softened, and occasionally containing liquid pus, while externally they are attached to the columnæ carneæ, and the valves of the heart. HASSE thinks that in order to produce such coagulation, it is indispensable, not only that a certain amount of morbid matter should pass into the circulating mass, but likewise that there should exist a peculiar predisposition of the body generally.

The most important pathological result of phlebitis, however, is that which involves secondary organic changes in the capillary system, called by some pathologists "*lobular inflammations*" and "*lobular abscesses*." They occur most frequently in organs through which the greatest portion of the blood is propelled within a short space of time, viz., the lungs and liver. They seldom occur in the spleen, kidneys, external skin, or cellular tissue; more rarely still in the brain, eye, and muscles. Serous membranes are not often the seat of this puriform effusion, the synovial membranes and pleura rather more so than the others. *Puerperal peritonitis* forms an important exception, though frequently the result of concurrent metritis. Veins, also, distant from those originally diseased, appear to be obnoxious to this secondary suppuration. The above explanation applies to abscesses in the liver and other organs, consequent on injuries of the head and other parts, which for so long a time were a source of mystery to medical men. These phenomena, then, are due to a phlebitis, in which the pus formed is not isolated, but mingles with the general sanguineous mass. As to the absorption of unaltered pus through the capillaries, it is hardly admissible on physical grounds. With regard to the abscesses that form in the lungs, liver, and spleen, it is now agreed by the best pathologists that these collections are not at once purulent at the outset, but the blood stagnates at certain points, producing suppurative inflammation of the surrounding tissue; or knots form of from the size of a pea to that of a walnut, become infiltrated with firm coagulated blood, and eventually suppurate. Formerly it was supposed that the pus formed within the veins at the part originally inflamed was transmitted through the current of the circulation to the lungs, liver, &c., and thus formed the abscesses in question. If pus be injected into the veins of horses, lobular abscesses will shortly afterward be found in the lungs. The pus-globules having reached the capillaries of the lungs, are unable, from their size, to permeate them, thus becoming central points of stagnation, and finally of extravasation in the minute branches of the pulmonary artery, and inducing inflammation and suppuration. VOGEL, however, considers it not impossible for single pus-globules to pass through the capillaries of the lungs, and HASSE remarks that it may be assumed that in some cases the substances commingling with the blood pass through the capillary system of the lungs without inducing any change in the pulmonary parenchyma. Some such admission seems necessary to explain the origin of purulent collections in other organs than the lungs and liver. Perhaps, as HASSE suggests, the nuclei of rup-

tured pus-globules may pass through the capillaries of the lungs into the general circulation, as also fibrin altered by the inflammatory process into finely-divided particles.]

63. *d. Softening* of the inner membrane of veins is often observed, and is generally conjoined with redness when it is the result of inflammation. Sometimes the softening is so great that the inner surface of the vessel is readily reduced to a pulpy state by gently scraping it with the back of the scalpel.

64. *e. Thickening* of this membrane is often associated with the foregoing changes; it may be either partial or general. In the former case the inner surface of the vessel presents an uneven appearance. But softening and thickening of the inner membrane of the veins are not always connected with redness; this membrane may present either of those alterations, or both of them, accompanied with paleness or with different shades of colour.

65. *f. The valves* of the veins are subject to the same alterations as the inner membrane. They are often deprived of their transparency, thickened, or partially destroyed; presenting the appearance of irregular fringes crossing the cavity of the vessel, and having generally coagulated blood adhering to them.

66. *g. The middle coat* of veins is often softened, generally at the same time as the inner. When this is the case, the vessel is torn with great ease. This coat is also subject to atrophy. When this exists the vessel presents an extraordinary degree of tenuity. *Hypertrophy* of the middle coat has been minutely described by M. ANDRAL. When this change exists, the coat is more distinctly visible, and its longitudinal fibres more evident. When the hypertrophy is considerable, this coat loses its transparency, acquires a yellowish colour, and becomes, to a certain degree, elastic, so that, when cut across, the vein remains open as an artery, to which it closely approaches in appearance. On minute dissection, however, the middle hypertrophied coat never presents any trace of circular fibres, nor does it possess the same degree of elasticity as the middle coat of arteries. M. ANDRAL states that he once detected, as he believes, muscular fibres in the vena cava inferior, near the heart; the cava was greatly hypertrophied. The hypertrophy in this case developed a structure similar to the natural condition of the vessel in some of the lower animals. In the horse, the structure of the vena cava near the right auricle is evidently muscular.

67. The middle coat, however, may be much thickened without actual hypertrophy or development of its fibres. This may arise from a deposition of fibrinous lymph in its texture, which becomes solidified by the absorption of its serous portion. M. ANDRAL accounts for this change by supposing that a quantity of blood accumulates in its tissue; that the colouring particles are absorbed, and the white fibrin remains behind in a solid form, combined, molecule to molecule, with the coats of the vein, presenting the lardaceous appearance described by authors as a particular tissue; but instead of having recourse to this complex explanation, would it not be preferable to consider this alteration as a result of chronic inflammatory action in the coats of the vein?

68. *h. The external coat* of the veins is subject

to the same changes as have been observed in the external coat of ARTERIES, and which are described in that article (§ 44). These alterations of both the middle and external coats are commonly seen after chronic phlebitis.

69. *i. Ulceration and perforation of the several coats of the veins are sometimes met with.* M. ANDRAL thinks that the latter is more frequently observed than the former. Perforation has been detected in the superior cava, both within and without the pericardium; in the inferior cava; in the vena portæ, both within and without the liver; in the splenic vein; in the jugular; in the subclavianæ; in the mesenteric veins, and in the veins of the extremities. The perforation is sometimes seen without any appearance of disease in the vicinity of the coats of the vessel, rupture taking place from external violence or muscular exertion. This form of perforation, or rather *rupture*, is most frequently observed in the vena cava and veins of the internal viscera. Instances of rupture of large veins are numerous. SCHENCK, MORGAGNI, DE HAEN, DOUBLEDAY, GROQUIER, LOVADINA, &c., have recorded rupture of the vena cava. MORGAGNI also found the pulmonary vein ruptured. In the majority of these and other instances, the rupture was occasioned by exertion or external injury. It is probable, however, that the walls of the ruptured vessel had been previously diseased. In cases of perforation the vessel is commonly more or less inflamed, ulcerated, softened, atrophied, &c.; and here, as well as in the case of rupture from exertion or violence, the perforation occurs from within outward; but the perforation may also proceed in a different direction; viz., from without inward, as when the vein is seated in diseased parts, as in carcinomatous ulcers of the stomach, or is pressed upon by a tumour.

70. *k. The calibre of veins may be much altered—may be increased or diminished—especially when the coats are diseased as described, the change of diameter occurring in the parts of their parietes which are affected.*—(a) *Dilated or varicose veins* present a variety of appearances: 1st. The veins may be simply dilated, in respect either of a whole vein or of portions of it, without any affection of the capillaries which nourish it, but more frequently with chronic inflammation of its coats; most probably the dilatation is the consequence of inflammatory action, this state disappearing, but the dilatation continuing. 2d. They may be dilated, either uniformly or at intervals, with thinning of their parietes. 3d. They may be dilated and their coats thickened, either uniformly or at intervals, the vessel being generally also lengthened, and consequently tortuous. 4th. They may be dilated and divided into compartments by the interposition of septa or partitions, between which the blood stagnates or even coagulates. 5th. They may be dilated, divided into compartments, and the dilated portions perforated, so as to allow the blood to pass into the cellular tissue surrounding the vein. M. ANDRAL thinks that the tumours described by the name of *erectile* are in reality nothing more than a cluster of small veins communicating with one another and with the surrounding cellular tissue by the perforations situated as now described.

71. The structure of every variety of hæmorrhoidal tumour may be referred to one or other of the foregoing varieties of dilatation or varix;

but these lesions are not confined to the veins in the vicinity of the anus. M. ANDRAL once found the external jugular altered in the manner described in the last variety. In some cases the tumours occasioned by dilated veins disappear spontaneously. When this occurs, the veins are generally obliterated. Some of the above kinds of varix, according to this pathologist, depend upon increased activity, others upon diminished activity of the nutritive process. Such, however, can be rarely the case. They are generally the results of pressure on the venous trunks into which the varicose veins pour their blood, or of some other obstruction to the circulation through the former vessel. In this case the varicose veins are not only greatly dilated and elongated, but their parietes are also hypertrophied.

72. (b) *Contraction and obliteration* are, according to M. ANDRAL, much more common than their dilatation. These lesions are occasioned, 1st, by obstruction in the interior of the veins; 2d, by causes seated in their parietes; and 3d, by mechanical compression external to them, generally from tumours, &c. The most frequent cause of the obliteration of the canals of veins is the spontaneous coagulation of the blood within the veins. That the blood may coagulate, during the life of the patient, within a vein or portion of a vein, and even within the sinuses of the dura mater, has been proved by the researches of many pathologists, particularly by MECKEL, GENDRIN, BOUILLAUD, RIBES, ANDRAL, CRUVEILHIER, ARNOTT, REYNAUD, ROKITANSKY, myself, and others. It has occurred in several which have come before me in practice, especially in the advanced stages of low fevers, of acute rheumatism, of puerperal disease, and in dysentery. It is often difficult to assign the particular cause of the coagulation. It is, in some cases, apparently owing to the low state of the vital energies and their effect on the blood. In other cases it is probably occasioned by the morbid state of the valves already noticed (§ 65), or to lesion of the internal parietes of the vessel. Most frequently, however, it proceeds from coagulable lymph or pus secreted from the internal surface of the vessel; this morbid secretion adhering to the inflamed surface producing it, entangling the fibrinous and colouring parts of the blood, and thus forming a coagulum which either partially or entirely obstructs the canal. This coagulum generally varies in colour, density, and firmness of adhesion to the sides of the vessel; and it increases in bulk until the passage is entirely obstructed by it. Occasionally the coagulum becomes, in some respects, organized. Some of the pathologists whose names I have just adduced suppose that these coagula live precisely as the veins in which they are formed, and, like every other part endowed with life, keep up a constant process of nutrition and secretion, and are also liable to become diseased.

73. The canal of a vein may be altogether obliterated, and the vessel reduced to a fibro-cellular cord. This seems to be effected in a similar way to that observed in arteries. Obliteration of large venous trunks gives rise, as observed in arteries, to a collateral circulation, kept up by means either of small veins, or of one vessel that has acquired an unusual size. The most remarkable instance of obliteration was observed by M. REYNAUD in the superior vena cava. The veins on the lateral surface of the chest were remarkably enlarged, and anastomosed freely with the

epigastric veins, which were also greatly enlarged. The circulation was carried on chiefly by the vena azygos and inferior cava. The consequences of obstruction and obliteration of veins, especially œdema and dropsy, are well known. Several instructive cases of obliteration of the cavity of the vena cava, of the iliac veins, and of the sinuses of the dura mater, are recorded by BARTHOLINUS, RHODIUS, MANTISSA, BONTIUS, ALBINUS, HALLER, MORGAGNI, HODGSON, BRESCHE, WILSON, TONNELLÉ, REYNAUD, ANDRAL, and ROKITANSKY.

74. *l. Ossific or calcareous formations* are rarely met with in the coats of the veins. They have, however, been observed by MORGAGNI, WALTER, MURRAY, BAILLIE, and TILOKIER, and more recently by MACARTNEY, BECLARD, and ANDRAL, in the femoral and saphena veins. Sometimes these concretions protrude into the cavity of the vessel, either bursting its internal membrane, or carrying this membrane before them. In either case they may at last escape into the cavity and lodge there, without any attachment to the sides of the vessel; for in the latter case the membrane may contract behind the concretion, forming at first a peduncle attaching it to the vessel, which at last is ruptured or absorbed.

75. These concretions have received the name of *Phlebolithes*; they vary from the size of a millet-seed to that of a pea. They have sometimes been found in the centres of coagula, which had evidently been formed around them. They have been observed by COLUMBUS, WALTER, SOEMMERING, JOHN, and LANGSTAFF. F. TIEDEMANN has described them minutely. Those which he has observed, as well as those noticed by the pathologists just now named, were formed in the uterine and hæmorrhoidal veins. TIEDEMANN and ROKITANSKY state that they are formed of concentric layers of the phosphate and carbonate of lime, sometimes with magnesia, united by albuminous matter, around a minute clot or coagulum; and deny that they are formed in the way which I have just stated (§ 74); and contend that they have been produced by a sort of crystallization, or deposition, of the earthy particles contained in the blood, around a nucleus which had formed in the nearly stagnant blood in the veins. M. ANDRAL also considers it possible that they may have been formed in the blood itself. It is difficult to assign limits to the range of possibilities without relation to the faith of those for whose belief they are adduced; but the question is, whether or no these concretions have ever been actually ascertained to have been formed in this manner. I believe that no such fact has ever been adduced.*

[* The mode of formation of these concretions, or vein-stones as they have been termed, is for the most part as follows: Slow inflammation occurs in pouches or dilated portions of vein, and in the prolongations of small venous twigs, suddenly dilated, which results in coagulation of the blood in distinct concentric layers. These coagula, which are mostly spherical in shape, become the nidus for the deposition of phosphate of lime and magnesia, until at length the whole clot is transformed into a *phlebolite* or ossific mass, made up of concentric layers. When the dilated portion of the vein or pouch is thus filled up, its walls commonly become atrophied; the inner surface of the vein assumes more of a cellular structure, and closes firmly around the vein-stone, sometimes making it appear to be external to the vein. At other times the coagulation of the blood extends beyond the point where a vein-stone has formed, the calibre of the vessel closes up, and an entire portion of the implicated vein is obliterated. In other cases there is good reason to believe that they occur free and movable within vessels which continue

76. *m. Fatty, suety, and atheromatous deposits* have been found in the parietes of veins, but not nearly so frequently as in the coats of arteries, where I have first described them (§ 59, 60). BONTIUS states that he has met with large masses of fat in the vena cava, obstructing its canal. I have sometimes found fatty and suety deposits between the coats of the vena portæ; and M. ANDRAL has noticed similar deposits in this vein.

77. *n. Tuberculosis* does not occur either in or on the coats of the veins. If any tubercular matter, or substance resembling this matter, be found within the veins, it can proceed only from imbibition or absorption. But before this matter can be imbibed it must be softened, or metamorphosed, and thus have lost the tubercular characters.

78. *o. Cancer* is met with in veins in two ways: 1st. The walls of a vein may be attacked by a cancerous or carcinomatous growth, penetrated by, involved in, and closed or altered by this growth. The portal, renal, hepatic, and other veins may be thus implicated: 2d. The cancerous matter, especially when existing in other parts of the body, may constitute in a large vein a variously-formed mass, attached to the interior of the vessel, that may either partially or entirely fill and obstruct the canal. This cancerous formation obviously arises from the imbibition or absorption of the cancerous matter or cells into the veins, where they attach themselves and collect into masses of various sizes and forms. The œdema and swellings occurring in the last stages of carcinoma are, in some cases, attributable to this formation in the veins, and in others to phlebitis, produced by the imbibition of the cancerous matters.

79. *p. Gaseous fluids* have occasionally been remarked in the veins. In some cases they have proceeded from incipient putrefaction, but in others this could not have been the case. The vapours and gaseous exhalations from blood very recently taken, or at the time of its being taken from veins, and those found in veins after death, have not been sufficiently examined. They manifestly are such as demand a much stricter investigation than they have hitherto received. In cases of surgical operations, when large veins are divided, air not unfrequently enters the veins; and if it rush in suddenly, and in considerable quantity, it is soon followed by death. The experiments of MM. MAGENDIE and PIEDAGNAL have demonstrated this fact conformably with what has occurred during several operations; but the mode in which this result takes place is not so evident. The air seems to act in deranging and arresting the contractions of the heart, and affecting the actions of the lungs.

80. *q. Entozoa* have been often found in the veins of the lower animals. The strongylus and filaria have been detected in the horse. M. ANDRAL found individuals of the class Nematodea in the vessels of a porpoise. In one only case he found *Acephalocysts* (hydatids) in the pulmonary veins.

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pervious to the current of the circulation. Some pathologists maintain that they form in peculiar sacs in the cellular tissue, external to the vein; others think they are deposited between the coats of the vein, and ultimately get into the interior of the vein by absorption; while OTTO, TIEDEMANN, LOBSTEIN, CRUVEILHIER, PRIQUET, CARSWELL, and HASSE suppose that they form originally within the vein, in the manner above indicated.]

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Chapman*, Cases of Phlebitis, with some remarks on its Pathology and Treatment. (In this article Dr. C. gives several cases of Phlebitis from diss. treated successfully by leeches, fomentations, poultices, and blisters to the part, and calomel, ipecacuanha, and opium internally. "Of all remedies," he remarks, "the one deserving of the greatest confidence is a blister. Numerous are the instances in which I have witnessed its superior efficacy; and I believe there is little division of sentiment as to its extraordinary value among the profession in this part of the country. From what I have seen and heard, I cannot entertain a doubt that it will at once arrest a large majority of cases. But though coming from the late Prof. *Physic*—published by him some 40 years ago, and since frequently alluded to with the highest commendation in the writings of this country—it seems to have attracted scarcely any attention in Europe, or at least I do not find it noticed in the treatises I have consulted on the subject, with a solitary exception. *Cooper*, in his *Surgical Dictionary*, appropriates a paragraph to it, without praise or censure. The manner of application is, to place a narrow strip of epispastic plaster along the course of the vein as far as it appears to be inflamed, cutting an opening in it at the orifice, over which a soft poultice is to be placed, and the blister having drawn is to be so dressed as to be kept freely discharging," &c. Dr. C. also dwells on the importance of supporting the limb, so as to secure an absolute state of rest, and for this purpose recommends a nicely adjusted case, if the vein be in the arm.)—*Stephen Smith*, Phlebitis consequent on Otitis, *Ibid.*, July, 1831, p. 83.—*George B. Wood*, a Treatise on the Practice of Medicine, 2 vols. 8vo. Phil., 1847, art. "Phlebitis."—*John Bell* and *W. Stokes*, Lectures on the Theory and Practice of *Physic*, 2 vols. Phil., 1848.—*Nobley Dunglison*, The Practice of Medicine, &c., 2 vols. 8vo. Phil., 1848, art. "Diseases of the Veins," vol. i., p. 569.—*Martyn Paine*, Medical and Physiological Commentaries, 3 vols. 8vo, p. 716, 815, 444, vol. ii., art. "Philosophy of Venous Congestion." (In this most elaborate Essay, embracing 343 pages, the author has fairly exhausted the whole subject of venous pathology, passing in review all that has been written on the subject from Hippocrates down to the present time. In it will be found fully and clearly set forth what is known regarding the organization and morbid anatomy of the veins, phlebitis, varix, puerperal fever, spontaneous hæmorrhage, &c., constituting one of the most learned and logical essays in the whole compass of medical literature.)—*John A. Swett*, Review of the above work, *New York Journal of Medicine*, vol. iii., p. 403. "In many points of view," says Dr. S., "it certainly surpasses every other work that has ever been issued from the American press," p. 31. To the correctness of this opinion we unhesitatingly subscribe.—*John Watson*, Review of same work, *Ibid.*, vol. iii., p. 145. "We know of but few works," says Dr. W., "and certainly none in the range of American medical literature, to compare with this for the extent and variety of professional research evinced in it." "A work that does honour to the medical character of our country," p. 172.—*Samuel Jackson*, Principles of Medicine and Animal Organization, 8vo. Phil., 1832.—*Joseph A. Gallup*, Outlines of the Institutes of Medicine, founded on the Philosophy of the Human Economy in Health and Disease, in 3 parts, 2 vols., 8vo. Boston, 1839; also "Sketches of Epidemic Diseases in the State of Vermont, 8vo, p. 419. Boston, 1815.—*David Hosack*, Lectures on the Theory and Practice of *Physic*, edited by *Henry W. Ducachet*, D.D., 8vo. Phil., 1838, p. 699.—*William E. Horner*, A Treatise on Path. Anatomy, 8vo. Phil., 1829, p. 459; and in *Am. Jour. Med. Sci.*, Aug., 1835, p. 282.—*Valentine Mott*, New Elements of Operative Surgery, by *A. A. L. M. Velpeau*, &c., translated by *P. S. Townsend*, 3 vols., 8vo. N. Y., 1845; also lectures in "The New York Lancet," edited by *J. A. Houston*, 2 vols., 8vo. N. Y., 1842-43.]

VENEREAL DISEASES.—GONORRHOEA—*SYPHILIS*.—SYNON. *Gonorrhœa*, *Blennorrhagia*,

Phallorrhœa virulenta; *Lues venerea*, *Fernelius*, *Boerhaave*, *Juncker*, *Astruc*, &c. *Syphilis*, *Sagar*, *Vogel*, *Cullen*, *Pinel*, *Young*, *Swediaur*, &c. *Syphilis venerea*, *Sauvages*. *Lues syphilis*, *Good*. *Syphilis*, *Sprengel*. *Scabies venerea*, *Locher*. *Lues syphilitica*, *Morbus Neapolitanus*, *Morbus Gallicus*, *Morbus venereus*, *Auct.* *Lust-seuche*, *Venerische Krankheit*, *Germ.* *Vérole*, *Vérole commune*, *Grande Vérole*, *Maladie Vénérienne*, *Fr.* *Mal Francese*, *lue Venerea*, *Ital.* *Poz*, *French Poz*, *Venerical disease*, *Venerical cachexia*.

CLASSIF.—III. CLASS, I. ORDER (Author in Preface).

1. DEFINIT.—Specific inflammations, or ulcerations, or both, affecting primarily the organs of generation of both sexes, and very frequently the whole frame, at subsequent and sometimes at remote periods, and propagated by contact.

2. Viewing venereal diseases as consisting of two very distinct forms—distinct in their primary character and in their consecutive effects—I shall very briefly notice, first, *gonorrhœa*, or *blennorrhagia*, or, more correctly, *Blennorrhagia specialis*, or *virulenta*, and afterward *syphilis*, or *Syphilis venerea*. The relations between these two venereal diseases have been for ages much discussed by both physicians and surgeons, and are not even now entirely disposed of. They, however, possess this in common, that they are primarily seated in the sexual organs, with very few exceptions; that they generally result from impure sexual connexion, or contact; that they are primarily either inflammatory, or ulcerative, or both; and that in many instances the frame becomes affected or contaminated by them, but in very different forms and grades, and much more frequently in the one form than in the other. These constitutional effects render them of equal importance to the physician and to the surgeon; and although both may sometimes require surgical appliances and aids, still they may be both cured by the prescriptions of the physician only, which alone are appropriate in the consecutive states of these maladies.

3. I. GONORRHOEA.—SYNON.—*Phallorrhœa*, *Phallorrhœa virulenta*, *Gonorrhœa virulenta*, *Blennorrhagia*, *Blennorrhagia virulenta*.

4. DEFINITION.—A specific inflammation of an acute form, affecting the mucous surface of the urinary and sexual passages in both sexes, with a copious puriform or muco-purulent discharge, propagated by contact, and in some instances occasioning severe consequences.

5. i. DESCRIPTION.—I have shown, in the article *VAGINA* and *VULVA*, that those parts are often the seats of a purulent or muco-purulent discharge, which presents the following states or forms: 1st. *Leucorrhœa*, or *Blennorrhagia*, the discharge arising from irritation or inflammatory action, of a non-specific nature; 2d. *Acute Gonorrhœa*, or *Blennorrhagia virulenta*, the discharge being the result of a specific inflammation, caused by the contact of this discharge; and, 3d. *Chronic Gonorrhœa*, or *gleet*, the discharge being more mucous or less puriform, and generally consecutive upon the acute form; and unless when thus related, being distinguished with difficulty from *leucorrhœa* in the female; its contagious property being doubtful, unless the morbid matter acts on very predisposed parts. These forms and states of discharge are also met with in males. The first variety may be communicated by the

female to the male, or by the former to the latter, owing to the fact of puriform discharges, the result of inflammatory irritation of mucous surfaces, being capable of producing a similar state of morbid action in similar surfaces when these discharges are allowed to remain in contact with them. This result follows only in a few cases, and probably only when the recipient surface is predisposed to the infection. Thus a non-specific blennorrhagia, caused by excessive sexual intercourse, or by the discharges of the female organs, may be distinguished with difficulty from gonorrhœa, or acute specific blennorrhagia, and with still greater difficulty from chronic specific blennorrhagia, more especially when the acute specific disease is not very severe, or when it is a renewed or repeated attack.

6. *A. Gonorrhœa in the female* has been described in the article VAGINA and VULVA (see § 8, 38). The *chronic states* of the disease have been noticed by Mr. HOLMES COOTE in his very able work on the treatment of syphilis. He remarks, "that *chronic gonorrhœa* is a disease from which the lower order of prostitutes is rarely free. It exists also among the better class, who live highly, and drink without scruple. In general it disappears when the patient is kept on moderate and regular diet, and confined to bed; but it returns upon the least excitement," &c., and is perpetuated by some internal ulcer or abrasion, notwithstanding the treatment, until this latter lesion is cured. The irritating discharge often causes an abundant growth of *soft vascular warts*, commencing at the lower part of the vagina, near the orifice, and extending at the junction of the mucous membrane and the skin towards the superior commissure. "The rapidity of this growth is quite striking. When removed by the knife they return within a few weeks, if the irritating discharge be allowed to continue."

7. Among other cases adduced by Mr. H. COOTE, showing that a female suffering from gonorrhœa may remain for months uncured, unless a proper examination be made, and some lesion beyond the reach of ordinary inspection be detected and treated in an effective way, the following deserves an especial notice. A young woman was admitted with a large growth of vascular warts from the external organs, and a copious puriform discharge. The usual means were applied, but they increased, and were removed by excision. The discharge, however, continued, a suitable treatment was prescribed, but the warts recommenced their growth, and the patient's general health declined. The os uteri was examined by the speculum, and it was found slightly ulcerated and abraded. Caustic was applied to this part. The discharge rapidly disappeared, the general health improved, and recovery was soon complete. In another case of chronic gonorrhœa, the usual remedies were employed with temporary benefit; but a recurrence of the symptoms invariably succeeded. When examined by the speculum, a large warty growth, soft, red, and vascular, was found two inches and a half from the orifice of the vagina. This growth was two inches in length, and an inch and a quarter across the base, springing from the anterior wall. It was removed by the knife; immediate relief, and complete recovery soon afterward, ensued.

8. *B. Gonorrhœa in the Male*.—This is not only a very painful and troublesome complaint,

but, if injudiciously treated, it may induce changes—or, rather, the treatment improperly adopted may occasion lesions unconnected with the disease, which may imbecillate, or even shorten the life of the patient. And during a somewhat lengthened period of observation I can assert, that numerous instances have become known to me of attempts made to effect a speedy cure having been followed by the most distressing and dangerous results. The complaint usually commences from three to ten days after morbid contact; and the shorter the period of its incubation the more severe the attack; the stronger dose of the virus hastening the effects. A slight itching is at first felt, then an irritation at the opening of the urethra, and afterward a smarting pain, more or less severe, upon micturition. The lips of the urethra become tumid; a thin discharge, at first scanty, but soon afterward more copious and puriform, flows from the passage. The corpus spongiosum urethræ becomes thickened and unyielding, owing to inflammatory exudation into it; and when erection of the penis occurs, a bending downward, or *chordee*, is produced. Hæmorrhage sometimes takes place during this state and affords partial relief; and occasionally irritation extends from the urethra to the glands of the groin, causing slight swelling, which very rarely goes on to suppuration, except in scrofulous subjects.

9. A form of gonorrhœa—*gonorrhœa sicca*—is occasionally met with, both in the male and female, and has been described by Mr. ACTON and Dr. DUFFY, in which the mucous membrane of the female organ is red, swollen, and tender, but free from discharge. In the male there are severe scalding and pain on passing the urine, painful erections, the lips of the urethra being red and swollen. This form of the disease has been called *dry clap*.

10. *C. Secondary Effects and Complications or Consequences of Gonorrhœa in Females*.—Owing either to neglect, to improper treatment, or to constitutional vice, or to neglect of proper regimen, several very serious consequences ensue upon the gonorrhœal disease. Most of those which occur in the *female* have been noticed in the articles UTERUS AND ITS APPENDAGES (§ 43, 53, 122, *et seq.*), and VAGINA AND VULVA (§ 8, 13, 38). These consequences are, chronic gonorrhœa, suppuration or abscesses in the labia, soft vascular warts (§ 6, 7), gonorrhœal inflammations of the cervix uteri, extending to the cavity of it and of the uterus along the Fallopian tubes to the ovaries, and even to the peritoneum; and, in rare instances, even to the uterine veins. Gonorrhœal ophthalmia and gonorrhœal rheumatism occur not less frequently in the female than in the male.

11. *D. The complications of gonorrhœa* sometimes observed in males are, 1st. *Balanitis* (from *Balanos*, glans), or *gonorrhœa externa*, is an inflammation of the surface of the glans and inside of the prepuce, with profuse purulent discharge and excoriation of the cuticle. This affection may be a complication of gonorrhœa, or may exist independently of it. In the former case it is produced by the gonorrhœal virus; in the latter by the want of cleanliness, and by the excoriations caused by the secretions of the part, which have become acrid by retention. In these latter cases the excoriations may be mistaken for chancre. 2d. *Phymosis* and *paraphymosis* occasion-

ally arise, owing to the swelling of the glans and prepuce. Edema of the prepuce presents a semi-transparent or diaphanous appearance. These states, although often complicating gonorrhœa, not unfrequently occur independently of it, especially as a consequence of self-pollution; and in some instances they lead to very serious results. They furnish additional reasons, to others which may be adduced, as to the propriety of circumcision during infancy. 3d. Irritation or inflammation of the lymphatic vessels, extending to the glands of the groin, is a common association of the disease; but the affection of the lymphatics may be so slight as to be imperceptible, although the glands may be much swollen, inflamed, or even suppurate. 4th. The mucous follicles of the urethra may be inflamed and obstructed, and may even suppurate and burst either into the urethra, or externally, or both. In these cases very serious obstruction to the discharge of urine may occur. 5th. The inflammation may extend along the urethra to the prostate gland and neck of the bladder, and even along the ureters to the kidneys; or it may give rise to acute abscess of the gland and great suffering, especially during micturition, to strictures, &c. 6th. More frequently, inflammation extends along the vas deferens, causing swelling of the epididymis, or swelled testicle.

12. Gonorrhœa is always most severe on its first occurrence, and in young and robust subjects, and in the irritable and scrofulous constitutions and habits. In these it is often attended by severe inflammatory fever and disorder of the urinary functions; and it may even prove dangerous to life, by inducing extensive inflammation and abscesses in the vicinity of the prostate and bladder. "But after repeated attacks the urethra becomes inured to the disease, and each subsequent infection is generally (although not always) attended with fewer of the symptoms of acute inflammation. In some instances, the constitutional affection is extremely anomalous, and characterized by severe and continuous rigors," or by slight remittent or intermittent rigors and paroxysms of febrile reaction.

13. These complications, and more especially those about to be noticed, are chiefly to be ascribed to the local and constitutional influence of the virus or infecting agent, an influence manifested in some cases more prominently than in others, and not observed in cases of simple urethritis. Certain of the above complications are, however, merely the local extension of the gonorrhœal inflammation, often owing to the causes above alluded to. Other complications or consequences of the disease are of a constitutional and very serious nature. Mr. HOLMES COOTE, in a work published while this was being written, corroborates the view I have taken in the article VAGINA and VULVA (§ 8, *et seq.*), as to the specific nature of gonorrhœa. This very able and rising surgeon remarks: "Is the disease the consequence of the application of a simple irritating fluid to the mucous membrane, or is there a morbid poison acting on the parts locally, and capable of being absorbed into the system? I must confess there appears to me to be a most marked difference between simple urethritis and true gonorrhœa, as we daily see it among those exposed to contagion." Gonorrhœa in some cases occasions peculiar secondary affections, which never proceed from simple urethritis; and not only is

it occasionally followed by the local complications just mentioned, but also by one of the very severest forms of inflammation of the conjunctiva (see *art. EYE, Gonorrhœal Inflammation of*, § 56, *et seq.*), by the most severe and obstinate form of rheumatism (see *art. RHEUMATISM, gonorrhœal* (§ 44, 163), and by a form of papular eruption. The occurrence of purulent ophthalmia, or of rheumatism, or the extension of inflammation from the urinary bladder along the ureters to the kidneys, is of a most serious nature, as respects both the immediate effects and the more remote consequences.

14. ii. TREATMENT.—A. *Of Gonorrhœa in the Female.*—A copious use of diluents and demulcents; a farinaceous and vegetable diet; avoidance of fermented and spirituous liquors, and of salted provisions; a recourse to alkaline and refrigerant substances in mucilaginous drinks, and repose on a cool couch or mattress, are generally sufficient to remove the severer symptoms in a few days, especially when aided by the following local treatment judiciously advised by Dr. DRUITT: "During the acute stage, rest in the recumbent posture, fomentations of decoctions of poppy-heads with chamomile flowers, frequent ablation, lubrication with lard or cold cream, and very frequent sponging with a weak solution of alum, a piece of lint dipped in which should be inserted between the labia, with laxatives and diaphoretics, are the measures until heat, pain, tenderness, subside; afterward injections of nitrate of silver, and sulphate or acetate of zinc should be used, as recommended for the other sex, and they should be continued for some time after all discharge has ceased." (DRUITT's *Surgeon's Vade-mecum*, &c., p. 175.)

15. If the disease becomes obstinate and *chronic*, the vagina and cervix uteri should be examined by the aid of a speculum, as the disease may be prolonged by lesions of the cervix or of its canal; and when this is the case, the means advised for such lesions, in the article UTERUS (§ 124, 125), should be resorted to. In *chronic* cases, the solution of sulphate of alumina, or decoction of oak-bark, or both conjoined, may be used as a lotion. Copaiba and cubebs may be given thrice daily in a mixture with mucilage, the spirits of nitric ether, and either mint-water or camphor julep, in the *chronic*, as well as in the advanced progress of more acute cases. In the former, preparations of iron, especially the tincture of the sesquichloride of iron, or the tincture of the ammonio-chloride may be preferred. In irritable and sanguine temperaments, camphor conjoined with nitrate of potash, with acacia and henbane, is often of much service, and may be prescribed in the form either of pills, of a mixture or draught.

16. B. *Treatment of Gonorrhœa in the Male.*—(a) Dr. DRUITT has advised, as a *prophylactic treatment*, that a person exposed to the chances of infection should wash out the anterior part of the urethra with a syringeful of some astringent lotion. I much doubt the complete success of this plan, or of the more usually adopted one of micturating immediately after sexual connexion: both plans may, however, be often successful. If any fissures or excoriations are perceived they may be touched with lunar caustic, and dry lint may be applied.

17. (b) *The abortive treatment of gonorrhœa*, or an attempt to cut short the attack by means

of strong injections, has been advised by some experienced surgeons. Ten grains of nitrate of silver, or four grains of the chloride of zinc, to the ounce of distilled water, have been prescribed with this object, when the disease is only commencing, and before scalding on micturition is experienced, or when the acute symptoms have passed. Mr. ACTON employs the nitrate of silver, and has recourse to only one or two injections performed by himself with due precautions. He never prescribed this treatment in cases of a first infection; and he states that he has not observed the injurious effects which have been supposed to result from it. For the modes of using, and the precautions to be taken when using, this treatment, I must refer the reader to Mr. ACTON's able work. Mr. HOLMES COOTE considers it not quite free from danger to the urethra; and he remarks that it should be remembered that it is in cases where the structures of the urethra are damaged that stricture occurs; the usual effects of gonorrhœa, in their acutest form, pass away, if not aggravated, without leaving any structural change. "At the commencement of the disease large doses of the tinctura ferri sesquichloridi, or of the citrate of iron and quinine, have been pronounced effectual in cutting short the discharge; and such remedies possess the advantage of inflicting no damage, if they do not produce the anticipated amount of good."

18. (c) *In the first or early stage of gonorrhœa* the antiphlogistic diet and regimen should be strictly enforced; and demulcents containing alkalies and refrigerants freely allowed, with the other means already noticed (§ 14, *et seq.*). Cooling aperients ought to be taken from time to time; walking and horse-exercise should be prohibited, and the patient confined to a cool sofa or mattress. The penis and scrotum should be supported by a suspensory bandage, and be kept constantly wet with tepid or cold water. If the acute symptoms have not appeared, M. RICORD recommends, according to Dr. DRUITT, the following plan, in order to arrest the course of the disease: "Let the patient inject the urethra regularly once in every four hours, with a solution of two grains of nitrate of silver in eight ounces of distilled water; let this be repeated twelve times, desisting, however, sooner if the discharge is rendered thin and bloody, which is the ordinary effect of the nitrate. Then let an injection of the sulphate of zinc be substituted, and be continued until the discharge ceases. At the same time the patient should take a mild aperient, and after it, three times daily, a dose of copaiba or cubebs." He should continue a strictly antiphlogistic regimen for a week or ten days after all trace of the discharge has disappeared. The penis should be wrapped in a piece of rag dipped in water. Dr. DRUITT proceeds to remark, that the "manner of injecting is of no small consequence, as the efficacy of the lotion depends entirely on its application to the whole of the diseased surface; and, as Dr. GRAVES observes, the ordinary opinion that gonorrhœa is limited to the anterior extremity of the urethra is unfounded and mischievous. The patient should be provided with a glass syringe, with a long bulbous extremity, and having filled it, should introduce it for about an inch with his right hand. Then, having encircled the glans penis with his left forefinger and thumb, so as to compress the urethra against the syringe, and prevent any of the

fluid from escaping, he should push down the piston with his right forefinger, letting the fluid pass freely into the urethra. The syringe should now be withdrawn, but the orifice should still be compressed, and the fluid be retained for two or three minutes; after which, on removing the finger and thumb, it will be thrown out by the elasticity of the urethra. It is always worth the surgeon's while to see that the injection is properly used."

19. (c) *In the second stage* the diet and regimen already advised should be continued. The patient may drink soda-water, barley-water, linseed tea, gum-water, and other mucilaginous fluids, containing alkaline carbonates and sedatives, and the bowels should be kept freely open. If much pain or chordee be complained of, the following pills may be taken night and morning, and the mixture occasionally through the day:

No. 372. R Camphoræ, ʒj.; Potassæ Nitratis, ʒss.; Extr. Hyoscyami, ʒj.; Mucilag. Acaciæ, q. s. Misce et divide in Pilulas, xxxvj. Capiat duas vel tres pro doſi.
No. 373. R Potassæ Bicarbon., ʒss.; Potassæ Nitratis, ʒss.; Spirit. Ætheris Nitrici, ʒss.; Tinct. Hyoscyami, ʒij.; Mucilag. Acaciæ, ʒss.; Syrupi Tolutani, ʒss.; Mist. Camphoræ ad ʒviij. Misce. Sumantur Cochl. ij. vel iij. ampla ter in die.

No. 374. R Liq. Ammoniac Acetatis, ʒj.; Spiritus Ætheris Nitrici, ʒss.; Potassæ Nitratis, ʒss.; Tinct. Hyoscyami, ʒij.; Mucilag. Acaciæ, ʒj.; Syrupi Althææ, ʒvj.; Mist. Camphoræ ad ʒviij. Misce. Capiat Cochl. ij. vel iij. larga 4tis vel 6tis horis.

20. The last of these prescriptions will be found serviceable in the most acute or inflammatory cases, and when the urinary organs become affected. In these cases a number of leeches should be applied to the perinæum, or above the pubes, or near the groins. In this stage of the disease injections should not be prescribed. For first attacks, and in young, strong, plethoric, or irritable subjects, they may be injurious. Refrigerants, diluents, demulcents, alkalies, and sedatives, are then chiefly required.

21. Dr. DRUITT advises that the bowels should be opened by a dose of calomel at night, and some castor-oil in the morning; and that a grain or half a grain of calomel, and one eighth of a grain of tartar emetic, and ten grains of Dover's powder, should be given every night while there is much pain and chordee. As soon as the patient is free from fever, he should take copaiba or cubebs. The former, in capsules, may be given before a meal, as it is then not likely to cause eructations. Mr. ACTON prescribes copaiba and cubebs in the following combinations:

No. 375. R Bals. Copaibæ, ʒvj.; Magnesie Calcinat., ʒss.; Extr. Hyoscyami, ʒss.; Pulv. Camphoræ, ʒj.; Theriacæ, ʒij.; Mica panis, ʒss. Misce. Fiat Electuarium. Capiat Cochl. j. minimum ter in die.

No. 376. R Pulv. Cubebæ, ʒss.; Bals. Copaibæ, ʒss.; Extr. Hyoscyami, ʒss.; Magnesie Calcinat., ʒss. Pulv. Camphoræ, ʒss.; Theriacæ, ʒj. Misce. Fiat Electuarium. Capiat Cochl. j. min. ter in die.

22. The last of these is altered from Mr. ACTON's prescription, and the dose of camphor reduced one half. Cubebs, when taken in very large or frequent doses, generally diminishes the discharge, and remarkably relieves the other symptoms in a short time; but when employed alone, the disorder often returns after some time, especially if it be relinquished, or the dose much diminished. Cubebs should therefore be conjoined with copaiba, or other substances, in mucilaginous mixtures; or the tincture of cubebs may be substituted for the powder, as in the following draught:

No. 377. R Copaibæ, ℥xv.; Mucilag. Acaciæ, ʒjss.; Pulv. Cubebæ, ʒj. (vel Tincturæ Cubebæ, ʒjss.); Spirit. Ætheris Nitrici, ℥xxv.—Liquoris Potassæ, ℥xv. Aquæ Menthe Piperitæ, et Mist. Camphoræ, āā, ʒv. Misce. Fiat Haustus ter in die sumendus.

23. *d.* Several unpleasant complications occasionally appear in the course of this stage. Painful erections and chordee are the most common. They may be treated with tepid or cold application, and by narcotics and refrigerants given internally. Antimonials may be prescribed with small doses of camphor, nitre, and henbane or opium; and a little extract of belladonna, or lint wet with the tincture of belladonna, may be applied over the course of the urethra at bed-time. Hemorrhage from the urethra often affords relief. If, however, it becomes excessive, it may be readily checked by cold applications, and by pressure. Inflammation of the mucous glands, or in the cellular tissue external to the urethra, may be poulticed; and if abscesses form, they should be opened early, or as soon as they obstruct the flow of urine. Swellings of the glands in the groin are generally removed by rest, and seldom require the application of leeches.

24. *If Epididymitis, hernia humoralis, or swelled testicle, supervene, Mr. H. Coote believes "that the best plan is to strap the testicle at once, after the fashion represented in the work of Mr. Acron. A layer of collodion over the strapping is often useful. The relief thus afforded to the patient is surprising, and the swelling will often subside to one half in twenty-four hours. The application of cold, either by cold lotions or by the careful use of pounded ice and salt in a bladder, tends to relieve pain, subdue the inflammation, and reduce the swelling. When in consequence of pain this treatment cannot be carried out, we may fall back upon the practice of leeching the testicles, and of administering emetics. Nothing reduces inflammation of these organs more promptly than this, but the treatment is severe. When induration remains after the acute stage has passed, pressure is more serviceable than frictions, whether of mercury or of iodine; both may, however, be employed."* (H. Coote, *Report, &c.*, p. 34.) Since 1824, for the cases respecting which I have been consulted, I have ordered an emetic, afterward an aperient, and the mixture (No. 374) last prescribed; and, two or three days afterward, full doses of the iodide of potassium in the above alkaline mixture (No. 373). Iodine is rarely of use when employed externally in this disease.

25. *d.* In the third stage, or when the acute symptoms have subsided, the injections advised in the first stage may be prescribed. If these fail, or if the discharge returns, injections with weak solutions of the sulphate or acetate of zinc or of copper, or of the bichloride of mercury, and with the addition of vinum opii, may be employed. These solutions should vary in strength with the circumstances of the case; but if either of these occasion severe pain, their strength ought to be much reduced.

26. If the disease becomes chronic, and passes into gleet, a long-continued treatment is generally required to remove it, however judicious the means may be. The habits of the patient should be strictly regular and temperate, and pills made with Venice turpentine, or with tar, or with copaiba and liquorice powder, may be employed. About thirty years ago I prescribed magnesia in the preparation of pills with these substances,

but they became so hard after a short time as to be often passed from the bowels undissolved. If these fail, camphor, with sulphate of iron, or with sulphate of zinc, kino, or catechu, and small doses of creasote, may be taken in the form of pills; or the tincture of the muriate of iron, with the tincture of quassia or of calumba, may be given in any suitable vehicle. If micturition be frequent or painful, or if the urine deposits any mucus, the preparations of buchu, pareira, and uva ursi, are generally indicated. In most of these cases the cold salt-water douche, or local bath, sea-bathing, regular and generous living, suitable tonics, and chalybeate mineral waters, will be of essential service. If the disease still remain obstinate, or if involuntary emissions occur, blisters to the perinæum, the introduction of a bougie, or other means which fall within the province of the surgeon, may be employed.

27. *e.* The diet, regimen, and beverages of the patient during acute, subacute, and chronic gonorrhœa, should be strictly enforced. In the acute and subacute stages, constant repose on a cool sofa or bed, and on a hair mattress; a diet restricted to vegetable or farinaceous food in very moderate quantity; the careful avoidance of active exercise, more especially of exercise on horseback, and of heating beverages. The fluids taken should be cooling and demulcent. Weak black tea, barley-water, weak veal soup, effervescing magnesia-water, or potash or soda-water, &c., may be allowed. In the chronic stage, or state of gleet, tar-water, spruce-beer, Dantzic spruce, the infusion or decoction of the tops of the spruce-fir, camphor-water, with nitre, &c., may severally be taken. They will tend to promote the effects of the medicines prescribed for this state.

[*Blennorrhagia.*—Acute inflammation of the urethra from gonorrheal virus is usually combated successfully by an antiphlogistic regimen and saline cathartics, followed, if necessary, by injections of zinc, lead, or silver, as in the following formula: R Aq. Ros., ʒv.; Sulph. zinc; Acet. plumb., āā, grs. viij. The patient, if the disease does not yield, should take half an ounce of the following electuary in the course of a day: R Copaiba, 1 part; cubebs, 2 parts; ess. menth. q. s., ft. electuary. A bolus of this, covered with unleavened bread, is easily swallowed. About four ounces is generally sufficient to effect a cure; or, the copaiba may be given combined with the sirup of Tolu and oil of spearmint, and given in as large doses as the stomach will bear. As a general rule, the antiphlogistic regimen, baths, rest, and leeches to the perinæum, will effect a cure in the course of one week; and it is safer to trust to these for that space of time, before commencing with the indirect anti-blennorrhagics, copaiba, or cubebs. Injections should never be resorted to at once; it is safer to trust to the above remedies for a reasonable time; if they fail, then resort to the above formula of zinc and lead, using it from two to four times a day. The nitrate of silver injection, in the proportion of one grain of the salt to six ounces of water, will also answer a good purpose. If chordee supervene, leeches should be applied to the perinæum, and camphor and opium administered in the form of pill, from two to six grains of the former, with from one half to one grain of the latter, two or three times a day. Cold applications to the genital organs, with laudanum, also afford great re-

lief; likewise mercurial ointment to the track of the urethra. Strict attention to hygiene is always necessary.

Blennorrhœa, or *Gleet*, is governed by the same principles of treatment as blennorrhagia or acute urethritis. It is generally a very obstinate affection, and requires a persevering use of remedies. Injections of sulphate of zinc, acetate of lead, nitrate of silver, and cold water will be indicated, but of a greater degree of strength; alum, tannin, and iodide of iron are also recommended as injections; blisters, also, to the urethra. The injections should be of moderate strength at first, and the strength gradually increased. BENJAMIN BELL advises half an ounce of sulphate of zinc to eight ounces of distilled water, using it several times a day. VIDAL uses from 15 to 30 grains of alum to two ounces of distilled water. A bougie, coated with an ointment of nitrate of silver, one grain to one drachm of lard, may be used, or with mercurial ointment, or the mercurial cerate, or 1 part ungt. hydrarg., and 2 parts extr. belladonna, or even the naked bougie may often be used with advantage. The bougie, according to VIDAL, should be large and soft, and introduced three or four times a day, sometimes for ten or twelve weeks together, and should not be discontinued till the cure is complete. If they cause an increase of irritation or inflammation, their use is to be discontinued. VIDAL remarks that a gleet which has resisted every kind of treatment occasionally disappears in an unknown manner—that there are some cases which resist every thing, even time, and which, after having been symptomatic of a form of inflammation of the urethra, are found at length to be maintained by strictures, disease of the prostate or bladder, or are complicated with seminal emissions. The treatment then, of course, has to be modified according to the complications of the case. Great caution should be used not to pass the bougie too deeply into the urethra, inasmuch as the disease is usually seated near the glans, and confined exclusively to that part.]

II. SYPHILIS—*Siphilis*, Sprengel and H. Mayo. *Lues venerea*, Auct.

28. i. HISTORY OF.—Medical writings furnish no precise or undoubted accounts of this distemper until the appearance of the epidemic towards the close of the 15th century in the south, and soon afterward through all of Europe. In that and the following century, venereal eruptions occurred so commonly after infection, not only by sexual congress but also by contact, that the disease was regarded as a contagious malady affecting primarily and chiefly the skin. At the present day, and for a long time past, these eruptions and the other affections which sometimes accompany or follow them are much less frequent, and appear after a longer period from the primary infection than they did formerly. This circumstance, as well as some other modifications of the characters of the distemper, as described by the earlier writers, may be referred to the long transmission of the distemper by contagion, the venereal poison having thereby lost something of its original influence, and to its having, during many ages, been almost exclusively transmitted by the intercourse of the sexes, and without general infection, or not by the emanations or secretions from the secondary affections, unless under peculiar circumstances hereafter to be noticed (§ 109, *et seq.*).

28*. As to the long-agitated subject relative to the early history of syphilis, it is quite unnecessary to enter farther than to notice a few of the authorities who have supported opposite opinions regarding it. GALESIUS (*De Podagra et Morbo Gallico*, 4to, Bon., 1637); BECKETT (*Philosoph. Trans.*, No. 357, 365); PLENK (*Beobachtungen*, &c., ii.); HENSLEY (*Geschichte der Lustseuche*, &c., b. i., 1783); KLEIN (*De Morb. vener. curat. in India Orientali*, Ham., 1795); STOLL (*Praelect.*, p. 94); THIERRY, RICHTER (*Chirurg. Biblioth.*, v. i., p. 163); and many others, have severally contended, but with insufficient evidence, for the existence of syphilis from remote antiquity, but in a sporadic form, before the discovery of America, and before its occurrence in an epidemic form at Naples in 1495. DE BLEGNEY even believed that it was known to MOSES; F. VALESIIUS (*Ann.*, iv., p. 57), that it caused the baldness and ulcerations of the face ascribed by TACITUS to TIBERIUS; LEFÈVRE (*Hufeland, N. Ann.*, b. i., p. 309), that it had existed 800 years before COLUMBUS; SCHENCK (*Observat.*, l. vi., 217), that it had been observed as far back as 1270; ALCAZAR (*Haller's Biblioth. Med. Pract.*, ii., 197), that it was an ancient disease, and that it was epidemic in 1456; SCHAUFUS, that it was brought from India into Europe by the gipsies; CLAVIGERO (*Storia Antica*, t. iv., 1781), that it was not imported from America; and DELIUS, that it was an ancient malady, but was sporadic, and became epidemic by its complication with camp diseases at the end of the 15th century.

29. The first author who contended that syphilis was a variety of leprosy was M. CUMANUS, in 1495. He considered it identical with the leprosy of Campania, described in the 13th century by PAPIA of Lombardy. A similar opinion was entertained by S. AQUILANUS in 1497, by CAMPERIO, LANGE, BIONDI, and DODONEUS, early in the 16th century; and was supported by ZACUTUS LUSITANUS, MAYNWARING, and MUSITANUS in the following century.

30. That the distemper was brought from America by the followers of COLUMBUS was asserted by several writers in the commencement of and early in the 16th century, especially by N. POLL, L. SCHMAUSS, et U. AB HUTTEN, and by many others. This opinion as to its origin was very ably supported by ASTRUC and GIRTANNER (*Abh. von der Lustseuche*, &c.). It was, however, denied by SANCHEZ (*Abb. Ueber der Ursprung Venussenche*, &c., Bremen, 1775), who argued that an indigenous malady could hardly be brought to Europe and there become epidemic; by SARMICUTO (*loc. cit.*, i., p. 67); and by HENSLEY (*Geschichte der Lustseuche die zu Esde dis. 15. Jahrh. in Europa Ausbrach.*, Altona, 1783). More recently DESRUELLES (*Op. cit.*) has contended for the antiquity of the disease, and denied the importation of it from America. DESPORTES (*Hist. de Malad. de St. Dominique*, t. ii., p. 61), LAGRANGE, SLOANE, and numerous others, however, have shown that a disease resembling syphilis was prevalent in Hispaniola when visited by the Spaniards, and was brought into Europe by them from 1493 to 1495. ASTRUC states that in the Neapolitan, or rather in the Spanish army, there were not a few of the soldiers who, returning from the Indies, either in the first voyage with COLUMBUS, in the month of March, 1493, or in the second with A. DE TORREZ, in the beginning of 1494, or in the third with P.

DE MARGARIT, at the end of the same year, were still infected with the venereal disease, or at least had contracted it in Spain, after it had been brought by others into Europe. And therefore it is by no means strange that many of the Neapolitans should be infected with the same distemper, as they served under the same colours, and conversed with the same females who followed the camp. Hence he concludes that the disease was communicated from the Spaniards to the Neapolitans, from both to the French, and from all three to the other European nations, and to most of the people of Asia and Africa; though he believes that, under the torrid zone, there are some countries where it seems to have been a native and an endemic disease. (*De Morbis Veneris*, vol. ii., 4to, Paris, 1740, lib. i., cap. &c.) SANCHEZ DE RIBEIRO, in 1765, contended that syphilis originated in Europe, and assumed the epidemic form in 1493. He was the first to shake the belief in the American origin of the malady, and was followed by HENSLEY, who believed it to have been intimately connected, in origin and nature, with the leprosy of antiquity, which he regarded as the precursor, in Western Europe, of syphilis at the end of the 15th century. RICHTER (*Chirurg. Biblioth.*, b. i., p. 163), however, contends that syphilis was an ancient disease, and was imported into America by the Spaniards. But there is no sufficient evidence of such importation by the Spaniards, whereas evidence is furnished by ASTRUC and others that a similar distemper was prevalent in the West Indies and America among the natives when first visited by COLUMBUS, and that they treated it with the same medicines as were found most successful subsequently by the Spaniards and other Europeans. That this distemper existed in America, in Western Africa, and probably also in other intertropical countries, before the discovery of America, appears to have been conclusively shown by numerous writers, although in more or less modified forms, according to race, modes of life, and numerous circumstances; and that it still exists in these forms, as a most prevalent and contagious distemper, in these countries, cannot be doubted. It was considered as being not improbable that the milder states of the disease prevalent in some of these countries, and in Hispaniola, when first visited by the Spaniards, assumed in the latter, as well as in other Europeans, a much more severe character, especially when they became associated with scurvy, or with leprosy, then so prevalent in Europe, or with other epidemic or endemic diseases, or when the distemper first infected different races from those in which it had first originated, using different kinds of food, adopting different modes of living, and observing very different social and domestic habits, &c. That the disease is modified by these causes, by climate and by treatment, even at the present day, cannot be disputed; and hence, most probably, it may have resulted from those distempers, which are denominated syphiloid by several writers, which are characterized by the most prominent features of constitutional syphilis, and which are different forms of syphilitic cachexia, arising out of those circumstances, in connexion with differences of race, with climate, habits of life, modes of communication, &c. (§ 84, *et seq.*).

31. In addition to these opinions as to the history of syphilis, another had been from an early

period entertained by several writers, but had received little attention until it was supported by D. C. G. GRUNER, who has inquired into the early history of syphilis with great learning and candour; and has described the symptoms of the disease, as it appeared in Italy in 1493 and 1494, and the ways by which it was propagated. From his account, or rather, according to the authorities he has adduced, it appears that syphilis was then a much more acute, rapid, severe, and complicated distemper than in modern times; and that it was communicated in its several constitutional forms, not only by sexual intercourse, but also by kissing, by sleeping in the same bed, by contact, especially with parts covered by eruptions, by shaving with the same razor, by drinking from the same vessel, by inhaling the breath of the infected, by the clothes, particularly woollen, of the diseased, and even by contact of any part of the body. The sudden appearance and rapid extension of the malady the medical men of the day were at a loss to account for. As to the opinion that diseases of the genitals were at all times an occasional or sporadic result of impure sexual connexion, GRUNER remarks, "Hoc quidem certum ac indubitatum est, homines nunquam sibi temperasse a venere vulgivaga, ideoque ab historicis stupenda narrari exempla, quin sub finem seculi xv increbrescere vitia genitalium venereis similia, sed ea fere leprosa. Hæc vero, nisi de verbis disceptare volumus, ut ferri quidem et defendi possunt, ita etiam corpora fuisse apta ad recipiendam contagionem affinem satis declarant. Medici enim et chirurgi horum temporum bene versati in cognitione morborum cutaneorum, cum maximæ lepræ, tantum non omnes novitatem morbi mirantur et stupent, et similitudine quorundam symptomatum opinantur eam esse lepræ proximam, vel in eam tandem transire; leprosi vero Gallico morbo correptos cane pejus ac angue fugiunt et procul abesse jubent. Ex hoc, ni omnis fallor, certissime colligitur, fœdum morbum non fuisse omnino eundem, sed paullo diversum et a causa quadam insolente productum. Quam in venere impura per se latuisse vix affirmandum est." (*Op. cit.*, xv.)

32. GRUNER contends that the opinion as to the introduction of syphilis in Europe from America cannot be sustained, inasmuch as it cannot be shown that the distemper was in 1493 endemic in America in the form in which it existed in Italy; that, if the foul ulcers and buboes observed in the latter existed in the former country, they should have been manifest in those aborigines brought to Europe; and that a malady imported into Spain by a few individuals from America, could not in the same year have been transmitted to Italy and there so rapidly spread the devastation which it was said to have produced. He therefore asserts that the evidences furnished by FULGOSUS, SABELLICUS, NAUCLERUS, LEO AFRICANUS, and others respecting the expulsion of the Moors and Jews from Spain in 1492, and in the five preceding years, and the fearful distresses and distempers consequent upon this expulsion are sufficient to account for the appearance and rapid dissemination of syphilis in Italy and in other countries. These writers state that the disease was brought from Africa into Spain, and that, when FERDINAND expelled the Moors and Jews from Spain, from 1487 to 1492, it assumed a severe and epidemic form, owing to the distresses experienced by these emigrants. It is expressly stated by NAUCLERUS, "In itinere abe-

untium Judæorum triginta millia pestis absumsit. Eodem tempore etiam Marrani (Moors) Romæ ad portam Appiam morati effecerunt, ut incontinenter pestis invaserit urbem, mortuique sunt quam plurimi ex peste et contagione dictorum Marranorum, de quibus tota urbs impleta est." GRUNER therefore infers from these and other authorities that the diseases to which the genitals were liable, owing either to impure connexion or to leprosy or other causes, were developed into a pestiferous form by the distresses and other circumstances connected with the expulsion and emigration of the Moors and Jews, that the distemper in this malignant form was disseminated throughout Italy—the French army which invaded Italy in 1493, bringing it with them on their return to France, and that it spread rapidly from thence and from Italy to other countries.*

* As it is manifest, in the present state of our knowledge, that syphilis is caused by a specific poison or contagious agent, originating, as far as we know, in the secretions of the sexual organs, and generally communicating the disease by sexual intercourse, but sometimes also by contact under different circumstances, and in different stages of the malady, and even to the fetus; that syphilis will not produce gonorrhœa, although both diseases are often associated; and that gonorrhœa will not give rise to syphilis, although like syphilis it is generally caused by sexual intercourse, but capable of being propagated by contact in other ways; so it follows that conclusions respecting the origin of the one disease cannot apply to that of the other. For being thus distinct, although sometimes associated, and generally propagated in the same way, it is very probable that these distempers may have originated in different epochs and in different circumstances. Admitting that syphilis was brought into Italy in 1493 by the Moors and Jews expelled from Spain, when it was developed into an epidemic and an acute distemper either by the sufferings and other circumstances of these emigrants, or by its being engrafted on or becoming associated with some other malady, as leprosy, camp fever, scurvy, &c., according to the evidence furnished by GRUNER; or that syphilis was imported in the following year into Europe from Hispaniola, where it had long existed as a specific disease, although manifesting various modifications in its primary and consecutive phenomena both there and still more remarkably in Europe, still there appears to be no sufficient evidence that gonorrhœa, also a specific disease, and known now as such, and existing most frequently unconnected with syphilis, either first appeared in connexion with this latter distemper, or existed previously to it. It is certain, however, that from an early period of the certain history of syphilis, or early in the 16th century, gonorrhœa was mentioned as a frequent complication, or prominent symptom of syphilis. It is very difficult to determine any thing conclusive as to the origin of virulent or specific gonorrhœa, as most probably a puriform discharge was not an uncommon result of impure connexion, or of sexual intercourse with unclean, leprosy, or otherwise diseased females in the early and middle ages. The descriptions of disease by most of the writers of these ages, as well as of those of the 15th and 16th centuries, are so vague as to give rise to grave doubts as to their precise application, and although some of the accounts given by authors long before the period at which this distemper was developed in Italy seem to apply to gonorrhœa, yet their accounts are not complete in some respects, and fail in mentioning the association of a copious discharge, and of certain other contingent symptoms and consequences of the disease, although other symptoms which are certainly characteristic of it are fully stated.

1. The testimonies which have been adduced as to the existence of SYPHILIS in Europe before the discovery of America have been considered as conclusive by BECKET, HENSLEY, SWEDIAUR, B. BELL, DESQUELLES, and altogether insufficient by ASTREUC and numerous writers in the 16th and 17th centuries. I may notice the following among the former: GULIELMUS DE SALICETO, in 1270, states (in l. i., cap. 42, *De Apostemate in inguinibus*), "Hæc ægritudo vocatur bubo vel dragoncella inguinis vel apostema inguinis" . . . et aliquando cum accedit homini in virgâ corruptio propter concubitum cum foedâ muliere, aut ob aliam causam. Itaque corruptio multiplicatur et retinetur in virgâ, unde non potest natura mundificare virgam aut locum, primò propter multam plicaturam partium illarum et propter strictam viam illius loci, unde redit et regurgitat materia ad locum inguinum propter habilitatem loci illius ad recipiendam

33. The question still remains unanswered as to the origination of the syphilitic disease brought

superfluitatem quamlibet, et propter affinitatem, quam habent hæc loca ad virgam."—Cap. 48. "*De Pustulis albis vel rubris, et de Milio et de Scissuris, et de Corruptionibus vel hujusmodi, quæ fiunt in virgâ vel circa præputium propter coitum cum foetida muliere, aut cum meretrice, aut ab aliâ causâ.*"

LANFRANC, of Milan, in 1209 (*in Artis Completæ Chirurgiæ*, tract. iii., doct. ii., cap. 11), asserts: "Sæpe provenire apostema in inguine propter ulcerâ virgæ et pedum, propterea quod locus est descensus humorum ad illa loca, et tunc non est ita timendum, propterea quod venire tunc potest sine multâ corporis plenitudine, et absque eo quod decursus humorum maxime ibi fiat." In tract. iii., doct. iii., cap. 11, *De Ficu, et Cancro, et Ulcere in virgâ virili*, he adds: "Ficus est quedam excrescentia, quæ nascitur supra præputium virgæ, et aliquando super caput, quæ quidem aliquando est mollis, ut de phlegmaticâ generata materia; aliquando dura ut de Melancholicâ; quæ si corrumpatur, transit in cancerum. Cancer fit in virgâ, sicut in aliis diximus fieri membris: ulcera veniunt ex pustulis calidis virgæ supervenientibus, quæ postea crepantur; vel ex acutis humoribus locum ulcerantibus; vel ex commissione cum foedâ muliere, quæ cum agro talem habente morbum de novo coherat."

BERNARD GORDON, in 1300, Professor of Medicine at Montpellier, remarks (*Lib. Med.*, part vii., cap. 5, *De Passionibus Virgæ*): "Passiones virgæ sunt multe, sicut sunt apostemata, ulcerationes, cancri, inflatio, dolor, pruritus. Causæ sunt exteriores aut interiores. Exteriores, sicut casus, percussio, et jacere cum muliere, cujus matrix est immunda, plena sanie, aut virulentia, aut ventositate et similibus corruptis. Si autem causa fuerit intrinseca, tunc sunt sicut humores corrupti, et mali descendentes ad virgam, et ad partes inferiores, inducentes predictas passionem."

JOHN OF GADDESSEN, in 1310 (*Rosa Anglica, cap. de curâ ulcerum virgæ*), states: "Ulcerâ virgæ virilis contingunt vel ex coitu cum juveniculâ, vel ex coitu cum menstruâtâ, vel ex retentione urinae et spermatis."

GUIDO DE CAULIACO, of Montpellier, in 1360 (*Chirurg. Mag.*, tr. vi., doct. ii., cap. 7), has a chapter, "*de Calefactione et Foetiditate in virgâ propter decubitum cum muliere foetida.*"

VALESCUS DE TARANTA, Professor of Montpellier in 1400 (*Phil.*, l. vi., cap. 6, *De Ulceribus et Pustulis virgæ*), describes these as follows: "Causæ possunt esse primitivæ, aut antecedentes, aut conjunctæ. Primitivæ, ut est vulnus, vel attritio, vel coitus cum foetidâ, vel immundâ, vel cancrôsâ muliere; alia causa potest esse portasse femoralia nigra, foetida et immunda; alia causa potest esse materia spermatica vel corrupta retenta inter caput virgæ et præputium, vel mali humores ibidem retenti, qui ibi retenti et non evacuati corrumpunt locum, quem tangunt, vel ulcerant." And again towards the end: "Pustulæ virgæ fiunt, si quis coeat cum foeminâ habente ulcus in matrice, quæ contagio sitate suâ inficit virgam, et in eâ facit ulcus."

PETRUS DE ARGELATA, of Bologna, in 1470 (*Chirurg.*, l. ii., tr. xxx., cap. 3. *De Pustulis, quæ adveniunt virgæ propter conversationem cum foedâ muliere, quæ albo sunt vel rubra*) writes: "Ex materiâ venenosâ, quæ retinetur inter præputium et pellem virgæ causantur istæ pustulæ tales per hunc modum, quoniam ex retentione illius materie, quæ remanet inter pellem et præputium, ex actione viri cum foedâ muliere, quæ non respirat putrefit; deinde ille locus denigratur et mortificatur substantia virgæ, quæ restaurationem non recipit, nisi corruptione illâ remotâ, et loco absterso." And then after prescribing certain detergent, styptic lotions, &c., for the cure of those pustules, he thus goes on: "Unum recorder vobis, quod antequam ista balnea dicta (or lotions) ex vino illo styptico fiant, fiat purgatio, aliter illis bubo superveniret in inguine, quoniam materia quæ venit ad locum illum retroPELLITUR à balneo isto (or rather lotion) et inveniens concavitate inguinis illic moram facit; quare bubo generatur ad exitum pluries deveniet. Quare purgationem universalem facias; et imperiti medici sperantes indiscretè vel incautè non faciunt purgationem, quare duplici modo lucentur, quoniam de virgâ et bubone. Iterum viri tales debentes materiâ venientem ad locum resolvere, querunt illud sanare ut aliquid lucentur, et hoc non debet fieri à discreto homine et magistro."

That the above brief notices of ulcers on the penis and buboes in the groins refer to syphilis can hardly be credited, unless consecutive constitutional disease had also been described; but of this latter no evidence is furnished. However, it may be stated by the abettors of the non-mercurial treatment that these sores were actually venereal or syphilitic, no secondary symptoms appearing, owing to the strictly local or non-mercurial treatment adopted for their cure. Among the first writers who de-

by the Moors and Jews from Spain into Italy. It has been, as stated above (§ 30-32), acknowledged

scribed the venereal disease, which appeared at Naples in 1494 or 5, and became epidemic over Italy, and rapidly spread throughout Europe, were MARCELLUS CUMANUS, NICOLAUS LEONICENUS, and CORADINUS GELINUS. Their works on this disease appeared in 1496 and 1497, and were followed by other productions in this latter year, in 1498 and in 1500, and in almost every successive year down to the middle of the 16th century. The writers were chiefly Italians, who describe the symptoms and treatment of the disease, assert it to have been an unknown malady previously to 1495, and speculate variously respecting its prevalence and rapid extension.

From these descriptions it is manifest that the distemper was virulently contagious; that it was communicated not only by sexual intercourse, ulcers appearing on the genitals, and followed rapidly by the most severe constitutional symptoms, &c., but also by contact of any part of the body of those infected, and by fomites, &c. Those who are desirous of becoming acquainted with the early history of this distemper—the most important chronic malady which infects the human frame—will consult with advantage the collection of early treatises on *Lues Venerea*, formed by ALOYSIUS LUISINUS, under the title *Aphrodisiacus sive de Lue venerea, continens omnia quaecumque de hac re sunt ab omnibus Medicis conscripta*, 2 vols. in fol., Lugd. Bat., 1728. The dates of the first appearance of these treatises are, however, not always given by LUISINUS. A Supplement to this work has been added in historical order by C. G. GRUNER, entitled *Aphrodisiacus sive de Lue venerea: ejus vestigia in Veterum Auctorum monumentis, et quos A. Luisinus Omisit Scriptores*, fol., Jenæ, 1789; and the following work, by the same author, will be perused with some interest: *De Morbo Gallico Scriptores Medici et Historici, partim inediti, accedunt Morbi Gallici Origines Maritima, Collegit, edidit, glossario et Indice Auxit*. 8vo, Jenæ, 1793. DANIEL TURNER published an abridgment of the folio volumes of A. LUISINUS, under the following title: *A Summary of the Ancient Writers on the Venereal Disease, extracted from his two Tomes, revised by BOERHAAVE, with Index of those omitted*. 8vo, Lond., 1736.

II. As the Identity of syphilis and gonorrhœa, formerly contended for by some and denied by others, is now satisfactorily disproved, although in the present day most commonly resulting from impure sexual intercourse, it follows that the evidence furnished respecting the period in which syphilis first appeared in Europe cannot be viewed as comprising also the time when gonorrhœa made its first appearance—or that the proofs as to the historical origination of the one could be extended to, or be considered as conclusive of, the same origination of the other, either as to time or to place. In the earlier histories, however, of cases of syphilis, gonorrhœa was often mentioned as a prominent symptom.

In the Statutes which JANE I., Queen of both the Sicilies, directed to be formed for the regulation of the public stews, established at Avignon in 1347, it is enacted (*Stat. iv.*) as follows: "The Queen commands that, on every Saturday, the women in the house be singly examined by the abbeys and a surgeon appointed by the directors, and if any of them has contracted any illness by their whoring, that they be separated from the rest, and not suffered to prostitute themselves, lest the youth who converse should catch their distempers." This statute may be viewed as applicable to either venereal disease, or to neither; for it has been contended that sexual intercourse with a female during the catamenia, or suffering under leucorrhœa, with a leprosy female, during the Middle Ages, or even in more recent times, when personal cleanliness was not so much attended to as now, would produce a sexual disease capable of propagation. That the malady which the above statute was intended to abate might have been gonorrhœal is not improbable, although no sufficient proof of its existence appears.

MR. BECKET (*Philosoph. Trans.*, No. 357, ann. 1715) has endeavoured to prove that a venereal gonorrhœa was known in England some ages before 1494, under the names of *Ardor*, *Arsura*, *Incendium*, &c., and in English of *Brenning*, or *burning*, and described as an *inward heat* and *excoriation of the urethra*. This affection is treated of by JOHN OF GADDESSEN in his *Pract. Med. seu Rosa Anglica*, in a chapter, "*De Infectione ex Conubitate cum leproso vel leprosa*;" and he there states: "Illum, qui concubuit cum muliere, cum qua coivit leprosus, puncturas intra carnem et corium, hoc est inter balanum et præputium, et aliquando calcificationes in toto corpore sentire." That this scalding might or might not arise from the cause here stated is equally probable, but it cannot be viewed as a proof of the existence of gonorrhœa, inasmuch as no mention is made of its coexistence with a copious muco-purulent discharge. That the time and the circum-

stances of the origination of gonorrhœa are not without some interest, will appear from the fact of this complaint being viewed by many recent writers as in no respect different from leucorrhœa, or blennorrhœa, according to modern nomenclature. In Africa, as I was able to learn from Moorish and other native physicians, gonorrhœa was viewed as a distinct disease, although often complicated with the yaws or syphilitic affections and with leprosy, and was viewed with syphilis, as possessing an antiquity as great as that of leprosy (see § 84, 85).

Whether gonorrhœa made its first appearance in Europe at the close of the 15th century, or previously to this period, admits not now of satisfactory proof; nor even do we now know at what time it was first viewed as a variety of the venereal disease, or at least intimately connected with syphilis. ASTREUC remarks that all the physicians who lived in the close of the 15th and beginning of the 16th centuries were unanimous in their opinion that the venereal disease was a new distemper; but they entertained very different notions as to its origin.

The earliest writers believed the malady to have arisen from the influence of the stars, or certain conjunctions of the planets; others that it proceeded from the state of the seasons in connexion with fortuitous circumstances; some that it was an offshoot of leprosy, or that it arose from the connexion of healthy with leprosy persons; a few that it was the result of unnatural or unclean sexual intercourse, or of bestiality; and many that it was indigenous or endemic among the natives of Africa and America; but it does not appear to what they attributed the origin of the disease in these countries. (See the Chapter on syphiloid diseases, or affections closely allied to syphilis).

It has long been the practice, especially with European writers, to attribute the origin of syphilis to the American continent, and that, too, in opposition to all well-attested facts connected with its true history. The first writers in Europe who described the disease say not a word in regard to its transatlantic origin, but attribute

34. But admitting that *syphilitic diseases* (§ 32) actually prevailed both in America and in Africa

it either to a celestial influx, a malignant conjunction of Saturn and Mars in the sign Scorpio, Divine vengeance, an earthquake, or a malignity of the air caused by an overflow of the Tiber, &c. Lord BACON, following FIORAVANTI, believed it to have been generated by the use of human flesh as food at the siege of Naples. The first writer who suggested its American origin was LEONHARD SCHMATUS, a German physician who wrote in 1518, twenty-five years after the disease first appeared in Italy; and he was followed by ULRICH VAN HULTEN, OVIEDO, and others on the same side, so that in the space of fifty years the American origin of syphilis was received very generally as a well-established fact in history. They unite in the statement that the disease was imported into Europe by the crews of COLUMBUS on his first or second return home, in 1493 and 1496, "a belief," says Dr. GOOD, who seems to have investigated this point with great industry and impartiality, "which seems to be altogether without foundation; for, at the period even of the first return of this celebrated circumnavigator, in March, 1493, it seems to have preceded his return by some weeks' time. On his reaching Seville in the ensuing month of April, in order to join the Spanish army, it had already arisen, and was spread over Auvergne, Lombardy, and various parts of Italy; as in the course of the summer months it was observed in Saxony, Brandenburg, Brunswick, Mecklenburg, and especially Strasburg, as all the German writers concur in admitting; and even at Cracow, in Poland, according to STREYKOWSKY's 'Chronicle of Lithuania.' While FRACASTORIO, who was an eye-witness of the entire progress of the disease, and from his high medical reputation, and residence almost on the spot of its first appearance, more largely engaged in the cure of it than any physician of his day, asserts that it was even ravaging a considerable part of Asia and Africa, as well as of Europe." Not only this writer expresses his disbelief in the disease having been imported from America by the crews of COLUMBUS, but not a single writer who was an eye-witness of the first outbreak of syphilis ascribed to it an American origin; nor did COLUMBUS, nor his brother, who left such accurate narratives of his voyage, make the least mention of such a disease having been discovered among the natives, or prevailing among the crews of their vessels. Moreover, we have the testimony of FULGORI that it prevailed in Upper Italy in the year 1492; of SABELLICO, INFESSURA, DELPHINI, and FULGORI that it prevailed in Upper Italy in 1493; and of MASSA, CATANEO, PINETON, BERCHARDI, and CAPEOLI, that syphilis prevailed extensively at Rome and in Italy in 1494. Now CHRISTOPHER COLUMBUS, on his first return to Europe, landed on the 4th of March, 1493. The statement, therefore, of OVIEDO, that this disease was carried to Italy by the army of GONZALVO must fall to the ground, inasmuch as this general arrived at Calabria as late as the month of May, 1495. OVIEDO has always been the great authority on this point, but he was charged and convicted of the grossest falsehoods, contradictions, and inaccuracies, by his contemporaries FERDINANDO COLUMBUS, A. HERREIRA, DE LA CASA, and others. There is, indeed, not a shadow of evidence that syphilis existed in America till the third voyage of COLUMBUS, in 1498, when it was probably carried to St. Domingo by his crews, and five years after it had prevailed extensively in Europe. If any thing more be wanting to confirm the belief that syphilis did not even exist in the West Indies and on the continent of America at the period of their discovery by the Spaniards, it may be found in the following letter, from our distinguished countryman, WILLIAM H. PRESCOTT, the historian, to Dr. A. E. HOSACK.

"Boston, Jan. 22^d, 1844.

"MY DEAR SIR,—I have received your note of the last week, inquiring whether in my researches relative to the history of Mexico, I had met with any trace of the existence of the venereal disease among the aborigines previous to the coming of the Spaniards. * * * In a note in the 'History of Ferdinand and Isabella,' vol. ii., p. 501, I took occasion to express my own conviction that the venereal disease did not exist among the natives of America at the time of its discovery. I had met with no allusion to it in the narratives of Columbus or his son Ferdinand, or in any other record of the Spanish adventures. I have been led into a much wider range of observation in preparing the 'History of the Conquest of Mexico,' but it has served to confirm my former opinion, since I have never met with a notice of this disease, or of any which resembles it. The ancient chronicles speak of an Indian epidemic, called the *Matlazahuatl*, which swept off great numbers of the nations both before and after the conquest, and which seems to have had some resemblance to the Yellow Fever. They also notice the introduction of the small-pox by a black, who came into the country the

for ages before the discovery of COLUMBUS, it does not follow that the disease brought by his followers from America was the cause of the epidemic syphilis of Italy and other countries in 1493, 4, and 5. Indeed this inference is completely disproved by facts; for, as SPRENGEL has contended, syphilis, according to the testimony of most reputable authors, had appeared early in 1493, and soon afterward extended to most of Europe, while, according to OVIEDO, the most credible of all witnesses on the subject, the fleet of GONZALVO, which conveyed the Spanish soldiers to Italy, arrived in Messina on the 26th of May, 1495. Thus the disease was existing two years before the arrival of the Spaniards, and spreading in the army of Charles VIII. of France. That the disease existed in Barcelona in 1494 or 5, appears in a letter published by THIENE, from NICHOLAUS SCYLLATIUS, a physician of Messina, the editor of an edition of the "*Rosa Anglica*," in 1492, and addressed to AMBROSIUS ROXATUS, physician to the Duke of Milan. From this letter it appears that SCYLLATIUS was in Barcelona in 1494, that the distemper was spreading among all ranks, and was propagated by contact only, and that it was universally believed to have proceeded from Provence, where it was named the disease of St. Ment. SCYLLATIUS thought it the *sahafathi* of AVICENNA; but while he describes its general characters, he says nothing, as may

year after the arrival of Cortez. The Spaniards would certainly not have omitted to notice so terrible a disorder as the venereal, had it been found among the natives; especially as, considering their own licentious indulgence, it must have fallen very heavily on themselves. Their uniform silence, therefore, is evidence so strong, that it may be called positive rather than negative, and may be considered as establishing the fact that the disease was not known in the Mexican empire at the time of its discovery. Whether a disease so easily propagated among adjacent tribes, and which seems to be circumscribed by no parallel of latitude, could have existed in other parts of the continent without finding its way into Mexico, is a question which your own knowledge of the subject will enable you to determine better than I can.

"W. H. PRESCOTT.

"A. G. HOSACK, Esq."

The following extract from "Ferdinand and Isabella" gives the paragraphs referred to above by Mr. PRESCOTT: "While the colonial commerce failed to produce immediately the splendid returns which were expected, it was generally believed to have introduced a physical evil into Europe, which, in the language of an eminent writer, 'more than counterbalanced all the benefits that resulted from the discovery of the New World.' I allude to the loathsome disease which Heaven has sent as the severest scourge of licentious intercourse between the sexes, and which broke out with all the virulence of an epidemic in almost every quarter of Europe, in a very short time after the discovery of America. The coincidence of the two events led to the popular belief of their connexion with each other, though it derived little support from any other circumstances. The expedition of Charles the Eighth against Naples, which brought the Spaniards, soon after, in immediate contact with the various nations of Christendom, suggested a plausible medium for the rapid communication of the disorder; and this theory of its origin and transmission, gaining credit with time, which made it more difficult to be refuted, has passed with little examination from the mouth of one historian to another to the present day.

"The extremely brief interval which elapsed between the return of Columbus and the simultaneous appearance of the disorder at the most distant parts of Europe, long since suggested a reasonable distrust of the correctness of the hypothesis; and an American, naturally desirous of relieving his own country from so melancholy a reproach, may feel satisfaction that the more searching and judicious criticism of our own day has at length established beyond a doubt that the disease, far from originating in the New World, was never known there till introduced by Europeans."—(*The N. Y. Journ. of Med. and the Collateral Sciences*. Edited by S. FORBES, M.D., vol. ii., New York, 1844, p. 150.)]

be expected from the date of his letter, of an American origin.

34*. It is difficult if not impossible to determine accurately either the place or the date of the first appearance of syphilis in Europe. So rapidly did it manifest itself in one place after another, that it is impossible to determine the place in which it was first recognised. FULGOSUS states that it appeared in Italy as early as 1492; PETRONIUS, C. TORELLA, HASCHARD, ULRICH DE HUTTEN, and BORGARUTIUS, in 1493; JOHN DE VIGO, MASSA, CATENEUS, HOCK, SCHMAUSS, FALLOPIUS, and many others, in 1494; BRASAVOLUS, in 1495; PHRISIUS, MONTESAVRUS, MAINARD, BENIVENIUS, and MONTANUS, in 1496; and FRACASTORIUS as early as 1490. It should not be overlooked that these and other authors evidently assigned these dates as the times when the disease became known to them, or in the places where they wrote, or they took the dates from the testimony of others. Wherever or whenever it first appeared, it cannot be disputed that it was speedily evinced in the chief cities of Europe. That it was seen as early as 1490, according to FRACASTORIUS, or 1492, as stated by FULGOSUS, may be inferred from the circumstance of its having been mentioned in the Mansfield Chronicle, in the Leising Chronicle, the Leipsic Annals, and the Zweifalt Annals, as being general in Germany in the summer of 1493; "and it is even said to have prevailed at least four years in Misnia. It was common in Auvergne in 1493. It was known in Paris in 1494, and in Augsburg in 1495." It appeared in Memmingen, at Nurnberg, and in Edinburgh, in 1496; and it spread through Bohemia in 1499. It has been considered remarkable that the Chronicles of Barcelona, Valencia, Murcia, Toledo, Seville, Burgos, Guadalajara, Valladolid, Segovia, and other cities in Spain, have made no mention of the period at which the disease first appeared, and the same is true of the contemporaneous annals of Portugal. The opinion which I have expressed (§ 112), that this distemper is identical with the African Yaws, which is indigenous among the negro races, that it spread to the Moors and Jews in Northern Africa, and was thence conveyed by them into Spain and Portugal ages before it spread into France and Italy, and there became epidemic, will account for the first appearance of the distemper in the cities of the Iberian peninsula not having been mentioned, inasmuch as it had become there a well-known malady for ages before the end of the 15th century.

35. ii. DESCRIPTION OF PRIMARY SYPHILITIC ULCERS.—These, usually termed *chancres*, are caused by the application of the syphilitic virus, to any part—mucous or cutaneous; to the former when entire or otherwise, to the latter also when entire, but much more readily when wounded or abraded. Their common seat is the genitals; in men, most frequently on the inner surface of the prepuce, or between the prepuce and corona glandis, and especially in the angle by the side of the frænum. "The time at which venereal sores appear is said to be from the third to the tenth day after infection; but it is more probable, as RICORD observes, that the syphilitic virus operates progressively from the first moment of its application, but that the ulcer is fully formed by the fifth day, although it may not be perceived till later." (DUNITT.) The average duration of a

syphilitic ulcer produced by inoculation is, according to WALLACE, twenty-five days.

36. Primary syphilitic ulcers present several varieties, which have been arranged by Mr. HENRY LEE under the following heads: 1st. The indurated or Hunterian chancre—a slow, torpid ulcer, encircled by adhesive inflammation; 2d. The non-indurated, or pustulous, ulcer, marked by early and free suppuration; 3d. The phagedænic or ulcerative; and, 4th. The sloughing; 5th. To these I may add, Urethral chancre.

37. 1st. *The indurated or Hunterian chancre* "is generally found on the common integument, or on the glans penis. It may begin either as a pimple, or as a patch of excoriation which heals up, leaving the centre ulcerous." When this ulcer is produced by inoculation, in order to observe accurately its progress, M. RICORD states, "that the puncture reddens during the first twenty-four hours; that in the second and third days it swells slightly, and becomes a pimple, surrounded by a red areola; from the third to the fourth day the cuticle is raised into a vesicle by a turbid fluid, with a black spot on its summit caused by the dried blood of the puncture; from the fourth to the fifth day the morbid fluid increases, and becomes purulent, the vesicle becoming a pustule with a depressed summit. The areola, which had increased, now begins to fade; but the subjacent tissue becomes infiltrated and hardened with lymph." After the sixth day, "if the cuticle and the dried pus which adheres to it be removed, there is found an ulcer, resting on a hardened base; its depth equal to the whole thickness of the true skin, its edges seeming as if cleanly cut out by a punch—its surface covered with a grayish pultaceous matter, and its margin hard, elevated, and of a reddish-brown or violet colour. The ulcer feels to the finger like a little cup of cartilage set in the flesh."

38. 2d. *The suppurating or non-indurated chancre* has been divided into four stages. It is first a small itching pimple or pustule, and displays when it bursts, secondly, a foul yellowish or tawny sore, with slight swelling and redness, and spreading circularly; it may or may not be covered at first with a dirty brown scab. "In the third stage it throws out indolent fungous granulations (and in this stage is sometimes called the *raised ulcer* of the prepuce), and is usually stationary for a little time, after it has ceased to ulcerate and before it begins to heal. In the fourth stage it slowly heals; cicatrization being preceded by a narrow vascular line. If the ulcer be seated near the frænum, it is sure to perforate it."

39. 3dly. *Phagedænic chancres* are very painful and rapid in their progress. Their surface is yellow, and dotted with red streaks; their shape irregular, their edges undermined or irregular, and the discharge from them profuse, thin, and sanious. The surrounding margin usually appears puffy or œdematous, generally presenting a low grade of vitality, but sometimes it is firm, and vividly red. These ulcers occasionally eat deeply into the substance of the penis, or undermine the skin extensively; but they generally spread much more widely than deeply, and hence they have been called *serpiginous*. Sometimes these sores are more irritable than phagedænic, being acutely painful, discharging a thin ichor, having a raised surface of yellowish exudation, but not spreading much although obstinately refusing to heal.

40. 4th. *Sloughing chancres* are most frequently observed in the prepuce and integuments. Other chancres, however, presenting the simple states of inflammation observed in the second variety, may be changed into a gangrenous or sloughing state by local irritation, excessive horse-exercise, by excessive debauchery, intoxication, or whatever depresses or exhausts vital force.

41. 5th. *Urethral Chancre*.—The secondary syphilitic symptoms which were formerly attributed to gonorrhœa have been satisfactorily proved by RICORD, but very long believed to proceed from a chancre in the urethra, and the distinct natures of the two venereal diseases thereby determined. The existence of chancre in the urethra may be inferred, if, with many of the symptoms of gonorrhœa, the discharge varies much, sometimes being thin, scanty, and bloody, sometimes thick and profuse; and if there be one painful and indurated spot, not far from the opening of the urethra. But the existence of urethral chancre can be certainly proved only by the ulcer being visible at the orifice, or by inoculation with the matter.

42. SYPHILITIC ULCERS IN THE FEMALE may assume the several states described above. They do not commonly cause so much distress as in the male, although there are many exceptions to this rule; but they are always slow in healing, especially when the urine passes over or comes in contact with them. When they are seated high in the vagina, the symptoms produced by them are very equivocal, the discharge not materially differing from that attending other lesions; an examination by the finger or by the speculum being requisite.

43. iii. THE DIAGNOSIS OF PRIMARY SYPHILIS.—Various affections, described under their appropriate heads, may be mistaken for chancre. These are, 1st. *Gonorrhœa externa*, or *balanitis*, consisting of inflammation of the glans and inside of the prepuce, with profuse purulent discharge and excoriation of the cuticle. It may proceed from gonorrhœal infection, or from neglect of cleanliness, and the acrid secretions of the part, or the unhealthy secretions of the female, especially in a person with a long prepuce; 2d. *Minute aphthous-looking points* surrounding the glans; 3d. *Herpes præputialis*; 4th. *Psoriasis præputii*; 5th. *Chronic eczema*, which, however, rarely affects the genitals, unless it be present in other parts; 6th. *Simple excoriations*, from friction or other non-specific causes.

44. It must, however, be admitted that the characters of primary syphilitic affections are not sufficient to enable us to distinguish them with certainty from the above or similar affections arising from ordinary causes; and that the several varieties of primary syphilis now described afford us no sure ground for practical distinctions between each other. The only circumstance in which all writers, from ASTRUC to the present day, agree, is that ulcers of an obstinate nature, attended or followed by induration, are those most likely to be followed by constitutional disease. That the indurated chancre alone is characteristic of genuine syphilis, according to HUNTER, CARMICHAEL, and EVANS, cannot now be credited, and would confine syphilis within very narrow primary limits; for the genuine Hunterian chancre is now extremely rare. Nevertheless, Mr. HENRY LEE and Dr. DRUITT, although they

divide primary syphilitic ulcers into four varieties (§ 36), state that it seems almost certain that it is only after the *Hunterian variety* that constitutional symptoms are to be dreaded, or preventive treatment required; and that sores of the suppurative, ulcerative, and sloughing varieties, and those attended by suppurating bubo, do not, as a general rule, affect the constitution.

45. On this fundamental subject, Dr. COLLES, a most experienced and enlightened surgeon, makes the following remarks: "Although every surgeon must admit that Mr. Hunter's description of a chancre is correct, and drawn from nature, still I believe few will confine this term, or that of primary venereal sore, to those ulcers only which answer to this description. As the result of long, attentive, and anxious observation, I should say that primary venereal ulcers present an almost endless variety of character. I would define a primary venereal ulcer to be one which is remarkably slow in yielding to ordinary, mild, local treatment; but which is curable by mercury, and which, if not so cured, is likely to be followed, in two or three months, by secondary symptoms, which again are also curable by mercury. If, then, there be, as I affirm there is, an almost endless variety in chancres, how can we decide on the nature of primary ulcers, so as to pronounce some to be syphilitic, and others to be mere common sores, or simple excoriations? I reply, that we are to be guided in our decision by observing, first, that many of these suspicious ulcerations cannot be referred to any class of common ulcers, as they strikingly differ from them; and, secondly, by attending to the course which these take, when not interfered with by any stimulant or caustic application, and when treated only with some mild ointment or cold water. If, under these circumstances, we find that, after eight or ten days, such ulcers show no disposition to heal, and if at the same time there be a total absence of any cause, such as defect in the general health, to account for this obstinate condition of the local disease, we may then pronounce them to be syphilitic." (*Op. cit.*, p. 75.)

46. *The constitutional effects* of syphilitic infection are even still more variable and uncertain in their characters than the primary. It is manifest that *bubo* has been considered by many, and more especially by M. BOYER, of too great importance, for it is certainly not a diagnostic of genuine syphilis, nor is it a secondary symptom, but merely a local consequence of the primary sore—the effect of irritation, or of the virus conveyed to the inguinal glands, by the absorbents from the local sore, no constitutional affection often supervening when it suppurates freely. When a patient has a syphilitic sore which has not been destroyed within five days, he is liable afterward to these effects which will hereafter be described as *secondary* and *tertiary syphilis*. Yet, according to Mr. HENRY LEE and Dr. DRUITT, it seems almost certain that it is chiefly after the Hunterian variety that these effects are to be dreaded, and their preventive treatment is required; and that the suppurative, ulcerative, and sloughing varieties, and those attended with suppurating buboes, do not, as a general rule, inflict secondary disease. A developed Hunterian chancre, or its cicatrix if hard or red, like the vaccine vesicle, affects the constitution, "so that if it be cut out or destroyed, the wound will assume the same character, and require the same consti-

tutional treatment, as if the malady had not been interfered with." It has also been recently shown that repeated syphilitic infection begets a protection against fresh attacks; and that the production of additional suppurating syphilitic sores not only does not confer any fresh liability to secondary symptoms, but seems to diminish that which exists already. Hence it has been proposed, as will be shown in the sequel, to inoculate syphilitic and other persons with syphilitic matter, or to *syphilize* them—in order to prevent and to cure this distemper—a subject which will be noticed in the sequel.

47. *The marked differences presented by the primary sores and the secondary symptoms of syphilis*, not only soon after the epidemic appearance of the distemper in Europe, but also during its subsequent prevalence, and in modern times, have been variously explained. Mr. CARMICHAEL believed that there were several distinct species of venereal poisons, each of which produced a specific primary sore and a specific train of secondary symptoms; that the Hunterian chancre, for example, was followed by an excavated ulcer of the tonsils, scaly eruptions on the skin, nodes, &c. But the history of the malady, the diversified symptoms which result from either form of primary sore, and various other considerations, warrant a belief only in one specific virus or poison, which manifests itself both primarily and constitutionally in varied forms, according to the circumstances of infection—to the intensity of the primary morbid action, to the tissue with which the virus is brought in contact, and to the temperament, habit of body, diathesis, and susceptibility of the person infected. Hence arise different modifications or even varieties of the distemper, all resulting from one specific morbid poison. Thus they pass into each other in every phase or grade, without being originally or specifically distinct; and hence the one form or variety may prevail in different countries and races, and even in different ages, and under different influences, and yet give rise to another variety either as to form or intensity, when it infects different races, diatheses, and constitutions. Even in the same country and race, the circumstances and habits of the infected, especially mental and physical distress, prolonged fatigue and exhaustion, debauchery, frequent excesses and intoxication, neglect of cleanliness, &c., will occasion a much more intense and intractable disease, than in persons differently circumstanced. It was most probably owing to these influences that the disease was so severe even in its primary symptoms among our troops during the campaigns in Portugal and Spain, and so mild among the natives. Owing probably to the difference in race, it presented to my own observation in Africa different modifications or forms and grades of intensity among the negroes, from those more usually observed in the white race. As to this topic, however, I would suggest a further, and more precise and extended observation, than I was enabled to make. There can be no doubt that in this country various forms of constitutional affection may proceed from the same kind of primary sore.

47*. III. SYPHILITIC BUBO.—Inflamed and enlarged lymphatic glands, consequent upon a venereal ulcer, arise from the virus contained in, or secreted by this ulcer or chancre. This affection of the inguinal glands may arise from the irritation of, or absorption from, gonorrhœal inflamma-

tion of the urethra; but it is not so frequent, nor so severe as when it is caused by chancre. Syphilitic bubo cannot be viewed as an indication of the existence, or even of the commencement, of the secondary or constitutional disease; for the affection of the glands may even, according to the more recent occurrences of the disease, be the means of preventing the constitutional contamination. This, however, was not the case in the earlier histories of the distemper, and more especially after the epidemic prevalences of the disease in the end of the 15th, and during the 16th century—a. The forms and diagnosis of bubo have been correctly and succinctly given as follows by Dr. DRUITT: 1st. *Bubo of the penis* is an inflammation of a lymphatic in the penis, which may be felt like a cord under the integuments, and which passes into abscess in some part of its course. 2d. *Acute bubo* in the groin generally affects one gland, and pursues the course of an acute abscess. The cellular tissue surrounding the gland is the usual seat of suppuration, but there may be also a small abscess in the centre of the gland, caused by the transmission of the poisonous matter, and the pus of this latter is alone capable of producing a chancre by inoculation. 2d. *Chronic or indolent bubo* commonly affects more than one gland. It occurs in weak or scrofulous habits, and especially in persons injured by the improper use of mercury. The glands enlarge slowly, suppuration is protracted and imperfect, and commences at several points. The skin is long in inflaming, and on becoming so a large tract assumes a dusky bluish tint; the matter extends, and at last large portions of skin perish by ulceration, leaving an extensive sore, that may be months in healing.

48. b. *The diagnosis of syphilitic bubo* requires attention. If one gland only, and that above Poupart's ligament, be affected, it is most probably caused by chancre on the penis, provided there be or has been one. "But if many glands are swollen, and they are below the level of Poupart's ligament, the swelling is probably caused by some irritation about the foot (or extremity). But the only sure diagnosis of a syphilitic bubo is that, if the matter taken from it be inoculated, it will produce a chancre; or that the sore produced by opening the bubo presents the elevated edges and copper-coloured margin of a chancre." As every bubo is attended by suppuration of the surrounding cellular tissue, the matter taken when first opened may not cause chancre by inoculation. There is no certain proof of a bubo being syphilitic unless preceded by chancre, unless a chancre can be produced by inoculation of the discharge, or unless decided secondary symptoms supervene.

49. IV. SECONDARY SYPHILIS.—Constitutional syphilis may occur from a fortnight to three or four months after the primary symptoms. The usual time is five or six or seven weeks. Early in the history of syphilis in Europe, the constitutional affection was much more early than the shortest time now named, and was not unfrequently the first produced, owing to the readiness with which the contagious principle was imparted and imbibed. Before the appearance of secondary symptoms, the constitution betrays its infection by a variety of *premonitory symptoms*—by a dispirited and even wan expression, by want of appetite and sleep; by heaviness of the eyes, rheumatic pains, especially during the night, and pal-

lor and loss of flesh; and, lastly, by a slight eruptive fever usually of an inflammatory type. Upon these, after a short but variable period, the secondary symptoms supervene, sore throat generally accompanying this fever or soon following it.

50. *The symptoms premonitory of the secondary or constitutional disease are sufficient evidence of the infection of the body by the primary disease, although those alterations usually termed secondary are not yet developed.* The dull, earthy hue of the surface, the loss of bodily health and mental vigour; the dryness of the hair, and loss of its smoothness and glossiness, and the giddiness, headache, uneasiness about the neck, or supra-orbital pain, usually on one side, and when the body is recumbent, are among the earliest indications of this infection. On these supervene pains about the joints; lassitude of the limbs; enlargement of the posterior cervical glands; loss of the tone, fulness and strength of the pulse; more or less anæmia, and falling out of the hair. The loss of hair indicates an inveterate form of disease, and is often attributed by patients to the use of mercury; but this mineral will not cause *alopecia*, but syphilis will. These symptoms, although not generally recognised as secondary, are so nevertheless, and, if not arrested by treatment, will soon be followed by those which are more generally described as such.

51. i. *SYPHILITIC ERUPTIONS.*—*The secondary effects of syphilis are ultimately developed either on the skin or mucous membrane, especially of the throat, or on both.*—A. The earliest of these to appear is an *exanthematous* or *erythematous eruption*, which may be either attended by fever, as stated above (§ 49), or entirely independent of fever. This eruption may occur either during the existence of the primary symptoms, or a few weeks after their disappearance. It sometimes assumes the appearance of either measles or scarlatina, and at its commencement is usually of a rose-colour, the surrounding skin being of an unhealthy or dusky hue. The redness disappears on pressure, but returns immediately when pressure is removed. The surface of the body may be covered at once, but more frequently in succession, by this eruption, which soon loses its rosy hue, and daily becomes more and more dusky, until it assumes a coppery and more permanent tint. It is generally unattended by either heat or itching. It generally fades away for a while, and then reappears; and it may thus proceed, with interruptions, for two, six, or twelve months, but after a year or two it entirely dies away. In half the cases the eruption remains unnoticed, and it very often fades away without the patient being aware that it ever had any existence; but some time after another and a deeper eruption makes its appearance. This state of the eruption may be mistaken for pityriasis, or this latter for syphilis; but the history of the case, the appearance of the eruption, the absence of itching, and the impaired health of the patient, will indicate its syphilitic nature.

52. B. A more developed form of syphilitic eruption may appear as *papulae*, of various sizes, or as *psoriasis*, in which the skin is raised in copper-coloured blotches, covered by *scales* of hypertrophied cuticle. These eruptions are succeeded merely by exfoliations of the cuticle or thin superficial scabs. An aggravated state of the foregoing begins with an eruption of copper-coloured blotches, which become covered with *scales* of en-

larged cuticle, and form *syphilitic lepra*. These scales are succeeded by thin scabs, and these, on falling off, leave shallow ulcers with copper-coloured edges.

53. C. *Vesicular eruptions*, often assuming the form of *rupia*, may occur, appearing at first as large flattened bullæ, filled with serum, passing into a purulent state, and finally drying into thick scabs, under which the skin is ulcerated. The ulcers spread under the scabs, and, owing to the successive additions of the dried matter as they extend, they become remarkably thick, conical, and resemble limpet shells. The eruption may be distinctly *pustular*, constituting *syphilitic ecthyma*, the pustules being large and prominent, leading to ulcers, with a copper-coloured base.

54. D. *Tubercular eruptions*, broad, reddish, or copper-coloured, appear on the face, most frequently at the alæ of the nose, or on the cheeks. They suppurate slowly, and are succeeded by deep irregular ulcers, terminating in puckered cicatrices. This eruption, in Dr. Druitt's opinion, more properly belongs to the class of tertiary symptoms, in which mercury is almost inadmissible. This eruption usually appears a very considerable time from the primary symptoms in persons of weak constitution, or who have been broken down by privation, dissipation, or unavailing courses of mercury; it is consequently an unfavourable form of the disease. "A patch of this kind of unhealthy inflammation is apt to form on the tongue, and after a time an abscess breaks, disclosing a ragged excavation, filled with orange-coloured sloughs, and exuding a copious fetid discharge. If it occur on the palate, a probe will detect bare exfoliated bone, which rapidly perishes, and leaves a hideous chasm."

55. E. *Mucous Tubercles, Condylomata*—*Tubercule muqueux, Pustule Plate*, consist of raised patches of skin, with a red and moist surface, like mucous membrane. They exude a thin, acrid, and offensive discharge. They are most frequently situated in the vicinity of the genitals, or in any other place where two surfaces of skin come in contact, presenting an excoriated appearance. They constitute a peculiar syphilitic eruption, and are undoubtedly capable of producing constitutional syphilis, generally with a similar eruption, in healthy persons. Indeed such a result may follow the tubercular or even the pustular forms of secondary syphilis in certain favourable circumstances. (*The several forms of syphilitic eruption are more fully described in the several articles devoted to diseases of the skin.*)

56. Venereal eruptions are not severally characteristic of any distinct form of syphilis, primary or constitutional. Dr. COLLES states, 1st. That he has not been able to trace back particular forms of eruption, to particular forms of primary ulcer. 2d. He has not unfrequently observed varieties of eruption existing together in the same person. 3d. After the removal of the first eruption by mercury or other means, the second crop will often prove of a different kind; and, 4th. Any form of eruption may be converted, by injudicious treatment, as the excessive use of mercury in bad habits, into one which is most obstinate and severe. This opinion agrees with those of HENNEN, OESTERLAN, S. COOPER, BACOT, and others. Mr. BABINGTON considers the variety of venereal eruptions to be so great as to baffle description. He, however, arranges the more distinct forms under the heads of *Tubercles*,

Lichens, Psoriasis and Lepra, and Rupia. The most important practical point, which many writers connect with these distinctions into form of eruption, is, that rupia and ecthyma are met with in a very dangerous general depression of health, requiring the greatest care.

57. *F. The diagnosis of secondary eruptions* is of great importance—is sometimes very easy, and occasionally very difficult. In all cases the previous history of the patient should be inquired into. It is not only necessary to ascertain whether or no a chancre has existed, but also the time when it occurred, its situation, and its character. If no chancre, but gonorrhœa only, in male or female, preceded the eruptions, it should be recollected that chancre may have escaped the patient's notice, or may have existed in the urethra of the male, or in the vagina or cervix uteri. In these cases caution and farther observation are required. If sores are admitted, their characters, especially as regards induration, are of importance.* A knowledge, likewise, of the existence of suppurating bubo may be useful, for indurated chancre is rarely attended by suppurating swelling in the groin; and, lastly, the existence of any traces of indurated chancre or bubo ought to be ascertained, the denial of the patient not being sufficient.

58. As respects the eruption, M. RICORD remarks that one of the most important characters of it is a total absence of pruritus, whereas itching is a very frequent symptom of the other kinds of eruption. When, however, the syphilitic eruption affects naturally pruriginous regions, as the anus, the genito-crural fold, there may be considerable itching, owing to the irritating nature of the secretion. Syphilitic eruptions are generally apyretic and indolent, involving in a short time the whole body, generally by successive instalments. They spread indiscriminately to all parts, and do not affect the face in preference to other parts. They emit no smell, unless there be an exudation of fluid or suppuration. "There is nothing specific in the smell, nor in the colour mentioned by SWEDIAUR, nor the ham-like hue spoken of by FALLOPIUS, which latter has been, with reason, looked upon as an important sign, and an absolute and constant character." Secondary eruptions generally present rounded and well-defined patches, the colour of which may be

more or less deep in their centres. They have very little tendency to suppuration; and when matter does form, it is generally small in quantity and unhealthy in character. The eruptions which do not suppurate, generally disappear in time by resolution or desquamation. The scales in these cases are less brilliant and thinner, dry more quickly, and more frequently furfuraceous than in non-specific affections, and the scales sometimes fall off in large shell-like pieces. The crusts sometimes accumulate in successive layers, as in rupia. When, by the falling of the crust, the ulceration underneath becomes apparent, it generally is rounded, its fundus grayish and pul-taceous, is surrounded by a darkish areola, with a certain induration in the margins. Phagedæna of these ulcerations is rare; but when it does happen, it sometimes extends rapidly. Secondary syphilitic ulcers are preceded either by some eruption, as ecthyma, rupia, papulæ, or tubercles; they rarely follow vesicles or psudaceous pustules. RICORD agrees with HUNTER in considering the diagnosis of secondary symptoms as most difficult; for "there is hardly any disorder that has more diseases resembling it in all its forms than the venereal disease."*

59. *G. Secondary affections of the scalp—Alopecia syphilitica*—is among the earliest constitutional disorders consequent upon syphilis. It commences with a slight itching, tenderness or soreness of the scalp, attended by rheumatic pains. On examination, no trace of eruption can be detected; but if the patient have suffered within four or eight weeks from chancre, or if any induration remain in its situation, the tenderness of the scalp will soon be followed by the loss of hair and some one of the affections of the skin, throat, &c. The alopecia commences very gradually. The hair at first becomes dry and crisp, loses its glossy appearance, breaks readily, a brush or comb causing great pain. The hair is often seen broken off close to the scalp, and patches of baldness, or approaching to it, are found here and there. At a more advanced stage the hair comes away with the bulbs in considerable quantity. Pityriasis now becomes troublesome; and various points of the scalp assume a rosy hue; the rest of the skin generally having a yellowish, unhealthy appearance. Slight febrile symptoms set in, attended often with rose-coloured spots on the abdomen. The patient now frequently complains of rheumatic pains in the joints, with loss of appetite and debility. The loss of hair requires immediate attention, especially when caused by syphilis, as it may be very considerable in a short time, and its growth very uncertain. It should, however, be remarked that if the hair does not fall out at the commencement, it is not very frequently lost in the latter stages of constitutional syphilis.

60. At a more advanced stage, a papular affection of the scalp, commencing with little rose-

* DR. MCCARTHY SAYS, "In 123 cases of secondary symptoms, indurated chancre had preceded the eruptions 118 times, and been recognised in the hospital, or the patient recollected having felt it. In one case only the patient could recollect that a clap only had preceded the condylomata which we observed on the patient; but this clap was attended, he told us, with a bloody discharge, which occurred seven months previous to his admission into hospital. In 4 cases we were unable to obtain accurate recollections on the subject of induration."

"The examination of these 123 cases clearly proved to us, in consequence of the frequent unexpected situation of the primary sore, the reason why we daily meet with cases which give reason to suppose that secondary symptoms may arise spontaneously. In 6 cases the sore was seated in the urethra, when inoculation enabled us to recognise it three times; in other cases the disease, at first concealed from view, ultimately appeared as a urethral chancre at the meatus. Four times at the anus, once in the nostril, once on the chin, once on the lip. Suppose we take these 123 patients, and compare those primary symptoms, for the purpose of attempting to discover some one character which appears sufficiently often to enable us to draw a deduction from it, we find that in one and all the inguinal glands have been observed enlarged, but suppuration took place only twice, and in these the buboes had a scrofulous appearance, and it was not possible by inoculation to obtain the specific pustule." (Note from ACTON'S *op. cit.*, p. 488.)

[* For the best description of the *syphilida*, or *syphilitic eruptions*, the reader may consult the American edition of VIDAL "On Venereal Diseases," with colored plates, translated by GEORGE C. BLACKMAN, M.D., 8vo, p. 499. New York: Samuel S. and William Wood, 1854. In this, the ablest work on this class of diseases hitherto published, the different varieties, including the *exanthematous*, *papular*, *squamous*, *vesicular*, *bullous*, *psutular*, and *tubercular*, are described at great length, and accurately represented by coloured engravings. We feel tempted to give a synopsis of these varieties, but the work is so accessible, and so well known to the American profession, that it is unnecessary.]

coloured elevations, attended by itching, is observed. These papulæ, or *lichen*s, increase in number, slight pearly-white scales form on their apices, which fall away and are replaced by others. The hair is scurfy, and the papulæ or elevations, at first the size of millet-seeds, become large and assume the form of *lepra* or *psoriasis*. When the scales are removed, the skin looks like a recently-blistered surface, and exudes a small quantity of thin pellucid fluid; or it is quite dry. In particular situations, especially behind the ears, in the folds of the neck of stout persons, or those inattentive to cleanliness, those places instead of becoming scaly remain moist, the oozing from them excoriating the surrounding parts, and developing mucous tubercle or condyloma. As the disease of the scalp advances the papulæ or lichen pass into an impetiginous or an eczematous state. In still more advanced stages, ulcerations of a very intractable character, forming tertiary symptoms, form in the spots of impetigo or eczema; and tumours as large as horse-beans form in the scalp, at first unattended by pain or redness. Fluctuation may be detected in them after some time, and when punctured a thin, serous, straw-coloured fluid exudes. If left alone they become painful and red, ulcerate, exposure of the bone ultimately following, and even necrosis, which are now chiefly seen in pathological collections, and but rarely in practice in the present day.

61. *H. Syphilitic Onychia*.—The venereal affections of the skin or scalp may be extended to the nails. In these cases the matrix suffers, and the nail grows thick and nodulated, closely resembling the changes which take place in it from inveterate psoriasis. There is a great similarity between onychia and alopecia. They both depend upon the constitutional infection interfering with the formation or nutrition of these cuticular appendages.

62. ii. SYPHILITIC AFFECTIONS OF MUCOUS SURFACES.—*A. Syphilitic Affections of the Throat*.—*a.* The mildest affection of this kind is a superficial excoriation of the mucous membrane, most frequently of the tonsils, but not unfrequently also of some other parts of the fauces or mouth, corresponding to psoriasis on the skin. The affected parts are slightly swollen and sore, afterward red and raw, or covered with a whitish exudation, or with a patch of thickened epithelium. If the disease proceed it will generally be followed by superficial ulceration.

63. *b.* An excavated ulcer may follow the foregoing, or may be first to come before the physician, although it may have been a consecutive lesion of the parts. This ulcer appears as if a piece had been scooped out of the tonsil. Its surface is foul or yellow, its edges raised and ragged, and swollen. It occasions much less inconvenience than its appearance might indicate; and there is very little constitutional disturbance from it, unless it be attended by eruption. As the lesion advances, or swelling increases, the patient's speech becomes guttural, and he often complains of pain shooting to the ears, and of partial deafness.

64. *c.* Sloughing ulcer begins as a small aphthous spot which rapidly ulcerates, and is attended with great pain and fever. "The surface of the ulcer is covered with an ashy slough, and the surrounding membrane is dark, livid, and swollen. The lingual artery may be opened by the spread

of the ulceration, and the patient may die of hæmorrhage, unless the common carotid is tied." (Druitt, p. 187.) In some instances, especially when mercury has been given in large quantities for primary symptoms, the affection of the throat comes on notwithstanding, and assumes a red and sloughy appearance; a piece of the tonsil appears as if punched out, and the ulcers rapidly extend in size and depth.

65. The situation of the ulcerations, most frequently of the excavated, is commonly on the tonsils, on the sides of the tongue, on the upper surface, or on the under surface close to the frænum. Sometimes they are met with on the dorsum of the tongue, here assuming an elevated character, like the condylomata around the anus. They occasionally attack the palate, pharynx, and more rarely in the posterior and lower part of the pharynx, in which latter situation it occurred in a patient many years ago under my care, ulceration also having extended to the larynx and terminated fatally. Ulcers also form at the corners of the mouth, where they may form scabs, or are liable to bleed when the mouth is fully opened.

66. *B. Syphilitic ulcerations of the nose and palate* commence with inflammation and ulceration of the mucous membrane covering the parts, similar to those of the throat. The ulcerations may proceed until they denude the periosteum, and afterward produce exfoliation of the bones and profuse fetid discharge, and ultimately very marked deformity. Ulceration of the nose generally begins with ozæna, or with a sense of pain, heat, dryness, and snuffling. But the bones of the nose may become otherwise attacked, as shown in the sequel (§ 75).

67. *C. Syphilitic ulceration of the larynx* is chiefly a consequence of the extension of ulceration from the palate or pharynx. It is characterized by tenderness, slight pain or uneasiness referred to the larynx, by huskiness of voice, followed by a low whispering, or loss of voice; by suffocative cough, and by expectoration of a sanguineo-puriform matter. There is great loss of strength and flesh; and life is often terminated by suffocation.

68. *D. Secondary Affections of the Eyelids and Eyes*.—Not only may inflammation of the eye be consequent upon gonorrhœa (see art. EYES, gonorrhœal inflammation of, § 56, et seq.), but eruptions and affections of the eyelids and of the eyes themselves, chiefly in the form of iritis, may appear in the course of secondary or constitutional syphilis. These eruptions often appear on the external surface and on the ciliary margins of the lids. In some instances the corners of the eyelids have a cracked, scaly appearance, resembling a similar alteration more frequently occurring at the angles of the mouth, and, as in this latter state, the eruption is connected with syphilitic affections of either the skin or of the mucous membrane, of the throat, &c., or of both; and it may appear in any period of the progress of these affections. In some cases the conjunctiva is also either partially or extensively implicated. Syphilitic iritis is not unfrequent; and is fully considered in the article on the diseases of the EYE (§ 132, et seq.), to which I must refer the reader.

69. iii. TERTIARY SYPHILITIC DISEASES.—Certain constitutional effects of syphilis, which more frequently are consecutive of several of those

already mentioned, than associated with them—although such associations, especially in the advanced course of the latter, are often observed—have been classed as *tertiary symptoms* of the disease. They may, however, occur after the removal of the secondary forms of the distemper, or independently of these, and at a remote period from the primary symptoms. Under the term *tertiary symptoms* have been arranged *nodes, inflammation of the periosteum, exostosis, caries of the bones, tubercles of the sub-cutaneous and sub-mucous tissues, disease of the testes* consequent upon primary or secondary syphilitic disease. These affections were generally classed with those secondary symptoms already noticed. JOHN HUNTER first distinguished them by designating them the "*Symptoms of the second period of constitutional syphilis*," a designation which many will agree with me in considering as more appropriate than that imposed on them by M. RICORD.

70. Though *tertiary symptoms* generally depend upon chancre, or, in rare cases, upon infection by a secondary disease, they follow the primary symptoms after a much longer interval, and they are seated in other and more deeply-seated structures than the secondary. They affect chiefly the sub-mucous and sub-cutaneous cellular tissue; the structure of the bones; the fibrous structures, especially the periosteum; the joints; the testes, and lymphatic system. The syphilitic poison may even develop disease of the liver, lungs, brain, and heart. Tertiary affections cannot be transmitted from parent to child—are not hereditary; but they are undoubtedly capable of producing a scrofulous diathesis in the offspring.

71. *A. Course.*—In the more usual course of the disease, tertiary symptoms do not supervene until six, seven, or nine months from the primary, and in some they may be delayed for several, or even as many years. Although these symptoms may be separated with propriety from the secondary, yet it will very frequently be difficult to draw the line of demarcation between them. They may be both so associated, or the one class may pass so insensibly into the other as not to admit of an inference as to the predominance of the one set of symptoms over the other. In the natural course of syphilis the tertiary form very frequently thus appears during the existence of the secondary, in the same way as the latter may come on during that of the primary. Under other circumstances, as from treatment, careful regimen, &c., the secondary symptoms may have successfully disappeared and returned, and ultimately the tertiary have supervened; and even, although in rare instances, an indurated chancre may have existed, and been apparently cured, yet, after a very considerable lapse of time, tertiary symptoms may appear generally from the influence of causes hereafter to be noticed (§ 109, *et seq.*), at first in a slight form, but with increasing severity, notwithstanding the non-existence of secondary symptoms between the primary and tertiary. During the course of tertiary affections, various complications may be developed, not only by the syphilitic poison, but also aided by treatment, by pre-existing tendency to visceral or other diseases; by the causes, influences, and circumstances to which the patient may have been exposed, and by climate, race, occupation, &c.

72. *B. Syphilitic affections of the testes* are generally among the earliest of tertiary symptoms to appear, and may occur during the existence of

the secondary. They may, however, supervene in five or six months, or not until as many years, from the primary infection. They may appear either alone, or attended by pains in the bones, exostoses, or gummata; but they are of rare occurrence in the present state of the distemper. ASTRUC first, and HUNTER, Sir A. COOPER and DUPUYTREN, subsequently, made the distinction between diseased testicle consequent upon syphilis and that following gonorrhœa. Syphilitic disease of the testes may commence in one and extend to both, or it may begin in both at once. Excepting slight nocturnal pains in the loins in some cases, the affection often reaches a considerable height before it is noticed. When the patient's attention is attracted by it, the testes are found heavy, hard, and generally much increased in size, although not always. The disease may run its course without much uneasiness, and hence be neglected, and organic lesions may supervene which cannot be removed. The erections, however, and the venereal desire become, on the full development of the disease, less frequent, and the seminal discharge is diminished. If the disease continue, or be neglected, the testes decrease in size, and ultimately may become atrophied, and may even disappear nearly or altogether. These changes are extremely slow, and may continue for several months or even years before the organs are entirely lost. A full description of them will be found in the works of M. RICORD and Mr. ACTON.

73. *C. Small tumours* are sometimes formed in the *scrotum*, and are described as *tubercles*, or *gummata*, either in connexion with disease of the testes or independently of it. They occur as a tertiary symptom in the deep layers of the *scrotum*, and sometimes implicate the testes, or are mistaken for affections of these organs. They never appear before the fifth or sixth month from infection; but they may occur after many years. They mostly appear as small elastic tumours, and feel as if they were filled with a gummy matter. As they grow they become painful, inflamed, and the skin covering them softens and ulcerates, and a deep ulcer follows a copious puriform discharge. The edges of the sore are undermined, and the adjoining parts are involved in the destruction.*

* See paper by JOHN WATSON (in *New York Journal of Medicine* for November, 1845), entitled "Further Observations on some of the more obscure and remote Effects of Syphilis;" also, in same journal for July, 1843. Dr. W. was one of the first, if not the first, in this country to show that the venereal disease in its progress through the system may affect the *brain* and its *meninges*, the *oesophagus*, the *bronchial tubes*, and the *testes*; and that it may simulate other diseases, as *pulmonary phthisis*, and diseases of the *digestive organs*, *liver*, &c. Among the cervical ganglia he shows that it may simulate *strumous adenitis*, and in the lower extremities *elephantiasis*, while it occasionally involves the *re-tum* and *prostate gland*. He also offers some very original and interesting remarks on "the rarity of secondary syphilis after sloughy primary sores; on the frequent and early occurrence of superficial necrosis in connexion with nodes; on the co-existence of syphilis with other constitutional diseases; and on mercurial cachexia, as liable to be mistaken for the remote effects of syphilis." With regard to the syphilitic affection of the testicle, from various examinations, Dr. WATSON concludes that the primary seat of the affection is in the fibrous envelope forming the proper capsule of the testis, which occasionally becomes enormously thickened, while the proper tissue of the testis remains healthy. The tubuli seminiferi, with their continuous vessels of the epididymis, were atrophied, pale, and immersed in serous effusion. In one case there was a deposit of a large yellow mass, irregular in shape, broadest in front, and apparently connected with the fibrous en-

74. *D. Syphilitic disease of the periosteum and bones* generally commences with tenderness in the situation of the more exposed and superficial bones, especially in the bones of the nose, in the tibia, ulna, cranial bones, clavicles, &c. The tenderness and pain become aggravated in the evening, last all night, but cease altogether or abate during the day. The pain is followed by oblong swellings or *nodes*, caused by the inflammation of the periosteum, and by the infiltration of lymph and serum. These swellings are tender, and the skin over them is at first pale and moveable. They present to the touch a doughy character, or an obscure sense of fluctuation. Dr. Druitt remarks that "if the disease is arrested at this stage, it causes merely a superficial deposit of rough porous bone, from the organization of the lymph effused; or else consolidation of the bone itself, through deposition of fresh osseous matter into its cancelli. If the disease proceed one step farther, a quantity of glairy serum is effused between the periosteum and bone, producing an exquisitely painful fluctuating tumour. If it advance still farther, the bone becomes carious; matter forms between it and the periosteum; extensive exfoliations ensue; the patient suffers severely from the pain and discharge;" and if the disease be seated in the cranium or os frontis—*corona Veneris*—death may ensue from extension of disease to the dura mater, or from protrusion of the brain through the eroded apertures in the skull. Such extreme cases are now very rare, but they were common enough many years ago, and when it was supposed that mercury given in excess was the only cure for the distemper.

75. *E. Disease of the bones of the nose* is often among the earliest of the tertiary symptoms, but it is of only occasional occurrence, and sometimes not until an advanced period. The nose may become diseased, as stated above (§ 66), from ulceration of the mucous membrane; but the formation of internal nodes on the palate, vomer, ethmoid, and bones forming the bridge of the nose, may cause these bones to be carious, and probably the spongy structure of these bones may contribute to this even so quickly as it is sometimes observed. In rare cases these bones are nearly destroyed before the nature of the disease becomes apparent. When caries of the os frontis near the root of the nose takes place, the disease may extend to the ethmoid bone, and produce the worst effects. The existence of a deep-seated pain in the palate, and at or near the root of the nose, with or without a fetid discharge, should always be viewed with suspicion, especially if either primary or secondary symptoms have existed at some previous period, although very remote, and apparently altogether removed. *Ozæna* may proceed from scrofula, scurvy, or even from chronic cephalic catarrh; but in 99 cases out of 100 it is the result of syphilis in the circumstances just named.

76. *F. The joints* are not frequently nor so quickly affected as the bones. Large gummy swellings sometimes, however, form around the ankle, knee, and elbow joints, owing to venereal disease; and in rare cases even the joints themselves. In two instances I was consulted

where nearly all these joints were remarkably swollen and diseased, consequently upon other serious syphilitic affections. In a third—that of a late M.P.—amputation of the leg above the knee had been performed by Mr. DALRYMPLE, of Norwich, and the case subsequently came under my care. The small bones of the extremities may also be similarly affected. In venereal diseases of the joints it is difficult to determine, as I have not seen these cases terminate fatally, although they doubtless occasionally do, whether the disease is entirely external to the joint itself, or whether the articulations or the ends of the bones are also implicated by the disease. That the cartilages are sometimes eroded, and even the ends of the bones or their epiphysis also are affected, may be inferred not only from the case for which amputation was performed, but also from what is observed to occur as regards the cartilages and bones of the nose. These local syphilitic diseases—of the bones, joints, &c.—are generally attended by a slow or *syphilitic hectic*, and with the several constitutional phenomena described hereafter as the syphilitic cachexia.

77. *iv. THE SYPHILITIC CACHEXIA.*—It may justly be asked, can syphilis so contaminate the constitution as to give rise to dangerous or even fatal results of a different kind, or in addition to those which have been described above as secondary and tertiary? To this question I cannot hesitate to answer in the affirmative. These results do not often occur in the present day; and even the most severe of the tertiary affections noticed above, although sometimes terminating fatally, have not always this issue. In their most unfavourable results, it is often difficult to say how much may be imputed to treatment. But, irrespective of the more severe and dangerous of the affections already mentioned, states of the system may be induced, attended by marked severity or imminent danger, in which none of these affections had appeared, or, if they have appeared at some previous periods, they had been removed by medical treatment or regimen. This dangerous state of constitution—this the most remote or advanced of the effects of the syphilitic poison—has not been overlooked by previous writers, more especially by Dr. COLLES and M. RICORD.

78. Syphilitic cachexia is generally a consequence of a single constitutional contamination (*such contamination not occurring twice*), and is favoured by the following circumstances: 1st, by an originally weak or bad constitution, by scrofula, scurvy, and a peculiar or vitiated diathesis, previously to the venereal infection; 2d, by the persistence of certain severe syphilitic symptoms; 3d, by an ill-timed or badly-managed treatment, and by neglect of treatment; and, 4th, by causes which tend to lower the vital powers subsequently to infection—such causes, according to my observation, being excessive sexual indulgences, masturbation, exposure to cold and moisture, to the continued influence of malaria, or to noxious exhalations, &c.

79. *The symptoms of syphilitic cachexia* are not always well defined; for they may be associated with certain of those already noticed, or they may appear as the sequelæ of some of the more severe of them, or they occur at periods so remote from them as to occasion grave doubts of their nature and origin. They may, however, be stated to consist chiefly of pallor, sallowness, and anæmia

velope of the testicle, and extending backward in the direction of the corpus Highmorianum. This mass, by pressure, produced atrophy of the tubuli seminiferi. For an excellent account of syphilitic sarcocœle, see also VIDAL.]

of the surface, flabbiness of the flesh, emaciation, debility of both body and mind, various anomalous scorbutic or cutaneous appearances, hectic or continued nervous fever, night exacerbations, diarrhoea, sweats, aphonia, and ultimately death, arising from some important internal organ experiencing disorganization, to which it may, previously or subsequently to the venereal infection, have become predisposed. Thus the patient may be cut off by extreme anæmia, by diarrhoea terminating in ulceration of the intestines, by affections of the lungs, &c.

80. Sometimes, after the patient has improved, under treatment for various secondary or tertiary symptoms, in respect both of these symptoms, and of flesh, strength, and appearance, he begins to exhibit a much less favourable aspect. He appears sickly, loses flesh, presents a waxen hue, complains of loss of appetite and strength, of want of sleep, and of night sweats. If any eruptions or other syphilitic symptoms are present, they may disappear, and yet the general constitutional cachexia may long remain, or even become more marked; or, if the local symptoms continue, they may be slowly deteriorated. Thus tubercular eruptions, or pains in the joints and bones, may continue in various grades of severity for some years, while the constitution is slowly wasted, anæmied and visibly contaminated. In some cases the local symptoms, in the course of the general breaking down of the frame, are so changed as hardly to be recognised as venereal—various local or visceral changes, the consequence chiefly of this cachexia, or of the treatment, being developed, and *masking* the venereal affection and its effects. This formerly obtained more remarkably when the treatment by mercury was carried to excess. There can be no doubt, however, that, even independently of this, or of any other treatment, the venereal cachexia may terminate fatally by calling latent tendencies into action, and by developing disease in vital or other internal organs. It may, however, be most manifest in all its indications, even when the local affections are comparatively slight; or, although they have been severe, after they have entirely or almost altogether disappeared. The local affections, as well as the constitutional contamination, are often developed, hastened, delayed, or aggravated by a number of circumstances, influences, and concurring or reinforcing causes (§ 115, *et seq.*), to which the patient may have been exposed subsequently to the period of infection. During syphilitic hectic or cachexia, not only may the contingencies now alluded to appear, but there are several others which may also supervene; namely, paralysis, epilepsy, hypochondriasis, melancholia, monomania, and even more or less general insanity. These disorders of the mind are, however, seldom met with even in the advanced states of constitutional syphilis—the intellect being generally but little, or not at all, affected to the last.

81. v. *The diagnosis of constitutional syphilis* is often very difficult, more especially when patients deny that they have had any primary symptoms, or even any suspicious intercourse, or even any sexual intercourse whatever. These last circumstances are, however, very rare, or may even be considered next to impossible. But the rare modes of communicating the distemper, independently of sexual connexion—much more common in former times than now—should not

be forgotten. These modes will be noticed in the sequel (§ 110, *et seq.*). If, however, copper-coloured eruptions, sore throat, loss of hair, enlargement of the glands around the occiput, pains in the joints, periosteum or bones, periosteal nodes on the long and superficial bones, with night pains, a faded, pallid, or waxen and unhealthy look, loss of flesh and strength, be complained of; and more especially if these symptoms follow a somewhat similar succession, and cannot be attributed to locality, diet, regimen, &c., or to any recognised visceral disease, they may be confidently referred to constitutional syphilis. Where, however, neither the above succession of symptoms, nor many of them appear, the difficulty of diagnosis will be much greater, especially if primary symptoms be not admitted; but, if admitted, there can be no doubt of the nature of the disease, although a long period between the existence of the primary symptoms and the appearance of those which are doubtfully secondary may have intervened. It has been stated above that the period to which the supervention of secondary and tertiary symptoms upon the primary may extend may be very long—even even extend to several years; but the exact term to which this interval may be extended has not been ascertained. Its duration evidently depends upon a variety of causes and circumstances (§ 115, *et seq.*).

82. vi. SYPHILIS IN CHILDREN.—*Syphilis Infantum.*—*Hereditary syphilis* differs so far from the disease as it occurs in adults, as to induce some writers to doubt its venereal origin. It is certainly the transmission of the constitutional contamination or distemper to the fœtus, during utero-gestation, and not the infection of the fœtus during parturition. The malady may exist at birth, or may not appear for some days or even weeks after birth. It is indicated by copper-coloured spots on the cutaneous surface, especially about the arms, genitals, and mouth, which may go on to ulceration. There are also a peculiar shrill or hoarse voice, excoriations and ulcerations, or an aphthous appearance at the corners of the mouth, on the tongue, throat, and palate. In more advanced stages, emaciation and a senile appearance of the countenance; snuffling, or obstruction of the nose, enlargement of the glands, general cachexia, terminating in death, if the disease be not early detected and judiciously treated, and even in such favourable circumstances the child may be carried off by some severe complication. In most of the cases of syphilis infantum the mother has been stated to have infected the fœtus. I believe, however, that the infection has not always proceeded from the mother only. SCHENCK adduces an instance (*Observ. le vij.*, No. 21) of the infection of the fœtus from the father, the mother being unaffected. It must, however, be admitted that it is very difficult to prove the mother to have been untainted by the distemper, when the father has been affected. Upon the whole, it may be generally expected that the fœtus will manifest the disease when the pregnant mother is constitutionally affected; and it is not improbable that the child may be infected by a constitutionally syphilitic father, without the mother having manifested any symptoms of the constitutional or primary distemper. MAURICEAU, however, has adduced instances of the child having been free from syphilitic taint, although the mother was affected; and I know cases of the

children being free from syphilitic taint although their fathers were constitutionally affected; but these children presented more or less of the scrofulous diathesis, or died in infancy. "The child may be also affected after birth, by a nurse suffering under syphilitic ulceration of the nipple, or by its mother under the same circumstances, if the disease of her nipple has been derived from a strange child; but no instance is known of a child infecting its own mother, although it will immediately communicate the disease to a strange nurse." The infection of the nurse is manifested by ulceration of the throat, identical with that succeeding primary disease, by cutaneous eruptions, by the formations of excrescences about the pudenda, which are capable of affecting her husband, in whom the infection is likewise followed by constitutional symptoms. HUNTER believed that secondary symptoms could no longer infect; but this opinion is disproved by many very experienced writers, and by several instances which have come under my own observation. There can be no doubt that during the 16th and 17th centuries, the communication of the distemper, and even in more recent times, by secondary symptoms was remarkably frequent. This circumstance shows the intimate connexion, if not the identity, of syphilis with yaws, sibbens, and some other diseases, which, in this and many other characters, differ in no respects from syphilis, as will be shown in the sequel.

83. Dr. Rizzi, of Milan, has recorded the results of his extensive experience of congenital syphilis, and has confirmed the remarks of Dr. COLLES. According to Dr. Rizzi, if a woman contracts syphilitic ulcerations of the breast by sucking an infected infant, mucous tubercles frequently appear on the vulva and about the anus. The syphilis, although secondary, is transmissible by contact, so that an innocent woman may communicate the distemper to her husband. Of this fact the physician should be fully aware. Of 100 persons with chancres on the breast from impure lactation, or in the mouth or throat from contact with an infected infant, 34 had tubercles of the vulva, 19 syphilitic angina, 2 iritis, 14 tubercles of the vulva and angina simultaneously, 5 tubercles of the vulva and others disseminated over different parts of the body, 6 tubercles of the vulva, angina, tubercles of the skin, and iritis, and 19 no secondary symptoms. In nurses, as well as in men infected by them, Dr. Rizzi found tubercles the most common form of secondary symptoms, and angina often superadded. Discharges, vegetations, and exostoses were rare, and buboes, when they occurred, consisted only of swelling and tension of the sub-maxillary or axillary glands. (RANKING'S *Abstract*, &c., vol. v., p. 250.)

V. VARIETIES OR MODIFICATIONS OF SYPHILIS— SYPHILOID DISEASES.

i. SYPHILIS ÆTHIOPICA.—*Syphilis vel Lucis Æthiopica*—*Syphilis Africana*—*Yaws*—*Sibbens*—*Sirvens*.—*Pian*, *Epian*, *Fr.*—*Frambæsia*.

84. This distemper has existed in Africa, certainly, for ages before the epidemic outbreak of syphilis in Europe at the end of the 15th century; and, if not identical with, is at least a form or modification of, the disease which existed in the West Indian islands when they were discovered by COLUMBUS, and which was considered as intimately resembling, if not the same

as, the epidemic syphilis of the 15th and 16th centuries.

85. The African syphilis, or the *yaws*, as commonly termed, in all respects more closely resembles the earlier manifestations of syphilis in Europe than the modern occurrences of this distemper. Indeed the few cases of yaws which I saw in Africa in 1817 agreed with the early accounts of syphilis so prevalent in Europe in the 15th and 16th centuries; not only as respected the character and severity of the distemper, but also as regarded the modes of its communication and the treatment of it found most beneficial. That the yaws in Africa is identical with the yaws or *pian* of the West Indies, is also undoubted; and it is most probable that the identity existed before the discovery of America. The descriptions of the disease, as observed in Africa and in the West Indies, agree as closely as the descriptions of any specific disease furnished by different writers, whether as occurring in negroes or in mulattoes. It is very rarely observed in white persons in modern times, as it is especially dreaded, and hence avoided by them. That it is also the same disease as the *sibbens* or *sirvens* formerly seen in the west of Scotland, is admitted by those who have seen both maladies. Dr. THOMSON remarks that he possesses the notes of an old physician in Jamaica, who visited a part of Scotland where the *sibbens* was prevalent; that these notes were made without any regard to theory; and that his observations confirm the identity of yaws and sibbens. (*Edin. Med. and Surg. Journ.*, vol. xv., p. 321, and vol. xviii., p. 31.)

86. This complaint is usually preceded by severe pains in the limbs, often resembling those of rheumatism, which are most severe around the joints. The pains are attended by languor and debility, and often continue for several days without any other appearance of disease. These symptoms are generally precursory, and are succeeded by more or less fever, sometimes preceded by slight rigors. In many cases, however, the fever is so slight as hardly to be noticed. Generally the patient complains of headache, loss of appetite, and pains of the back and loins, which are exacerbated towards evening. These symptoms are continued for several days, and are followed by an eruption of pustules, more or less numerous, in various parts of the body, but especially upon the face, neck, groins, pudenda, and around the anus, vulva, &c. The eruption of these pustules is not completed over the whole body at one time, nor do they appear in any regular succession on the different parts; but while one crop is falling off, another is making its appearance in other places. Every fresh eruption of pustules is preceded by a slight febrile paroxysm. The pustules are filled with an opaque whitish fluid: they are, at their first appearance, not so large as the head of a small pin; but they grow larger gradually, until they attain the size of a sixpence or even of a shilling. When the pustules burst, a thick viscid matter is discharged, which forms a foul and dense crust or scab upon the surface. The number and size of the pustules is proportioned to the degree of eruptive fever. When the febrile symptoms are slight, there are few pustules, but they are mostly of a larger size than when the complaint is more violent. From the larger pustules red fungous excrescences frequently arise of various magnitudes,

from the size of a pea to that of a large mulberry, which fruit, owing to their rough, granulated surfaces, they somewhat resemble. These fungi, though they rise considerably above the surface of the skin, have but a small degree of sensibility. They never suppurate kindly, but gradually discharge a sordid glutinous matter, forming an ugly scab round the edges of the excrescence, and covering the upper parts of it, when much elevated, with white sloughs. When these eruptions appear upon any part of the body covered with hair, the colour of the hair is gradually changed from black to white. At the commencement of the disease, when there is any doubt of the nature of the complaint, the natives open one of the pustules and drop upon it a little of the juice of the capsicum: if it be of the yaws species, little or no pain is excited.

87. The eruption is more elevated and broader, and more numerous in the face, groins, axilla, verge of the anus, and labia majora, than in any other part of the body. The crops of yaws are various. In some there is only one copious eruption, of a healthy nature, with well-defined edges; it continues on the skin for a long time, the patient enjoying his usual health. This is the most favourable form, and in the robust and well-fed is terminated in seven or nine months. More frequently small watery yaws appear, and recede in a month or so. The patients lose flesh; become cachectic, and dropsical; but in these a nourishing diet will often, in a month or two, induce a return of the eruption in a more copious and larger form; and several crops of such eruptions may successively appear. When the disease attacks the throat, the soft parts are always lost. If there be any tendency in the constitution to hereditary or visceral disease, it is generally excited into action, especially upon the disappearance of the eruption; and caries of the bones, disease of the joints, dropsy, &c., supervene. In the successive eruptions of yaws there is often one ulcer which does not heal, but becomes larger than the rest, and if neglected is apt to produce caries of the adjoining bones. Nocturnal pains, swellings of the periosteum, ulcers of the pharynx, &c., generally attend the advanced course of the distemper; and are accompanied by chronic hectic, and general cachexia. If the infection takes place in the mouth or lips, ulcerations appear in these parts, and extend to the fauces, palate—the bones of the palate and those of the nose becoming implicated.

88. *The duration* of the period elapsing from exposure to contagion to the commencement of the eruptive or febrile symptoms varied in several cases, accurately observed by Dr. THOMSON, from seven to ten weeks. In some cases in which he had recourse to inoculation, the eruption appeared in seven weeks. The duration of the disease after the appearance of the eruption varies from some months to several years. It depends upon the complete eruption of the pustules. When the eruption is slight, the pustules being few and small, the hectic cachexia and complications superinduced prolong the distemper, and ultimately occasion death, the eruption having long previously disappeared.

89. ii. *SIBBENS OR SIVVENS*.—This form of syphilis was formerly seen in the southwest of Scotland, especially in the counties of Ayr, Galloway, and Dumfries, but is now entirely extinct. The descriptions given of it by ADAMS, HALL, GIL-

CHRIST, HOPE, BARRY, and others, show that this is the same disease as the yaws, and the syphilis epidemic in the 16th century. Indeed, yaws, sibbens, and other forms of syphilis about to be noticed, are merely modifications of the same specific distemper, owing to local circumstances, manner and habits of living, &c.; these forms being in no respect different, as to their modes of communication, from the malady of the 15th century. The syphilis of the present day is that form which has become most sensibly modified in the course of ages, but which, under circumstances of neglect, unwholesome living, want of cleanliness, &c., will in most cases assume as virulent and infectious a character as was displayed by it when first disseminated throughout Europe.

90. *Sibbens* shows itself, according to the mode of infection, in modified states, especially at its commencement. Like yaws and other forms of syphilis about to be noticed, it was communicated by sexual intercourse, by mercury, by the common use of the same utensils, of the same bed-clothes, especially when blankets only were slept in, and by want of cleanliness, and by two or more sleeping in the same bed, as not unusual in former and even in recent times. In infants at the breast, and in children, the distemper appeared first in the throat and mouth, with inflammation of the velum palati and adjoining parts, followed by a whitish eschar, or a superficial red ulcer. At the same time white spots, eschars, and small elevations of a pearly or milky colour occurred on the insides of the cheeks, lips, &c., and in these situations, excrescences, or small fleshy growths, resembling a raspberry, which became covered with a scab, were afterward developed. These excrescences were diagnostic of the malady. This state, when neglected, or occurring in cachectic or debilitated subjects, was followed by destructive ulceration and extension of the mischief to the pharynx, larynx, &c., with loss of the velum palati and affection of the bones of the nose, face, &c.

91. In others, after pains in the joints, bones, and febrile symptoms of varied duration, the disease appeared in the skin, under somewhat different aspects. The whole surface of the body was often spotted with a coppery or dusky-red eruption. In many clusters of pustules broke out, followed by successive desquamations, or scabby eruptions of the scalp, forehead, insides of the thighs, accompanied by little hard tubercles in the skin. In some tumours resembling furuncles were seen in various parts, and gave rise to ulcers which perforated the integuments. These ulcers were supposed to be produced by the virulent matter of the disease having come in contact with the surface, as when the disease had been caught by sleeping with the infected, or in the same foul blankets as had been used by an infected person. Ultimately soft, spongy, raspberry-like tumours (hence the name *frambæsia*, sibbens, sivvens) broke forth in various parts of the body. Affections of the bones were not observed by some; but BELL and others mention *nodes* and *caries*. The affections of the genitals, when not occurring primarily, owing to the contagion affecting the surface of the body, sometimes appeared consecutively. Different cases presented somewhat different appearances, manifestly owing to the parts primarily infected and affected, and to the progress the distemper had made when arrested by treatment. The disease

was often fatal in children and infants in whom it had made progress before submitted to treatment.

92. iii. *PIAN* or *EPIAN* is the term usually applied to yaws, as observed and described by physicians who have practised in the French West India Islands, and although manifestly the same disease as yaws, and as syphilis at its earliest appearance in Europe, presents a few differences in the character of the eruption, especially, according to the descriptions of these physicians. The patient experiences slight fever, with pains in the limbs and bones, and small red spots on different parts of the body. He loses flesh, and the skin becomes scaly. The intensity of these symptoms slowly decreases, but the eruption is developed, and assumes *three* aspects. The first, or *large pians*, sometimes become as large as the hand, from which fungous excrescences shoot, and a thick sanious matter exudes. The *small pians* are much less in size and more numerous than the former; their excrescences are redder and less fungous. The *red pians* are larger than the latter, but less than the former, of a flesh colour, and are developed slowly and successively; but are accompanied and followed by more serious symptoms than those of the other two varieties, particularly those of the first, which is the mildest.

93. One of the ulcers of pian generally becomes larger than the others, forming a deep ulcer of a bad character, without fungi, discharging much sanious matter. It is aggravated by the usual dressings, and is called the *mother pian*, as a similar large ulcer in yaws is called the *mother yaw*. It is dangerous to dry it up before the general infection is fully manifested. In this variety, as in yaws, if a patient has an ulcer on any part of his body before the infection of pians, the first pustules are developed upon it, and the ulcer often becomes the mother pian. This variety of syphilis, if allowed to proceed, is followed by farther alterations. These consist chiefly, 1st. Of excrescences on the soles of the feet and palms of the hand, which are tender at first, or before they break, but which, when they break, discharge a purulent matter; 2d. Of thickenings of the skin of the soles of the feet and palms of the hand. These are red, painful, tender, and hardened, but without exudation; 3d. Of wandering pains in the bones, of the tumefaction of the spongy bones and of the extremities of the long bones, attended by caries, softening, exostosis, &c. This state of the disease, called *bone-evil*, is often attended by the formation of numerous ulcers, by affection of the bones of the face, of the palate, &c.; the patient often being reduced to a horrible state. The chief difference between yaws, pian, and syphilis, in its aggravated state of secondary disease, is in the fungiform aspect of the ulcers in yaws and pian; but this state of the eruption in these affections (*Frambæsia*) is probably to be imputed to the peculiarity of the skin and habit of body of the negro, in whom this distemper was observed by those who have described it. The following accounts of the occurrence of syphilis as local epidemics are interesting, inasmuch as they exactly agree with the descriptions given of syphilis in the 15th and 16th centuries.

94. iv. DISEASE OF ST. PAUL'S BAY (*Canada*). *Le Mal de Chicot*—prevailed between the years 1776 and 1780, not only in this locality, but also in some other parts of Canada. It was described

by Dr. BOWMAN, who was ordered by the governor to investigate the distemper. In children most frequently the disease commenced with aphthous pustules on the lips, tongue, and inside of the mouth. These advanced rapidly, and the tongue, palate, &c., were sometimes nearly destroyed by them. The whitish puriform matter exuded from them communicated the disease to others. Older patients complained of pains of the bones, and of slight febrile exacerbations, until eruptions, followed by ulcers, appeared on the skin, and in the mouth and throat, when the pains abated. These ulcers, according to their situation, which depended upon the contact of the virus, were followed, in many instances, by cervical, axillary, or inguinal buboes. At a more advanced stage the body became covered with pruriginous tetters, which soon disappeared. The bones of the nose, palate, cranium, pelvis, and extremities were ultimately attacked by nodes and caries. The frame appeared altogether contaminated, all the functions disordered; and many sunk in a state of extreme wretchedness, especially children, the weak, and neglected. Robust persons withstood the successive complications of the distemper for many years.

95. The inhabitants of the parts where the disease appeared stated that it was introduced and extended by sexual intercourse, by contact, and by foul clothing. It spared no one exposed to infection, but was most virulent in children. SWEDIAUR, admitting the imperfections of the description given of the distemper by Dr. BOWMAN, considered that it agreed with the earliest accounts of syphilis in the 15th and 16th centuries. It is also manifestly the same malady as that which was epidemic in 1800, and in following years until 1809, in districts of *Scherlievo*, *Gronemico*, *Fiume*, &c.

96. v. THE SYPHILIS OF SCHERLIEVO, or the epidemic which received this name from its prevalence in this locality. MM. PERCY and LAURENT state that, in this district and those adjoining it, the commission appointed to inquire into the nature of the distemper found more than 13,000 persons infected by it, out of a population of 38,000. It reappeared, or became epidemic again, in 1808 and 1809, where it seemed to have been perpetuated by the filth of the lower orders, whose damp cabins were shared with their domestic animals. The disease usually commenced with lassitude of the limbs and pains in the bones, which increased during the night. The voice became hoarse, deglutition difficult, and the velum palati, uvula, the tongue, and pharynx, red and aphthous. Soon after the aphthæ burst and discharged an ichorous matter, which eroded the adjoining parts. Ulcers afterward were formed, which extended into each other, creating sores of various dimensions, but always rounded, of an ashy colour, and with hard or raised and dark red edges. These ulcers were seated chiefly in the tonsils, uvula, velum palati, tongue, and cheeks, and were followed by caries of the bones of the face and nose, and the discharge of foul, fetid pus. The voice was more and more changed, and at last lost, from ulceration extending to the larynx. The exostoses and nodes in rare cases vanished along with the pains, as soon as a pustular eruption was evolved on the skin.

97. In many cases, after the pains in the bones a pustular eruption appeared on the surface, which M. BOUÉ states to have been announced

by itching, which disappeared when the eruption was fully out. The pustules were of a coppery colour, round, and of various extent; and appeared most frequently on the forehead and hairy scalp, on the inner surface of the thighs and extremities, and around the anus and genitals. In some cases an acrid ichor exuded from them, which excoriated the skin; in others the discharge dried and formed scabs. The disease often remained stationary in this state for a long time. After the scabs had fallen off the skin retained marks of a coppery hue, which were removed with difficulty.*

98. The disease appeared in some cases with various-sized blotches of a coppery colour, in the centres of which ulcers were formed, from which a matter was exuded which formed scabs similar to those which covered the pustules. These blotches were surrounded by a coppery areola. It was remarked that the female genitals were more frequently affected than the male. Dr. CAMBIERI, among an immense number of cases, found only one of gonorrhœa, which complicated the distemper. The ulcers which often eroded the scrotum were consequent upon the general infection. Buboes in the groins, or enlargements of other lymphatic glands, were seldom seen. The modes of communicating the malady were the same as those which will appear in the sequel (§ 109, *et seq.*).

99. VI. DIAGNOSIS OF SYPHILIS.—This is often very difficult; for although the distemper has generally presented a modified and milder character in modern times, nevertheless cases sometimes occur which, owing to neglect, to constitution and habit of body, to treatment and manner of living, are as virulent as many of those which were described by writers in the 16th century, or of those which have been termed *syphiloid diseases*. It will have been remarked, from what I have stated above, that I consider these latter as identical with the early manifestations of syphilis in Europe; the differences actually observed being only such as arise from the manner of infection—from the exudation from the cutaneous and other parts, during the constitutional disease, having infected these parts in persons with whom these exudations had come in contact, and from differences of race and other circumstances (§ 109, *et seq.*). That the disease assumes a different character as respects the different races, may be expected in as far as the integuments are concerned; for, owing to the structure and vital condition and functions of the skin, and to the asthenic diathesis of the dark-skinned races, and more particularly of the negro, syphilis attacks these structures with greater severity than in the white race—although even in this there are often exceptions—and assumes in the former the characters described under the head Yaws and other Syphiloid Distempers. As regards the treatment, that found most beneficial in the one is also most beneficial in all the others. I have seen small-pox in the negro in Africa, and yaws in the same race; and the difference of the for-

mer malady in the negro from that observed in the white race is as great as that of the latter disease is from secondary syphilis in the white. The causes, efficient and concurring, are the same in character; the treatment is also the same; and this being admitted as respects yaws, the inference must necessarily extend to the other modifications of the distemper belonging to this category.

100. *The diagnosis of constitutional syphilis*, as it occurs in the present day in the white race, and after the virus has passed through many generations, is often very difficult, even when aided by the history of the case; and this difficulty is increased by the different tissues and parts which are secondarily affected, either singly or conjointly. Mr. HOLMES COOTE has classed the *secondary effects of syphilis* as follows, and to these I may add the *tertiary*:

101. i. SECONDARY SYMPTOMS OR EFFECTS.—1. *Cutaneous eruption*.—*a.* Erythema; *b.* Scaly eruption; *c.* Papular eruption; *d.* Pustular eruptions; *e.* Tubercular eruptions. 2. *Mucous tubercles, or condylomata*. 3. *Ulcerations between the toes, Rhagades digitoria*. 4. *Superficial ulcerations of*.—*a.* The meatus auditorius externus; *b.* The navel; *c.* The nose; *d.* The lips and the angles of the mouth. 5. *Syphilitic affections of the tongue*.—*a.* Excoriations of its surface; *b.* Ulcerations, fissures, &c.; *c.* Induration of its substance. 6. *Ulceration of the gums*. 7. *Ulceration of the tonsils*.—Soft and hard palate. Excoriations of these parts without ulceration. 8. *Ulceration of the pharynx*. 9. *Ulceration extending to the rima glottidis*. 10. *Affections of the eye and appendages*.—*a.* Ulceration of the eyelids; *b.* Iritis; *c.* Scleritis. 11. *Ulceration of the roots of the nails*. 12. *Alopecia, or baldness*. 13. *Ulceration of the rectum and large intestines*. Syphilitic dysentery.

102. ii. TERTIARY EFFECTS.—1. *Tubercles or gummata*.—*a.* Of the skin and cellular tissue; *b.* Of those parts passing into phagedænic ulceration; *c.* Of muscular and fibrous structures. 2. *Inflammation of the periosteum*. 3. *Inflammation and enlargement of joints*. 4. *Diseases of the testes*.—*a.* Inflammation and enlargement of one or both testicles; *b.* Atrophy or other structural lesion of the testes. 5. *Inflammation of bone and its effects*.—*a.* Pains in the bones; *b.* Exostoses; *c.* Caries. 6. *Inflammation and structural change of the eyes, eyelids, or lachrymal apparatus*. 7. *Phagedænic ulceration of the scalp*.—*a.* Without disease of the pericranium and subjacent bones; *b.* With disease of these parts. 8. *Phagedænic ulceration of the pharynx*.—*a.* Extending to the larynx, cartilages, trachea, &c.; *b.* extending upward to the bones of the nose, face, and palate; *c.* extending to and causing caries of the cervical vertebræ. 9. *General syphilitic cachexia*.—*a.* Without any prominent visceral disease; *b.* With prominent disease of the viscus, as the lungs, &c.; *c.* With paralysis; *d.* With dropsy, &c.

103. It is not to be expected that the lesions belonging to the *first* or the *second* of these classes of constitutional disease will appear singly. On the contrary, they are generally associated in various forms or groups; affections of the skin being often complicated with those of the throat, tongue, gums, &c. Affections of the joints may be conjoined with inflammation of the periosteum and bones, and with phagedænic ulcerations,

* J. BONTIUS (*Medicina Indorum*, 4to, Lugd. Bat., 1718) describes the "*Amboyne Pox*" in terms which are equally applicable to *yaws*, *sibbens*, and other varieties of syphilis, and states that the disease is indigenous to Amboyna, the Moluccas, and other Eastern islands. He says that it is identical with constitutional syphilis, but differs from it in being most frequently communicated otherwise than by sexual intercourse. He states that the remedies employed for its cure are preparations of mercury, of antimony, sarsaparilla, guaiacum, China root, &c.

Even various tertiary lesions may be accompanied with one or more of those which are secondary ; or, more correctly, certain secondary affections, such as those of the skin and throat, may persist, although one or more tertiary alterations are fully developed. Thus, in a case which I saw with Sir B. C. BRODIE, there were ulcerations of the throat, pharynx, larynx, nodes, pains in the bones, &c., consequent upon syphilitic eruptions and cutaneous ulcerations, which still remained, the pharyngeal ulcerations implicating the cervical vertebræ. The disease in this case was preceded by suppurating buboes. In another case, which I attended with the late Mr. COPLAND HUTCHINSON, there were extensive ulcerations of the skin ; nodes, caries of the bones of the nose and palate, inflammation of both eyes and eyelids, remarkable enlargement of the knee and elbow-joints, phagedænic ulceration of the scalp, and general cachexia. In other cases, in addition to affections of the bones and joints, there were phagedænic ulcerations of the pharynx, with inflammation and necrosis of the palate and nose, enlargement of the bodies of the testicles, and large ulcerating tubercles of the integuments.

104. *The diagnosis of syphilis* depends chiefly upon the history of the case, especially as respects the existence of primary symptoms, of buboes, and exposure to infection by direct or indirect contact, more especially by sexual intercourse, suckling, &c. (See the CAUSES, § 109, *et seq.*). The eruptions in the secondary stage will generally indicate the nature of the malady ; but even all that has been stated above (§ 57, 81) on this subject may not be sufficient for this purpose, if other particulars be not sufficiently considered. The colour of syphilitic eruptions, although generally yellowish or coppery, especially before they ulcerate, may be of a brighter hue if febrile action be present. In rare cases the pustular eruptions may very closely resemble the eruption of small-pox ; but a few days will disclose the differences. These eruptions and their rapid enlargement and ulceration in the early history of the distemper were very common, and hence the name of *great-pox*, very commonly given to them. Mr. H. COOTE very correctly remarks that syphilitic eruptions do not always preserve the same type in the same individual. The scaly and tubercular, or the scaly, papular, and pustular, may be combined in the same case ; and a scaly eruption may exist on the trunk and a pustular on the scalp. A scaly eruption often becomes tubercular as the constitutional cachexia advances. Scaly and papular eruptions are often coexistent, both terminating in desquamation, leaving copper-coloured stains. Large tubercles of the integument pass into deep, excavated, or phagedænic ulcers, and may be attended by the usual forms of rupia. Syphilitic scaly eruptions are generally circular, and more strictly resemble lepra than psoriasis. The eruption on the trunk is often different from that on the extremities ; on the former it is more generally erythematous, papular, scaly, and pustular ; on the latter it is often tubercular, passing into large and deep ulcers with elevated edges, especially on the lower extremities. Rupia, however, may equally affect all parts.

105. Syphilitic erythema usually precedes other eruptions, but it may continue in the form of dull red or coppery patches, or coexist with other eruptions. The most common eruption is syphilitic lepra, the scales of which are dark, and differ

widely from the silvery scales of lepra vulgaris. This eruption may extend over the whole body, causing the hair to fall off, and affecting the palms of the hands and soles of the feet. It spreads into mucous outlets and canals, into the nasal, buccal, anal, vaginal, and others, where it causes ulcers, fissures, tubercular elevations, excoriations, discharges, &c. Lepra syphilitica often attacks and excoriates the scrotum, and is frequently attended or followed by foul ulcers between the toes, mucous tubercles about the arms, in the axillæ, groins, or where the transpiration of the surface is allowed to accumulate. The elevation of the scales of lepra into copper-coloured tubercles is always, according to Mr. H. COOTE, associated with impairment of the general health, and is an indication, during a mercurial course, that the medicine is acting injuriously, that the treatment should be changed, or at least that the patient should be allowed a more generous diet, and a moderate amount of stimuli. The cicatrices from syphilitic sores, it may be remarked, are often characteristic, being usually rounded, depressed, of a dull white hue, and irregular on the surface.

106. *The tertiary effects of syphilis* may generally be recognised with greater certainty than the secondary. The history of the case, the antecedent symptoms and lesions, however remote, and the nature of these as inferred from their characters and succession, are to be taken into account. But there are hardly any of the lesions which are termed tertiary that may not be inferred to be one of the more remote effects of constitutional syphilis, when viewed and considered with reference merely to its own characters and relations. The mere enumeration (§ 101, *et seq.*) of these effects sufficiently indicates their nature ; and are equally the results of neglected or injudiciously treated syphilis, as observed in the present day, and of the African yaws as observed by myself and others.

107. VII. THE PROGNOSIS OF SYPHILIS manifestly depends upon so many circumstances as to be stated with much difficulty, and even with uncertainty. It depends not only upon the progress the distemper has made, and upon the effects observed, but also upon the health and constitution of the patient previously to infection, and at the time of his coming under treatment. Nor should the mode of infection, and the course it has pursued, and its recurrences when the distemper has become constitutionally chronic, be overlooked. If the patient be young, in previous good health, be not exposed to fatigue, cold, or anxiety of mind, and not given to excesses of any kind, a favourable opinion may be given both in the primary and secondary stages of the distemper. But if his health, strength, and constitution be manifestly impaired ; if he be dissipated, exposed to fatigue, and irregular in his habits ; and more especially if the secondary effects be severe, be complicated, have been rapidly developed, or have reappeared after courses of mercury, or after other judiciously employed means, an unfavourable or at least a guarded diagnosis should be given, the danger of the case fully admitted, and due precautions for the guidance of the patient fully stated. In most cases ulcerations of the pharynx, owing to their disposition to extend to important adjoining parts, or to become phagedænic, should be viewed unfavourably, more especially in the circumstances just mentioned. The severer kinds of secondary effects should also be much dreaded

in infants; and they are always most difficult to remove in patients of all ages when they are produced by the now infrequent modes of infection (§ 110, *et seq.*) which commonly prevailed in the 16th century, or by the discharges or exudations of secondary sores, either directly or indirectly coming in contact with the naked cutaneous or mucous surfaces.

108. *The tertiary effects* of syphilis are always attended by more or less present or prospective danger. But the imminence of the one, or the amount of the other, will depend upon the extent of lesion already produced, upon its complications and constitutional relations and effects, upon the history of the case, and upon the effects of appropriate treatment. When pharyngeal ulceration has become phagedænic, or has extended to the larynx, to the bones of the face, and to the eyes, the patient is in great danger; and this is more extreme if the cervical vertebræ become implicated. The same prognosis may be given if, with general and increasing cachexia, pulmonary, paralytic, or dropsical disease supervene, after obstinate, prolonged, or even rapid course of the distemper; although in some of these cases life may be prolonged for a considerable time under favourable circumstances, and suitable regimen and treatment. In this far-advanced category of morbid results an opinion of the issue will be based upon experience of the effects of the most influential medicines, upon the local and constitutional associations of each case, upon the previous and existing circumstances of the patient, upon the history of the malady, and upon the various influences which have modified its course. In respect of the tertiary effects of syphilis, I may state that an opinion respecting them should always be given with caution and reservation; even although circumstances may not warrant that opinion to be unfavourable.

109. VIII. THE EFFICIENT CAUSE OF SYPHILIS, AND THE CAUSES AIDING ITS OPERATION.—The former has been very generally recognised, and its effects admitted; but all the modes and circumstances of its application and operation have not been sufficiently shown and considered. The latter have been either overlooked or imperfectly estimated, especially as regards the successive changes, promoted and brought to maturity, as manifested in the secondary and tertiary results of the poison. The causation of syphilis has been studied merely from what has been observed in modern times, and from the common way of propagating the distemper at the present day. But the more general way by which this infection was produced soon after its introduction into Europe, and during its epidemic prevalence, has been altogether overlooked; although, under the circumstances existing in these ages, it may be still propagated in the same ways, and its effects present as severe a character, and the same features as those which distinguished it in former times; and which still distinguish it in that form of the distemper which prevails in Africa, and which prevailed there from immemorial ages before it was introduced into Spain.

110. The contagion of syphilis at the present day, and for many years past, has arisen from sexual intercourse, either the male or the female being the subject of the primary disease. In these cases the infection is produced by the virus, poison, or morbid secretion of the primary sore. This mode is generally admitted, and is

now, with very few exceptions, especially in Europe, the common mode, no other being acknowledged by many, the exceptions being altogether ignored. But I have had sufficient reason to conclude that whenever a secondary venereal ulceration, seated on the integuments, or in the mouth and throat, produces a secretion or discharge which comes in contact with a mucous surface, or with an abrasion of the cutaneous surface, or is even allowed to remain in contact with an unabraded surface, infection is liable to take place, and that this liability exists both in children and in adults. The communicability of secondary syphilis, especially when the sores have proceeded to secrete or produce a fluid exudation, was a well-recognised fact in former times, and has been witnessed by myself during the course of my experience in several instances. It was a recognised fact by Dr. COLLES; and although HUNTER believed that secondary symptoms could no longer infect, Mr. BABINGTON remarks, when commenting on this belief, that "the facts (that they do infect) are so well established, that it is more easy to question the principle than to doubt the facts."

111. Judging from what I have seen in several countries and climates, and in children and adults in this country, I conclude that the morbid secretion from secondary sores, if allowed to remain in contact with the more susceptible surfaces or parts of a healthy person, will infect that person, provided that he be predisposed to, or susceptible of, the infection; and that the local contamination, at first confined to, and more particularly and severely affecting, the tissues first infected, will become general, and will the more readily and severely, by means of the secretion from the ulcers or sores produced in the course of the distemper, infect those to whom this secretion is either directly or indirectly applied. This mode of communicating the malady was often observed in all the varieties of it described above as syphiloid diseases, and in the usual manifestations of the malady, from the end of the 15th until the close of the 17th century, or even later. The extensive prevalence of syphilis during these centuries, although imputed by many, and probably not without reason, first to a leprous diathesis, and afterward to a scorbutic diathesis, or to a complication of syphilis with leprous or with scorbutic symptoms, may be more correctly accounted for by the facts of the secondary, or early constitutional effects of the malady having become thus virulently contagious, both by this mode of communication, and by its successive propagation in this manner.

112. If we note the habits of the lower classes in those ages, the ready infection and the severity of syphilis are easily explained. As observed in the present day, with respect to yaws in negroes, the contagion was produced by the secretion from the sores on the cutaneous surface, by mediate or immediate contact, much more frequently than by sexual intercourse. In the lower classes in Europe, in the 15th, 16th, and 17th centuries, the circumstances favouring this mode of communicating the malady were much more remarkable than in the negro, with whom the disease most probably originated; for among this race its antiquity appears to have been the greatest, and by this race the distemper was communicated to the Moors and Jews in the north of Africa, and by them conveyed into the south of

Spain, where it existed long before the expulsion of them from the Iberian peninsula.* The lower classes in Europe during the centuries of the earlier prevalence of syphilis were remarkable for their neglect of cleanliness, for their use of woollen night and day clothes next to the skin; for the habit of two, three, or more sleeping in the same bed, often in a state of nudity; for drinking and eating out of the same vessels; and for these and other social conditions favouring the communication of the disease, in its secondary stage, independently of sexual intercourse.

113. With the progress of civilization, and with the knowledge acquired of the communication of the distemper by these means, the infection of it otherwise than by sexual intercourse became less frequent; and the virus more generally having to pass through the absorbent system, when the genitals were the seats of primary infection, was either arrested in the course of its constitutional contamination, or rendered more mild, and slower in producing its successive specific effects, than when infection was produced by the virulent secretions from secondary sores applied to parts which more readily admitted of constitutional contamination. The successive propagation of the distemper in this latter mode, and generally without the intermediate interruption and amelioration resulting from the action of the virus on absorbent glands, without the production of buboes, manifestly rendered the malady more rapid and more severe, and was the chief cause of the early prevalence of syphilis being in some respects different from what is observed of it at the present day, but in every respect similar to the varieties mentioned above (§ 84, *et seq.*); many of the influences producing these varieties actually having existed at the time of, and for ages after, the introduction of syphilis into Europe.

114. As observation rendered persons aware of the habits and circumstances causing and favouring infection, more especially in the higher classes of society, these habits were reformed or refrained from. Persons no longer drank out of the same glass or cup, or slept in a strange bed, without due precaution; and much of the manners of modern times originated either in precautions against infection, or in evincing a confidence that no precaution was required. But in whatever manner the infection may be produced, whether by primary sores on the genitals, where the morbid secretion was favourably placed to operate its effects, or by the secretions from secondary sores or ulcers in the cutaneous or in the mucous surface, under circumstances favouring their operation and consequent contamination—now occurring very rarely, in former ages very frequently—there are a variety of causes or influences which aid the efficient or exciting cause

—the syphilitic poison—in developing, hastening, or in aggravating its constitutional or contaminating effects. These are so diversified and yet so influential, whether acting simply or in combination, as to require a brief but particular notice; and are first *predisposing*, and next *concurring* and *determining*.*

115. A. The chief *predisposing* causes of syphilitic infection are infancy, childhood, and early age; delicacy of constitution, original or acquired; debility or temporary exhaustion; debauchery, fatigue, and irregularities of any kind; and the neglect of all those habits and social observances which constitute modern civilization. The precautions observed in several cities and places against the propagation of the distemper manifestly tend not only to render it less frequent, but also more mild, than in other countries where no precautions are instituted, especially among those who more commonly are infected by, and who communicate the malady. But the predisposition, however produced, or in whatever form it may exist, favours not only the primary infection and effects, but also the development of the secondary or constitutional disease, and the tertiary results, if the morbid procession be not arrested by treatment; and, according to the amount of predisposition, will be the rapidity with which the morbid effects are produced. Doubtless cases are not unfrequent which evince no particular predisposing cause of the infection, or of the rapidity or severity of the results; but these may be imputed to a diathesis, or some unascertained cause favouring the operation of the poison, or to susceptibility of infection and contamination inherent in some constitutions.

[* M. VIDAL has clearly proved that secondary accidents are transmissible, and the same doctrine is supported by the following British and American authorities: SIR ASTLEY COOPER, *Lectures on Surgery*, by TYRRELL, Am. ed., p. 497; MR. LISTON, *Elements of Surgery*, by DR. GROSS, p. 205; MR. COLLES, *On Venereal*, p. 263; MR. WALLACE, *On Venereal*, p. 335; MR. HEY, *Med. Chir. Trans.*, vol. vii., 1830, p. 541; JESSE FOOT, *On Venereal*, p. 402; H. MAYO, *On Syphilis*, p. 122, 123; SIR B. BRODIE, *Lecture in London Lancet*, Feb., 1844, p. 677; MR. BABINGTON, *Notes to Hunter*, Am. ed., p. 321; MR. LAWRENCE, *Lectures on Surgery*, London Med. Gazette, March, 1830, p. 806, 807; MR. PORTER, *Lectures on Syphilis*, Dublin Med. Press, Feb. 17th, 1847, p. 99; MR. WHITEHEAD, *Illustrations of transmitted Syphilis*; SAMUEL A. LANE, *Lectures on Syphilis*, London Lancet, May 28th, 1842, p. 294; MR. BACOT, *On Syphilis*, p. 252; MR. CARMICHAEL, *Clin. Lectures on Venereal Diseases*, p. 51; LANGSTON PARKER, *Modern Treatment of Syphilitic Diseases*, 2d ed., p. 169; MR. EGAN, *On Syphilitic Diseases*, p. 293, 294; EUGENUS WILSON, *On Syphilis*, p. 36; GEORGE M'LELLAN, *Princ. and Prac. of Surgery*, p. 250, 251; DR. NELLIGAN, *Dub. Quar. Journal of Medicine*, Feb., 1853, p. 119; DR. CAMPBELL, *North. Journal of Med.*, 1844; or *Cornwall's Journal*, Sept., 1844, p. 773; JOHN R. CORMACK, *London and Ed. Monthly Journal of Medical Science*, Sept., 1844, p. 773; EVANSON and MAUNSELL, *On Diseases of Children*, Am. ed., p. 350; JAS. STEWART, *On Diseases of Children*, 4th ed., p. 468; DR. WATSON, *United States Med. and Surg. Journal*, vol. ii., p. 103; DR. H. D. BULKLEY, *On Syphilis in Infants*, New York Journal of Medicine and Surgery, Oct., 1849; GEO. C. BLACKMAN, Amer. ed. of VIDAL *On Venereal Diseases*, p. 55. This question is very ably and successfully argued by VIDAL in opposition to RICORD, who very inconsistently admits the infection of the nurse by the child and the contagiousness of the mucous tubercle in the adult—in other words, physiological inoculation, while he denies the fact of experimental inoculation. M. MALGAIGNE has very happily, in few words, characterized this author as follows:

"M. RICORD, possessed of a theatre of observation vast as could be wished, began by rejecting the observations of others; then, adopting a certain theory, he disregards those of his pupils made under his own eyes, in his own service; and finally, I must say it, he takes no heed of his own when they conflict with his own preconceived views."—*L'Union Medicale*, Aug. 30, 1851.]

* DR. WINTERBOTTOM (*An Account of the Native Africans*, see vol. ii., p. 148) remarks that "the yaws is not mentioned by authors as a disease which occurs in Egypt, though, from the frequent communication of that country with those parts of Africa in which the disease is endemic, we might be led to expect that it would be imported. There is reason, however, to suppose that the yaws does actually appear there, though mistaken for the venereal disease." He proceeds to remark that a Copt, who professed to cure the venereal disease in its advanced states, prescribed "two coffee-cups of flax oil to be taken every morning fasting," directing no regimen farther than to keep the patient warm. The pustules and other eruptions he covered with a red earth common in some parts of Egypt. They gradually became dry, and left no mark. At the end of three months a cure was effected. It is farther stated that those persons who have been affected and fully cured have no fear of a second infection.

116. That all persons who have not been previously constitutionally infected are liable to syphilis, provided that the virus is applied in sufficient quantity, or is allowed to remain in contact with a part upon which it is capable of acting, may be inferred; but there is reason to conclude, from what has been observed in persons previously infected, that a second constitutional infection of syphilis rarely or never takes place, and that such an occurrence is merely the return, or the re-development, in a state of active manifestation, of the disease, which had been lurking in a latent state in the body, and which various influences had reproduced independently of any second local infection. While, therefore, all previously uncontaminated are liable to syphilis, those who have been thus diseased are not liable to a second constitutional infection, provided that they have been completely cured; but they are liable to a return in an aggravated form of the secondary or tertiary disease, if it have not been completely eradicated, especially if they are exposed to the causes about to be noticed (§ 117, 118); or, in other words, that constitutional syphilis, when cured, renders the body unsuceptible of a second constitutional infection.*

117. *B.* Several causes favour, 1st, the development of the constitutional disease from the local infection or primary sores; and, 2d, the aggravation and local manifestations of the syphilitic contamination, when it is not completely removed, but remains lurking in a more or less latent form, in the body. The most remarkable features of constitutional syphilis are the severe and even dangerous developments sometimes assumed by it after it has remained for several, or even for many, years latent in the frame. These cases present two difficulties—*first*, to estimate the influence of the poison in affecting the vital cohesion and conditions of the tissues in so permanent a manner as to render them liable to ulterior changes and disorganization after very remote periods;

[* We are by no means convinced that syphilis can only occur once in the same individual. No fact is better established than that a person may have repeated attacks of the disease, especially of the milder forms. Syphilis, like other diseases, occurs under various forms and in various degrees of severity. The virus may only induce a chancre, which is readily cured, leaving the constitution perfectly sound; or it may produce caries, necrosis, various visceral affections, and profound cachexia, from which it is very doubtful whether a patient ever entirely recovers. If, under the latter circumstances, a person exposed to new infection has a new bubo or chancre, the advocates of the *unicity* of syphilis maintain that it is only a relapse, and not the result of the recent inoculation. Statistics are wanting on this subject, but it is stated by M. VIDAL that M. BOULEY, physician of the Lourcine in Paris, produced a second syphilitic infection in a woman labouring under genuine tertiary symptoms by inoculation. The obstacles in the way of settling this question conclusively are, the difficulty of finding cases so complete that we may know that the syphilitic diathesis is exhausted, that it has produced all it can produce; and, 2dly, to collect under one head a sufficient number of cases to form statistics, the result of which may be considered a pathological law of real value. When we consider the varying durations of syphilis, its modifications in different constitutions, the suppression of many of its manifestations by treatment, its relapses from various causes, &c., we shall perceive at once the difficulty, if not impossibility, of establishing any such law. In cases of typhoid fever, variola, rubeola, pertussis, &c., no great difficulty exists, inasmuch as they are acute diseases, continuing but for a short period, and most persons are liable to repeated exposures. At any rate, this question cannot be settled till it is ascertained what is the duration of the *primary*, *secondary*, and *tertiary* stages of syphilis, how long it takes to expend its full force, and, indeed, whether confirmed syphilis is ever perfectly curable, which is denied by some of the ablest syphilographers. See VIDAL, *Am. ed.*, p. 290.]

and, *second*, to recognise the effects of constitutional remedies upon these vital conditions and consecutive changes, and to determine how much of these effects may be imputed to the operation of the means employed, and to the efforts of nature, or of the vital resistance opposed to successive changes. It is impossible for these difficulties to be overcome without a satisfactory knowledge of the various circumstances which thus tend to develop the constitutional infection, and to aggravate this infection into dangerous local disease.

118. Observation satisfactorily and extensively conducted will demonstrate that all depressing influences acting upon the body after infection has been produced will favour the supervention of the secondary upon the primary disease; and will even more remarkably develop the latent constitutional taint or contamination, wherever it exists, into active disease and disorganization. Among these aiding and determining causes may be mentioned anxiety of mind, and fears of the consequences of infection; fatigue, debauchery, drunkenness, venereal excesses, unwholesome and insufficient food; want of sleep and sufficient repose; excessive exertion, exposure to extreme ranges of temperature; moist states of the atmosphere; and exposure to malaria in any form, more especially miasmatic exhalations in hot countries. While these causes aid the constitutional infection in accelerating the changes resulting in local disorganization, they also counteract the vital resistance opposed to these results, and throw down the barrier which the vital force raises for the protection of the organization.

119. *C. Infection of the Fetus by one or both Parents.*—*Congenital syphilis*, or the direct transmission of syphilis to the unborn fetus, is a subject of considerable interest. That the syphilitic taint is more frequently in the father than in the mother appears manifest; but it is not so evident that the disease is conveyed directly from the father by means of the seminal fluid to the ovum, for the father may first infect the mother, the disease being afterward communicated by her to the fetus. Secondary syphilis, however, being a constitutional taint, like other constitutional taints, it may be transmitted to the offspring from either parent, in a more or less modified form. There can be no doubt, also, that secondary syphilis may be communicated to married women by their husbands without pregnancy having taken place; or even to them or to any one else by close contact, independently of sexual intercourse, when the circumstances stated above (§ 112) favour the infection.

120. Dr. PORTER mentions the case of a lady who had become pregnant three months before the father's first contraction of syphilis, and whose fetus died within a week from birth of unmistakable lues. The circulation of the mother had therefore been poisoned at a considerable time subsequently to impregnation, although the father had never a sore capable of furnishing a drop of matter, and the mother never a symptom of any description, until an eruption appeared a few days before her delivery. Dr. PORTER believes "that the semen of a diseased man deposited in the vagina of a healthy woman, by being absorbed, may contaminate that woman without the necessary occurrence of a chancre or any open sore secreting matter in either the man or the woman." Mr. HOLMES COOTE very correctly remarks (and his

remarks bear out my own observations in a variety of cases) that "when the mother has once been infected with the syphilitic poison it becomes extremely difficult, if not impossible, to say when the taint will become extinct. The immediate effect, as regards the fœtus, is to cause its death *in utero*. As the poison becomes less virulent, the child is born with the disease, and perishes in a few days or weeks. Then comes a class of cases in which the characteristic eruptions break out some weeks or even months after birth; but the exact limits of these periods have not been, and perhaps cannot be, accurately ascertained. In illustration of these remarks, I refer to the two following cases. In the first a respectable woman is infected by her husband. She is delivered consecutively of three dead children. At the expiration of thirteen years she gives birth to a living child, which is covered by the usual eruptions shortly afterward. In the second, a fine healthy-looking young woman is infected by her husband a few weeks after marriage. She is delivered of a dead child; after which she does not again become pregnant. But, eight years having passed, she suffers in her own person from the original taint." (*Op. cit.*, p. 129.)

121. While I was physician to the Infirmary for Children, cases illustrative of the above remarks, as well as of the following statements, were occasionally brought under my observation. 1st. That an infected mother may not communicate the disease to her infant. 2d. That an infected mother is very liable to transmit the distemper to the fœtus or infant. 3d. That the mother has been infected several, or even for many years, has given birth to one or more dead children, and has had at last a living child, which soon after birth presented the syphilitic cachexia, with anæmia, copper-coloured lepra, and ulcerations of the nose, mouth, anus, or genitals. 4th. The mother has had syphilis communicated to her by her husband; and the disease has disappeared, but she has been delivered of dead children; and after a number of years from the infection by her husband, the distemper has appeared in the throat and bones of the palate, or in other parts. 5th. The mother has been the subject of syphilitic eruptions, &c., has been apparently cured; but after many years has had a return of secondary symptoms, and been pregnant, either in the interval or at a later period. The child when born, has been, and has continued in good health for several months or years, but has presented secondary symptoms subsequently. 6th. A woman has been the subject of secondary syphilis—of syphilitic eruptions, &c., and has communicated the distemper to the child given to her to nurse. 7th. Secondary syphilis in a child has been communicated to another child with which it has slept, the severer forms of secondary disease resulting. 8th. Secondary syphilis in a child has been by it communicated to its nurse, who has soon afterward experienced the characteristic syphilitic eruptions, sore throat, alopecia, and other still more severe affections. 9th. A healthy woman has suckled, even for a few times, a syphilitic infant, and the secondary disease has been communicated to this woman by this infant; she afterward has suckled her own infant and given it the distemper.

122. These statements have been fully confirmed by my experience at the institution mentioned above, and in private as well as in gratu-

itous practice, during a number of years, and will readily be admitted by other experienced physicians. Indeed, they are fully confirmed by the writings of Dr. COLLES, Mr. H. COOTE, and by nearly all the old writers on syphilis. Dr. COLLES remarks that the child may be infected after birth by a nurse suffering syphilitic ulceration of the nipple, or by its mother under the same circumstances, if the disease of her nipple has been derived from a strange child; but that no instance is known of a child infecting its own mother, although it will immediately communicate the malady to a strange nurse. The infection of the nurse by a diseased infant manifests itself by syphilitic affections which cannot be distinguished from that succeeding primary disease—by ulcerations of the throat, &c., by cutaneous eruptions, and by the formation of moist excrescences about the pudenda, which are capable of infecting her husband, in whom they are likewise followed by constitutional effects. In him the ulceration of the throat has not the same venereal character; it is superficial, and its surface is covered with patches of whitish lymph. Dr. COLLES believes that the disease may be further imparted to other members of the family by contact, the use of the same utensils, &c., for it is remarkable, he adds, that its contagious property increases as it extends farther from its source. Its symptoms, he states, bear an exact resemblance to each other in different individuals; and in this third remove from the source of contagion, it is permanently fixed in the parts it first seizes, and is of a much milder nature. If we compare the histories of the manifestations of syphilis in different ages, as furnished us by the most trustworthy writers down to OESTERLEN, WALLACE, and to still more recent authors, we are compelled to conclude that syphilis is one specific malady, that it presents various modifications resulting from modes of infection, race, treatment, and other influences; all its varieties being traceable to one stock or source.

123. *D. INFERENCES.*—As the result of observation and research, I conclude, 1st. That syphilis, in the various forms and modifications it has presented in different ages and localities, is derived from, and hence originally identical with, the indigenous yaws of the native Africans. 2d. That this identity or derivation is proved by the characters of both forms of disease, by modes of infection or contamination, by the susceptibility and unsuitability of both, as shown by inoculation,* and by the same treatment being appropriate to both. 3d. That the indigenous African or Ethiopic syphilis was communicated to the Moors and Jews in the north of Africa, and thence conveyed into Spain, and probably also into France and the north of Italy, even before the discovery of America. 4th. That the distemper was farther diffused and rendered epidemic or pestilential by the expulsion of the Moors and Jews from Spain by Ferdinand, towards the end of the 15th century, and by the distresses consequent upon this act; the miseries and the horrible sufferings resulting from it, as well as the diseases diffused by it, being recorded by contemporary writers. 5th. That this occurrence shortly preceding the

* The yaws are inoculated at an early age in many places in Africa, in order to prevent subsequent infection; and syphilization is now practised in some places in Europe to prevent infection, as well as to produce a permanent cure of constitutional syphilis (see syphilization in the sequel).

invasion of Italy by Charles VIII. of France, by augmenting the sufferings and distresses of the inhabitants, increased the spread of the malady, and rendered it at the same time more virulent, acute, and fatal. 6th. That the diffusion, severity, and the infectious character of the malady were promoted by the distresses then prevalent in those countries, and for many years afterward, by the prevalence of a leprosy, or of a scorbutic diathesis in many, and by the habits and social conditions of communities in those ages and countries. 7th. That there is sufficient evidence to conclude that the disease existed as now stated, and had been propagated extensively, before the connate malady, the *yaws*, or *pian*, or *epian*, which was said to have existed in America when discovered by COLUMBUS, could have been conveyed by his followers into Europe. 8th. That the manifestations of the distemper, usually described as varieties of it—as *yaws*, *epian*, or as syphiloid diseases, or as pseudo-syphilis; * the chief of which are noticed above (§ 84, *et seq.*), are merely modifications of the malady resulting from modes or sources of infection, race, social conditions and habits, food and regimen, neglect of cleanliness, treatment, &c., as already insisted upon (§ 111, *et seq.*). 9th. That whatever lowers the vital forces of the economy, and more especially a combination of causes producing this effect, will favour the infection of syphilis, the development of the constitutional contamination, and the outbreak of the distemper when it lurks in the body. 10th. That the parent tainted by syphilis will often, but not always, communicate the disease in a more or less severe constitutional form, with marked local affections, to the *fœtus*—with a severity often sufficient to destroy the life of the *fœtus*, either previously to or soon after parturition; and that, in many cases where the venereal taint has not been congenital, scrofulous diathesis or more manifest tubercular disease will result. (See § 82, *et seq.*) 11th. That many of the circumstances and social habits which have been shown above to have favoured the dissemination and severity of syphilis for ages, after it was introduced into Europe, now no longer exist, excepting in limited localities; but when they have existed in more modern times, the distemper has presented a severity, and other characteristics displayed by it in former ages. 12th. That there is reason to believe that the disease existed in China from time immemorial, or at least ages before the period at which it became epidemic in Europe; but the extent, or the form, of its prevalence in that country at the present day I have not the means of knowing.† 13th. That inoculation, as prac-

tised for ages on children by the negroes on the Gold Coast, for the prevention of *yaws*, and as lately had recourse to on the Continent against syphilis (see *Syphilization*, § 155, *et seq.*), may be expected to lead to some important results.

123. * IX. TREATMENT.—i. HISTORY OF.—It would appear, from the earliest writings respecting the discovery of America, that the disease existing in Hispaniola, when discovered by the Spaniards, was a variety of syphilis, if not the same distemper, or the same as the *yaws* existing at the same time, and for centuries previously, in Africa (see § 84, *et seq.*); that this disease was treated successfully by the natives of Hispaniola by the decoction of guaiacum; and consequently that guaiacum was employed by the Spaniards who had there contracted the disease. We accordingly find many of the early writers on syphilis, especially from the commencement of the middle of the 16th century—as DE HUTTEN, DELGADO, FERRO, POLL, ZENE, GALLUS, MICHEL, RYFF, BONCOSSUS, HUSCHARDUS, &c.—recommend guaiacum for its cure. Although a very few writers mention, towards the close of this century, mercury as a remedy for syphilis, yet it was not until the middle of the 17th century (1649) that BONNJONNIER asserted that this malady could be cured by mercury alone. Some years afterward, MENDEZ (1668) and VON HAMMON (1674) proposed the question, whether or no mercury should be preferred to guaiacum in the treatment of syphilis? Since then, and especially from the commencement of the 18th century until the beginning of the 19th century, mercury has been the almost universal remedy for this distemper; and corrosive sublimate was the most employed preparation of it; more than one hundred writers (117) during the 18th century alone recommending it. CIEZA and BLANCARD prescribed sarsaparilla; the former stating that this medicine was adopted by the native Peruvians for the cure of syphilis, as it prevailed among them; and numerous Spanish and Portuguese writers in the 16th and 17th centuries employed it, in conjunction with guaiacum and sassafras; this combination being very generally resorted to as a part of the treatment of syphilitic cachexia down to the present day.

124. Early in the 18th century, WILLOUGHBY (*Salivation shown to be of no use or efficacy in the cure of the Venereal Disease*, 4to, Lond., 1723) contended against the practice of salivation, then so generally adopted; and in 1779, COCKBURN affirmed that all venereal ulcers will heal under a local treatment merely, and that mercury should be resorted to only when constitutional symptoms appear. Early in the present century several army surgeons, probably instructed by their observations in Spain and Portugal, where the practice followed before the general introduction of mercury still lingered, proclaimed the treatment of syphilis without mercury; and from 1820 to 1830, experiments were made in the hospitals of Sweden—a country where scientific progress is always in advance—and in Hamburg, on the non-mercurial treatment of this distemper. In the

* SYDENHAM believed the *yaws* to be the same disease as syphilis. The writer of the article "*Epian*," in the "*Encyclopédie Méthodique*," has classed it, the *yaws*, and venereal disease as the same maladies. "*Epian*. Nom que les naturels de Sainte-Dominique donnoient à la vérole, qu'on croit avoir été endémique dans cette île. Quelques-uns ont cru que c'étoit un caractère de maladie plus grave et plus fâcheux encore que la vérole; mais il est actuellement prouvé, que c'est la même maladie que les François ont appelé mal de Naples, et les Italiens mal François, chacun s'empresant de désavouer l'origine d'un mal aussi honteux, et accusant ses voisins d'en avoir propagé la contagion." (Tome vii., p. 2.)

† My relative, Mr. FORTINGER, who passed some time in China, informed me that syphilis appeared to be a disease of great antiquity in that country, and that the primary sores caught by Europeans from Chinese females generally assumed a phagedenic or sloughing character. The constitutional affection rarely occurred. He states, in answer to my inquiries, that the disease appeared indigenous to the country; that secondary symptoms are

not more frequent among Europeans in China than elsewhere; that the phagedenic form of chancre was very common, but the round indurated ulcer was often met with, and was extremely obstinate; that as the phagedenic sore progressed towards a cure, much hardness appeared about its edges; and that it was then necessary to make the gums slightly tender in order to heal it up completely.

present day there can be no doubt of the success of this treatment in the majority of cases; and that the worst states of the disease—the most prolonged and most dangerous forms—have been those for which mercury had been most abundantly employed at an early stage, and the most copious salivation produced and continued for the longest periods.

125. In the summer of 1825 the iodide of potassium was first prescribed by me for the cure of secondary and tertiary syphilis, and the prescriptions were then prepared by Mr. MORSON, the well-known operative chemist, who also, about the same time, prepared for me an iodide of sulphur, in order to employ it in similar cases; but I soon relinquished the internal use of the latter for the former, as being, even in small doses, too irritating to the digestive mucous surface. In the following year I had recourse, in the case of E. L., Esq., M.P., to the use of iodine. This case, the nature and history of which was well known to Mr. C. BEEVOR, of Upper Harley Street, had been treated unsuccessfully by mercury in every conceivable form and combination; and when it came under my care I viewed the severe symptoms, which were seated chiefly in the large joints, as the result of the combined effects of syphilis and mercury. Iodine was had recourse to successfully in this case. The correspondence between this gentleman and myself respecting the treatment during his absence from London is still preserved by me in proof of the early and successful employment of iodine and its preparations for secondary and tertiary syphilis.

126. Since 1825 I have prescribed these preparations whenever I have been consulted in cases of this nature; but in some, and in certain stages and states of the disease, they have failed, as in two instances which lately came before me, and which I remitted to the care of Mr. H. LEE, for the employment of his plan of mercurial fumigation. Most of the severe and dangerous cases of syphilis which I have had an opportunity of witnessing have been reduced to this state by an excessive or an improper use of mercury; and it has been more especially in those cases that the use of iodine, especially the iodide of potassium, has been most successful. The worst symptoms, which have been too frequently ascribed to local manifestations of syphilis, especially affections of the periosteum, bones, &c., have been demonstrated to me to have been the results of excessive doses of calomel alone, very commonly given in hot countries, during the early part of the present century, for the cure of fevers. At one period it was attempted to bring the system under the influence of mercury in these maladies, but the practice very generally failed; and in some of these cases, in which recovery took place, disease of the periosteum was the result.*

* The following interesting case illustrates this fact: it occurred more recently than the period above referred to. Some years ago a gentleman trading to the west coast of Africa was attacked by fever, and was treated by calomel given in scruple doses every three or four hours. He recovered from the fever, and returned to England. I was called to see him soon afterward, and found him completely hemiplegic, with two large swellings of the pericranium. Having heard the account of his case, that he had never any venereal symptom, primary or secondary, that he had taken an excessive quantity of calomel during the attack of fever, I inferred that a tumour of the dura mater, as well as of the pericranium, had resulted from the calomel, and now pressed upon the brain. The iodide of potassium was therefore prescribed, and he rapidly recovered the use of his side, the paralysis disap-

127. ii. TREATMENT OF PRIMARY SYPHILIS.—

A. The *intensions* of cure in this stage of syphilis are, 1st. To destroy the poisonous ulcer and heal the part as soon as possible; and, 2d. To prevent the contamination of the constitution. The *first intension* is best accomplished by touching the sore with nitric acid, nitrate of silver, or any other escharotic. The penis may afterward be wrapped in a rag dipped in warm water. An aperient may also be given, and rest and low diet enjoined. If the sore have lasted above a week, it may still be expedient to destroy it; but there will not be the security against constitutional contamination which an earlier recourse to these means might afford. When, however, the chancre consists of a well-marked indurated lump, or when the penis is swollen and inflamed, the patient feverish, or when there is swelling or tenderness in the groin, then the above local treatment is no longer applicable; and mild liquid applications, consisting of the black wash, lotions containing tannin or catechu, or of other substances capable of decomposing the contaminating secretions, may be prescribed to the affected parts. If there be much irritation, the penis should be enveloped in a poultice, or in a fomentation of boiled chamomile flowers and poppy heads, and the patient kept in bed. If induration exist, an ointment with calomel may be applied. "Afterward, during the indolent and granulating stages, the sores may be treated with any astringent lotion, and be touched occasionally with nitrate of silver or sulphate of copper." (DRUITT.)

128. B. The *prevention of the constitutional contamination of syphilis* was formerly attempted by a recourse to mercury contemporaneously with the treatment of the primary sores, the belief being general that where this object was not attained by means of this substance, the disease would infallibly proceed from bad to worse. Had, however, the malady been studied with a due reference to its origin and to its treatment, during the earlier periods of its history, as well as to the treatment of the connate malady, of which I have contended that it is merely an extension and modification, a different method of cure would have been instituted; and a recourse to mercury would have been either reserved or entered upon in such a manner, and with such precautions, as would have secured successful results. The modern opinion, however, is, that every case of primary syphilis *may* be treated without mercury; that the too profuse administration of it may render the disease infinitely worse; that there are many cases which do not admit of it at all; but that in the right cases the moderate and judicious use of mercury removes the existing symptoms, and renders the patient far less liable to a relapse.

129. Mercury is either not required or not admissible under the following circumstances: "When the primary sore has been destroyed, or has healed within seven days from its commencement; when it is much inflamed, irritable, sloughing, or phagedænic; when the patient is feverish and irritable; when a bubo is present; when the health or constitution has suffered from attacks of syphilis or the use of mercury; when mercury

appearing with the subsidence of the pericranial tumours, He has continued in good health up to this time.

While this was passing through the press I was called to a lady similarly affected to the above case, after the prolonged use of mercury for hepatic disease. The iodide of potassium has already been very beneficial to her, but sufficient time is not yet elapsed to show the full results.

is known to cause rapid salivation, or to occasion loss of flesh, sore throat, night sweats, or mercurial erethism; and when scrofulous disease is manifestly pronounced, or when tubercular consumption is fully developed. If there be none of these contra-indications, and more especially if the sore be indurated, mercury may be given, not because absolutely necessary to a cure, but because it has been proved by experience to hasten the cure of the primary, and to lessen the chance of secondary symptoms." (DRUITT.)

130. But, as Mr. H. COOTE has justly stated, "every form of primary syphilitic disease may be followed by constitutional affections, the nature and the duration of which no one can predicate," whether the treatment be mercurial or non-mercurial. The want of fixed opinions as to the treatment of the disease, displays itself in all the countries of Europe; and although it causes much uncertainty and distrust of the use of remedies, the injurious recourse to the excessive use of mercury, so common in former times, is no longer adopted. The most important question, however, is the frequency of constitutional disease after primary syphilis, when treated with, or without mercury; for the primary affection is, in by far the greatest number of cases, an evil of comparatively little magnitude. Secondary syphilis, when once established, is a disease of which no one can foretell the termination. Its various phases, their succession and complication, are almost beyond the reach of our knowledge, and often out of the sphere of treatment. Dr. HENNEN treated 105 cases of primary sores without mercury; secondary symptoms followed in eleven instances, and all these were cured without mercury, excepting one obstinate case. In the report of the Army Medical Department, from December, 1816, to December, 1818, 1863 cases of primary chancre were cured without mercury out of 1940 cases, ninety-six having had secondary symptoms; the average time required for their cure being twenty-one days when bubo did not exist, and forty-five days when bubo was present. The average time for the cure of secondary symptoms without mercury was from twenty-eight to forty-five days. In the above period, 2827 cases of primary affection were treated with mercury; secondary symptoms occurred in fifty-one of them. The average time for the cure of primary symptoms without bubo was thirty-three days; with bubo, fifty days; and for the cure of secondary symptoms, forty-five days. Of thirty-two cases treated by Mr. GREEN without mercury, buboes occurred in sixteen cases, six only suppurated, and constitutional disease, preceded by febrile symptoms, followed in nine cases.

131. From these data it will be seen that the balance of advantages is not much in favour of mercury; and yet there are a few cases which cannot be cured, or at least not so soon or certainly cured, without this mineral, when used in a judicious manner. The opinions of some of the ablest recent writers as to the use of mercury for primary syphilis appear to accord with those of H. LEE, DRUITT, and ACTON; and upon the whole, with the results of my own experience, which agrees also with the following remarks by Mr. HOLMES COOTE: "I am far," he states, "from undervaluing mercury as a remedy in syphilis; on the contrary, it is the most certain and powerful remedy we possess; but it requires to be administered with caution. The best method of secur-

ing a patient against the invasion of secondary symptoms is by destroying the primary sore, when small and manageable, by caustic; next, by healing the primary sore when that measure is impracticable as quickly as possible without detriment to the patient's health. If we salivate a patient in whom a small superficial sore is running its usual brief course of two or three weeks, we positively do the man an injury. But if induration should occur, either in the base of the sore as in the indurated chancre, or in the cicatrix, a course of mercury, judiciously administered, is invaluable." The rules which should guide the treatment of chancres, are, 1st. To destroy, as rapidly as possible, the syphilitic virus, by applying the nitrate of silver, the strong nitric acid, or the acid nitrate of mercury, or the Vienna paste, to the sore when it is small, and spreading, but without induration; 2d. For sores which are not indurated, spread feebly, and show signs of incipient granulation, the administration of mercury is injurious, as retarding the healing process, and not protecting the patient from secondary symptoms; 3d. When induration exists in the slightest degree in or around the sore; when the chancre continues to spread quickly, or when, after seven days, it shows no disposition to heal, then mercury is required; 4th. Mercury is either inadmissible, or not required, or even dangerous, for phagedenic and sloughing chancres, and in the other circumstances above noticed (§ 129); 5th. The longer a syphilitic sore continues unhealed and secreting the contaminating matter, the greater the risk of constitutional infection; 6th. The more robust the constitution, and the more perfect the general health, the risk of secondary symptoms from primary sores appears diminished; but this vital resistance to contamination should not prevent the early cure of chancre, more especially when it is indurated, nor prevent a recourse to mercury if the sore has been neglected or of long continuance.

132. Having determined, after due consideration, to have recourse to mercury, the selection of the preparation and mode of exhibiting it require some attention. The preparations which are most suited to the primary disease, when there is no bubo, are the hydrargyrum cum creta and calomel, and in some cases the pilula hydrarg. chloridi composita. The other preparations of mercury, especially the mercurial ointments and the bichloride, are more beneficial in other states of the distemper. The dose, and frequency of exhibiting the hydrarg. cum creta or calomel, require no remarks. They should be regulated according to the state of the patient, and their effects upon the bowels. Calomel generally requires to be conjoined with small doses of opium, or with the pilula saponis composita, but in this latter combination the dose of calomel should be much increased. The object is to produce a slight soreness and sponginess of the gums, with a very slight salivation when indurated chancre exists, and to continue it for four or five weeks, preferring in the latter case the longer period. The dose of the medicine should be regulated according to its effects. During this course the regimen of the patient should in part depend upon his state of health when commencing it. He should live regularly, but not too low. If he be in ill health in other respects, the treatment, and regimen, and diet suited to his state should be prescribed. In

general, excesses in food and wine should be avoided, and whatever is calculated to disorder his digestive and biliary organs. The clothing should be warm; and fatigue, cold, wet, the morning and night air, ought to be carefully avoided. If, notwithstanding this attention to health, and to the prevention of disorder, any of the indications described, when treating of the injurious effects of mercury, make their appearance, the means recommended for their removal, in the articles ERYTHISM, MERCURIAL, and POISONS (§ 562, *et seq.*), should be employed.

[In regard to the use of mercury in the treatment of syphilitic diseases, the editor, from a long course of dispensary, hospital, and general practice, has arrived at the following conclusions: 1st. That venereal affections of every description are curable without mercury, and especially all secondary and tertiary forms of the disease; 2d. That the accumulated experience on this point ought to suffice to banish this mineral from the treatment of this class of diseases, except perhaps in some rare cases, when there is hepatic derangement and torpor of the liver, when it may be advantageously given as an alterative, in small doses; 3d. Mercury has no power to prevent secondary symptoms when given in the primary stages; 4th. This mineral, if given freely, will induce, and in all cases increase the tendency to ulceration of the mucous surfaces, especially of the mouth, fauces, palate, and throat, and also cause affections of the bones very similar to those caused by syphilis. The diseases produced by it have very generally been confounded with those produced by the venereal poison; 5th. The symptoms following mercurial treatment are more severe and difficult to remove than those following primary sores not treated with mercury; and, when relapses do occur in the secondary stage, they are far more readily removed in those cases where no mercury has been given; 6th. Mercury, when given incautiously, or in too large quantities, especially in syphilitic diseases, tends to undermine the constitution, to predispose to and aggravate constitutional affections, to increase general irritability, to induce inflammation and ulceration in and destroy the mucous textures, to promote morbid absorption and removal of the fatty, fibrinous, and osseous substances of the system, and to induce synovial, albuminous, and serous accumulations in the respective cavities lined with the membranes producing such secretions; though, given in moderate doses, and with proper care, it may tend to remove such accumulations; 7th. The extent and injury to the soft and bony parts of the system, produced by mercury, are more to be dreaded than any primary or secondary effects of venereal poison; 8th. Mercury is not, therefore, a *specific* against any form of syphilitic disease or virus, and is not essential to its cure; thousands having been easily, effectually, and permanently cured of every form and in every stage of the venereal disease without having taken a particle of mercury; 9th. Mercury should especially be avoided in sloughing sores of the penis and other parts, attended with high inflammation and tumefaction of the parts affected, attended with fever, &c.]

133. *C. Gangrenous chancre*, when it occurs in strong, sanguine, plethoric, or healthy persons, is usually the result of excessive inflammatory action, and requires large vascular depletions, free purging, and afterward opium conjoined with sa-

lines, antimonials, &c. Locally, poppy fomentations, poultices with balsam of Peru, or with turpentine, after the nitric acid lotion, will detach the sloughs. If the ulcer which remains is healthy, and heals, there is no need of mercury; but if it ulcerates, independently of the state of the general health, or if secondary symptoms appear, mercurials should be directed. *Sloughing, gangrene, and phagedæna* of venereal sores are, however, most frequently consequences of an exhausted or broken-down constitution, from intemperance or other causes. In such cases, the application of opiate and camphorated lotions to the sore, of strong nitric acid, if it spread; and opium and camphor, or ammonia, the fixed alkalies and tonics taken internally, aided by a generous diet, beef tea, wine, &c., are indispensable.

134. *D. Phymosis* is sometimes caused either by *balanitis*, or by one or more ulcers under the prepuce. In these cases there is more or less discharge. A chancre is often detected by local hardness and tenderness. If the prepuce be elongated, and cannot be retracted, circumcision may be advisable; but generally it will be sufficient to split the prepuce so as to enable the parts underneath to receive due attention, and the treatment which the character and progress of ulceration may require. The frænum is not unfrequently perforated by a chancre; and it then requires to be divided. In the circumstances now stated, the duration of the chancre, and the confinement of the secretion under the prepuce, increases the risk of constitutional contamination, and requires, unless in very recent cases, a recourse to mercury. A chancre in the urethra requires astringent injections, preferably such as contain the bichloride of mercury, and a course of this mineral if not contra-indicated by the state of the patient.

135. iii. THE NON-MERCURIAL TREATMENT of primary syphilis may be adopted in the circumstances above stated (§ 131, 132), or even in others where it may be considered prudent or advisable to have recourse to means which will improve the general health, and enable the constitution to resist the invasion of the poisonous virus. If there be debility or impairment of the digestive and assimilating functions, tonics, the chalybeates; the preparations of cinchona, or of sarsaparilla, or of guaiacum; cod-liver oil, simple or medicated; the compound decoction of sarsaparilla, with or without iodide of potassium and liquor potassæ, will be found the most deserving of confidence, especially if prescribed appropriately to the circumstances of the case, and if the patient live regularly, and avoid intemperance of all kinds, and all causes of vital exhaustion (§ 118).

136. iv. TREATMENT OF BUBO.—Mr. H. Coote states that he knows of no relation between the occurrence of bubo and the frequency of secondary syphilis; and he believes the idea that a copious suppuration from the groin eliminates the venereal poison to be unfounded. "When swelling of the glands occurs in conjunction with primary syphilis, or is supposed to depend upon the syphilitic poison, mercurial frictions are directed upon the thighs, that the mineral may pass through the enlarged parts." In more chronic enlargements the swelling may be covered by a plaster of the unguentum hydrargyri, or of the unguentum ammoniaci cum hydrargyro. "Leeches are not often required to an inflamed bubo, but they

may sometimes be applied with advantage." The existence of suppuration should not suggest an early recourse to the lancet, as absorption often takes place after the skin has become red or even thin. Absorption of the matter from suppurating buboes does not add, in Mr. H. COOTE's opinion, to the patient's danger of secondary syphilis. An opening, when required in a suppurating bubo, should always be made in the long axis of the thigh. If any burrowing of matter occur, particularly in scrofulous persons, who are most liable to buboes, tonics, with a restorative and digestible nourishing diet, are required.

137. The treatment advised by Dr. DRUITT and Mr. H. LEE for bubo is very different from that now stated. The former writer remarks that the first indication is to produce resolution of acute bubo—"by rest, aperient and saline remedies, low diet, leeches and fomentations. The applications to the chancres must be soothing, and mercury, if being administered, should be at once given up. As soon as the tenderness is relieved, pressure by means of a compress and bandage, or by placing a weight on the part as the patient lies in bed, is useful. Even if matter does form, and does not seem inclined to come to the surface, the iodine paint, cold lotions, aperients, tonics, and pressure will sometimes cause it to be absorbed. But if it increases, and the skin becomes inflamed and shining, a puncture should be made, and the case be treated as any other acute abscess." The chief circumstance deserving notice in this quotation is the abandonment of mercury if it have been already prescribed. My observation in former days has induced me to agree with Mr. H. COOTE in a recourse to mercurial inunctions on the thighs, as they produce "a complete effect upon the constitution, and may be used with advantage in cases of chronic bubo, combined or not with primary disease." Suppurating buboes, or solid inguinal swellings, will often disappear under this treatment, which, to be effectual, he advises to be done in the following way: "The patient, sitting before the fire, should rub on the skin at the inner part of the thighs a drachm of the strong mercurial ointment every night, or every night and morning. He should slip on a pair of drawers and go into bed, that the absorption of all that which stains the skin may go on. The patient should not be allowed to wash the part except at intervals, to prevent the skin from being chafed." The introduction of a drachm or two of mercurial ointment into the axillæ when in bed will generally produce the mercurial action when it is required in other circumstances.

138. In cases of *indolent bubo* the indication is to improve the general health, by sarsaparilla, tonics, and the other means advised above (§ 135). For these, change of air, sea-voyaging, removal to a warm and dry locality, and digestible food, are the most beneficial means of cure. The local use of iodine is sometimes of service both in these and in the chronic enlargements of the inguinal glands, but it is not so beneficial as the internal use of the preparations of this substance, which, when used internally, should be combined with either the liquor potassæ, or with either of the carbonates of potash, and be prescribed with other suitable medicines. If *sinuses* form, or if *sloughing* or *phagedæna* occur, or if the ulcers become *irritable* or much inflamed, the means suitable to the case, both internal and external, should be employed.

139. V. TREATMENT OF CONSTITUTIONAL SYPHILIS.—A. Of secondary Affections.—It has been contended by some recent writers and stated above (§ 46), that the simple and phagedænic sores are rarely followed by constitutional syphilis, whereas the indurated chancre rarely if ever fails to be succeeded by the secondary disease. Mr. H. COOTE disputes these positions, and concludes that secondary symptoms in large proportion ensue after every variety of simple and non-indurated chancre. After primary phagedæna, too, secondary symptoms may be dreaded, and no lapse of time seems to render the patient's constitution free, the secondary disease partaking of the character of the primary sore. "If a person were to have a well-marked phagedænic ulcer, I would not guarantee his not suffering phagedænic ulceration of the throat after an interval of ten years, or even more." Mr. COOTE adds, that no one who has primary syphilis in any or in its slightest form can be safely guaranteed from the occurrence of constitutional disease; but if six months elapse after the healing of the primary sore, the patient remaining well, the chances are greatly in his favour that he will escape any further disease. An exception, however, must be made in the case of primary phagedæna.

140. It is often necessary to disabuse the patient's mind of the belief that the syphilitic poison may be destroyed by some specific which will enable him to revert to his former habits. All, however, that can be done is to combat the disease as it appears, and to point out those modes of living which may prevent, although they cannot procure complete security from, the constitutional infection, or certainly remove the contamination when it has already been produced. Much depends upon the patient himself, in respect of the amount of protection which may be afforded him. For anxiety of mind, gloomy ideas, and all irregularities and excesses, and the other concurring causes mentioned above (§ 115-118), will perpetuate the constitutional contamination, and develop its local manifestations, and induce a state of syphilitic cachexia.

141. If venereal eruptions, sore throat, &c., be ushered in, as they often are, by febrile or inflammatory symptoms, aperients, salines, and antimonial diaphoretics will be of service. The diet should be restricted, the patient confined to the house, and the warm bath often resorted to. "When the febrile state has vanished, if the patient has never taken a course of mercury—or if he have been subjected to an imperfect course of it for the primary symptoms—and his constitution is sound, he may take mercury as already directed. If under its use the strength and general appearance are improved, so much the better; but if the patient gets thinner, weaker, and haggard, and suffers from chills and feverishness, or if his ulcers become irritable and phagedænic, it must be given up. The mercurial vapour bath, or the corrosive sublimate in very small doses, and not carried to the extent of affecting the mouth, will often be of great service when the full course of the mineral is inapplicable." (DRUITT, *Op. cit.*, p. 189.) The numerous authorities in favour of the bichloride,* and my own experience

* Dr. DZONDI, Professor at Halle, prescribes the bichloride as follows: R. Hydrarg. bichloridi, gr. xij.: solve in aquæ distillatæ q. s. et adde mîcæ panis, et sacchari albi, ññ, q. s. ut fiant pilulæ ec., sing. gr. j. The pills are to be rolled in powdered Canela bark; and on the first day four pills are to be taken (one fifth of a grain); on

of its effects, have rendered me partial to the adoption of it, in preference to other preparations, when a recourse to mercury should be had.

142. The iodide of potassium is often of great service, especially when a recourse to mercury is considered inexpedient or improper (§ 129); or after mercurial remedies have been prescribed without a satisfactory result, or when they appear to have been injurious. It is in these latter circumstances, and especially where a protracted course, or a too liberal exhibition of this mineral has been directed without avail, that the preparations of iodine, especially the iodide of potassium, in due solution and combination, according to my observation, have been most beneficial.

143. The preparations of sarsaparilla, especially the compound decoction, are always productive of great benefit. They may be prescribed either subsequently to a course of mercury or of iodine; or the bichloride of mercury, or the iodide of potassium may be taken with the compound decoction of sarsæ, or with the fluid extract or sirup. In some states of secondary syphilis, the muriate or the nitrate of ammonia may be taken in tonic and aromatic infusions, in as large doses as will not offend the stomach; or the nitro-muriatic acids may be tried, either in weak dilutions or in the infusions just mentioned. But in most cases of secondary syphilis, characterized by much debility and loss of flesh, or by anæmia, few means are so generally useful as a prolonged course of the bichloride of mercury in the tincture, or compound tincture of cinchona, in the proportion of half a grain or a grain to the ounce of the tincture, a drachm or a drachm and a half being taken twice or thrice daily in a little water, according to the circumstances of the case. When the throat, palate, or other parts of the mucous surfaces are much affected, this combination, or the bichloride in the sirup or fluid extract of sarsæ, aided by gargles containing the bichloride, or by mercurial fumigation, is very frequently efficacious.

144. In cases of indurated chancre of considerable duration, in most cases of secondary syphilis, and generally in tertiary syphilis, analyses of the blood demonstrate a great diminution of red corpuscles, an increased amount of albumen, the fibrin not being materially altered in quantity. These results should not be overlooked, as they indicate the propriety of caution in the exhibition of mercury, and of selecting the mode of exhibiting it now advised; or of adopting the preparations of iodine, and especially the iodide of iron, prescribing it in the sirup of sarsaparilla.

145. During the treatment of constitutional syphilis, it should always be kept in recollection that whatever depresses the vital force or impairs the general health favours the development of the syphilitic contamination and its external

or local manifestations; and that, if the remedies resorted to produce these effects upon the constitutional energies, they will very probably prove more injurious than beneficial. Hence the remedies should be so combined, exhibited, and alternated; and so aided by a regulated diet, and by a healthy, temperate, or warm and dry atmosphere, as to promote the constitutional powers; improvement in the healthy appearance of the patient generally indicating the success of the medicine employed.

146. *B. The local treatment of secondary syphilis* consists chiefly of warm, vapour, or sulphur baths, for the eruptions; of the application of lotions of corrosive sublimate, or ointments containing the unguentum hydrarg. nitratis, or the unguent. hydr. præcipitati albi, especially when the eruptions are severe, or are leprous or tubercular. If itching or irritation be experienced, lotions or frequent sponging the parts with a saturated solution of the biborate of soda in any emollient fluid will generally be of much service. Dr. DRUITT states that "for the common excoriated sore throat any soothing detergent gargle will do. When there are ulcers, it is advisable to use gargles of corrosive sublimate; and when the ulcers are indolent they may be touched with the linimentum æruginis. Mercurial fumigation is also occasionally of benefit. It is effected by putting a scruple of red sulphuret, or of the common black oxyde, or twice the quantity of mercury with chalk, on a heated iron, in a proper apparatus, and inhaling the vapour; a heated penny-piece in a tea-cup will answer the purpose.*

* Mr. HENRY LEE has given (*Transact. of Med. Chir. Society of London*, vol. xxxix., p. 339) the following directions as to the use of mercurial fumigations:

"Finding from experience that it was the light-coloured oxyde alone which volatilized, and produced its effects upon the patient's constitution, and having reason to believe that the light colour depended upon the presence of calomel, I performed a series of experiments with calomel alone, or mixed in a certain proportion with the gray oxyde. The general result of these experiments has been to satisfy me that, for the purposes of mercurial fumigation, five or ten grains of calomel alone is, in ordinary cases, quite sufficient; and that when the gray oxyde is used, the admixture of a few grains of calomel will facilitate its sublimation and insure its medicinal action.

"Upon making comparative trials with calomel alone and combined with steam, it was found to act more certainly and with greater regularity in the latter case.

"The plan which I have adopted is very simple. Two small lamps are procured in which the methylated spirit (much cheaper than spirits of wine) is used; over the first lamp is a thin metallic plate, upon which the ten grains of calomel are placed; over the second lamp is a small cup of hot water. A small cane-bottomed chair is placed over the lamps, and the patient sits upon it. He is then enveloped, chair and all, in a blanket; at the expiration of a quarter of an hour or twenty minutes he rolls himself up in the blanket and goes to bed.

"For patients to whom it may not be convenient to procure the spirit lamps, the mode of proceeding may be varied as follows: The patient is directed to heat a thick tile in the fire; this is then put into a night-stool, and a gallipot full of warm water placed upon one corner of it. The calomel powder is then sprinkled over the rest of the tile, and the patient sits over it, being enveloped, as before, in a blanket. This mode of applying the vapour is very convenient in cases of affections, either primary or secondary, of the generative organs. It is not necessary in either case that the patient should breathe the mercurial fumes. It is remarkable how soon the patients' systems are brought under the influence of the mercury by this simple means, and, according to my experience, how effectually it acts in cases both of primary and secondary syphilis. Its great advantage, however, consists in the very little constitutional disturbance produced, and in the avoidance of those symptoms of irritation and debility, both mental and physical, which the prolonged internal use of mercury is so apt to occasion. The mercurial action, when the medicine is introduced through the skin, may be continued for nearly any length of time that may

the second day none; on the third day six pills; on the fourth none; on the fifth eight pills; on the sixth none; on the seventh day ten pills, and so on, until the twenty-seventh day, when thirty pills are to be taken (1½ grain). The treatment is then complete, but in some instances of severe secondary symptoms they are to be carried even farther. The pills may be taken on a full meal. Sarsaparilla is also to be taken during the course, or even afterward. Also animal food is to be reduced to one half the usual quantity, and pork and bacon avoided. The cold night and morning air, and cold and wet are to be shunned. I have been consulted by patients for whom this treatment has been adopted, but the cases have been too few to admit of an opinion respecting it. It is merely a modification of the well-known treatment advised by VAN SWIETEN.

When a foul ulcer is seated in the velum, or roof of the mouth, or pharynx, or *alæ nasi*, an attempt may be made to check its ravages, by destroying its surface and edges with acid nitrate of mercury." (*Op. cit.*, p. 190.) The ulcerations at the roots of the nails, or between the toes, are cured by the internal administration of mercury, and the application of a solution of nitrate of silver, from four to ten grains to the ounce of distilled water. When the hair falls off the scalp, the hair should be kept short, and the dilute ointments just mentioned applied, or the means resorted to which are advised in the article on the HAIR (§ 32, *et seq.*).

147. Mr. H. COOTE remarks that the common warm bath effects but little in comparison with the Turkish bath, which is admirably suited for the chronic stages of secondary syphilitic eruptions,* and which may now be procured in London. Extremes, or even alternations, of temperature should be avoided; and the regimen and diet should be regulated according to the habit of body, the usual modes of living, and the peculiarities of the case, avoiding too great abstinence on the one hand, and too full living on the other; moderation in all things being always observed.

148. VI. THE TREATMENT OF TERTIARY SYPHILIS.—In this state of constitutional contamination, mercury, if exhibited at all, should be prescribed with great caution, and it ought not to be given if it have been previously resorted to, either in prolonged courses, in large quantity, or in such a manner as to occasion copious salivation, or any of the more unpleasant effects described in the article POISONS (§ 562, *et seq.*). But if the patient have not had recourse to this mineral in any form, if none of the more severe tertiary affections exist, the bichloride of mercury may be prescribed in full and increasing doses in the compound decoction of sarsaparilla upon a full meal, or as advised by VAN SWIETEN, or mercurial fumigations may be resorted to. But if a manifest improvement in health, and in the local affection, in a reasonably sufficient time be not observed, or if there be any aggravation of symptoms necessary, and may be repeated as often as may be convenient without injuring the patient's constitution.

"The small quantity of calomel which it is requisite to use at each fumigation is probably one reason why mercury in this form may be used with such comparative impunity."

* Mr. COOTE describes this bath as follows: "The clothes having been removed, and a suitable bathing-dress supplied, the bather is conducted into a heated apartment, where he is allowed to sit and accustom himself to the increase of temperature. During this time the body becomes covered with a tolerably profuse perspiration. Next he is conducted to another apartment, where there is a higher degree of heat (115° F.), and the atmosphere is charged with watery vapour. There he reclines on a heated marble slab, and undergoes a slow process of shampooing. The quantity of cuticle that peels off surprises one who has not witnessed the process, but the skin is left in a cleaner state than perhaps it had been in for years. After the movements of the limbs have been tested in a variety of ways the bather is conducted to a recess, in which is a fountain with hot and cold water, where he may apply soap and hot water as his taste dictates, or have the process performed by an attendant. A feeling of languor, not by any means unpleasant, supervenes, which renders a short period of repose on a couch agreeable. This process removes a large quantity of cuticle from the integument, causes the blood to circulate through the minute capillaries, and brings into activity the sudoriparous and sebaceous glands. We may, I presume, infer that without the proper performance of these functions the skin is not in a healthy state; and that any morbid condition, such as lepra or lichen, would be materially benefited by rousing them into activity." (*Op. cit.*, p. 108.)

toms from this treatment, the iodide of potassium should be substituted, and given in doses of three grains thrice daily, increasing them to five grains conjoined with the liquor potassæ, or with either of the carbonates. In cases where mercurials have been freely employed, and especially where there is reason to infer that the affection of the periosteum or bones has been caused or aggravated by these medicines, or where there is doubt whether or no any of the tertiary affections have been caused as much by mercury as by the distemper, the decided use of the iodides of the fixed alkalies is generally the most beneficial. In cases manifesting more or less anæmia (*see* § 143, 144), the courses of iodides, and still more those of mercury, should be followed by a course of the iodide of iron taken in sirup of sarsaparilla.

149. If the periosteum or bones be diseased, still greater caution in having recourse to mercury is required, although in strong constitutions, and where mercury has not been previously given, full doses of calomel and opium, or of these with camphor, will often initiate the treatment with benefit, and they may be continued or modified as long as they continue of service, and afterward the iodide may be prescribed, increasing the doses until success result from it. I have generally prescribed this medicine in the following combinations:

No. 378. R Potassii Iodidi, ℥j. ad ʒij.; Liquoris Potassæ, ʒij. (vel Potassæ Bicarb., ʒij.); Tinct. Aurantii (vel Cascariillæ), ʒvi.; Extr. fluidi Sarzæ, ʒss.; Infusi Gentianæ Comp. ad ʒviij. M. Fiat Mist. cuius capiat cochl. ij. vel iij. larga, ter in die in aquæ cyatho amplo.

150. It will generally be of service to take the iodide in weak solutions, even when it is prescribed in the largest doses. If it relax the bowels, a few drops of tinctura opii, or a little tinctura camph. comp. may be added to each dose; or the iodide and the alkalies may be taken in the compound decoction of sarsaparilla, to which a tonic or aromatic tincture, or an opiate, may be added, according to circumstances. When this remedy succeeds in removing the venereal affection, it should be continued for some weeks afterward, gradually diminishing the dose. In some cases it causes irritation of the mucous surface of the throat, nostrils, and eyes, with a copious defluxion, or pains at the region of the stomach, or irregular febrile symptoms. These disorders are observed especially when the iodide has been given in too large doses, or uncombined with the carbonate or solution of potash. When taken thus uncombined, the acid in the stomach decomposes the iodide, and the free iodine irritates the mucous surfaces.

151. In cases of ulceration of the pharynx, or larynx, or of disease of the bones, of the palate or nose, mercurial fumigations may be first tried, if mercury has not been already employed; but care should be had not to allow it to affect the mouth. Sarsaparilla, with a cautious use of the iodide of potassium and sedatives; the application of a strong solution of the nitrate of silver, or of the bichloride of mercury to the ulcerated surface, and of terebinthinate embrocations to the throat externally, are often beneficial. Gargles containing either the bichloride or the iodine, neither of these substances being in such quantity as to occasion much irritation of the throat, may also be tried. In all these the utmost attention and care are required. When tuberculated or other eruptions assume the characters of open sores or ulcers, the simple or compound

tincture of iodine will be most advantageously applied to them, in modes and in degrees of dilution varying with their appearances.

152. When nodes are formed, the pain and consequences which often result require iodine, alkalies, sarsaparilla, and opiates, with light, nutritious diet, residence in a warm and dry air, and blisters over the affected parts. The blisters often should be repeated, in order to prevent, by the external discharge, the inflammation from extending to, or disorganizing the osseous structure. If mercury have not been employed, the blistered surface may be dressed with strong mercurial ointment, and either with opium or morphia; and the diet and regimen duly regulated, with strict reference to the several peculiarities of the case, to the extent to which the general contamination and cachexia may have advanced, and to the state of the local affections.

153. vii. SYPHILIS IN INFANTS AND CHILDREN.—The treatment should be directed not merely to the infant or child, when the state of either admits of any hope from treatment, but more especially to the parents. For these as well as for the child, a mercurial course, if not previously had recourse to, should be prescribed; and in the majority of cases, the bichloride of mercury, exhibited as above (§ 141), or combined with either of the tinctures of cinchona, will be found the most efficacious. Subsequently the iodide of potassium or iodide of iron, and the preparations of sarsaparilla may be employed, according to the peculiarities of the case, more especially if anæmia be very manifest. It has been recommended for children to rub ten grains of mercurial ointment, daily, into the axilla or soles of the feet, or to administer half a grain or a grain of hydrargyrum cum creta every night until the symptoms disappear. But the disease is not so completely eradicated by these means as by a judicious exhibition and management of the bichloride, especially when followed by the means just named, varying the dose, and the vehicle in which it is prescribed, with the age and circumstances of the case.

154. X. SYPHILIZATION, or the inoculation of syphilis, has recently attracted attention not only as a cure, but as a prevention of any future occurrence of the distemper.—i. HISTORY.—M. AUZIAS TURENNE first proposed this startling mode of treating and of preventing syphilis in 1850, by bringing it before the French Academy of Medicine. This young physician commenced, about 1844, a series of experiments with the view of testing JOHN HUNTER's doctrine of the non-communicability of syphilis to the lower animals. After many experiments and some failures, he succeeded in producing in monkeys, inoculated with chancre-matter, a true chancre, and the disease thus communicated to them was transferred to rabbits, cats, and horses. "The malady was again returned by inoculation from these to the human species, the first trials in this regard having been made by Dr. ROBERT WELTZ, of Würzburg, on his own person. On four separate occasions Dr. WELTZ succeeded in producing an unmistakable chancre on his own person, by inoculation from animals, and this was acknowledged even by RICORD."

155. This discovery, as stated by Dr. RADCLIFFE, issued in one more surprising still, upon which the process of syphilization is founded, namely, the strange and curative change of the

disease when the inoculations are often repeated in the same individual. Experimenting upon apes, it was found that the artificial ulcers regularly diminished in size and virulency, in proportion as the inoculations were multiplied, until at length the virus ceased to take effect. The system seemed to become protected, as in ordinary inoculation and vaccination, and a state or diathesis was produced in which the body was no longer capable of being affected by syphilis; and the process by which this is accomplished is that to which the name *syphilization* belongs. This result, also, is all the more surprising because reiterated inoculations were evidently essential to it, for only once inoculated and then left to themselves, the poor apes speedily perished with all the signs of the syphilitic cachexia. Having satisfied himself of the reality of these results, M. AUZIAS TURENNE then proceeded to inquire whether man was capable of syphilization. He had many ardent followers, who eagerly submitted to the experiment, and who shortly seemed to furnish evidence in the affirmative.*

156. This pretension excited great opposition, particularly in the Académie de Médecine. In other quarters, however, the impression was more favourable. At Turin, M. CASIMIRO SPERINO, the chief surgeon in the Syphiliticoma, or Syphilitic Hospital of that city, at once took up the new views, and put them to the test on a large scale. He was favourably inclined towards them, he tells us, for several reasons. He had observed that severe inguinal buboes are more apt to follow small and insignificant chancres, which heal in a few days, than those which are large and obstinate; that the constitutional symptoms held an almost inverse relation to the severity and continuance of the local disease; and that he had known many prostitutes, whose constitutions had never been sensibly affected, who had had chancres for years, either constantly open, or closed only to open again immediately. He had repeatedly satisfied himself that foul buboes were more prone to heal in those cases in which their syphilitic character had been tested, after RICORD's plan, by inoculations on the surrounding skin.

157. The subjects of M. SPERINO's experiments were fifty-two hospital patients, all prostitutes, and all suffering from aggravated forms of primary or secondary syphilis. The virus was taken from the person syphilized, or from a comrade—from the first, if possible—and always from a growing ulcer. The inoculations were repeated once or twice a week in three or four distinct places, usually in the abdomen. The time required for the establishment of the artificial chancres was from two to three days. The effects of the second inoculations were less serious than the first; of the third, than the second; of the fourth, than the third, and so on until the virus ceased to produce any effect whatever; contemporaneously with which epoch, all former ulcers had healed, and buboes, recent nodular enlargement of bones, and cutaneous stains or blotches,

* In Dr. WINTERBOTTOM's work on the native Africans already referred to, it is stated, on the authority of Mr. EDWARDS, the author of the "*History of the West Indies*," that the natives of the Gold Coast of Africa give their children the *gaws* by *inoculation*, and that they perform the operation by making an incision in the thigh and inserting some of the matter from the sores of the yaws. By this means the infants or children have the disease slightly, and recover speedily; whereas, by becoming infected at a later time of life, it is much more severe, and "gets into the bone." (Vol. ii., p. 156.)

had either disappeared, or were in rapid process of disappearance. The virus, also, which made no impression at this time, was found to retain all its virulence when tried upon an unprotected person.

158. Since this time M. SPERINO has shortened the intervals between the several inoculations, and has increased the number of punctures in each operation to twelve, sixteen, or twenty, and with the effect (he tells us) of expediting the process, and of ensuring a slighter form of artificial chancre. He has also subjected his syphilized patients to a course of bathing in the sulphureous waters of Acqui, which waters are notorious for their power of bringing out secondary symptoms in the subjects of syphilis, and he has found them to resist this test as well as that of inoculation.

159. Such are the main particulars of these fifty-two cases, as gathered from M. SPERINO's communication to the Academy of Medicine and Surgery at Turin. No other treatment was employed. They are said to have been without exception of an aggravated character, and without any spontaneous tendency to heal. For a month before the institution of the experiments they had been purposely left without any treatment, and during this period they had retrograded.

160. An account of Dr. SPERINO's proceedings was given by Dr. RADCLIFFE (in RANKING's *Abstract of the Medical Sciences*, vol. xvi., p. 333), and M. TURENNE's experiments were noticed by Dr. DE MERIC (*Lancet*, July, 1853, p. 203) before Dr. SPERINO's work had appeared. The subject has been very recently brought before the profession in an able article on syphilization in the "*British and Foreign Medico-Chirurgical Review*" (No. xxxvii., p. 410), in which the subsequent experience of Dr. SPERINO in Turin, of Professor BOECK in Christiana, of Dr. DANIELSEN in Bergen, and of Dr. CARLSSON in Stockholm, during several years, has been given. These enlightened men, professors and physicians to hospitals in cities where medical science is in its highest state of rational cultivation, instead of declaiming against the doctrine promulgated by M. A. TURENNE, have been engaged in a series of careful experiments and observations to determine its truth or its fallacy. Experiment and careful observation can alone decide this question, which is one of the greatest importance in practical medicine.

161. Dr. SPERINO's observations were confirmed by similar results obtained by Dr. GAMBERINI at Bologna, and by Dr. GULLIGO at Florence. In 1853, Dr. SPERINO published a detailed account of ninety-six cases of syphilization. Of these ninety-six cases, fifty-three were of primary syphilis, and forty-three of the constitutional disease. Fifty of the cases of primary syphilis were cured, two failed, and one was not treated by syphilization alone. "Of the forty-three cases of constitutional affection, twenty-six were treated by syphilization alone, and seventeen by this method, in conjunction with mercury or iodine. Twenty-five of the twenty-six in the first category are said to have been cured. In only two cases of the primary disease did any constitutional symptoms appear, and these symptoms rapidly yielded under a continuance of the syphilization. No relapse has yet taken place in any case. Many of these cases were of very severe character, and were such as were not likely to have healed spon-

aneously; while the numerous inoculations that were required produced no serious effects, except in one or two instances a slight tendency to form phagedænic sores."

162. Dr. BOECK, of Christiana, in 1853, published, in the seventh volume of the *Norwegian Medical Journal*, the results of a few experiments he had then made on syphilization. Since then he has closely investigated the subject, and has extended the practice to infants at the breast. The same plan of treatment has also been pursued by Dr. DANIELSEN in the hospital at Bergen. When the writer of the review above referred to (§ 160) revisited this hospital in July, 1856, he was assured by this physician "that he fully coincided with the views of Dr. BOECK, and that the results obtained in Bergen by syphilization were as successful as those recorded by the latter at Christiana." The reputation, talents, and high position of those physicians in Norway are unquestionable.

163. Dr. BOECK states that all the cases which he treated by syphilization laboured under constitutional syphilis, in its most varied stages and forms. Some of those cases had previously undergone every mode of treatment that science could devise, while others had had no treatment at all. He thought it of great importance to collect observations from both classes of cases. If syphilization is not had recourse to till all other remedies have been tried, it is difficult to form a correct estimate of its powers; for under such circumstances, as Dr. BOECK justly remarks, we can hardly know what symptoms belong to syphilis, and what to the medicines administered; and particularly to mercury. He states that cases which have undergone a mercurial treatment, persons of an inflammatory diathesis, habitual spirit drinkers, and weakly constitutions, should not be subjected to this treatment. In these cases the artificial chancres may take on a malignant action. "The bowels should be regulated, and the digestive organs brought into good order; but it is not necessary to enforce any strict rule of diet. In the hospitals of Bergen and Christiana the ordinary full diet was always allowed." Dr. SPERINO and Dr. BOECK mention the readiness with which patients submitted to, and even sought for, the mode of cure which they had seen so successful with their fellow-sufferers.

164. ii. MODES OF INOCULATION.—M. A. TURENNE at first kept up a succession of single chancres; while SPERINO made three or four separate inoculations at once, and repeated these two or three times in the week. After having in this way reached twenty-four or thirty inoculations in all, he found that the chancres last produced were exceedingly small, and he then diminished the intervals, and made more inoculations at each sitting. He found that the first chancres were deeper, larger, and more inflamed than those which succeeded them; and that by diminishing the intervals and increasing the number of inoculations the earliest chancres visibly diminished, and were less painful and inflamed. After a large number of inoculations which did not appear successful, he returned to his former plan of inoculating for six to ten chancres at a sitting. "While these chancres are progressing, it is not advisable to inoculate afresh, nor should this be done until the former chancres are developed. Should the chancres be developed too freely and threaten active inflammation, or to extend

as phagedænic sores, he checks their progress by inoculating afresh at shorter intervals."

165. The practice of Dr. BOECK differs little from that of SPERINO. He inoculates for two chancres only every six days, because he found from experience that it required about five days to produce induration in a chancre, although he does not consider this latter circumstance absolutely essential. He subsequently shortened his intervals to three days, and increased the inoculations to eight or ten. Less time is thus required to produce immunity; but Dr. BOECK is distrustful of pushing cases too rapidly through their course of syphilization. With regard to the parts of the body selected by these physicians for inoculation, SPERINO preferred the lower regions of the abdomen, Dr. BOECK the arms and thighs.

166. The conclusions drawn by Dr. BOECK from the eighty-four cases of syphilization, which he has treated up to March, 1856, are: 1st, that in all cases, without exception, immunity to the venereal virus is obtained, sooner or later, by inoculation of the poison; 2d, that the symptoms of syphilis present at the commencement of syphilization disappear during the employment of this mode of treatment; 3d, that the general health does not suffer in the least from syphilization; on the contrary, if the patient has been in weak health before inoculation, he most materially improves in strength and appearance during the process. These propositions are conceded as undoubted facts by Dr. BOECK's colleagues, by Dr. SPERINO, by M. A. TURENNE, by DANIELSEN, by Dr. CARLSSON, and by Dr. STENBERG of Stockholm.

167. The time required to produce immunity from syphilis by syphilization depends upon the various strength of the virus, upon the rapidity or otherwise with which the inoculations succeed each other, upon the number of the chancres produced, and upon the idiosyncrasy of the patient. Dr. BOECK states that "the attaining to immunity depends upon the length of the intervals between each inoculation—the more frequent the inoculation the more rapidly does it ensue. If there were sufficient virus to be obtained, we might, if we chose, inoculate every day; but if, as is generally the rule, we keep to obtaining the virus from the most recent inoculation, we cannot easily do this. From my own experience, I would say that the matter obtained in a pustule of only one day's growth is generally capable of being inoculated; but I have also seen that pustules of three days' growth produced no effect; while three days later, the matter taken from them was decidedly contagious." (P. 196).

168. Granting that immunity is really produced from the disease, the question follows, Is it merely from the existing disease, or from any subsequent infection? and if from subsequent infection, is the immunity, produced for a time only, becoming impaired gradually, and ultimately lost after an indefinite time; or is it continued through life, a diathesis being imparted by it, rendering the frame insusceptible of the syphilitic infection? That the immunity is at least for a

time, is shown by the fact of the last inoculation having failed to take effect, however virulent the matter employed. Dr. BOECK is of opinion that persons who have reached perfect immunity to inoculation in the course of syphilization are insured against contracting syphilis for all the rest of their lives; but the lapse of time since the first employment of this practice admits not of any conclusive evidence of the fact.

169. Of forty-two cases of constitutional syphilis, where no mercury had been previously used, not one had exhibited any relapse up to the commencement of 1856, and many of these had been for three years or more without requiring any treatment whatsoever. Of the twenty-one cases recorded in Dr. BOECK's first work, six had been treated without mercury, and in all these syphilization dispersed the symptoms, which have never returned. The average duration of the treatment in these six cases was six months and two days, the average number of chancres were 322. In a second class of cases, in which the constitutional symptoms were chiefly confined to the skin and mucous membranes, but which had all taken more or less mercury, the average duration of treatment was six months and twenty-four days, the average number of chancres being 432; two thirds of the number being, however, very small and transient. In the third category of cases, in which the constitutional disease was very inveterate, all of which had been subjected to mercurial treatment, some repeatedly, the average duration of treatment was seven months and twenty-four days, the average of chancres 570.

170. The increase in both of the last categories of cases in the number of chancres, and in the length of time required to complete the cure, is ascribed by Dr. BOECK to the previous administration of mercury. It is, however, probable, as he observes, that another circumstance may have retarded the cure, viz., that the syphilitic virus may have undergone a material change during the many years it had been resident in the system. The more inveterate, and especially the tuberculo-serpiginous forms, were found to be extremely rebellious to treatment, and some of them were not cured when immunity was reached. It was necessary then to have recourse to iodine, upon the exhibition of which all symptoms rapidly disappeared, though previous to syphilization both mercury and iodine had proved inefficacious.

171. Dr. BOECK suspects that in those very obstinate cases a union of the syphilitic with mercurial poison has taken place. In most instances this union seems to be dissolved by syphilization, and then iodine, which had before been ineffectual against the united poisons, acts readily on the mercury, and eradicates it from the system. During the two years elapsed from the publication of his first work, he had treated sixty-three cases by syphilization, and of these thirty-six had never taken mercury. In the twenty-seven cases, for which mercury had been given, he invariably found the cure more difficult, and in some cases impossible without the aid of iodine. Where

[* "I am much inclined to believe," says Dr. BOECK, "that this is really the case, but to prove it is not so easy; for, according to my views, this question cannot be determined by artificial inoculation. I have not considered myself justified in putting those healed by syphilization to the proof of inoculation after some time had elapsed since the cure, as I thought it possible that such inoculation might produce constitutional symptoms, as I

believe that syphilization destroys the syphilitic poison in the system. Ricord's dogma, that an individual can only once in his life be affected with constitutional syphilis, may perhaps be erroneous, and the patient might then be in the position of a previously healthy person newly inoculated with syphilis. I have, therefore, always abstained from testing by inoculation those who had not previously been treated with mercury."—*Med. Chirurg. Review*, Apr., 1857, p. 321, Am. ed.]

mercury has not been employed, he is decidedly in favour of syphilization, for, as far as can be ascertained from the forty-two cases of this character thus treated, no relapse had occurred up to the present period. A great objection to syphilization is the length of time required for its complete performance. In the Christiana hospital, the average duration of the mercurial cure is three months and a half, while syphilization averages a full half year. If, however, the latter be not liable to relapse—at least in non-mercurialized cases—it is preferable, even if it required a much longer period. It is doubtful whether it is possible to syphilize, so as to cure permanently, by matter taken from one source alone; for Dr. Boeck met with cases where complete immunity existed to the matter taken from one source; but upon obtaining fresh virus from other persons, the inoculation succeeded perfectly again. However, he has been able, in some instances, to effect a complete and permanent cure with matter from one source alone.

172. I have given this account of syphilization, as it is hardly known in this country. It is manifest that it could not be rationally submitted to, but as a cure of the distemper, and not by a healthy person to prevent the infection of it. If, however, it be found to be by farther experience, not only a permanent cure, but also a permanent preventive, it will establish for itself a reputation not possessed by any other means; for none besides, however judiciously administered, has been found constantly and permanently curative—has proved a remedy under all circumstances, and for the future duration of life in all cases.

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[AMER. BIBLIOG. AND REFER. — *John W. Francis*, an Inaugural Dissertation on Mercury, embracing its Medical History, Curative Action, and Abuse in certain Diseases. N. York, 1811; also, an Essay on the same subject in Amer. Med. and Phil. Register for April, 1813, and April, 1814. In this essay Dr. F. condemns the practice of giving large quantities of mercury for the cure of syphilis, and especially the practice of inducing salivation at that time generally supposed necessary for the cure of the disease, and advocates the use of small doses of corrosive sublimate in connexion with the free employment of a decoction of guaiac and sarsaparilla, drunk warm. The advantages which he claims for this mercurial preparation over all others are that, if judiciously administered, it is particularly mild and safe in its operation, will admit of a more extensive use in all the various forms of the disease, and subject the patient to fewer inconveniences; that it readily enters the circulation, and soonest arrests the progress of the complaint by eliminating the morbid matter from the system; that it supercedes the necessity of salivation by its action on all the secretions, and especially those of the skin and kidneys; that it is the only preparation to be depended on in those peculiar habits of body so susceptible to salivation by every other form of mercury now in use; and, lastly, that in its ultimate effects on the constitution it is attended comparatively with no injury. Dr. F. recommends it to be given in doses of one eighth of a grain twice a day in pill, after the following formula: *R Oxymercurii Hydrarg., Muriat. Ammon., aa, gr. xv.; Aquæ destillat., jss.; Panis q. s., ft. pil. cxx.* To children he recommends it to be given in a state of solution, two grains to one ounce of brandy, of which three or four drops may be given in sweetened water to a child of one year, and repeated three times a day; and to a child of two or three years old, six or eight drops three times a day, increasing the dose after two or three days to ten or twelve drops. This mode of treating syphilitic affections was introduced into the New York Hospital in 1811, and about the same time into the New York Alms-house and City Dispensary, and, according to Dr. Francis, with marked success compared with former modes of treatment. He advises that the medicine should be continued two or three weeks after the disappearance of the disease, in order more effectually to accomplish a radical cure. The decoction of guaiac and sarsaparilla are to be prepared by boiling an ounce of each in three pints of water to two pints, of which the whole is to be drunk warm in the course of twenty-four hours. See also in this connexion M'Neven's Account of the Rob of Laffacteur, in New York Medical and Phil. Journal, vol. iii., p. 28. — *S. A. Cartwright*, Essay on Syphilis, Am. Med. Recorder, vol. viii. — *D. M. Reese*, Am. edition of Cooper's Surgical Dictionary. N. York, 1833. — *John Le Conte*, an Essay on the Origin of Syphilis, in New York Journal of Med. and the Collateral Sciences, vol. xi., p. 59. — *Wm. H. Prescott*, on the American Origin of Syphilis, in Ibid., vol. ii., p. 150; also, "History of Ferdinand and Isabella," vol. ii., p. 504; also, "History of the Conquest of Mexico." — *Washington Irving*, History of Columbus; also, New York Journal of Med., vol. ii., p. 153. — *Humboldt*, Nouvelle Espagne, tom. I., p. 333; and iv., p. 162, 2d ed. — *Samuel Forry*, New York Journal of Med., &c., vol. ii., p. 180, on the Origin of Syphilis. — *A. J. L. Jordan*, Historical and Critical Observations on Syphilis, translated from the French, by *R. La Roche*,

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Stedman*, Report of Cases in the United States Marine Hospital, Chelsea ("Primary Syphilis," says Dr. S., "has for the last six years been treated on the antiphlogistic plan; with a very few exceptions, mercury has seldom been made use of, and the cure has been easily effected in all cases where the patient has submitted to the necessary restrictions in diet and regimen"), *Ibid.*, vol. xv., p. 245.—*Prof. Sigmund*, on the Duration of the Incubation of Syphilis, in Brit. and For. Medico-Chirurg. Review, No. xxxvii., January, 1857, Am. edition, p. 205; also, on the Cure and Relapse of Syphilis, *Ibid.*, January, 1858, p. 201.—Notice of *H. Labatt's* Observations on Venereal Diseases, *Ibid.*, July, 1853, p. 138, American edition.—*Thomas Harris*, on the Mercurial Treatment of Syphilis, in North Amer. Med. and Surg. Journal, Nov., 1825. (Dr. Harris states that he had not used mercury in the treatment of any forms of this disease for the last six years, during which time he attended 164 cases of venereal. He treated it by bleeding and purging, the warm bath once a week, and the "decoction of the woods." Secondary symptoms rarely appeared; in two cases of the latter, nitric acid and the above decoction were entirely successful. Twenty-three other secondary cases, which had been treated with mercury by other practitioners, were effectually cured without it. The local treatment consisted in poultices and cooling lotions, if there was much inflammation; afterward the black wash, a strong solution of blue vitriol and the nitrate of silver, where a stronger caustic was indicated.)—*John Bell*, a Treatise on Baths; including Cold, Sea, Warm, Hot, Vapour, Gas, and Mud Baths, &c., 12mo, p. 658. Phil., 1850. (Dr. Bell gives a very favourable account of the influence of the Vapour Bath in Syphilitic Eruptions and Ulcers, also of sulphurous fumigations; he also gives a history of mercurial fumigations, and baths of corrosive sublimate for the cure of venereal affections, which the reader may consult with advantage.)—See also "Lectures on the Theory and Practice of Physic," by *John Bell* and *William Stokes*, 2 vols. 8vo. Phil., 1845. (Dr. Bell advocates the non-mercurial treatment, and says, p. 567, "I can speak confidently, after positive experience, of the success attending the use of iodine in tincture, and of the iodide of potassium, with the compound sirup and decoction of sarsaparilla in cases of venereal disease, both of the tonsils, and mouth, and tubercular ulcerations, after mercury had been prescribed by

those who preceded me in vain.")—*Grover Coe*, "Concentrated Organic Medicines; being a Practical Exposition of the Therapeutic Properties and Clinical Employment of the combined proximate medicinal Constituents of Indigenous and Foreign Plants," &c., 8vo, p. 431. N. Y., 1858. Of the indigenous plants recommended for the cure of syphilitic affections, the most important are: *Smilacin*, the active, neutral principle of the *Smilax officinalis*, in doses of two grains three times a day; the concentrated Tincture of *Smilax sarsaparilla*, in doses of fifteen drops; *Menispermum*, derived from the *Menispermum Canadense*, in doses of from two to five grains, three times a day, especially for the train of symptoms termed *Mercurio-syphilitic*; *Xanthoxylin*, derived from *Xanthoxylum fraxineum*, in doses of from two to four grains, including the Oil and concentrated Tincture of *Xanthoxylum*, in doses of from two to five drops each; *Hydrastin*, from *Hydrastis Canadensis*, in gleet and gonorrhœa in doses of one or two grains three times a day; *Irisin*, from *Iris versicolor*; *Corydalin*, from *Corydalis formosa*; *Stillingin*, from *Stillingia sylvatica*; *Phytolacin*, from *Phytolacca decandria*; *Rumin*, from *Rumex crispus*; *Alnuin*, from *Alnus rubra*, Swamp Alder; *Podophyllin*, from *Podophyllum peltatum*, May-apple; *Chimaphillin*, from *Chimaphilla umbellata*; *Ampelopsin*, from *Ampelopsis quinquefolia*; *Macrotin*, from *Macrotis racemosa*. The actual value of the above remedies, in the various forms of syphilis, is to be determined by farther observations and more extended experience. There is good reason, however, to believe that among them will be found some of the most valuable alternatives in the Materia Medica, and good substitutes for the foreign sarsaparilla, guaiac, mezereum, &c.]

VERTIGO.—*SYN.*—*Vertigo* (from *verto*, I turn round); *περιστροφή*, *σκότωμα*. *Vertige*, Fr.; *der Schwindel*, Germ. *Giddiness*, *dizziness*, *swimming in the head*.

CLASSIF.—IV. CLASS, III. ORDER (*Author*).

1. DEFIN.—*A transitory erroneous perception, or a sense of general whirling or turning round, with difficulty of standing, or a feeling of impending sinking or falling.*

2. *Vertigo* has been noticed by HIPPOCRATES, GALEN, ARÆTÆUS, and other ancient writers; and by these, as well as by modern writers, it has been viewed chiefly as a symptom of many diseases, and in some, but in much rarer cases, as the chief or only apparent disorder. That it is as much a primary affection, on some occasions, as headache, or several other disorders, may be admitted, although it may be shown, if the pathogeny of the affection be duly considered, that it is commonly owing to previous disorder of the organic nervous influence endowing the brain, or to the state of the capillary circulation in this organ, or not improbably to both in various degrees. In the great majority of cases, however, it is merely a symptom, either of a very early, or of a more or less advanced stage of some malady, very often of some disease which has not fully declared itself, or which still remains latent or imperfectly developed, or of extreme debility, or of protracted indigestion, &c.

3. I. DESCRIPTION.—*Vertigo* occurs as an illusion, or a transitory erroneous perception of objects, although quiescent, in a state of more or less rapid motion, usually in that of gyration or whirling round; but also not unfrequently with either a descending or ascending movement, or with a sense of sinking. In the more extreme cases, or when caused by ebriety, these sensations are often present in a greater or less degree, although the eyes at the time are quite shut. In some instances the objects which thus appear in motion are also changed in colour—are either variegated or obscured. *Vertigo* may be experienced only when assuming the erect posture, as in cases of fever, extreme debility, &c.; but it may also be felt while recumbent in bed, objects presenting not only a rotatory, but also an ascend-

ing motion, with a feeling of sinking, and sometimes also with noises in the ears. In this latter form it should be viewed as a most serious symptom, especially when occurring in malignant or pestilential maladies, or when these are prevalent, or in the course of organic disease of the brain. In many instances, vertigo precedes, or is followed by, severe paroxysms of retchings or of vomitings. This sequence is commonly observed in pestilential cholera, in sea-sickness, in fits of drunkenness, after ingestion of the sedative or depressing and irritating poisons, and especially after the improper or inordinate use of tobacco. In all cases of vertigo, walking or even standing is difficult or impossible; and, from a dread of falling, objects are laid hold of for support. Vertigo may be only temporary and quickly evanescent, or it may continue for a considerable time. It is more rarely continued or prolonged. It is often evanescent, but marked, when it occurs as a prelude of syncope, or of fully-developed disease of the brain, as epilepsy, paralysis, or apoplexy. It often precedes amentia and other states of insanity. SWIFT was very subject to vertigo at different periods of his life, and more especially before the loss of his powerful mental faculties. It is more prolonged or continued when it is a symptom of either active or passive congestion of the cerebral vessels, or of anæmia of the brain, or of the vascular system generally. When vertigo occurs as a severe or acute paroxysm, it may gradually pass into the epileptic state; the extreme giddiness, after several occurrences of the seizure, being attended by a temporary loss of consciousness, and ultimately by convulsions and all the phenomena of a complete epileptic attack.

4. The more continued or prolonged states of vertigo are generally referrible to the following pathological conditions: 1st, to determination of blood to the brain; 2d, to congestion of blood in the cerebral vessels, owing to impeded return of blood or retarded circulation through the heart; 3d, to lesions of the cerebral arteries, and softening of the structure of the brain; 4th, to general or local, momentary or prolonged anæmia, or insufficient supply or circulation of blood in the brain. In these states, however, one or other of the primary changes already assigned as characterizing the more evanescent states of the affection (§ 3) are also present. In either of these forms, or owing to either of their pathological states, vertigo may manifest certain grades, either of which only may be complained of, or all of which may supervene in succession, either very slowly and imperceptibly, or more or less rapidly. These states or grades are usually described as, 1st, confusion, unsteadiness, or indistinctness of perception; 2d, dizziness or fear of falling; 3d, giddiness, with incapacity of progression; and, 4th, swimming in the head, or complete vertigo, with an incapability of standing.

5. i. *The occasional exciting causes* of vertigo are very different, or even opposite in different cases. Whatever determines the blood inordinately to the brain, as long and intense thought and reflection; or prevents and impedes the return of blood from this quarter, as cinctures of the neck, &c.; and whatever promotes a rapid return of blood from the brain, as suddenly assuming the erect from the recumbent posture, long abstinence, inanition; and, in short, whatever occasions too great fulness on the one hand, or too great a deficiency of blood in the brain on the

other, will, in weak, susceptible, or predisposed persons, give rise to this state of morbid perception.

6. Vertigo is most frequent in persons of advanced age, in hysterical females, in persons who are bald, especially on exposure to cold, or in cold seasons and in variable weather; in those liable to hæmorrhoids, epistaxis, or other hæmorrhages, especially when these are suppressed, and in crowded and close apartments; in females during prolonged lactation; in persons addicted to excessive sexual intercourse, or to the vice of masturbation; and in those who indulge in too much sleep, or who lie too long in bed, or who live irregularly as to diet and regimen.

7. The more common causes of vertigo are obviously those which produce the diseases of which vertigo is a more or less prominent symptom; while those occurrences of it which assume more of a primary or idiopathic form, are referable entirely to whatever occasions the pathological states of which it is a chief manifestation. Thus, if it be imputed to vascular determination to, or congestion of blood in the brain, the numerous remote and efficient causes of these conditions should be ascertained, as indicating the only obvious means of removing the affliction. If it be chronic, protracted, or of frequent recurrence, the temperature of the scalp, the state of the arterial and venous circulation in the neck, temples, &c., the circulation through the heart; the functions of the stomach, bowels, and kidneys, &c., severally require examination, especially with reference to excessive or to deficient fulness of blood in the vessels of the brain. The causes of these very opposite conditions are generally manifest on due investigation; but these conditions are commonly attended by others of not less importance, namely, by excited or by depressed vital power—by the latter especially. This association of disordered circulation with depressed vital power obtains in most cases of this affection, whether protracted or evanescent; and in febrile diseases the blood is also more or less altered, although not in a manifest degree at an early stage of these diseases. The impairment or depression of vital power is especially evinced by the organic nervous system, through the media of the several organs which this system endows, and more particularly of the digestive, assimilating, and generative organs. Impairment of the former, and exhaustion from abuse of the latter, are among the most efficient sources of this affection, in its more chronic forms. When it proceeds from this last source, the disorder is often most protracted and most difficult to cure, for the cause generally continues; and it not unfrequently assumes a recurrent or periodic form, and even ultimately, but gradually, passes into fully-developed epilepsy, or the worst forms of hysteria. Of these results I have seen several instances in both sexes, in the course of my practice.

8. ii. The chief states and associations of vertigo may be enumerated as follows, with reference to their causes: 1st. *Vertigo nervosa*: nervous, hysterical, epileptical, or hypochondriacal vertigo. 2d. *Vertigo traumatica*, from injury, concussion, &c., of the brain. 3d. *Vertigo plethorica*, from determination of blood to, or inflammation or active congestion of, the brain. 4th. *Vertigo toxicata*, from poisons, especially sedative and narcotic poisons, and from poisonous fish, meats, &c. (See art. Poisons.) 5th. *Vertigo febrilis*,

in the invasion and progress of most fevers, especially when the organic nervous force is depressed, and the blood contaminated. 6th. *Vertigo gastrica vel Stomachica*, from gastro-bilious disorder; such disorder, however, often being, as well as the vertigo, merely symptomatic of disease of the brain. 7th. *Vertigo exsanguinea*, from an insufficient supply of blood to the brain, or from general anæmia, or unequal distribution of blood. 8th. *Vertigo cardiaca*, from disease of the heart impeding the return of blood from the brain. 9th. *Vertigo arthritica*, from misplaced or retrocedent gout. 10th. *Vertigo rheumatica*, from rheumatism of the membranes of the brain, or of the pericranium. 11th. *Vertigo accidentalis vel fugax*, from various odours or smells, especially in certain idiosyncrasies, or from various causes, often of an indefinite or not very manifest nature.

9. iii. *The Diagnosis and morbid Relations of Vertigo.*—The nature of the affection is generally manifest from the account given by the patient of his sensations. It may, however, in the more sudden attacks, be mistaken for a slight seizure of either apoplexy or epilepsy. From both these it may be readily distinguished by the loss of consciousness, which does not occur in vertigo. When fits of vertigo are likely to pass into epilepsy, a momentary loss of recollection or consciousness then generally characterizes them. The difficulty in the diagnosis respects chiefly the pathological condition of which vertigo is a chief or related manifestation—as regards the states of organic nervous or vital power, and of vascular action or congestion in the brain—as to the affection being a precursor of a febrile or exanthematous disease, or a symptom of disordered digestive function, or of misplaced gout, or of most serious disease, or of structural lesion of the nervous masses within the cranium. This, the most important diagnosis of vertigo, entirely depends upon the peculiarities of individual cases; upon the age and previous diseases of the patient; upon the recognised and presumed causes of the affection; upon the states of organic, nervous, or constitutional power, and of local and general vascular action; and upon the phenomena observed, and the symptoms ascertained, during the disorder. It must be apparent from this that the knowledge, acumen, and experience of the physician will be called into requisition in most cases of vertigo; and his success in their treatment will altogether depend upon the pathological inferences he may form.

10. There are other circumstances than the above to which attention should be directed; and among these the probable existing morbid states causing this affection at different periods of life may be noticed. If the disorder occurs soon after, or even several years after, puberty—and if the patient be thin, pallid, or anæmied, and be incapable of directing his eyes firmly on the person addressing him, impaired nervous power, very probably occasioned by masturbation, may be inferred. If the affection occur in mature or advanced age, although it may proceed from disorder of the digestive organs, it may, as well as such disorder, be much more likely a prominent symptom of disordered circulation in the brain, caused either by atheromatous, fatty, ossific, or other changes in the coats of the arteries, or by disease of the heart, of its valves, or even by organic lesion of the intimate structure, or by more mani-

fest alterations of the brain, either consequent upon one or other of these morbid conditions of the vessels, or taking place independently of them. I have seen cases where this affection has been produced by these several lesions, by scrofulous, tubercular, cancerous, or other formations in the membranes or substance of the brain, and by impeded return of blood from the head. In a remarkable case of colloid cancer of the mamma, under my care a few years ago, that was seen by Dr. RAMSBOTHAM and Mr. FERGUSON, the cancerous disease ultimately invaded the brain, occasioning, for a considerable period, constant vertigo, and ultimately general paralysis and coma. The connexion, also, of vertigo with the gouty diathesis, and the occurrence of it as a form of misplaced gout, should not be overlooked when it affects persons of mature or advanced age, especially when the exact nature of this affection is clinically investigated. The connexion of this affection, also, with cachectic states of the system, with imperfect excretion and depuration of the blood, and with disordered function or organic lesions of the kidneys, but still more intimately with organic lesions of the heart, its orifices, or of its valves, demands due consideration. Several instances of chronic vertigo have come before me which had been referred to cerebral disease, but which, upon auscultation of the heart, were found to depend upon impeded return of blood from the head, owing to interrupted circulation through the heart.

11. II. *THE PROGNOSIS* of vertigo should be always given with caution, and often with much reservation. In some cases, especially in early or middle age, when the affection is slight, and depends chiefly on disorder of the digestive organs, or the organic nervous system, a favourable opinion may generally be given, unless there be reasons to infer that it is a precursor of fever of an exanthematous or any other form; and then the result will entirely depend upon the consecutive disease. Whenever the affection occurs suddenly or in fits, then its passage into fully-developed epilepsy should be dreaded, however judicious the treatment may be, more especially if there be any reason to infer that it is caused by masturbation, or by excessive venereal indulgences. Of this causation and transition of vertigo, many cases have come under my observation, not only in early and middle, but also in far-advanced age. In this last period of life, as well as in middle and mature age, vertigo, in any of its grades, should always be dreaded and viewed as a precursor of a more serious or dangerous attack. In these cases the symptoms connected with the organs contained within the cranium should be carefully observed, especially the several senses; the temperature of the scalp, the state of the pulse in the carotids; the action, rhythm, and sounds of the heart, and the appearance of the veins of the head and neck, and an opinion be given conformably with the evidence furnished by these sources, the *juvantia* and *lædencia* being also taken into due consideration.

12. III. *THE TREATMENT* should be based upon the inferences arrived at as to the causes and pathological states of vertigo.—(a) If the causes inferred be such as reduce organic, nervous, or constitutional power, and if they are of such a nature as are likely to convert the disorder into either hysterical or epileptical seizures, as certain of the causes above noticed (§ 6, *et seq.*), a restor-

ative, antispasmodic, or tonic treatment, such as the preparation of valerian, asafoetida, zinc, &c., cod-liver oil, oxyde of silver, &c., ought to be prescribed; and if there be any indications at the same time of local or general anæmia, chalybeates, either alone or in addition to these means, are also required. In cases of this description, as well as in those indicating a tendency to assume either an hysterical or epileptic character, I have found the tincture of sumbul, either alone or conjoined with other medicines of a tonic or antispasmodic nature, of great service in several cases. In these, also, I have prescribed the cotyledon umbilicus, but not with so marked benefit as I expected, although it also was sometimes very beneficial.

13. (b) In persons who are liable to vertigo from prolonged or profound thought and reflection (§ 5), and especially if the scalp be hot, and vascular determination to the brain, as evinced by the action of the carotids, be excessive, cooling applications to the brain, local depletions, internal and external derivations, purgatives, a regulated diet, and, above all, the avoidance of the cause, change of air, of scene, and of habits, travelling, voyaging, &c., and relaxing amusements, or agreeable and slight occupations merely, are the means upon which the chief reliance should be placed.

14. (c) In persons of a full habit of body, in those who live luxuriously, or even moderately, and who take little exercise, the temperature of the scalp, the pulsation of the carotids, or the action or sound of the heart, indicating local or general plethora, or impeded return of blood from the head, the occurrence of vertigo should be viewed in a very serious manner, and local depletions, derivations, both external and internal, purgatives, setons, or issues, spare diet, and regular exercise in the open air, are generally beneficial. Other means in addition to these may be resorted to; but they must be left to the judgment of the physician, who will prescribe them appropriately to the features characterizing individual cases. Emetics, the application of cold to the head, the restoration of suppressed hæmorrhages, bleeding from the nostrils, and venæsection, were the chief means recommended by ARÆTÆUS for vertigo, and they are indicated in the circumstances just now mentioned; but emetics should follow, not precede, the other means when cerebral or general vascular plethora is present.

15. (d) In cachectic habits of body, in cases manifestly depending upon disorder of the digestive organs, and when the temperature of the scalp, and the local and general states of the circulation and of vascular action, present no contradiction of the propriety of the practice, the treatment of vertigo may be initiated by the exhibition of an emetic. When this affection is indicative of the commencement of fever, or of one of the exanthemata, and is attended by lassitude, pains in the back or limbs, or by chills or shivering, this practice is then also productive of benefit; but ipecacuanha or sulphate of zinc should be preferred to antimony as an emetic; or, if this last be prescribed, it will be advantageously conjoined with a warm, aromatic, or antispasmodic medicine, such as Cayenne, ginger, &c.; but it ought not to be repeated oftener than once. Vertigo in the gouty diathesis requires, in the first instance, cholagogue purgatives, followed by alkalies, magnesia, sulphur, and other vascular depurants, which increase the functions of the kidneys, skin, and digestive mucous surface. In

all cases of vertigo unconnected with the invasion of either of the forms of fever, the previous habits, modes of living, and disorders of the patient should be ascertained, and a more or less complete change of these habits be insisted upon, as far as his age and other circumstances may render the change advisable.

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VOICE AND SPEECH—DISORDERS OF.—1.

Voice and speech are functions by means of which the human species claims and maintains an ascendancy over all animated nature. The more perfect animals, including the winged creation, possess the power of emitting vocal sounds, which admit of such changes in power, modulation, and character as convey intimations to individuals of their own genus or species of danger, of pleasure, of sources of nourishment, of desire, and even of affection. The practised ear can recognise, in nearly all animals which emit sounds, variations in cadence, character, and power, which are known by the same species as announcements of the presence of objects of prey and subsistence, of sources of danger, of the loss of offspring or objects of affection, and of danger, suffering, or distress. And it is by no means improbable that

the sounds characteristic of individual species, even of the lowest capable of emitting them, are so modulated as to convey to one another the various instincts and suggestions which seasons, localities, and external circumstances and influences may excite; the sounds thus modulated becoming known, as regards each species, as a distinct, but limited language, although unknown, unless in its more manifest and prominent characters, to man.

2. The sounds produced by the organs, so wonderfully and beautifully provided for them, in the human species, are the chief means of developing the mental faculties, of exercising dominion over the rest of the animal creation, and of acquiring and of exerting power over those requiring guidance or governance. The sounds produced by the human organs of vocalization and articulation are the manifestations furnished to the species of the finest sentiments, of the deepest as well as the highest states of feeling, of the most profound and abstract results of thought, and the wisest and best revelations of mental reflection and of human reason. But considered philosophically, they are studies rather for the physiologist than for the pathologist. To the latter, however, the more strictly philosophical consideration of human sounds, as manifested in the modulated voice and in speech, becomes a necessary introduction to an intimate knowledge of the several modes in which both voice and speech are disordered, or more or less impeded, or even lost. For these preliminary sources of knowledge the reader is referred to the recent writings of MÜLLER, CARPENTER, TODD, BOWMANN, BISHOP, and WILLIS, which are in the hands of most medical men.

3. Vocal sounds and articulate speech or language are two distinct functions; and although the latter proceeds from the former, an additional apparatus is required for its production. The instrument of vocal sound, the larynx, is distinct and appropriate to this purpose, and is calculated by its mechanism to produce the several grades and modulations of voice; but, although thus independent, the vocal sounds cannot be modified into articulate speech, or even into a near approach to articulation, without the aid of the *oral cavity*, more especially of the *tongue*. Hence there may be vocal sound without speech; but this latter cannot be produced without the former; and hence both may be separately or even conjointly disordered, or even lost. But, although speech may be altogether lost, a vocal sound can hardly be quite lost while respiration is performed, unless in complete syncope, catalepsy, apoplexy, in the coma of fever, and in other occasions of loss of sensibility and consciousness; for even in these states, unless in profound syncope and catalepsy, a simple or low respiratory sound may still be emitted.

4. I. VOICE is produced, according to Mr. BISHOP, by the conformation of the vocal apparatus, which combines the properties of a stretched chord, a membranous pipe with a column of air vibrating in it, and a reed, and is the perfect type, of which these instruments are only imperfect adaptations. Dr. CARPENTER states "that the sound is the result of the vibrations of the vocal ligaments, which take place according to the same laws with those of metallic or other elastic tongues; and that the pitch of the notes is chiefly governed by the tension of these laminae." However the various tones, modulations, &c., of the

voice may be explained, or referred severally to the especial or combined movements and actions of the different parts constituting the vocal apparatus by physiological writers, it must be manifest that a healthy condition of the vocal chords and ligaments, of the cartilages, of the muscles which move them, and of all the parts both above and below the larynx, as well as of the larynx itself, and the mucous membrane covering it and its vicinity, and even of the velum palati also, is necessary to the production of the human voice in its natural and perfect state; and consequently that this function, capable of the utmost perfection, of the greatest range in power and modulation, and of astonishing improvement as regards these, by careful and scientific cultivation, depends upon a perfect condition of their several parts, disorder or structural lesion of any one of them affecting the voice in a more or less remarkable manner.

I. APHONIA.—LOSS OF VOICE.—SYN.—'Αφωνία (from *a priv.* and *φωνή, voice*). *Aphonia*, Vogel, Sagar, Cullen. *Dysphonia*, Good. *Raucedo paralytica*, Darwin. *Perte de la Voix*, Fr. *Die Stimmlosigkeit*, *Aphonie*, Germ.

CLASSIF.—IV. CLASS, II. ORDER. (See Preface.)

5. DEFINIT.—More or less impairment or complete loss of the power of emitting vocal sound, owing either to functional disorder or to structural lesion.

6. The voice may be impaired in every degree from the slightest catarrhal form to the most complete loss from organic change. The impairment or loss may be either temporary or permanent. The slightest as well as the less permanent aphonia often proceeds from functional disorder, especially from extreme nervousness, fright, fear, and hysteria; but it also is frequently caused by catarrhal congestion of the mucous membrane of the larynx and of the subjacent cellular tissue, and by temporary impediment to the movements of the vocal chords from this cause, or from inflammation and its results implicating for a time any of the parts of the vocal apparatus. In the more strictly nervous states of aphonia there is no manifest lesion of structure, the nerves supplying the laryngeal muscles and chords having become for a time incapable of conveying the dictates of volition to these parts, unless volition be most energetically exerted.

7. A. FUNCTIONAL APHONIA occurs chiefly in delicate, nervous, or hysterical females, and much more rarely in similarly constituted males. In the former sex it is most frequent about and subsequent to the period of puberty, and during the catamenial epoch of life; in the latter chiefly before the period of puberty, and only in very rare cases, and when occasioned by fear or fright, and it is then of short duration only.

8. *Hysterical aphonia* may be viewed as one of the forms of functional paralysis, which not unfrequently complicates disorder of the female organs, such disorder being generally either not otherwise manifested, or latent, or masked by some other affection. In most cases it is easy to distinguish the hysterical from all other forms of aphonia; other allied symptoms, the previous history of the case, the state of the uterine functions, the moral affections, impressions, and sentiments, which may have preceded the loss, &c., generally indicating its nature. It should not be overlooked that, in hysterical females, more especially in those most subject to uterine or sexual

irritation, aphonia is sometimes *feigned*. In rare instances, also, it may be difficult to determine whether or no it is hysterical or owing to structural disease in or near to the base of the brain; and this difficulty is increased, 1st, by the absence of other hysterical symptoms; and, 2d, by the presence of other states of cerebral paralysis, the catamenial functions or organs having been previously disordered. I was recently called in consultation to a delicate, nervous female, aged 18, who had menstruated irregularly and scantily, and was seized with incomplete hemiplegia and complete loss of voice—the muscles of the face not being affected. In this case it was difficult, at first, to determine whether the aphonia was hysterical or owing to some lesion within the cranium, causing also the hemiplegic affection. Their history and progress, however, generally elucidate the nature of these cases.

9. *B. STRUCTURAL APHONIA* is caused, *firstly*, by changes implicating one or more of the parts composing, or in the immediate vicinity of, the vocal apparatus; and, *secondly*, by lesions at the origin or in the course of the nerves distributed to the laryngeal muscles and vocal chords. The slighter or more incomplete forms of aphonia are those of a catarrhal nature, arising from more or less congestion and tumefaction of the mucous and sub-mucous tissues of the larynx and adjoining parts. Severer cases of aphonia are often occasioned by serous infiltration into the sub-mucous tissue, with or without inflammation of the mucous membrane of the larynx and of its vicinity, in the direction either of the fauces or of the trachea, or of both. This serous infiltration may be slight, and continue only during the catarrhal attack, or it may be so very considerable as to nearly suppress the voice altogether and cause suffocation, as observed in *œdema* of the glottis and epiglottis. Aphonia from this and other affections of the vocal apparatus is fully considered in the articles *LARYNX* and *TRACHEA*, where the lesions which affect the voice are described, and the treatment appropriate to each pointed out. The voice may also be affected in different degrees by inflammatory affections of the fauces, pharynx, and tonsils, by tumours in these situations, or by morbid growths pressing upon or implicating the larynx or trachea, by aneurisms, and most frequently by chronic laryngitis and its consequences, especially thickening, ulceration, &c., arising either primarily or consecutively of acute laryngitis, or of tubercular disease of the lungs, or of syphilitic infection. All these are fully discussed in the articles now referred to; but in all the voice is affected rather than the power of articulation, which is perfect as far as the production of vocal sound admits; for the affections of the larynx in such cases are rarely associated with any interruption to the movements of the tongue and of the parietes of the oral cavity, by means of which articulation or speech is performed.

10. II. *DEFECTUS LOQUELÆ*.—*SYN.*—*Alalia*, Frank. *Loquela Abolita*, Auct. Var. *Mutitas*, Sauvages, Macbride, &c. *Sprachlosigkeit*, Stummheit, Germ. *Loss of Speech*.

11. *Voice*, as stated above, is produced by the *larynx*, its modulations into musical sounds being effected by means of this organ aided by the epiglottis and adjoining parts. *Speech* is the modification of the voice, or sounds emitted by the *larynx*, by the organs or parts intervening between

it and the *os externum*. It is obvious that, to produce articulate sounds, forming language, the movements of the tongue, fauces, and connected parts must be complete; and that these should be in a healthy condition to render articulation perfect. The tones of the voice, and articulate speech, cannot be produced in childhood, when the sense of hearing is completely lost in early infancy, or in the fetal state; and as long as the sense of *hearing* continues lost, *dumbness* is the result; for the sense required to modify and adjust vocal sounds does not exist.* *Voice*, especially in its healthy and cultivated states, and in its modulations into music, is capable of expressing the several emotions of mind, in a more remarkable degree and manner than articulate speech; but *speech* or language has a much greater, more varied, and more extensive power of addressing, informing, and enriching the intellect, of furnishing definite ideas of objects, properties, actions, &c., and of conveying the results of reflection and of rational deductions. The vocal organ, aided by the movements of the tongue and parts composing the oral cavity, is adapted for, and in health is capable of, forming a number of simple sounds, which are readily combined into groups forming words. Dr. CARPENTER justly remarks, that the number of combinations which can be thus produced is so inexhaustible that every language has its own peculiar series, no difficulty being found in forming new ones to express new ideas. There is much diversity in different languages, even with regard to the use of the simplest of these combinations; some of them are more easy of formation than others, and these accordingly enter into the composition of all languages; while, of the more difficult ones, some are employed in one language, some in another; no one language possessing them all, or using them to any co-ordinate extent.

12. The mechanism producing vocal sounds being complicated, and actuated in its individual parts and in its combined movements by volition, and by the states of vital force, as influenced by health, constitution, and disease, and adjusted by the sense of hearing, it necessarily follows that the faculty of speech, in whatever language, will be modified, altered, interrupted, impeded, and even altogether lost, in numerous modes, so as not only to furnish most important indications of disease of the slightest as well as of the most dangerous nature. The articulate sounds which have become familiar to the ear are often remembered as long as the appearance of the person by whom they were furnished; and the per-

* The nicest modifications and adjustments of the actions of the muscles of the larynx, and of the several parts of the fauces and oral cavity, are requisite to the production of determinate tones, accents, and speech; and these actions are ordinarily adjusted and modified by the sense of hearing. Hence a fine or educated ear in music is of great advantage in singing and in the pronunciation of languages. This adjustment, being learned in the first instance under the guidance of the sounds actually produced and heard, is subsequently effected voluntarily, in accordance with the mental conception—or inward sensation—of the tone or sound uttered, which conception cannot be formed unless the sense of hearing has previously brought similar tones to the mind. Hence it is that persons who are born, or become, quite *deaf* before articulate speech is formed or attempted, are also *dumb*. They have no malformation, no paralysis of any part of the organs of voice and speech; but they cannot utter distinct musical tones or articulate speech, because they have not the guiding conception or sensation of the nature and character of these sounds, furnished by the sense of hearing.

son, even after many years, is often recognised by his voice and speech before he is seen. Debility weakens the articulating power, or the strength of articulate sound; but disease may alter it more remarkably, different maladies affecting it in various ways. When the voice is altered, or lost by disease, the speech is then necessarily similarly circumstanced, as already stated (§ 5, *et seq.*). But speech is more especially affected as a precursor, or as a symptom, of apoplexy and paralysis; and, when so affected, it indicates the most serious results at a period which, although indefinite, may generally be viewed as comparatively short. In cases where speech is altogether lost, especially at an advanced age, or is so nearly lost as hardly to be understood, or when the sounds are mostly inarticulate, if no apoplectic or paralytic seizure have preceded or accompanied this loss, then either of these seizures may be expected before a long time elapse, unless the time be deferred by treatment, and diet, and regimen; and more frequently, notwithstanding these means of prevention. (See *arts.* APOPLEXY and PARALYSIS.)

13. *Loss of speech*, whether complete or incomplete, is generally to be imputed to structural disease, wounds, or fractures, implicating either parts within the cranium, or the nerves in their course to the organs of articulation. Cases of loss of speech, consequent upon apoplexy, or associated with other paralytic states, are very frequent, and are by no means rare as a precursor of a dangerous apoplectic or paralytic attack. When thus present, as the only apparent ailment, the result is not the less to be dreaded. In several cases, for which I have been consulted in the course of my practice, speech was so completely lost, that no articulate sound was produced, the simple vowel-sounds *a* and *o* being only emitted, and yet none of the organic, or of the cerebro-spinal functions, and none of the senses, evinced any disorder. In all these, an apoplectic, hemiplegic, or more general paralytic seizure supervened generally in a few weeks or months, owing to the development of latent pre-existing organic lesion. Whenever, therefore, the faculty of speech becomes impaired, or is lost by persons who had previously possessed this faculty in a healthy state, more especially if this change occur in mature, middle, or advanced age, it should be viewed as a form of local or partial paralysis, which is generally followed, at no very remote period, by a very dangerous form of apoplectic, or of more general paralytic seizure.

14. III. IMPEDIMENTS OF SPEECH—HESITATIONS OF SPEECH—STAMMERING—STUTTERING.—This affection is generally functional, or of a nervous nature, and may present several forms. These are usually observed in childhood and in early life; while incomplete or complete *loss of speech*, briefly considered above (§ 13, *et seq.*), is the consequence of structural lesion or of injury, and is a form of paralysis of a most dangerous nature. Hesitations in articulating sounds, or a momentary impediment in uttering certain words or letters, or a stammering, or repetition of certain consonants, are generally observed from infancy or childhood, but they may increase or diminish, or even disappear as age advances. They may continue during a long life, or they may occur only occasionally. In this latter case they are induced or aggravated by fear, anxiety, and various mental emotions. They cannot be mis-

taken for impairment or loss of the previously healthy power of articulation, which, as stated above (§ 13), proceeds from slowly-formed organic lesions implicating the origins or course of the glosso-pharyngeal nerves; and which occurs under different circumstances, and is attended and followed by very different phenomena and consequences.

15. The muscles employed in the production of definite vocal sounds and of articulate speech, being actuated by volition conveyed from the brain to these muscles by means of the nerves proceeding from the former to the latter, it necessarily follows that both voice and speech depend on the capability of the brain to generate or exert volition, and of the nerves to convey this act to the muscles. Thus speech, as well as voice, requires for its perfection a due exertion, and a healthy transmission of volition, by means of the nerves, to the apparatus destined for its production; and, if volition be feebly exerted, or imperfectly transmitted to the muscles concerned in articulation, various imperfections of these functions will result. But the complete performance of both voice and speech depends also upon the healthy functions of the lungs and respiratory passages, these functions being modulations of expiration by means of the larynx, tongue, fauces, oral cavity, and lips.

16. Thus it is apparent, as remarked by Mr. BISHOP, that "the mechanism provided for the production of speech comprehends a large assemblage of organs. The most simple vocal sounds require the combined action of the lungs, windpipe, larynx, and respiratory muscles; and for articulate language, an additional set of organs must be called into play, namely, the pharynx, hard and soft palates, uvula, tongue, teeth, lips, and nostrils."

17. It is justly observed by Dr. CARPENTER that, "great as is the number of muscles employed in the production of definite vocal sounds, the number is much greater for those of articulate language; and the varieties of combination which we are continually forming unconsciously to ourselves, would not be suspected, without a minute analysis of the separate actions. Thus, when we utter the explosive sounds (explosive consonants), we check the passage of air through the posterior nares, in the very act of articulating the letter; and yet this important movement commonly passes unobserved. We must regard the power of forming the several articulate sounds and their simple combination, as so far resulting from intuition, that it can in general be more readily acquired by early practice than other actions of the same complexity; but we find that, among different races of men, there exist tendencies to the production of different sounds, which, though doubtless influenced in great degree by early habit (since we find that children, when first learning to speak, form their habits of vocalization in great degree in accordance with the examples amid which they are placed), are certainly also dependent in part upon congenital constitution, as we often see in the case of children among ourselves, who grow up with certain peculiarities of pronunciation, not thus derived from imitation, of which they do not seem able to divest themselves."

18. I must refer the reader to Mr. BISHOP for a notice of mechanical contrivances for the production of vocal sounds; but these can never suf-

ficiently illustrate the intonations of voice or the production of articulate speech, or even satisfactorily show what it is that constitutes the essential character or distinction between the vowels, and on what part of the mechanism of the voice the vowel-sounds depend. These sounds, as well as those of the consonants, are formed by so slight changes in the relative position of the several parts of the complex organs of voice and speech, varying in accent and intonation so remarkably with the language, &c., as hardly to admit of any estimate. Mr. BISHOP observes that, "in the application of the theory of vowel-sounds to the mechanism of the human voice and speech, there are two hypotheses which would equally satisfy the conditions for their production artificially. The first is, that the glottis produces the primary, and the air in the pharynx, mouth, and nostrils, the secondary or vowel-quality pulsations. The second is, that the glottis produces the primary, and the membranes of the pharynx, mouth, and nostrils produce the secondary pulsations of the air." Dr. THOMAS YOUNG observes, in respect of the first of these, that the "reflection of the sound from the various parts of the cavity of the mouth and nostrils, *mixing* at various intervals with the portions of vibrations directly proceeding from the larynx, must, according to the *temporary form of the parts*, variously affect the laws of the motion of the air in such vibration."

19. As to the second view, Mr. BISHOP remarks, that "we know by experience that the breath passing through the glottis is thrown into a certain state of vibration, and reaches the cavity of the mouth, which is already so disposed as to present a proper extent of its own membranes to the action of the breath. By these means the membranes are also made to vibrate, and these latter vibrations, coexisting with the original vibrations of the glottis, may generate the vocal sounds." Now the chief objections which may be offered to this view are, that the surfaces of parts, over which the vibrations of air from the glottis pass, are not membranous or are not membranes capable of vibration, but are surfaces constantly changing their configurations by means of the muscles by which they and the subjacent parts are actuated, the vibrations of air thrown out by the glottis being modified or changed by the alteration in the configuration of these surfaces—of the surfaces of those parts between the glottis and the external features—so as to produce the different vowel-sounds, and to pass from one simple vowel-sound to another. Without attempting to proceed farther in the consideration of the other simple sounds, or of the physiology of voice and speech, my limits oblige me briefly to notice the more practical part of this subject.

20. Very great ignorance, some mischief, and no little discredit to medical science, have been displayed by the energetic proceedings of some surgeons who have either written upon *stammering* and *stuttering*, or who have officiously meddled with, and injuriously operated upon, certain parts which are in no way implicated in the disorder under consideration. It has been supposed by these meddlers, with surpassing profundity, that these momentary or temporary affections arise from some lesion of the muscles of the tongue, or of the *frænum linguæ*, or of the *volum palati*, or of the uvula, or even of the tonsils, each

acting on his own peculiar inspiration—with a success properly exposed by Mr. BISHOP, and sufficiently manifested to my own observation. It must be very demonstrative of the progress of surgical science to see one surgeon "dividing the muscles of the tongue at its root, cutting at the same time through the linguales, the genio-hyo-glossi, and stylo-glossi muscles, with their blood-vessels and nerves; or cutting a transverse wedge-shaped slice out of the dorsum of the tongue!" Or another surgeon extirpating the tonsils, which may affect the pitch and the quality of the voice, but which can have nothing to do with stammering! Or a third surgeon cutting off the uvula, which is unconcerned in articulation! Now these pleasant operations have all been done, and may be done again and again, under the seductive and perfectly safe (!) influence of chloroform, but what are the results! Let the victims articulate the answer, if they can intelligibly—for I have seen some of them who found this very difficult. For, as I have already noticed in another place, both the uvula and the tonsils perform functions necessary to the perfection of both voice and speech; and if these be removed, the pharynx and glottis are insufficiently lubricated, and are liable to experience, in consequence, more or less irritation, often passing into chronic inflammatory action, as have been demonstrated by cases which have come under my observation, and in which these parts had been extirpated. In other cases, where these effects have not appeared, or where the speech has been without huskiness, or any lesion of distinct articulation, the voice has been so much injured as to prevent attempts to sing.

21. There are several conditions which combine to produce stammering, each being more or less concerned in the morbid effect. The *first* is imperfect vocalization, or an insufficient expiration, owing generally to an imperfect respiration or to the lungs having been nearly emptied of their due quantity of air at the moment of articulation; the *second* is an insufficient force of volition, by which the act of articulation is attempted; the *third* is, generally owing to the foregoing, a want of synchronous and appropriate action of one or more of the parts concerned in the production of voice and speech; and *fourth*, an irregular or spasmodic action of some of the muscles engaged in articulation. This last state is generally, also, a consequence of attempts at articulation being made either without sufficient force of volition, or without due vocalization, or during an insufficient expiration from defect of air. It follows from the above that the chief source of stammering is to be referred to the nervous centres—more especially to the seats of volition and emotion, and to the functional condition of the medulla oblongata.

22. Dr. CARPENTER has justly remarked the analogy between stammering and chorea, the former being sometimes one of the modes in which the disordered condition of the nervous system in chorea manifests itself. "The slightest disturbance of the feelings is sufficient in most stammerers to induce a complete perturbation of the vocal powers; the very fear that stammering will occur, particularly under circumstances which render it peculiarly annoying, is often sufficient to bring it on in a predisposed subject; and the tendency to consensual imitation sometimes occasions stammering in individ-

uals (especially children) who never show the slightest tendency to it except when they witness the difficulty in others."

23. That one or more of the *four conditions* which I have stated to be chiefly concerned in the production of stammering actually exists, will appear from what is observed as to the manner in which timidity, fear, and anxiety affect these conditions, and, by thus affecting them, produce in many persons either stammering or stuttering; although they are not subject to these disorders of articulation in other circumstances. On this topic Mr. BISHOP very correctly remarks: "The emotions which arise in a person when he is about to address an audience are often so overpowering that the voice loses its natural volume, becomes tremulous, and sometimes inaudible, the respiratory functions are irregular, the flow of ideas is impeded, and the articulating organs perform their office so imperfectly, that he who is generally ready and fluent in conversation hesitates, stammers, and cannot utter a single connected sentence. Now if persons, who at other times have a perfect voluntary control over the organs of voice and speech, partially lose it under the circumstances just mentioned, *a fortiori* those who have at all times an imperfect control over their articulation will, in similar states of feeling, find their powers paralyzed, and their speech more than usually defective."

24. But it is chiefly in childhood and boyhood, when the sensibility and the emotional susceptibility are greatest—while the due co-ordination of those movements of the parts which contribute to correct articulation is either being formed, or is in the course of development, or only recently perfected—that stammering either commences or is chiefly manifested. At these ages, and more especially in those children in whom the faculty of speech is slowly developed, or appears only at a later period than usual, the emotions are most likely to disturb the force of volition, and, with this disturbance, the normal exercise of the intellectual, the respiratory, the vocal, and the articulating functions.

25. Whatever may be the cause or nature of the changes in the brain corresponding to the several emotions, they are propagated to the medulla oblongata, and influence the action of the respiratory and the motor nerves of the face, throat, and tongue, as well as other nerves, and through them the muscles they supply. The emotions may thus occasion irregular actions of the parts concerned in articulation: 1st, by causing a momentary spasm or closure of the glottis, and thereby arresting all vocal sound; 2d, by causing irregular action, or by closing the isthmus of the fauces and obstructing the pronunciation of letters and syllables which begin with *guttural letters*; 3d, by the irregular or spasmodic motion of the tongue, the dorsum of this organ being carried backward, or brought into contact with the palate, thereby affecting the *lingua-dentals*, *lingua-palatals*, and *lingua-palato-nasals*, and syllables or words commencing with these letters; and, 4th, by closing the lips and posterior nares, by affecting the pronunciation of the *labials*, and even also of all the other letters. An acute and experienced observer may readily detect the particular cause of obstruction—whether the glottis, fauces, the dorsum or tip of the tongue, or lips.

26. IV. THE TREATMENT of stammering must

be based upon the result of observation as to the seat of difficulty, or obstruction in the organs of articulation. Dr. ARNOTT proposes that all the words should be connected by a vocal intonation, in such a manner that there shall never be an entire stoppage of the breath. But the difficulty is often at the commencement of a word or sentence, especially when the glottis is spasmodically or irregularly affected; and, as MÜLLER contends, this plan cannot do all that is required, as the impediment often occurs in the middle of words, although it may afford some benefit. The most important remedial means is that much insisted upon by Dr. CARPENTER, and this is to study carefully the mechanism of the articulation of the difficult letters, and to practice their pronunciation repeatedly, slowly, and analytically. "The patient would at first do well to practice sentences from which the explosive consonants are omitted; his chief difficulty, arising from the spasmodic suspension of the expiratory movement, being thus avoided. Having mastered these, he may pass on to others, in which the difficult letters are sparingly introduced; and may finally accustom himself to the use of ordinary language. One of the chief points to be aimed at is to make the patient feel that he *has* command over his muscles of articulation; and this is best done by gradually leading him from what he finds he *can* do, to that which he fears he *cannot*." (*Op. cit.*, p. 771.)

27. The circumstance of stammerers being often able to *sing* their words better than to speak them has been explained by the supposition that, in singing, the glottis is kept open, so that there is less liability to its spasmodic action; but, in singing, the velum palati, and the other parts concerned in articulation, are also much less liable to irregular or spasmodic action, they being brought less into action than in articulation. The difference may, however, as Dr. CARPENTER supposes, be due to the direction of the attention rather to the muscles of the larynx than to those of the mouth. One of the most obvious and important objects in the treatment of stammering is the prevention of any emotional disturbance during the act of speech; "and this requires the exercise of the voluntary powers over the direction of the thoughts, in the following modes: 1st. To *reduce* mental emotion, by a daily, hourly habit of abstracting the mind from the subject of stammering, both while speaking and at other times; 2d. To *avoid exciting* mental emotion by attempting unnecessarily to read or speak, when the individual is conscious that he shall not be able to perform these actions without great distress; 3d. To *elude* mental emotion, by taking advantage of any little artifice to escape from stammering, so long as the artifice continues to be a successful one." Having mastered the articulation of the difficult letters, and of the words containing them, and having thus avoided or overcome mental emotion, the patient should practice reading and speaking aloud, slowly, and with due enunciation and intonation, and with a full and free respiration, never allowing the lungs to become too far exhausted of air. Due attention should also be paid to the digestive and excreting functions, and to the improvement of the organic nervous force and of the mental powers, by air, exercise, medical treatment, and diet. Frequent declamation, and reading or reciting aloud such passages as interest the mental emo-

tions, should be practiced as soon as the patient has acquired a complete command over his articulation and over the difficulties which mental emotions have occasioned him.

[Did our limits permit, it would be interesting to trace the history of the treatment of stammering, in this country, from the empirical modes adopted by teachers down to the still more empirical practice of various surgeons, who, following in the footsteps of DIEFFENBACH, severed the muscles at the root of the tongue, removed a V-shaped portion from its substance, or excised the tonsils and uvula, mistaking the temporary relief produced by the strong mental impression caused by the operation for a permanent cure; and this, too, when it is well known that a severe toothache, rheumatic affections of the jaws or face, tic-doloreux, ulcers on the tongue or inside of the lips, and other casualties, will cause a temporary cessation of stammering. The late Dr. C. C. YATES, of New York, was the first to hit upon a philosophical and successful method of treatment. This was imparted to the governess in his family, Mrs. LEIGH, who, in connexion with him, established an institution for the treatment of such cases, which was carried on for many years with very remarkable success. Pupils flocked to them from every part of the Union, and were in most cases speedily cured. Other teachers, instructed by them, established other schools in different parts of the United States, and were equally successful in effecting speedy cures. The result which followed was what might have been anticipated; the cures obtained were so numerous and wonderful, and attended with so much profit to the teachers, that multitudes of other persons soon set up to cure impediments of speech who were totally unqualified, and the system soon fell into disrepute. At present very little is heard of the system, and it would seem to have been generally abandoned. Dr. YATES's method may be found fully and very ably described by Dr. E. WARREN, of Boston, in vol. xxi. of the *Am. Jour. Med. Sciences*, p. 75. One thing is certain, that, although apparent cures are easily made by this system, and appear perfect for the time, there is great danger of a relapse unless confirmed by long habit. In a few cases they will remain permanent, but in a majority, unless the course is persisted in, the difficulty returns. Whatever method is employed for the relief of this affection, in a majority of cases no permanent advantage will be gained unless resolutely persevered in for one or two years.]

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VOMITING AND RETCHING.—SYNON.—

Emecia, Hipp. *Vomitus*, *Vomitio*, *Vomitum*, *Vomitum*, *Evomitio*, *Emesis vomitio*, *Vomituriatio*, *Emesia*, Auct. Var. *Hyperemesia*, Swediaur. *Palmus vomitus*, Young. *Emesis Vomitus*, Good. *Erbrechen*, Germ. *Vomissement*, Fr. *Vomito*, Ital. and Span. *Puking*, *Spewing*.—**RETCHING.**—*Vomendi conamen inane*, *Subversio stomachi*; *Dysemesia*, *Aegritudo ventriculi*—*Ayant envie de vomir*, Fr. *Sich Worgen*, Germ.

CLASSIF. — PATHOLOGY — SYMPTOMATOLOGY AND THERAPEUTICS.* (See Preface.)

* The mechanism of vomiting has been a subject of discussion with both physiologists and pathologists. Three principal opinions have been entertained on this subject. **MAGENDIE** was of opinion that the stomach was passive in the act, and that the contraction of the diaphragm and abdominal muscles on that organ is the sole cause of the phenomenon. "This view was adopted by **RICHERAND**, **ROSTAN**, and **PIEDAGNEL**; while **MARQUAIS**, **MAINGAULT**, **PORTAL**, **TANTINI**, **GRAVES**, **STOKES**, and **HALL** have embraced more or less contrary opinions." **MAINGAULT** attributed vomiting exclusively to a gradual anti-peristaltic movement and contraction of the stomach. **PORTAL** concluded that this act takes place during expiration, consequently during relaxation of the diaphragm. That vomiting may take place without the action of the diaphragm is shown by a case observed by Drs. **STOKES** and **GRAVES**, where vomiting was a principal symptom, but the stomach was found situated above the diaphragm. In a case recorded by **M. LEPINE** (*Bullet. de l'Acad. Roy. de Med.*, 1844), in which the abdominal parietes having been accidentally laid open in the human subject, and the stomach having wholly protruded itself, it was seen to contract itself forcibly and repeatedly, until, by its own efforts, it had expelled all its contents except gases. The relaxation of the cardiac sphincter is essential to the act of vomiting, for its fibres can resist, by their contraction, the combined force of the expulsive muscles. The retchings or fruitless efforts at vomiting are owing to the contrac-

1. **DEFINIT.**—The rejection of the contents of the stomach, with or without retchings, generally symptomatic of visceral or of constitutional diseases, but sometimes occurring independently of these, or of any serious derangement: **RETCHING** is an ineffectual effort to reject the contents of the stomach, or painful contractile efforts, either before the stomach is evacuated, or afterward, and when the stomach is empty.

2. **Vomitings and retchings** are subjects of great interest: 1st, as symptoms of disease; 2d, as a therapeutical indication; and, 3d, as a prominent manifestation, if not a primary or idiopathic state, of serious disorder. The first of these is considered in the article on **SYMPTOMATOLOGY** (§ 130, *et seq.*), as well as in the history of the several forms of disease; the second is partially noticed under the head of **THERAPEUTICS** (§ 40, 43, and 56), and in the eighth class, and the third order of **THERAPEUTICAL AGENTS**. Before, therefore, I proceed briefly to consider vomiting as a chief and prominent affection, requiring to be palliated or allayed, I shall notice the circumstances which appear mainly to require the artificial production of vomiting.

3. **I. VOMITING AS A THERAPEUTICAL INDICATION AND AGENT** has not, in the article just now referred to, owing to the scope and object of that article, been considered so fully as its importance demands. It is more especially required when poisonous or injurious substances have been taken into the stomach; or when the stomach is overloaded by food or drink to a hurtful amount, more particularly when either or both threaten to occasion apoplexy, or any other seizure, or when these attacks actually result from these causes. In all such cases the selection of the emetic should be suitable to the cause and nature of the evil produced, and always be so energetic as to produce a rapid and full effect.

tions of the cardiac sphincter. Vomiting, like other efforts at expulsion of the contents of the natural cavities, is performed by the muscles of expiration, and while the diaphragm is relaxed and pressed up upon the lungs by the action of the abdominal muscles.

The immediate causes, or the physiological pathology of vomiting, may be stated under the following heads: 1st. The contact of irritating, poisonous, or unwholesome substances irritate the ganglial nerves supplying the villous coat of the stomach, and affect the coeliac ganglion and adjoining plexus. The morbid impression or irritation is conveyed to the roots of the spinal nerves and cord by the ramifications of the ganglial nerves to these parts, and is reflected thence, by the motor nerves of expiration, to the abdominal muscles, by what I termed a "reflex sympathy," and Dr. **MARSHALL HALL** long subsequently designated a "reflex function." 2d. Irritations, &c., affecting other parts of the body (as stated § 18, *et seq.*), are propagated by the splanchnic ganglia and plexuses to the stomach, and through them to the spinal cord, and are reflected in a similar manner, by the motor nerves chiefly of expiration, to the abdominal and expiratory muscles. The vomiting which thus occurs I have denominated from reflex sympathy, because it is only occasional or contingent, and not so constant or necessary an effect as to warrant the appellation of a function. 3d. Impressions made on the senses, or violent emotions, may, through the medium of the pneumo-gastric nerves, affect the ganglial centres, and either through these latter affect also, in the way above stated, the spinal cord and motor nerves, &c., or be more directly propagated to both the splanchnic and spinal nerves. 4th. Sea-sickness and vomiting cannot be referred to either of the above categories. They proceed from an impression of an irritating or depressing character—the latter more particularly—made primarily on the semilunar and other splanchnic ganglia and plexuses, and propagated on the one hand to the ganglial nerves of the stomach, and on the other to the ramifications of these nerves to the spinal nerves and cord, thereby occasioning contractions of the stomach simultaneously with contractions of the muscles supplied by the motor expiratory nerves.

4. *a.* Diseases of the *respiratory passages*, especially those attended by spasm, by suffocation, difficulty of breathing, by difficult expectoration, &c., are generally much benefited by a suitable emetic and free vomiting. Croup, whooping-cough, asthmatic seizures, spasm of the larynx, and laryngitis, congestion of the lungs, bronchitis, and bronchial catarrh, are severally relieved by emetics. In most of these, ipecacuanha, in a full dose, is the best emetic; but when there is fever or inflammatory action, the potassio-tartrate of antimony may be given, but if it fail of producing vomiting in a short time, a full dose of ipecacuanha should be exhibited. The sulphate of zinc and ipecacuanha, conjoined with capsicum or other warm spices, are most useful when vomiting is indicated during states of vital depression or exhaustion; and in cases of poisoning by sedatives, narcotics, &c.

5. *b.* The *invasion of fevers*, continued or exanthematous, is often most satisfactorily treated by an active emetic; and, as well as in affections of the respiratory passages and organs, the good effect is enhanced by the free promotion of vomiting, and by exhibiting warm diluents, especially the warm infusion of chamomile flowers, or demulcents. *Agues* and other *periodic fevers*, especially *remittent*, *gastric*, and *bilious fevers*, are also much benefited by initiating the treatment by an active emetic, and by promoting its effects by these means. Antiperiodic and febrifuge remedies, and cholagogue purgatives, exert a more certain effect when they are preceded by free vomiting, artificially produced.

6. *c.* Various *disorders of the digestive canal* are most beneficially treated by procuring free vomiting at the commencement of the disorder or of the treatment. The several forms of *Cynanche* or *Angina*, especially when they embarrass respiration or deglutition, often require a recourse to emetics. In the more malignant states of *Cynanche*, or those characterizing *Scarlet fever*, the sulphate of zinc, or ipecacuanha, conjoined with capsicum or other spices, and promoted by the decoction of senega, and by tonics, stimulants, camphor, ammonia, &c., should be preferred to others.

7. *d.* Some forms of *indigestion*, or those arising from accumulations of mucous sordes, or crudities, and torpid states of the biliary formations, as indicated by a foul or loaded tongue, and by morbid appearances of the evacuations, are often the most successfully treated by commencing with an ipecacuanha emetic. All forms of *dysentery*, inflammatory or sthenic, adynamic or asthenic, acute or chronic, endemic or epidemic, simple or complicated, hepatic or scorbutic, derive benefit from free and copious vomiting, especially when produced and promoted by means suited to the peculiarities of individual cases. Ipecacuanha is, however, the emetic which is most generally applicable to dysenteric affections; and next to it the sulphate of zinc. After a free effect has been procured by means of ipecacuanha, this medicine, so valuable in *dysenteries* and *chronic diarrhæas*, may be continued subsequently, in as large doses as the stomach may tolerate, but preferably in the form of pill, combined with appropriate remedies—narcotics, aromatics, tonics, &c.

8. *e.* *Hypochondriasis* and *melancholia* are sometimes relieved for a time by an energetic emetic, judiciously selected and exhibited. But it ought, in order to be of service, to be followed by medi-

cines calculated to promote the secretions and excretions, and to impart tone and energy to the organic nervous system and to the organs which it actuates, by exercise, change of air and locality, and by travelling and occupations which both employ and interest the mind.

9. II. VOMITING AND RETCHING AS PROMINENT AFFECTIONS, OR STATES OR SYMPTOMS OF DISEASE.—Retching or vomiting may be the most remarkable and distressing symptoms, owing, 1st. To injurious or poisonous ingesta; 2d. To severe constitutional disease, as at the invasion, or in the course, of severe exanthematous or continued fevers, or of pestilential maladies; 3d. To severe functional disorder or irritation, or structural disease of the stomach itself; and, 4th. To sympathy with disease or irritation in some allied or more or less distant organ. The presence of either vomiting or retching, or of both, necessarily induces the physician to inquire, 1st. As to the exciting causes, manifest or presumed; and, 2dly. As to the pathological states to which either or both may be referred.

10. *A.* When a physician is called to a person who has previously enjoyed good health, or who has not complained in such a manner as to indicate a liability to an attack of vomiting or retching, then he should suspect the nature of the *ingesta* as having produced it, and inquire as to the food or drink, or other matters which the patient may have taken; and the matters ejected from the stomach should all be preserved for future examination, if circumstances should arise to require such examination. Where neither food nor drink is the cause, then poisonous matters taken voluntarily or accidentally, or given by others, ought to be suspected, and be carefully and artfully ascertained, and the matters rejected from the stomach carefully preserved and examined by a competent person. If poisonous substances have been taken or given, or are manifested by the character of the vomiting, by the allied symptoms, or by the state of the vomited matters, or by their presence in these matters, the antidotes and other means of treatment described with reference to the individual poisons (*see that article*) will be required.

11. *B.* When the vomitings or retchings are not caused by the ingesta, their *pathological relations* must then receive the necessary attention. In infants and children, as well also in adults, these affections may proceed from hot seasons, owing to bilious or gastric disorder; from a bilio-gastric, continued, or remittent fever; from the invasion of exanthematous fevers, especially scarlet fever and small-pox, and in the former class of patients more frequently than in the latter; from disease of the brain or of its membranes. They may be the invasion of the usual forms of cholera, or of gastro-bilious disorder, during summer and autumn; or the very prominent and urgent symptoms of pestilential cholera; or, in warm climates, of hæmagastric or yellow fever. In these climates, also, they may usher in remittent or other fevers and maladies; and in all these, although most severe and even dangerous, as well as the most prominent manifestations of disease, they are very far from being the disease itself, or even the greatest part of it.

12. *C.* Severe functional disorder, local or constitutional, will occasion vomitings or retchings, as that following dissipation or DRUNKENNESS (§5), and that occurring at the commencement of the

fevers, and pestilential maladies already noticed; but the most distressing attacks of retching and vomiting are often caused by the *motions of vessels at sea*, and by *organic lesions of the stomach itself*. Of the former a more particular notice will be taken in the sequel under the head of SEA-SICKNESS, or vomiting and retching during voyaging by sea; and as to the latter causes, viz., inflammation and structural changes of the STOMACH (§ 22-95), the symptoms now being considered, when arising from these lesions, are duly noticed at that place. To what I have there stated, and to the article on the pathology of the DIGESTIVE CANAL (§ 37-43), I must refer the reader. But there are other remarks which may be adduced at this place calculated farther to elucidate the history of vomiting.

13. i. VOMITING AND RETCHING FROM ORGANIC LESIONS seated in, or implicating the Stomach.—These lesions have been described at the places now referred to; and, among these, *ulcerative perforation of the stomach*, either commencing in this viscus or extending to it from structural changes in adjoining parts, has occupied a conspicuous rank. These perforations may give rise, owing to previous agglutination or adhesion of the opposite serous surfaces, to communications, 1st. Between the stomach and the substance and vessels and ducts of the liver, owing most frequently to abscess in the latter viscus; 2d. Between the stomach and the pleural cavities and lungs; 3d. Between the stomach and pericardium; 4th. Between the stomach and vena cava; 5th. Between this organ and portal vein; 6th. Between the stomach and external surface of the abdomen; 7th. Between this viscus and the gall-bladder; 8th. Between the stomach, gall-bladder, and duodenum; 9th. Between the stomach and duodenum; 10th. Between the stomach and some part of the small intestines; 11th. Between the stomach and the colon; 12th. Between the stomach and peritoneal cavity. Other fistulous communications between parts of the digestive canal and other viscera are met with on rare occasions, and are occasionally attended by vomiting; but they are noticed in their appropriate places. Of the several kinds of perforated communications between the stomach and other viscera now enumerated, the *first* is most commonly the result of abscess in the liver; although it may arise otherwise in rare instances, as in a case which came under my care where the perforation of the stomach extended far into the substance of the liver. The *second* is also most frequently the result of an abscess opening into the stomach. The *third*, *fourth*, *fifth*, and *sixth*, almost in all cases, are referable to perforating ulceration, cancerous or simple, commencing in the stomach. The *seventh* and *eighth* forms of fistulous communication are most commonly caused by large gall-stones in the gall-bladder. The *ninth*, *tenth*, and *eleventh* most frequently proceed from cancerous or simple ulceration commencing in the stomach or pylorus. The last of these lesions are caused chiefly by the absence of adhesion of the opposite peritoneal surfaces, which adhesion takes place in the others, although it is weaker, or more readily separated, in the cancerous or malignant, than in the simple forms of ulceration. Of these forms of fistulous communications between the stomach and other viscera, *gastro-colic fistula* is probably the most frequent. This form has been ably described by Drs. BRINTON and MURCHISON,

and references have been given by them to interesting cases, published in medical journals, and to preparations contained in the principal pathological collections.

14. ii. VOMITING FROM GASTRO-INTESTINAL FISTULA.—The vomiting caused by an abscess in the liver, or by abscess from diseased vertebræ, opening into the stomach, or by a communication with purulent collections in the pleura or lungs, or in any other situation, may be recognised by the history of the case, and by the purulent characters of the rejected matters. When occasioned by cancerous ulceration or growths, the vomitings, with the antecedent and attendant symptoms, are described at the places above referred to. But when perforation of the stomach, either from these lesions, or from other ulcerative processes, takes place, then the vomitings frequently assume distinctive characters, which indicate the nature of the mischief. In cases of *gastro-colic fistula* the matters vomited very frequently indicate, or at least render probable, the existence of lesion from either cancerous or simple ulceration. In a very able memoir on this subject, Dr. MURCHISON has adduced 33 cases, of which 21 were caused by cancer, and 9 or 10 from simple ulceration. As to these he remarks, "that the proportion of cases resulting from cancer is more than double that from simple ulceration; and, as simple ulcer of the stomach is about five times as common as cancer, Dr. BRINTON was not far wrong when he conjectured 'that its proportion in the malignant disease is at least thrice (and probably six to ten times) as great as in the ulcer.' This accounts for the fact that some pathologists, as ROKITSKY and BOCK, speak of it as a result of cancer of the stomach, but make no mention of it under the head of simple ulcer." Had Dr. MURCHISON consulted what I have stated on this subject in the article STOMACH, and in the chapter on "Ulceration and Perforation of the Stomach," he would not have asserted that pathologists "make no mention of it (gastro-colic fistula) under the head of simple ulcer." This may be true as respects the foreign pathologists whom he has referred to; but if he will turn to p. 1008 of the *third vol.* of this work he will find, among other remarks pertinent to this subject, the following: "The ulceration may be cicatrized, as shown in the article just now referred to (§ 39), or it may proceed onward after adhesions have been formed between the opposite portions of the peritoneal membrane, and thus the ulceration may proceed not only to perforation of the stomach, but also to perforation of a contiguous portion of the digestive canal, as the colon, or to more or less ulceration and perforation of another organ;" and I proceed to farther illustrate the subject, and, in the following paragraphs, to describe the commencement and course of ulceration and perforation of the stomach, the several varieties they present, and the symptoms which they occasion.

15. This greater rarity of gastro-colic fistula, as a sequela of simple ulcer, may, according to Dr. MURCHISON, "depend on three causes: viz., the fact that simple ulcer is much more rarely met with in that part of the stomach nearest the colon—the great curvature (in 5 only of 220 cases); and that there is a greater tendency in cancer to contract adhesion to neighbouring parts before perforation; while, at the same time, the cementing matter is of a less permanent quality than the lymph thrown out in the vicinity of a

simple ulcer." The absolute frequency of gastro-colic fistula, as a sequela of cancer of the stomach, can only be approximated. DIETRICH observed this lesion in 6 out of 160 cases, or in 3.75 per cent.; Dr. BRINTON in 11 out of 507 cases collected by him, or in 2.17 per cent. That the ulceration generally commences in the stomach, I have shown in the places above referred to; but I have admitted that it may originate in the colon or other parts, and extend by perforation into the stomach. The cases recorded by Dr. MURCHISON fully illustrate this inference. He remarks that, "Out of the thirty-three cases, there is every reason to believe that the disease commenced in the stomach in twenty-six; in four cases there are not sufficient data for forming an opinion on the point; and in three only does the disease appear to have been most advanced in the colon after death." In cases where tubercular disease or abscess finds its way into the stomach or into both stomach and colon, as in very rare instances, when this result has occurred from disease of the kidney or the gall-bladder, the course of the alteration is manifest.

16. iii. THE DIAGNOSIS of *gastro-intestinal*, or *gastro-colic fistula*, depends chiefly on the characters of the matters thrown off the stomach. The topic is partly discussed, especially as respects the antecedent and many of the existing symptoms, in the articles referred to above; but those phenomena which indicate the presence of this fistula have not been so fully described. Vomiting is always present, although it sometimes recurs only at intervals. It is often preceded, and attended, by fetid eructations, or by bilious, dark, or grumous matters in the ejected fluids. When there is a free communication between the stomach and intestine, the vomited matters generally are more or less faecal. But where the fistula is long or circuitous, vomiting of faecal matters may not, or only occasionally, be observed. Dr. MURCHISON remarks that out of nineteen cases in which the history was clear, faecal vomiting was observed in eleven, and fetid—perhaps faecal—in three; and he draws the following conclusions: "1. Faecal vomiting is probably present in all cases in which the opening (except this be very minute) is situated in the fundus, or great curvature, of the stomach, and may also be present when the disease is in the pylorus. 2. In all cases in which food is vomited the opening is at or near the pylorus, so as to preclude the passage of food." In cases of cancer of the pylorus or duodenum, vomiting may be less after the formation of the fistula than before, as the food in the former case may pass into the intestine, into which the fistula opens.

17. Where gastro-intestinal or colic fistula exists there may be present eructations with a faecal odour, as well as faecal vomitings; or there may be only fetid eructations. Next to faecal vomiting, the presence of undigested food in the stools is an important indication of gastro-intestinal fistula. I have long supposed that at least some of the cases of *hientery*, among the many which came before me at the Infirmary for Children, were actually instances of this form of fistula. As the disease advances, as it usually does, to a fatal issue in the course of several days (although it is sometimes prolonged to some weeks or even months, with intervals of partial ease), diarrhoea with undigested matters in the stools soon after they had been taken, or an occasional recurrence

of costiveness, emaciation, anæmia, general cachexia, or yellowness of the body, as described in the articles already referred to, are commonly observed.

18. III. VOMITING AND RETCHING FROM SYMPATHETIC IRRITATION.—Irritability of the stomach, so great as to be attended by vomiting or retching, on receiving all, or most kinds of food or drink into the stomach, is often occasioned by vascular erythism, inflammation, or organic alterations of an adjoining, or even of a distant organ or part. The vascular excitement of, and determination of blood to the uterus during pregnancy, and the death of the fœtus in utero in the advanced months of gestation, are often productive of vomitings or retchings; and organic and inflammatory diseases of the uterine organs frequently occasion the same symptoms, especially in delicate and susceptible females, or when those diseases are of an acute or severe kind. As may be readily inferred, inflammations and organic lesions of any of the allied or adjoining viscera very often are productive of vomiting, the rejected matters consisting, as in the preceding diseases, chiefly of the ingesta, and of watery, ropy, and mucous fluids, sometimes coloured with bile, unless when congestion, inflammation, or abscess may give rise to the discharge of blood or purulent matter from the stomach, or from adjoining parts, communicating with the stomach. Enlargements, morbid growths, or other lesions, in the liver, spleen, pancreas, mesentery, omentum; disease of the diaphragm, or of the gall-bladder and ducts; misplaced, or suppressed, or retrocedent gout; suppression of urine, or retention of this excretion, verminous diseases, &c., severally occasion vomitings when they reach an advanced stage of development.

19. In some serious organic diseases of the brain, vomitings sometimes occur, and occasion, in both children and adults, in the latter especially, much difficulty in determining the true cause and morbid relations of this symptom, which, however, may be readily ascertained in most instances from the history of the case, and by estimating the succession and grouping of the accompanying phenomena. Diseases of the stomach itself, especially of the pylorus, duodenum, and of the intestines, particularly of the small, of the liver and gall-bladder—more especially when the concave surface of the liver is much affected—and of the kidneys, are frequently attended by vomiting; and when gall-stones irritate the gall-bladder or ducts, or are passing along the latter, the vomitings and pain are then very distressing. The irritation of calculi in the kidneys, or in their pelves, or when calculi are passing along the ureters, produces the same distressing symptoms; but the most urgent and dangerous vomitings occur in obstructions of the bowels, especially of the small intestines, from internal or external strangulation, from intussusceptions, from inflammations, or from various mechanical or structural causes of intestinal obstruction, as shown in various places (see *arts. COLIC and ILEUS, CONCRETIONS, BILIARY AND INTESTINAL, &c.*), more particularly when the vomitings are attended by fetid eructations, and when the vomited matters present a fetid or faecal odour, or a more unmistakable faecal character. In all cases of obstruction, and irritation of any of the ducts and canals within the abdomen, especially when the obstruction is caused mechanically or by a solid

body, the sympathetic occurrence of vomiting is generally very urgent and distressing, although often presenting intervals of comparative ease. In all cases of vomiting and retching, the history of the case should be ascertained as fully as possible.

20. Besides these more strictly local diseases, which are attended by vomitings and retchings, there are several constitutional maladies, especially those adverted to above (§ 18, 19), in which these symptoms are of a most prominent character, and proceed from contamination of the blood, acting both on the frame generally and upon the stomach and its allied viscera in particular. No doubt that in all these maladies, whether the choleric and hæmagastric pestilences, or the contamination occasioning malignant puerperal fevers, or that arising from poisoned wounds, inoculation, &c., the morbid impression is primarily and energetically made upon the organic nervous system, the retching and vomiting often following closely upon it; but nevertheless, this impression being made, the alteration produced in the blood aids it, and promotes both by increasing the depression of the organic nervous force, and by irritating the stomach and adjoining parts, thereby rendering the vomitings of a more serious, dangerous, or obstinate character, as evinced in these maladies.

21. IV. VOMITING AND RETCHING FROM SEA-SICKNESS are common to all persons soon after they feel the motions of vessels on the sea, if they have not acquired an immunity from this suffering by habit.

22. i. DESCRIPTION.—In some, vomiting is preceded by a prolonged nausea, with extreme prostration, faintness, vertigo, and apathy. In others, vomiting takes place more or less quickly, after nausea is first felt; and in many the nausea and distressing retchings, with headache, vertigo, and prostration, continue or return at shorter or longer intervals after the stomach has been completely evacuated, but only if the motion of the vessel continues. When the retchings continue or return after free vomiting, a ropy, mucous fluid, mixed with more or less bile, is evacuated, owing to the emulgent operation of the retchings on the liver, gall-bladder, and ducts, thereby producing a favourable influence on certain diseases noticed hereafter (§ 25).

23. The severity and duration of sea-sickness depend much upon the susceptibility of the individual, and the extent of motion to which he is subjected; and, although generally all persons are liable to sea-sickness on first going to sea, yet its severity and continuance are great in proportion to weakness and delicacy of constitution. Usually, however, the sickness either subsides or ceases altogether in a few days; and in previously healthy persons it is followed by a good or craving appetite, and a return of health, although the cause of the suffering may continue. Many persons who, from frequent or prolonged voyaging, have become exempt from sea-sickness, at least while at sea, experience a recurrence of it when they return to sea, after having passed a considerable time on land; but it is usually of short duration, or slight in these persons. Sea-sickness occurring during a short passage, as in crossing the Channel, immediately ceases with the stillness of the vessel, or on landing, vertigo only remaining for a time. Some delicate persons, who are very susceptible of sea-sickness,

are also liable to nausea and vomiting from the motion of a carriage, especially while they remain inside, but escape from the sickness when they ride outside.

24. ii. PROGNOSIS.—Sea-sickness, although mentally and physically most depressing, and although both vomitings and retchings are most severe, is generally unattended by danger, and it very rarely terminates fatally. When this event takes place, it is more the consequence of the continued nausea, and of the loathing of all kinds of ingesta, owing to their inducing retchings, and of the resulting inanition, exhaustion and fatal sinking, than of any alteration of structure, or contingent lesion, produced by the severity of the retchings. In all cases where this species of sufferings is prolonged by severe weather, and susceptibility or peculiarity of constitution, more or less debility, exhaustion, inanition, anæmia, and loss of flesh are observed; but generally, as soon as the cause ceases, or even considerably subsides, as on the occurrence of fair weather after storms, or on landing, these effects soon disappear, and are often followed by restored health, or even by an improved state of health, owing to the circumstance noticed above (§ 22).

25. iii. THE NATURE OF SEA-SICKNESS has been a subject of frequent discussion. The brain, the heart, and the cerebro-spinal nervous system generally, have been severally referred to as the seat of this distressing disorder. That these are more or less affected during its continuance—that the brain and nervous system are impaired in volition and in the vigorous discharge of all their functions, mental and physical, cannot be doubted; and that the heart acts feebly, although sometimes rapidly, but without tone or vigour, is equally manifest, until the retchings and vomitings occasion more or less reaction, accompanied with perspiration, which varies with the severity of the sickness and the constitution of the patient. But the affection of these—of the cerebro-spinal nervous system and of the vascular and muscular systems, with the organs and parts more immediately concerned in the act of retching—is the necessary result of the effect produced by the motion of the vessel upon the semilunar and allied ganglia, and the viscera they endow with the organic nervous force. This effect continues until retching and vomiting supervene and occasion more or less reaction, according to the constitutional powers of the sufferer. That the primary influence of the vessel's motion on the semilunar and allied ganglia is depressing may be inferred from the distressing sense of sinking referred to the epigastric region, and from the general physical and mental prostration preceding the retchings. That vomiting and retching, each varying in grade and character, follow very powerful depressing influences, is shown by the effects of most sedative and exhausting agents—whether poisonous, morbid, or infectious—which act more especially or immediately on organs or surfaces endowed by the organic nervous force. It may, therefore, be inferred that the vital depression produced by the vessel's motion is the chief cause of the sickness and vomiting, the irritation caused by matters contained in the stomach during this depression merely aiding in developing the retching and vomiting, this act and the evacuation of the stomach affording a slight temporary relief, the depression and sickness still continuing more or less, or for a period, according to

the continuance of the cause, and to the constitution and predisposition of the sufferer.

26. iv. THE REMEDIAL INFLUENCE OF SEA-SICKNESS is sometimes remarkable in several diseases, more especially when the sickness is attended by free vomiting, the appetite returning afterward, and when the patient does not suffer inordinately, or when the suffering is not long continued. In severe *hooping-cough*, especially in persons near or past puberty, and even in infants and children, sea-sickness is often of marked advantage. In this complaint the patient, sufficiently protected from exposure or weather, may be placed in a rowing or sailing boat, when much swell of the sea is observed, and carried out to sea, until vomiting takes place, when a return to land may be directed. In other cases and circumstances, a short voyage in sailing vessels furnishing the requisite accommodations, may be taken with benefit. A similar advantage may accrue in cases of *tubercular consumption*, as I have shown in that article (§ 420); in *hæmoptysis*; in *spasmodic asthma*; in *chronic bronchitis*; probably in some cases of *chronic diarrhoea* and of *dysentery*, when suitable accommodations are afforded, and in *torpid states of the liver*, &c. In these cases, the influence of nausea in lowering vascular action and removing spasm, and the action of retching and vomiting in emulging the biliary apparatus (§ 21), and in evacuating mucous accumulations in the bronchi, are of essential service. By this action, also, congestions of the lungs and liver are removed, or are aided in their removal, and a healthy secretion of bile promoted—circumstances of great importance in several pulmonary, biliary, hypochondriacal, gastric, and intestinal diseases.

27. V. THE RETCHINGS AND VOMITINGS which may be viewed as idiopathic or primary, and which are not necessarily connected with inflammation or structural disease of the stomach and allied viscera, although they ultimately, by persistence in their cause, become thus associated, are those which take place in the morning, and which either recur frequently or habitually, and which the patient generally removes for the time with a glass of brandy, or of brandy and water, or of some other favourite liquor. In these cases, morning sickness is the result of exhaustion from previous over-stimulation, and for a time is merely functional, but sooner or later it becomes more and more structural. The same form of sickness often follows in the morning heavy suppers, either with or without excessive drinking. The circumstance of a person complaining of sickness or vomiting habitually or frequently in the morning, and more especially if he have recourse to spirits to remove it, before any food can be taken, is most positive evidence of such person being an incurable drunkard, although he may never have been intoxicated.*

* The following cases will illustrate this: A young man in a large wine-merchant's house, and having free access to extensive wine vaults, was seized, after habitual sickness and vomiting in the morning, with most violent pain in all the smaller joints, and especially in the wrists and ankles. He came under my care, when he confessed that sickness and vomiting every morning upon getting out of bed had continued for three or four years; that it was instantly cured by a glass of brandy, but that he could take little or no breakfast. As soon as he returned to business in the morning, he continued drinking at intervals sherry or port wine, or brandy, as either came in his way, and he thus took from two to three bottles of wine, besides brandy, every day, unless Sunday, when his supply was not so liberal. He recovered his health,

The form of disorder may be considered as allied to *vomiting from sea-sickness* (§ 21, *et seq.*), the most idiopathic form of vomiting.

28. When the functions of the stomach are exhausted by the excessive excitements of intoxication, or by the irritation of indigestible or unwholesome food, and more especially by the ingestion of substances which readily enter into the acetous, the lactic, or the vinous fermentations, when received in the weak and exhausted stomach, then pain, vomiting, or eructations are produced by the gaseous products, by the acidity, and by the various irritating matters and combinations resulting from the fermenting substances, which, if they fail in undergoing these processes during the imperfect digestion, experience putrefactive changes, and occasion the same, or even more serious and more obstinate disease.

29. When the digestive processes are impaired or exhausted, owing to general DEBILITY (*see that article*, § 15, *et seq.*), or to inordinate muscular or mental exertions, or to local or constitutional disease, the articles of food most prone to undergo fermentation, as bulky vegetables, raw fruits, fermented bread and liquors, &c., produce an increase of disorder, by the fermentation which ensues, and the frequent repetition of such disorder at last passes into more serious disease, which is characterized by recurrences of retching and vomiting, and by gastrodynia, whenever such disease is aggravated by the ingestion, or commixture of fermentative substances. The connexion of fermentation in the stomach with indigestion and vomiting, has been well discussed by Dr. TURNBULL, and although the doctrine of fermentation has been pushed too far by him, there can be no doubt of the importance of giving due consideration to changes of this nature, which certainly take place in the digestive canal, when the nature, the quantity, and the admixture of indigestible, saccharine, and putrescent substances are taken into the stomach during functional or structural lesions of the digestive organs. Persons addicted to the excessive use of intoxicating

relinquished this habit, and he has for very many years been sober and temperate. He never evinced any symptom of disease of the stomach or liver, and he is the only instance I can recollect of a complete reformation from drunkenness.

A cook in my family was always sick and retching in the morning, and could take no breakfast. Her principal meal was supper; soon after which she retired into her own room, and nothing was known of her until she had partly recovered from her sickness and resumed her morning duties. Upon hearing this I became alarmed at the probable consequences of her after-supper indulgence, and means were devised to prevent her apartment from being fastened on the inside, and then she was there found drunk. These cases are not of unfrequent occurrence; but in some instances vomiting is only occasionally present, chiefly in the morning—a chronic diarrhoea, sometimes passing to a fatal dysentery, with diseased liver, taking its place.

Several cases of very young persons, mostly females, who have died from the excessive use of spirituous liquors have been brought under my notice. These were characterized by habitual sickness and retchings in the morning, which were allayed by the accustomed stimulus or by strong tea, but followed, after a longer or shorter period, by enlarged and fatty liver; or by emaciation, chronic diarrhoea or dysentery, with ulcerated bowels; or by the most violent pains in the extremities, of a mixed neuralgic and gouty or rheumatic character, terminating in several of the cases before the age of twenty. In one fatal case, at the age of 17, the growth was remarkably stunted owing to this vice, all the others who had commenced it at an early age being very much under size. In this instance the fatty liver filled almost the whole abdomen, and descended deep into the pelvis, and produced an abdominal enlargement as great as the full period of pregnancy.

liquors experience more or less fermentation in the stomach after the excitement caused by these liquors has subsided; and the products of the fermentation, acting on the exhausted organ, frequently produce that amount of irritation which is manifested by nausea, retchings, vomitings, and gastrodynia, and which the drunkard relieves by a recourse to the accustomed stimulus.

30. VI. VOMITING ATTENDED BY THE DISCHARGE OF THE SARCINA VENTRICULI.—In 1842 Professor GOODSIR described this remarkable production, and since that time many cases of this kind have occurred, most of which have been either observed or referred to by Dr. TURNBULL, of Liverpool. I have not observed more than three instances of this production in the substances vomited since attention was first directed to it, and these occurred in cases of organic disease of the stomach, in which the fermentative and putrefactive processes appeared to have been readily produced. The writer just mentioned has noticed thirty cases of *sarcina ventriculi* recorded by various authors, and has himself observed six. Of these eighteen had terminated fatally. He arranges these cases in four groups: "1. Cases in which ulcers or cicatrices arising from them, or some other non-malignant disease of the stomach, obstructed the pyloric orifice. 2. Cases of cancerous disease contracting the pylorus. 3. Cases in which there was no disease of the stomach itself, but displacement or some other condition obstructing the pylorus. 4. Cases in which the disorder may have been functional, recovery having taken place more or less perfectly." The analysis of these cases furnishes the following: the disease is more common in males than in females, in the proportion of twenty-four to ten, and between the ages of thirty and fifty. Of the three cases which I saw two occurred in confirmed drunkards between forty and fifty-five years of age. In all the cases vomiting was the prominent symptom; flatulent distention, offensive eructations, pain in the stomach, costiveness, emaciation, and anæmia being also present. According to Dr. TURNBULL, the sensation of "something alive in the stomach" was also experienced, but this was not remarked in any of the cases for which I was consulted. Dr. B. JONES found the urine alkaline, and this excretion has, in some instances, contained oxalate of lime and sugar.

31. VII. TREATMENT.—i. TREATMENT OF SYMPTOMATIC VOMITING AND RETCHING.—It is manifest that the treatment of retching and vomiting can only be successfully accomplished by a strict examination of the history of each case, and of its causes, extrinsic and intrinsic; and by ascertaining the particular category of causes to which each individual case should be referred; whether the vomiting has been occasioned, 1st, by the ingestion of an injurious or poisonous substance (see POISONS); 2d, or by the invasion or accession of a febrile, exanthematous, or pestilential malady; 3d, or by disease of the stomach or bowels, or of some adjoining organ or part; 4th, or by sympathy with the irritation or structural lesion of a more remote organ; 5th, or lastly, by the abuse of intoxicating or stimulating liquors.

32. A. If the vomiting be caused by poisonous ingesta, it is obvious that the means advised in such cases in the article now referred to are required, conformably with the evidence obtained as to the nature of the poisonous substance which

has been taken. To this extensive subject I can add nothing to what I have adduced in the article POISONS.

33. B. If there appear any reason to ascribe the vomiting to the invasion of an exanthematous, infectious, or pestilential malady, especially when any such is prevalent or epidemic in the same locality, or when the vomiting is associated with shivering or any of the other symptoms of the invasion of any of these maladies, then the treatment advised for the accession of such malady ought to be adopted. (*See the treatment recommended on the accession of the CHOLERIC, and HÆMAGASTRIC PESTILENCES, of SCARLET FEVER, SMALL-POX, &c.*)

34. It should, however, be recollected that the vomitings accompanying marked vital depression, especially those occurring in, or characterizing pestilential and malignant maladies, and in animal or fish poisons, and in contaminated states of the blood, admit not of being cured, or even mitigated, by depressing or sedative remedies, whether narcotic or anodyne, unless exhibited in small doses, and conjoined with stimulants, aromatics, and cordials. Opium, morphia, and their preparations, hydrocyanic acid, chloroform, and hydrochloric ether, will produce little benefit unless they be given in the manner now stated. In these cases, opium and hydrochloric ether, when judiciously combined with other means, will sometimes be of service; but the hot spices, warm stimulants, and cordials, prescribed in large doses, according to the malignancy of the case, will be found the most efficacious. Thus large quantities of capsicum, brandy, and of other powerful stimulants, have been retained by the stomach in malignant and pestilential maladies, while sedatives and narcotics have been instantly rejected by it; and even the spirits of turpentine have been retained, both in these maladies and in the last stage of low fevers, as well as in similar states of disease, especially when the blood is contaminated and vital depression is extreme. I have seen these effects in numerous instances since 1817, when I first employed these substances in the hæmagastric pestilence or yellow fever. In all these diseases the usual means of allaying vomiting had failed, and increased the vital depression, the sense of sinking and mental apathy, and therewith the vomiting; which symptoms generally terminated in a fatal pumping up, or rejection of the contents of the stomach, without retchings, but often with singultus, when sedatives and narcotics were employed.

35. C. It is obvious that the vomitings and retchings caused by inflammatory and organic lesions of the stomach and allied viscera can be allayed only by means which will remove or alleviate the disease of which the vomitings are merely a symptom. In the less severe of these a temporary aid may be obtained from the use of hydrocyanic acid, from opiates given with oleaginous demulcents and nitrate of potash, or the muriate of ammonia in very small doses, and from external derivatives. But creasote and the more heating substances, often of service in the opposite states of vomiting, are seldom of service in these. In cases of intestinal disease the remarks now made are equally applicable; and where strangulation or obstruction from any cause exist in, or otherwise implicate, the intestinal canal, the removal of it is essential to the removal of the vomiting. (*See arts. COLIC and*

ILEUS, CONCRETIONS, BILIARY AND INTESTINAL, DIGESTIVE CANAL, STOMACH AND INTESTINES, INFLAMMATION AND ORGANIC LESIONS, &c.)

36. *D.* The retchings or vomitings caused by irritation, inflammation, and organic lesions of distant organs require careful examination and discrimination; and although these sympathetic vomitings are often allayed, especially by demulcents conjoined with refrigerants and sedatives, or with hydrocyanic acid, or creasote, opiates, &c., yet the treatment should be mainly directed to the particular disease, or structural lesion, of which vomiting is a distressing symptom, whether it be seated in the brain, in the kidneys, uterus, or other part. When the irritating cause is a calculus, or concretion in the gall-ducts or bladder, or in the urinary apparatus, the means advised for these, under their respective heads, and warm anodyne fomentations, tepid or warm baths, are those which are most appropriate, although these may be conjoined, or alternated, with those which are most serviceable in allaying the vomiting (§ 34). Creasote is often of much benefit, when the stomach itself and its allied viscera are free from inflammatory and organic disease, and when the retchings are purely sympathetic; but it soon fails as a palliative when the primary or chief disease has not received due attention, or when it remains unsubdued. Moreover, creasote, when given in too large or frequent doses, is apt to increase inflammatory action when it exists, especially if it be of a sthenic or plegmonous character. When the vomiting is attended by manifest asthenia, or vital depression or exhaustion, creasote, as well as stimulants, aromatics, and cordials, are frequently very beneficial.

37. *E.* The vomitings, &c., attending pregnancy, especially in the earlier months of this process, will often be palliated or prevented by the above means—by the combination of the alkaline or earthy carbons with infusions of columbo, cascarilla, and with tinctures of the same tonics, and with the addition of hydrocyanic acid, or small doses of opium, or of chlorodyne. In this class of cases fermentation often accompanies the sympathetic irritability of the stomach, and develops this latter state into the act of retching or vomiting. In the more obstinate and severe cases, or when these means prove inefficacious, then creasote in pill or in mixture, combined, according to circumstances, with opiates, alkalies, &c., should be prescribed.

38. *ii.* TREATMENT OF SEA-SICKNESS.—This is a very hopeless subject, yet it is nevertheless one which should not be abandoned, for with care and judgment sea-sickness may be more or less alleviated and its duration abridged. The usual means employed for it are seldom of service and often tend to prolong the nausea, without ultimately preventing the vomiting. It is generally preferable, when the sufferer is young or even moderately strong, to partake of such food and drink as he may prefer, thereby to prevent ineffective retchings; and when free vomiting is accomplished, to take small and frequent doses of a suitable anodyne, in small quantities of fluid. Substances of large bulk, or gaseous fluids, by distending or filling the stomach, generally bring back the retching and vomiting. During the nausea, or even after it is moderated, the stomach is quite incapable of digesting alimentary substances; there-

fore their presence in the stomach acts only as an irritant of the weak and susceptible organ, and in a short time brings back the sickness and vomiting. Having, therefore, promoted a free evacuation of the stomach, in the way now advised, small doses, often repeated, of either hydrocyanic acid, or tincture of opium, or chlorodyne, or of chloroform, or of hydrochloric ether, may be given in small quantities of a demulcent mixture, which may be made agreeable by the addition of a few drops of an aromatic cordial. Creasote has been recommended, but its odour is disagreeable to many persons; but, when prescribed for sea-sickness either in the form of pill, or in a demulcent mixture, it should be given in small doses, or not exceeding half a minim for a dose, which may be repeated according to its operation. The demulcent and anodyne medicines may be given in any of the mint waters, especially when the patient is distressed by flatulence and eructations, and any cordial or aromatic may be added if sinking at the epigastrium or vital depression be experienced.

39. Females and delicate persons, subject to sea-sickness, should retire to their cabins immediately on embarking, if the voyage be likely to be longer than a few hours, or to continue during the night. Unless the sufferer be weak, or extremely depressed by the sickness, retchings, and vomitings, it is generally preferable for him to keep up and struggle against his enemy, as he will be the more likely to overcome ultimately, and to shorten the duration of the attack. If he have any return of appetite after vomiting, it should be indulged in great moderation, the food being the most digestible within his reach; if sickness and vomiting recur, they will generally be of short duration, and be followed by a return of appetite, which, if prudently indulged, will be generally followed by health. This plan is to be preferred if a long voyage, or one beyond three or four days be anticipated; for by that time, or not much longer, the evil will cure itself. It is only for the more severe cases, or in short voyages, or for delicate females and weak persons, that the medical treatment advised above (§ 38) is either much required, or particularly appropriate.

40. *iii.* TREATMENT OF RETCHINGS AND VOMITINGS CAUSED BY DRUNKENNESS AND BY FERMENTING INGESTA.—The drunkard generally knows well how to remove the morning effects of his previous indulgence, and he finds the recurrence to his accustomed liquor, or to one still more energetic, to be the most efficacious remedy. But he counts not the ultimate cost, viz., according to the nature of the liquor indulged in, organic disease of the stomach, pylorus, liver, &c.; or chronic diarrhoea, or dysentery, delirium tremens, &c., often complicated with the foregoing. Safer remedies for retchings and vomitings consequent upon DRUNKENNESS are the aerated waters, the compound decoction of aloes with cinnamon water, creasote in pills or in mucilaginous mixtures, and the means advised in the article now mentioned (§ 15, *et seq.*). When the vomitings are of daily recurrence, it is evident that the only permanent cure is to subject the patient to such restraint as may be legally permitted, seeing that he is incapable of restraining himself. This is, however, one of those forms of moral degradation against which the laws have no provision, and for which medical aid is rarely

of any avail, especially as regards prevention or permanent cure—

"Hic cum hominibus, non cum Diis agitur."

41. Vomitings caused by *excessive fermentation* in the stomach are generally allayed by medicines which either arrest or neutralize the process, or develop the vital force of the organ, or allay excessive irritability of it, or which operate in more than one of these modes. The sulphite of soda, the alkaline carbonates, the carbonates of magnesia or of lime, calcined magnesia, the citrate of magnesia, the sub-nitrate of bismuth, the biborate of soda, are severally of use in these cases, especially when prescribed in conjunction with tonics, stimulants, and anodynes, and sometimes with narcotics. As the fermentation and the vomitings are generally attended by impaired organic nervous force, as well as by irritation of the digestive mucous surface, tonics and stimulants are required for the former morbid condition, while anodynes, especially hydrocyanic acid, or small doses of opium, or of opiate preparations, or of the lupulus, or of hyoscyamus, are appropriate for the latter. In many instances, in addition to a frequent recourse to certain of the above, in varying combinations, other substances which are calculated to remove irritation and to check fermentation, and at the same time to promote a healthy secretion from the stomach, liver, and duodenum, may be given from time to time. Of these the most beneficial are Hydrargyrum cum cretâ, the pilula hydrargyri, and calomel, and these, according to circumstances, may be given in full doses with opium, creasote, the preparations of hop, &c. Small doses of the nitrate of potash, or of the hydrochlorate of ammonia, given with hydrochloric ether, in mint water, &c., are also beneficial in these cases.

42. In all cases of *retching and vomiting*, referable either to the *abuse of intoxicating liquors*, or to *extreme dyspepsia attended by vomitings*, or to *gastric fermentation*, or to *pregnancy*, attention should not be directed alone to the morbid condition of the stomach, for the vomitings or retchings will not be permanently removed, or they will be liable to recur after a time, if the biliary and gastro-intestinal secretions and excretions be not duly promoted. In all such cases, therefore, having palliated the vomitings, a moderate action should be kept up on the bilio-intestinal functions; and the means which I have most frequently employed have been the hydrarg. cum cretâ, or blue pill, or Plummer's pill with soap taken at bed-time, once or twice in the week, and the following draught early on alternate mornings, or every morning, or at bed-time:

No. 379. R Potassæ Bicarbh., gr. xij. ad xvij.; Ammonie Carbonatis, gr. vj.; Tinct. Sennæ Comp.; Tinct. Cardamom. Comp., aa, ʒj.; Infusi Sennæ Comp., ʒss.; Infusi Gentianæ Comp. ad ʒjss. Misce, et sit Haustus.

To this draught may be added, according to the peculiarities of the case, a dose either of hydrocyanic acid or of the extract of taraxacum.

43. iv. VOMITINGS ATTENDED BY THE REJECTION OF THE SARCINA VENTRICULI are generally the result of protracted indigestion, attended either with fermentation or with organic disease, malignant or otherwise, of the STOMACH or pylorus (§ 80, et seq.). In the majority of these cases the means already advised may first be employed, and if these fail, as they often will in this form of complaint, other more energetic medicines should be prescribed, generally in efficient combinations,

viz., camphor, creasote, and small doses of opium, made into pills, with any suitable powder, and with either common tar (pix liquida) or the balsam of Peru. These having been taken for a time, the exhibition of tonics with alkalies, or alkaline carbonates and hydrocyanic acid; or of the sulphites, or the pyroxilic spirit, or limewater, or the chlorides, may be tried, conjoined with preparations of either cinchona or cascarilla bark, or with an infusion or decoction of cedar or pomegranate bark.*

44. v. DIET IN CASES LIABLE TO VOMITINGS, &c.—*Vomitings*, when palliated or removed, present the greatest difficulties as to the selection of alimentary substances. As a general rule, all such as are liable to readily undergo any of the fermentative processes should be avoided. But most alimentary substances undergo one or other of these processes, whether of an acid, or of a putrefactive, or of a saccharine nature, when mixed with the morbid secretion of the stomach, and when the organic nervous force of this organ is much impaired. Still there are aliments which are much less prone to undergo these changes than others, although much depends upon the peculiar idiosyncrasy of the patient. Frequently the food which the patient most desires in these cases, or for which he feels a relish, will be found the most easily digested or retained. Substances which readily undergo fermentation, as fermented new bread, vegetables, raw fruit, the ingestion of varieties of food, and fermenting liquors should be avoided. In this subject, however, I can add nothing to what I have advanced in the article on INDIGESTION. (See § 55, et seq.)

BIBLIOG. AND REFER.—*Hippocrates*, Opp. p. 1080. (*Vom. nigra*).—*Celsus*, l. ii., c. 13.—*Oribasius*, Synopsis,

[* We present some of the *Formulae* which we have found most successful in allaying idiopathic vomiting:

i. R Catechu, ʒi.; Columbo, grs. xxx.; Winter's Bark, grs. xx.; Boiling Water, fl. ʒiv. M. Digest for eight hours; strain, and add Sirup of Red Roses, fl. ʒj. M. In ten-spoonful doses, repeated ʒro re nata.

ii. R Powdered Columbo, ʒiv.; Opium, grs. iv.; Oil of Peppermint, gtt. x.; Sirup sufficient. M. Beat into a mass, and form thirty pills. Give two three times a day in spasmodic vomiting.

iii. R Columbo, ʒss.; Boil in Water, liij. to five fl. ʒ.; strain, and add Carbonate of Potassa, grs. x.; Lemon Juice, fl. ʒij.; Tinct. of Opium, gtt. xii. M. A tea to a table spoonful every hour as an anti-emetic.

iv. R Creasote, gtt. j.; Camphor Water; Comp. Infus. Gentian, aa, fl. ʒvj. M. A tea-spoonful occasionally.

v. R Tinct. of Opium, fl. ʒss.; Decoct. of Starch, fl. ʒiv. M. For an enema in obstinate vomiting.

vi. R Burgundy Pitch, ʒij.; Yellow Wax, ʒss.; Powdered Cinnamon, ʒvj.; Oil of Pimento; Oil of Lemons, aa, ʒij. M. Melt the resin and wax together, and strain; when they begin to thicken, on cooling, mix in the cinnamon previously rubbed with the oils, and make a plaster. This plaster over the stomach will very generally relieve nausea and vomiting, and relieve gastric uneasiness when nausea is not present.

vii. R Bicarbonate of Soda, ʒjss.; Powd. Gum Arabic, ʒij.; Oil of Mint, gtt. iv.; White Sugar, ʒj.; Carbonic Acid Water, ʒiv. M. A table-spoonful occasionally; very useful.

viii. R Powdered Ipecac., grs. ij.; Carb. of Soda, grs. x.; Sirup of Popples, ʒj.; Mint Water, ʒvj. M. In tea-spoonful doses, to check spasmodic vomiting.

ix. R Infusion of Spearmint, fl. ʒvj.; Burned Brandy, ʒj.; Paregoric, ʒij.; White Sugar, ʒss. M. A table-spoonful every fifteen minutes.

x. R Bicarbh. Potassa, ʒj.; Powd. Gum Arabic, ʒj.; White Sugar, ʒij.; Seltzer Water, ʒvj.; Tinct. of Camphor, gtt. xi. M. A tea-spoonful frequently.

A strong mustard cataplasm over the epigastric region will often prove more successful than any internal remedies. These cases, however, must not be treated empirically, but always in reference to the pathological cause.]

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[AMER. BIBLIOG. AND REFER.—See various American Treatises on the Practice of Medicine, already so often quoted; also American Journ. Med. Science, vol. viii., p. 242, &c.—N. York Journal of Med., vol. ii., p. 167: Review of Langston Parker, "The Stomach in its Morbid States," &c. See ref. to art. on INDIGESTION.]

WORMS—VERMES—VERMINATION—ENTOZOA (from ἐντὸς, within; and ζῶον, an animal). Σκωλήκωσις, ἐλμινς vel ἐλμυνς, Gr. Ἑλμινθολογία, Ramsay. Verminatio, Pliny. Helminthia, Good. Helminthologia, Helminthiasis,

Swediaur. Parasitismus intestinalis, Young. Vers, Fr. Würmer, Wurmsucht, Germ. Vermi, Ital. Worms, Invermination, Intestinal Worms, Animal Parasites.

CLASSIF.—I. CLASS, I. ORDER. (See Preface.)

1. DEFIN.—Animal parasites are independent organized beings, descended from peculiar animal parents, which require, in order that they may be enabled to complete their development, growth, or reproduction, to take up abode either constantly or temporarily in or upon a second animal organism of a different kind, from which they also derive their nourishment. Human parasites are those which select the human body as this second organism.

2. The above definition is a modification of that given by Dr. KÜCKENMEISTER, in the very able translation of his work *On Animal and Vegetable Parasites*, by Dr. LANKESTER. LEUCKART (*Parasiten und Parasitismus*, in VIERTOT'S Archiv, 1852) remarks, that whenever "an animal is too small and too imperfectly armed to overcome and destroy another living being upon which its instincts direct it to seek for nourishment, it must be contented with robbing it, by feasting upon its blood, juices, and solid parts." As respects the human body especially, it would be more correct to state that, whenever the vital force of this body is reduced by disease, inanition, and exhaustion, it is then exposed to the invasion of those parasites which are peculiar to it; and that these parasites are developed and multiplied with a rapidity generally in proportion to the diminution of vital force or of vital resistance to their invasion and multiplication. The only animal parasites which appear in or upon the human body belong to the classes of insects and worms, and probably also to the infusoria. "As far as we know, these parasites of man are not subject to the attacks of secondary parasites." Many of them are common to man and other mammalia, while others are peculiar to him.

3. It has been very justly remarked by Dr. LANKESTER, in his excellent and instructive preface to the work just referred to, that the study of animal parasites involves questions of the highest scientific and practical interest, and that it teaches that, though scientific theories may sometimes be barren of immediate practical results, they cannot fail to free the mind from prejudices which lead to erroneous practice, and even to disastrous results. On this ground, therefore, he refers to some apparently of the least practical topics, with the hope of assisting the reader to understand those generalizations which the subject of animal parasites involves. But however barren the consideration of the generation and reproduction of organic beings may at first sight appear to be, it is of the utmost importance in respect of its ultimate or practical results; and Dr. LANKESTER has done medical men a great service in furnishing them with a succinct and correct summary of the results of the recent researches of Dr. KÜCKENMEISTER and others as to this subject, especially as regards the history of the human entozoa. Dr. LANKESTER justly remarks that, although it was easy to account for the existence of intestinal worms, by referring it to the ingestion of their eggs, yet a difficulty presented itself regarding hydatids, which evidently had an independent animal existence. Hydatids exhibited no sexes, they produced no eggs, and readily supported the theory of "spontaneous, or equivocal generation." Even as this theory was driven successively from

every other part of the animal and vegetable kingdoms, it "found refuge among the strange and paradoxical creatures imbedded in the tissues of man and other animals, far removed from any external influences." The time has, however, at length arrived when it can be demonstrated that the cystic worm is no longer to be regarded as the result of a "fortuitous concourse of atoms," but that it is the offspring of the tape-worm, undergoing one stage of its growth, through which it must pass before it can attain to the more dignified development of its parent. In many cases the cystic worm has the power of developing, at this stage of its growth, a large number of creatures resembling itself, and these have, each of them, the power of developing themselves into tape-worms. "The cystic worm—let it be an *Echinococcus*—has originated from the egg of a tape-worm, the embryo of which has found its way from the stomach and intestines, through their walls, into the tissues of the body. This worm consists of a vesicle or bag, to which is attached a head, called the 'scolex.*' In *Cysticercus*, the hydatid of the pig, there is but one scolex, but in *Echinococcus* there are many scolices. Now this scolex, or scolex-head, as it is sometimes called, is the stock or germ—the head—from which all the segments of a tape-worm proceed. The cyst of *Echinococcus*, then, has the power of producing a large number of these heads, each of which may grow into a tape-worm. The cyst—the original cyst of the worm—is, in the language of STEENSTRUP, 'a nurse.' KÜCKENMEISTER and the Germans call it a mother cyst. But this cyst will produce not only scolex-heads, but other cysts like itself. These are 'daughter cysts;' and these secondary cysts will also produce scolex-heads. They are also 'nurses;' and in virtue of their existence the mother cyst becomes, in the language of STEENSTRUP, a 'parent nurse.' The second cyst may contain, as it frequently does in the *Echinococcus altricipariens* of KÜCKENMEISTER, a third cyst—a 'grand-daughter cyst,' which is also a 'nurse,' and thus on." (LANKESTER, in *Preface to his Trans. of KÜCKENMEISTER, &c.*)

4. Neither these cysts nor scolex-heads have any sex. Nor do they acquire sexuality as long as they remain in the flesh in the hydatid condition; and to this state of the worm Professor HUXLEY applies the term "*agamozyoid*." In order to acquire the conditions necessary to the development of sexual organs, the cystic form of the worm must be followed by another animal. "The scolex-head then becomes, in its turn, truly a 'nurse,' and this of a most prolific kind; for, the cysts below being displaced, the numerous segments ('proglottides,' as they have been called) begin to make their appearance. The conditions are now such, that sexes appear; each segment is merely a capsule containing a male and female generative apparatus, and nothing else. Eggs, the result of the union of sperm-cells and germ-cells, are now produced in myriads. These pass into the external world, and, being swallowed and digested, set free the embryos, which again

become cystic, as above described." (*Op. cit.*, p. xiii.)

5. These phenomena are not peculiar to *entozoa*. STEENSTRUP observed them in the *medusa*, the claviform polypes, the salpæ, and the trematode entozoa. Professor OWEN has also adduced similar cases, in the exposition of his views on "Parthenogenesis," or the successive production of procreating individuals from one ovum, or asexual reproduction. Not only are there some among the lowest animals, in various stages of development, capable of producing buds, or individuals like themselves, without sexual union, and embryo-bearing eggs, but there are also among the *articulata*, both in the *crustacea* and *insects*, females producing eggs, which proceed to the development of perfect animals without any sexual intercourse, or union of sperm-cells and germ-cells. Such a phenomenon is so opposed to the general opinion as to the necessity of sexual intercourse for the development of the embryo in the higher animals, that many have not hesitated to express their disbelief in it. Dr. LANKESTER thus expresses himself respecting it: "Regarding, however, the phenomena of reproduction from the point of view afforded us by the *entozoa* and other forms of lower animals, we must receive the facts in both cases equally cautiously, and judge according to the evidence. VON SIEBOLD, in his work on 'True Parthenogenesis,' affords good evidence for believing that the queen bee deposits two kinds of eggs, the one of which has come under the influence of the sperm-cells of the male, and the other not. A very curious point in this history is the fact that while both eggs produce young bees, the impregnated eggs produce worker or female bees, while the unimpregnated eggs produce male or drone bees. In a recent communication to the Royal Society, Mr. LUBBOCK has shown that species of the entomostreous crustaceous genus *Daphnia* produce living young in all respects like their parents, without any sexual intercourse. It would appear, then, that up as high as the most developed forms of articulate animals, we have evidence that there is no real difference between the functions of reproduction and generation."* (*Op. cit.*, p. xiv.)

6. I. THE ORIGIN OF ANIMAL PARASITES, more

* Dr. LANKESTER, for the better understanding of these and other general remarks he has offered, has subjoined the following diagram:

GENESIS.		
Growth.	Reproduction.	Generation.
HOMOGENESIS.		
(Reproductive force acting through similar cells.)		
It is represented in—		
A. Plants, by Phytoids.		
1. Isophytoids.		
Buds.		
2. Allophytoids.		
Bulbills.		
Bulbs.		
Sporules, &c.		
B. Animals, by Zooids.		
1. Isozooids.		
Gems or buds.		
2. Allozooids.		
"Nurses" (Steenstrup).		
"Agamozooids" (Huxley).		
"Virgin Aphides" (Owen).		
"Agamic eggs" (Lubbock).		
"Drone bees" (Siebold).		
HETEROGENESIS.		
(Reproductive force acting through dissimilar cells, sperm-cells and germ-cells.)		
It is represented in—		
A. Plants, by		
1. Gynophytoids.		
Female flowers.		
Fistillidia, &c.		
2. Androphytoids.		
Male flowers.		
Antheridia, &c.		
3. Androgynophytoids.		
Hermaphrodite flowers.		
B. In Animals, by		
1. Gynozooids.		
Females.		
2. Androzooids.		
Males.		
3. Androgynozooids.		
Hermaphrodites.		

* The word "Scolex"—σκόληξ, Wurm, or Spulwurm, Germ., or round worm, was employed by MÜLLER to designate, generically, imperfectly-developed forms of tape-worm. "The head was the most characteristic part of these creatures, and gradually the term 'scolex' was applied to the heads of all forms of cystic or tape worms. The term *scolex* has now no generic signification, as the creatures to which it was applied were immature forms of other genera." (LANKESTER, in *Preface, &c.*)

especially of the worms which often infest the human body, has long been a subject of speculation among naturalists and physicians. One class of writers believed that these parasites, at least many of them, originated in the endowment of animal molecules with vitality from the parent body, favoured by certain states of the vital forces of that body, the states originating their organization also promoting their growth and propagation. Since the progress of microscopic research consequent upon the improvement of our instruments, this doctrine, which till then had been gaining ground, has received a signal overthrow, chiefly at the hands of German helminthologists. VON SIEBOLD, one of the most recent and of the ablest of these, remarks on this topic, "that he has gradually arrived at the conclusion that these parasites do not originate by 'equivocal generation' from substances of a dissimilar nature; and physicians and naturalists thought themselves justified in assuming that the parasitic worms in the intestines of men and animals owed their origin to ill-digested nutriment, or that they were developed in the most widely different organs from corrupt juices. They took it for granted that certain morbid processes in any organ were competent to give rise to parasites, assuming that the elementary constituents of an organ affected by disease, separated themselves from their natural connexion, and not perishing, but transforming themselves into independent organisms, became parasites. It was certainly more convenient thus to speculate than to endeavour to attain, by patient researches and careful experiments, a secure insight into the hidden workings of nature. It was by the latter method that the hitherto unanticipated development of the sexual apparatus was discovered in many parasites, such as round worms, thread-worms, tape-worms, and flukes, in which such an immense mass of eggs and young can be generated, that it seems unnecessary to look farther for their origin. As to tape-worms, it is well known that a single individual is often composed of many hundred joints. Each joint is capable of laying many hundred ova, so that the number of the progeny of a single tape-worm is enormous. Dr. ESCHRICHT, of Copenhagen (*Das Physische Leben in Popularen Vorträgen*; Berlin, 1852; p. 112-115), possesses a tape-worm expelled by a patient of his, which consists of 1000 joints; and some of the joints contain more than 1000 ova. According to this writer, a careful examination of the reproductive organs of a female *Ascaris lumbricoides* shows the number of ova to be innumerable." (VON SIEBOLD, *Op. cit.*, p. 4.)

7. The precise mode in which such an immense brood of these parasites make their way into the interior of animals was long imperfectly understood. It was, however, ultimately ascertained that intestinal worms undertake emigrations in order to reach that animal whose organs are fitted by nature for their habitation. VON SIEBOLD states that the young of the tape-worm (which inhabits the intestine of the higher animals only) "leave the place where they were brought forth, or laid as eggs (that is to say, they emerge from the intestine of their parent's host), and seek an opportunity to enter into the intestine of some other creature. It is easy to convince one's self of the emigration of the tape-worm, by examining the excrement of animals infested by them, at those times of the year at which they attain their

sexual maturity. We then observe that sometimes single joints, or connected series of joints, full of ova, sometimes immense masses of the ova, are passed with the fæces. The same thing holds good with regard to the ova of the *Distomata* that infest the livers of our ruminating animals; their eggs, after they have been transferred from the liver to the gall-ducts, being washed out with the bile into the intestine, and evacuated with the dung. These emigrations of the young of the intestinal worms benefit not only the creatures they infest, but themselves. There are many kinds of intestinal worms in whose eggs the embryo is never hatched, if they remain in the place where they have been laid."

8. The description (German like) given of the accidental but frequent ingestion or passage of the ova of parasites into other animals, and the dignifying of this passage into an emigration, as if it were an act of instinct, imparts an air of imagination to what is nevertheless the fact of the frequency of this passage, and of its consequences. This writer states that these parasites "must wander to some other place in order to develop their young, or to allow of the escape of the young already developed in them. These young must then either wait for, or seek, an animal to lodge in, having entered into which, they are capable of attaining sexual maturity. By such emigrations the infested animals are at the same time freed from guests whose increase would be both troublesome and prejudicial. For example, what would happen if the millions of eggs that a single round worm or tape-worm can produce were developed and generated in the same intestine in which they were laid? Would not the intestine, after the young had attained their full growth, and brought forth others in their turn, become at last so choked up as to disable this part of the digestive apparatus, so that the whole organism of the unhappy animal must perish along with his parasites?" (*Op. cit.*, p. 5.)

9. These emigrations and immigrations of the young of intestinal worms, or, in less imaginative language, this discharge and passage of their ova from and into other creatures, are very important, though long an unregarded part of the history of their propagation; and numerous facts have been discovered showing that the origin of intestinal worms in the viscera of animals can be readily accounted for according to natural laws, without recurring to the mysterious hypothesis of "equivocal generation." An important circumstance favourable to the preservation and passage of the ova of parasites into animals in which they become developed is the hardness of the shells which envelop them. Owing to this the germ or embryo of many of them are protected from external injury, and their vitality preserved for many months, and until circumstances admit of their development. After leaving the dwellings of their parents the ova pass into privies, drains, dust-heaps, &c., where, surrounded by more or less moisture, and subjected to various grades of temperature, and contained in manures, and spread on fields and meadows, they are, either in the state of ova or in that of more advanced development, taken with various articles of food into other animals, or they are washed by rains into streams or brooks, and are swallowed in the drink. Many of the young intestinal worms, according to VON SIEBOLD, more or less developed, but still enclosed in their egg-shells, remain quite

inactive in their passive emigrations, and it is of course a mere chance whether they reach their goal or not. The young of others, having left their egg-shells, may take a more active share in the process, creeping out of their holes and corners in wet weather, or in damp mornings, upon plants or grass, and enter animals suited for their habitation and development with the food. By preventing sheep from being driven out in the morning till the dew is off the grass, or from grazing in wet swampy pastures, these animals are so far protected from *Strongyli* and *Distomata*. The origin of the thread-worm, known as the *Filaria insectorum*, that lives in the bodies of adult and larval insects, could not be accounted for, and was referred to equivocal generation; especially as they contained no trace of sexual organs. But VON SIEBOLD ascertained that they were not true *Filaria*, but belonged to the peculiar family of thread-worms, comprising the genera *Gordius* and *Mermis*; and that these parasites wander away when full grown, boring their way from within through any soft part of the body of their host, and thus creeping out. "These parasites do not emigrate because they are uneasy, or because the caterpillar is sickly, but from that same internal necessity which constrains the horse-fly to leave the stomach and intestine of the horse where he has been reared; or which moves the larva of the gad-fly to work its way out of the boils on the skin of oxen. The larvæ of both these insects creep out in order to become chrysalises, and thence to proceed to their higher and sexual condition." Now this desire to emigrate is implanted in very many parasitic insect larvæ, and the perfect full-grown, but sexless thread-worms of insects, are in like manner moved by this desire to wander out of their previous homes in order to enter upon a new period in their lives, which ends in the development of their sexual organs.

10. As some kinds of parasites that have emigrated are never met with below a certain size, so some kinds that have already made their way into the interior of animals are not to be found under a certain size. It is known that many parasites do not enter into the animals in which they are to pass through their farther stages of growth, until they have attained a certain degree of development elsewhere. This is particularly the case with such intestinal worms as remain parasitic in the last stage of their existence, viz., that of sexual maturity, while the *Gordiaceæ* quit their parasitical life, in order to become sexually mature away from the animal they have infested. During these early wanderings, the worms in question, VON SIEBOLD remarks, commonly undergo a change of form, often accompanied by other phenomena of so highly remarkable and abnormal a character as to render their metamorphosis or phases of existence almost incomprehensible. By degrees a mass of observations of remarkable metamorphoses of intestinal worms accumulated and formed a complete chaos of seemingly irregular phenomena, until the Danish naturalist, STEENSTRUP, succeeded in evolving a certain order out of this confusion, by the discovery therein of a hidden underlying law of nature, by which all the phenomena that had seemed so devoid of plan could be reduced to order. He named this law the "*Alternation of Generations*," and advanced two points of difference between it and *metamorphosis*; the first is,

that the young of those animals which come under the former term are not only unlike their parent at first, but remain so; the second distinction is, that this young generation, so dissimilar to the parent animal, brings forth new creatures, which either themselves or their descendants revert to the original form of the first parent. Whereas, in simple metamorphosis, the dissimilar young pass by gradual changes into the likeness of the parent animal, and until this metamorphosis is complete are incapable of generation. Thus in the alternation of generation the parent animal produces dissimilar young, which STEENSTRUP terms "*nurses*," whose descendants only take her form. "A most important circumstance which characterizes these *nurses* or '*Agamozooids*' physiologically is, that they bring forth young without themselves possessing any real sexual apparatus. Those agamozooids, in fact, multiply by division, by external or internal gemmation; they develop within their bodies germs which become new creatures. But these germs do not deserve the title of eggs, nor is the place where they are developed to be called an ovary, since the germs which VON SIEBOLD distinguishes by the name of '*sporulae*' are not only devoid of the ordinary constituents of an ovum, a vitelline membrane, yolk, germinal vesicle, and so-called germinal spot; but the farther development of the germ-body is not preceded by those conditions which are essential to the development of true ova within an ovary. The organ in which, in certain agamozooids, the '*gemmae*' are formed, cannot, therefore, be properly termed an ovary, and I shall distinguish it by the name of '*sporularium*.' No '*nurses*' present any sexual distinctions, and hence their method of multiplication and propagation, which takes place by means of sporulae formed within sporularia, or by ordinary budding, or by division, must be arranged amid the modes of asexual reproduction." (VON SIEBOLD, *Op. cit.*, p. 13, 14.) I must refer the reader to what this writer farther remarks on the topic of alternation of generation, especially as it occurs among the *Trematoda* and *Cercariae*.

11. From his researches, VON SIEBOLD infers that certain sexually matured Trematoda—*Monostomum*, *Distomum*—generate young within their sexual organs, which are not developed into sexual individuals similar to their parents in form and structure; but that each embryo is converted into an animal of remarkably different form—into a *Cercaria*-sac, which has the nature of a sexless nurse, since, without possessing sexual organs, it nevertheless generates young *Cercariae*. These *Cercariae* again differ from their parents, but gradually become sexually perfect, and in form and structure take the likeness of their grand-parents. If we follow these *Trematoda*, which are subject to the alternation of generations, in their wanderings, we shall find that they meet with many obstacles to the completion of their developmental course, which is the entering into the viscera of an animal in which they can become sexually developed. The destruction of the various forms of *Trematoda*, by the untoward circumstances to which they are liable, is compensated by the fact that they are furnished by the alternation of generations with the means of greatly multiplying the various developmental stages of their descendants—a sufficient number of individuals always remaining out of the numerous young of the

nurses and larvæ, which achieve the propagation of their species.

12. The history of the *Cercariæ* explains many phenomena erroneously interpreted by the supporters of the doctrine of equivocal generation. It was difficult to understand how living entozoa could have originated in the viscera of animals, sometimes in organs deeply seated or cut off from all external communication, and could there propagate their kind; the mode of origin—by equivocal generation—assumed for them apparently accounting for the circumstance of these entozoa being unprovided with sexual organs. Frequently, also, young or imperfectly developed intestinal worms were met with in the substance of organs, and were attributed to equivocal generation, "though in reality these entozoa were in the act either of emigrating, or immigrating, or else were tarrying until the creature they infested should be swallowed by some other animal, when the passive immigration for which they waited would take place. Many wandering parasites are unresistingly suffered to bore their way into and remain in the organs of animals, while certain kinds are stopped by becoming enclosed in a coagulable lymph thrown out by the organs they traverse." There are two kinds of cysts connected with parasitic worms: in the one the cyst is thrown out by the parasite itself, as in the case of the *Cercariæ*; in the other, the organ in which the encysted parasites lie imbedded furnishes the walls of the cyst. In such cysts or capsules are found the most diverse kinds of intestinal worms, whose farther course may be very various. "Many of the encysted young of intestinal worms experience no farther change, but only remain for a longer or shorter period until such time as they may, together with their host, pass into the intestine of some animal of prey suitable for their future development. To this kind belong the *Cercariæ* already mentioned. There is also a small, imperfectly developed, round worm, hitherto always erroneously described as a perfect intestinal worm, under the name of *Trichina spiralis*, which remains a long time in its cyst without either growing or developing sexual organs. This minute *Trichina spiralis* is met with not only in the substance of the muscles of man, but also in the pleura and peritoneum of the most widely different kinds of vertebrate animals, enclosed in oval capsules about a quarter of a line in length." After a certain time of confinement is allotted to this little worm, and its deliverance not effected, it dies and undergoes a process of calcareous degeneration, its form being altered or entirely destroyed. Other encysted intestinal worms succeed in obtaining nourishment through the walls of their prison, and thus go on growing. Those, however, which are intended by nature to attain their sexual maturity only in the digestive organs of certain animals cannot arrive at this condition in their cysts, and must, notwithstanding their farther growth, fail in the attainment of the power of sexual propagation, until the animal they inhabit is devoured by the predaceous creature whose intestine is alone fitted to allow of the passage of these asexual intestinal worms into the last stage of their development. (VON SIEBOLD.)

13. From what has been stated we gather that those young intestinal worms which are developed at a distance from the nidus of their parents succeed, in the end, in reaching those situations

where they may repeat the part of their progenitors, and reproduce their kind. The embryo parasites that have only just left their eggs disperse in all directions, so that they may immigrate into other animals, whenever an opportunity offers. Many thousands of these embryos of necessity never attain their object, owing to the numerous casualties they are liable to. However we may accept the facts displayed in the researches of VON SIEBOLD and others, it by no means follows that the emigration or immigration of these parasitic animals is the result, as they suppose, of instinct. The parasite having arrived at the full stage of sexual development produces numerous ova, many of which necessarily are so circumstanced, by situation, dissemination, &c., as to admit of their passage through the different phases and metamorphoses of evolution and development; but that these changes, and the emigrations resulting from the circumstances common to all or most of them, admit of the inference that instinct has any thing to do with the phenomena; or that their temporary or continued residences, their journeys or passages from one place or animal to another—their migrations, &c., proceed from their possession of this endowment or principle, or that their migrations and residences are otherwise than altogether passive, cannot be received or credited without farther evidence. But, after thus stating a disbelief of the instinctive faculties of these parasites, the facts connected with their propagation and evolution become practically of importance.*

14. Instead of viewing the migrations of the embryo or young parasites as passive, and the accidents connected therewith as equally so, VON SIEBOLD considers the former as altogether instinctive, and the latter as stray migrations. But, while altogether disbelieving that instinct has any thing to do with the matter, this writer's views deserve consideration. The point of most importance, he remarks, is "that these embryos should select, as their temporary residence, such creatures as will be consumed by those animals, whose intestines served their parents as a habitation and birthplace for their young. But many of these young, immigrated, intestinal worms will die without reaching the last stage of their development, in consequence of their host and involuntary carrier escaping from his natural enemies. Again, many embryos will be led astray

[* If we understand by the *instinct* of animals that unknown faculty or endowment implanted in their constitution by the Creator, by which, independent of instruction, observation, or experience, and without a knowledge of the end in view, they are impelled to the performance of certain actions tending to the well-being of the individual and the preservation of the species, there is as much reason to believe that the minutest organisms in nature are as perfectly controlled by it as the largest. That it is not infallible in either is evident from the fact that both are sometimes at fault, and commit mistakes; but then these errors are quite as frequent among the one class as the other. Indeed, facts would seem to establish that insects, and even worms, are endowed with a much more exquisite and flexible instinct than the larger animals. Such pliability to circumstances, such adaptation of means for accomplishing an end, as is observed in the bee, the spider, the ant, the silk-worm, the moth, the caterpillar, the locust and its larvæ, &c., can nowhere be found among birds, fishes, or any of the higher species of animals below man; and the same remark, we think, will apply to human entozoa and ectozoa in all their varied conditions and modes of existence. No one can read "An Introduction to Entomology," by KIRBY and SPENCE, one of the Bridgewater Treatises, without being convinced that instinct is more strikingly manifested in the insect tribe than in any other class of animated nature.]

by the migratory impulse (!), and pass into animals which never become the prey of those whose digestive canal is their goal." The embryos which thus "fail in their object" are here viewed as "strayed parasites;" and VON SIEBOLD remarks that "the *Trichina spiralis*, which is found in human beings, and which must be regarded as an encysted sexless nematoid worm, can hardly have found its way into the muscular structure of man, except by having gone astray: so also the *Cysticercus cellulosæ*, which not unfrequently appears in the muscles and other organs of man, and which is an asexual tænioid agamozoid. The *Cysticercus cellulosæ* changes to a sexual tape-worm in the intestinal canal of certain mammals; the *Trichina spiralis*, after transportation to another and more favourable situation, will also become sexually developed." Many of the young of the intestinal worms, which only attain the last stage of their development in the digestive canal of the *vertebrata*, are said, by this writer, to pass, in the course of their wanderings, into the wrong organs [their instincts, I may infer, have not yet been fully developed or perfected!]; for instance, into the muscular substance, the liver, or the peritoneum; here they remain undeveloped, while other individuals of the same brood, which have found their way into the intestines of the same animals, arrive at maturity. "The *Trienophorus nodulosus*, infesting fishes, offers an example of this, developing into a long sexually mature tape-worm, in the intestines of pikes and perch, while at the same time these fishes often harbour other tape-worms, which are, however, always sexless, in cysts in their liver. These last must certainly be also regarded as strayed parasites."

15. VON SIEBOLD believes that, in the bodies of vertebrate animals, the small embryos of intestinal worms bore their ways not unfrequently through the walls of the blood-vessels, and fall into the current of the circulation, and are carried thus to distant parts. Embryos of intestinal worms, to which the term of hæmatozoa has been given, have often been discovered in the blood of birds, reptiles, and fishes. These hæmatozoa never increase in size, nor become farther developed in the blood, but often stick in the small blood-vessels of organs, which afford a more congenial soil for their farther growth; and hence appear, on some occasions, worms in the brain, in the spinal marrow, and in the eyeball of man and animals. The *Cysticercus cellulosæ*, the *Cœnurus cerebralis*, and the *Echinococcus hominis* and *veterinorum*, have been occasionally found in these situations, and have served as an argument for the doctrine of equivocal generation; [also the *Filaria*.] "With the migrations and alternation of generation among the intestinal worms two other phenomena are connected, which were formerly quite unnoticed, but which now have been generally observed. In the vicinity of those sexually perfect intestinal worms which, in their wanderings, are subject to the alternation of generations, only eggs, or recently-hatched embryos, are met with; but the farther stages of development are always wanting, since they first make their appearance after the emigration of the young to other places. Farther, many of these intestinal worms, taken while in the act of migrating, are never found below a certain size, since they do not commence their wanderings, either as nurses or larvæ, until they have already

reached a certain stage of their development." (*Op. cit.*, p. 30.) Would it not be more correct to view these evolutions of parasites from germs and ova, and their passages, or passive migrations, during their development, as accidents connected with the numbers generated, and with the locations and transitions of the embryos—their development and sexual perfection being results of favourable circumstances which happen only to a few of the many generated—instead of viewing these migrations and their consequences as events produced by the instinctive endowment which VON SIEBOLD has conferred on these parasites? While the possession of this endowment by these animals may be disputed, the facts adduced by this writer, respecting their origin, development, and alternation of generations, are more deserving belief and consideration.

16. II. THE CLASSIFICATIONS OF INTESTINAL WORMS have been so numerous and so different the one from the other, that an attempt to place them before the reader would not be consistent with my limits and with expectations of utility. Recent researches, also, have thrown doubts on the principles by which the older arrangements were guided; and the *orders*, *genera*, and *species* of *entozoa*, which have been found in the animal kingdom, are so numerous as to prevent even a brief notice of them at this place. I must, therefore, refer the reader to the more recent works enumerated in the BIBLIOGRAPHY, and especially to those of Dr. JOY and M. FELIX DUJARDIN. Dr. KÜCHENMEISTER has given a classification of animal and vegetable parasites, which, as far as it refers to the *human entozoa*, I shall, with some alterations, adopt.

17. I. CLASS, INFUSORIA.—II. CLASS, VERMES, HELMINTHIA.—i. ORDER, PLATYELMIA.—A. Sub-order, *Cestoidea*. (a) Genus, *Bothriocephalus*. (b) Genus, *Tænia*.—B. Sub-order, *Trematoda* or *Trematoidea*. (a) Genus, *Monostoma*. (b) Genus, *Distoma*.—ii. ORDER, NEMATELMIA.—A. *Trichocephalus dispar*, *Trichina spiralis*.—B. *Oxyuris vermicularis*.—C. *Strongylus gigas*, *S. longivaginatus*.—D. *Ancylostomum duodenale*.—E. *Ascaris lumbricoides*.

18. 1st CLASS.—THE INFUSORIA are destitute of high organization. They are simple, vitalized, membranous structures, which live by mere endosmose. The *vibriones*, the *bursariæ*, *monades*, and *bodones* "are a peculiar attribute of fermenting and putrefying fetid animal substances, or always presuppose a half-dead soil, and do not derive their nourishment so much from living substances as from matters which the living body has expelled, or are in the course of expelling as foreign to it; they are properly only to be regarded as indirectly parasitic upon the human body." FICINUS found sluggish bean-shaped infusoria 1-1000 to 1-1500 of an inch, and sometimes double this size, and of a globular form, in the perspiration of the feet, on the places where the epidermis was thrown off, as well as on the moist folds of the skin in young children; and others have met with them in purulent and foul secretions from the vagina, urethra, bladder, putrescible urine, &c.

19. i. *Trichomonas* (DUJARDIN). *T. vaginalis*.—"Corpus nodulosum, gelatinosum, lacteum; cauda brevis; flagellum corpore triplo longius. Motus vacillans. Longit. 1-222." This parasite occurs only in women with gonorrhœal discharge, or with an abundant vaginal secretion containing

mucous and pus globules, and never in a healthy vaginal secretion. KÖLLIKER and SCANZONI found it in the vaginal—never in the cervical—secretion of both pregnant and unimpregnated women, especially in the creamy and acid secretion, sometimes in the neutral, but never in the alkaline. Owing to its resemblance to the mucous corpuscles, it has been confounded with them. The body of this parasite is 0.01 to 0.018 millim. in length; the flagellum, 0.028 to 0.08 millim. in length; and furnished with 4 to 8 short cilia, in continual movement, which facilitate its recognition. The capability of infection by these infusoria has not been determined, although very probable.

20. ii. *Denticola hominis* (FICINUS). "*Genus valde dubiosum*" (KÜCHENMEISTER).—This parasite, according to FICINUS, is an aciliated infusorium, with the mouth on the ventral surface, and probably furnished with a carapace, resembling the *paramesia* and *kolpoda*; but he considers it more allied to the *monodes* and *vibriones*. The genus he believes to be numerous; and he infers that every mammal has its peculiar species. Dogs and horses, he says, next to man, exhibit these infusoria in abundance. He states that he found them especially in the interstices of the molars; more rarely on the mucous membrane of the mouth, scarcely in the saliva; but most abundantly where the teeth have been neglected, and in hollow teeth. They adhere, form filaments, and advance between the teeth and gums, pushing between the roots of the former and the latter, destroying their union. These effects are, however, prevented and remedied by the usual operations on the teeth, and by aromatic, tonic, astringent, and antiseptic dentifrices.

21. 2d CLASS.—a. VERMES, HELMINTHA, are of the greatest importance to both the pathologist and the practical physician. The parasites belonging to this class are destitute of many of the organs possessed by the higher animals. They have no distinct respiratory organ; the oxygen necessary to their existence can only be taken up in their fluid food. Hence they are enabled to exist within the human body, either in its closed or open cavities, or in its tissues. "They constitute the true entozoa, and furnish no representatives to the series of human *Epizoa*, although some of them may be destined, in the course of their development, to pass a portion of their lives in water, or perhaps (as in the case of the *Cercaria*) as epizoa upon other animals. Sexual organs may always be detected in those specimens of these animals which have attained their last grade of development." The senses of sight, smell, and taste are wanting in all these parasites, but their sense of touch appears to be highly developed. The intestinal canal is wanting in the *Cestoidea*. In the *Trematoda* it forms a cæcal canal, in which the mouth also performs the functions of the anus; while in the *Nematoidea* it becomes a complete alimentary canal, with a mouth, œsophagus, stomach, intestine, and anus. In the tissues of the *Cestoidea* is a tendency to the formation of an envelope of a calcareous nature, which is wanting in the *Trematoda* and *Nematoidea*. These three kinds of true HELMINTHA are characterized, 1st. By a general sense of touch; 2d. By a vascular system, of four longitudinal lateral canals in the *Cestoidea*, and of a fine network of vessels in the *Trematoda*, which are less distinctly marked in the *Nematoidea*; 3d.

By a muscular system, composed of transverse and muscular fibres, without transverse striæ; 4th. By the structure of the epidermis, which consists of a homogeneous finely checked substance, closely approaching the character of chitine; 5th. By the property of giving off a strongly refractive, albuminous substance, in oleaginous drops, when in contact with water; and, 6th. By their scarcely effecting their development without a passive and active migration of their embryos and immature young.

22. b. As to the last of these characters, KÜCHENMEISTER, more rationally than was stated, as shown above, by VON SIEBOLD, remarks that "this migration itself is passive during the embryonal state, and as long as the embryos are still enclosed in the egg-shells or envelopes, during which period they usually emigrate once, passively, into the external world, generally with the excrements of the hosts of their parents; and then again, passively in general, into the intestinal canal of the animal in which they are to acquire a higher development. From the latter moment commences their active migration, by which they seek the situations, usually external to the intestinal canal, in which they are to undergo their metamorphosis into the next higher step or steps of development, which is generally accompanied by an encysting process. Finally, as a general rule, at least as regards the trematoda and cestoid worms, they must afterward migrate, passively, once more into the intestine of the animal in which they are to attain maturity; that is to say, they must pass with the food of their new and final host into its intestine." (*Op. cit.*, p. 4.)

23. c. General pathology shows that the worms cannot effect their active migration without causing some irritation of the regions through which they pass, whether this migration is performed by the youngest brood, as is usually the case, or by the more or less mature animal, as rarely occurs, and chiefly among the *Nematoidea*. The passive migration of all immature parasites into the human intestine takes place without any perceptible morbid phenomena.

24. d. The general prognosis of this class of parasites may be stated as follows: 1st. The young animals engaged in their migration are the most dangerous; 2d. Next to these, the migrating mature individuals, which inhabit the intestinal canal, produce the most dangerous symptoms; 3d. The animals which reside in cysts or closed cavities can become dangerous only when they attain an enormous size; but, when small, they may be present without doing any mischief; 4th. Most of the mature individuals are more accessible to curative means than those of lower stages, especially those which live outside the intestinal canal.

25. e. The principles of treatment for the *Helminta* are, 1st. The destruction or removal of the mature worms, and of their progeny; 2d. The observation of a rational prophylaxis, founded on the modes of life and migrations of the immature individuals; on the constitution and circumstances, and the habits and modes of life, of people subject to these parasites; and on a knowledge of the nature and peculiarities of the situations in which these plagues are endemic.

26. III. The animals of which I have now to treat belong to the first sub-class of DIESING—*Helminta achathelminthica: animalia evertibrata inarticulata* (i. e., *extremis artibus articulis nullis*

prædita), *nunc mollia, aut elastica, ebranchiata, setis retractilibus nullis*. I have, following VOGT, VIRCHOW, and KÜCHENMEISTER, divided this class into two divisions: i. *Platyelmia*, flat worms; and, ii. *Nematelmia*, round or thread worms; and again dividing the first section or order into, 1st. The *Cestoidea*, VOGT; the *Cephalocotylea*, DIESING; or the *Platyelmia colonias exhibentia*, or flat-worm colonies, of KÜCHENMEISTER; and, 2d. The *Trematoidea*, VOGT; *Myzelminta*, DIESING; or *Platyelmia isolata*, isolated flat-worms, KÜCH.

27. i. Order, PLATYELMIA.—*Entozoa solitaria aut composita, androgyna. Corpus depressum vel teretiusculum, molle, organis ad fixandum aptis præditum. Anus nullus; canalis cibarius aut divisus (rarissime simplex), aut nullus. Cavitas corporis non distincta. Metamorphosis in plerisque; larvæ gemmiparæ aut sporoliparæ.* (LEUCKART.)

28. A. Sub-order, CESTOIDEA.—*Cephalocotylea, DIESING; Platyelmia composita, aut colonias exhibentia, Plattwurm-Colonien, or flat-worm colonies, KÜCHENMEISTER; Bandwürmer, tape-worms—Animalia tomotoca, per longum plerumque tempus larvæ nutriti juncta et una cum ea corpus elongatum, articulatam, polymorphum formantia. Larva (Scolex, vulgo caput) pyriformis, foreis aut osculis suctoris quatuor vel duobus instructa, sapissime uncinata. Proles sexualis (Proglottides, vulgo articuli) organis externis destituta, embryones uncinulis armatos gignentes. Canalis cibarius nullus.* (LEUCKART.)—*Quinque variae inveniuntur in us metamorphoses: 1. Animal maturum (Proglottis); 2. Embryones uncinulati (Grand-nurse, Grossamme); 3. Scolex passivam vitam agens sub forma vermis cystici seu Cysticercæ, sub forma Platyercæ, et sub forma Acerce; 4. Scolex activam vitam agens (Nurse, Amme); 5. Strobila.*

29. It is only recently that the *cystici*, or *hydatids*, have been shown to be only a stage in the development of the *Tæniæ*, and not to be a distinct family among the *Helmintha*. HIPPOCRATES, ARISTOTLE, and many anatomists and physicians up to the times of REDİ and HARTMANN—in 1683–5—regarded the *Cysticerci* as *hydatids*; but the distinct animal nature of these was not recognised until the work of REDİ appeared, and not fully established until the researches of TYSON were communicated to the Royal Society in 1691. (*Philosoph. Transact.*, No. 193, p. 506.) PALLAS, in 1766, stated that all cystic worms are forms of tape-worms, and belong to a single species—“*Tænia hydatigena*, cystic tape-worm”—which only presents some differences, especially in the caudal vesicle, according to the animal it inhabits. But neither TYSON nor PALLAS, by the terms *Tænia hydatigena*, or *Lumbricus hydropicus*, given by them to cystic worms, expressed any opinion as to the genesis of these worms, or their derivation from ordinary tape-worms. GOEZE, in 1780, and WAGLER, advanced but little the views of TYSON; and, although the subject of cystic worms was considered by ZEDER and RUDOLPHI, it made no progress in their hands. At last, in 1842, STEENSTRUP's theory of the alternation of generations made its way, he believing that the cystic worms were early steps in the development of helmintha, which were unknown to him. In 1845, in consequence of STEENSTRUP's discovery, DUJARDIN first asserted that the cystic worms were undeveloped animal forms, and young states of tape-worms; and that they

were produced from those germs of tape-worms which, instead of the intestine, had got into the parenchyma of the body of their host, and, under the influence of this unusual dwelling-place, had advanced to the abnormal state of development which is called a “cystic worm.” Simultaneously, VON SIEBOLD, in Germany, expressed the same opinion with DUJARDIN in France. At first, however, VON SIEBOLD inclined towards STEENSTRUP's view, and said: “In its form, its suckers, and its circle of hooks, the head of the asexual cystic worms possesses such a striking similarity to the heads of certain tape-worms, that one is tempted to believe that the cystic worms are nothing else than undeveloped and larvæ-form tape-worms.” He subsequently, nevertheless, arrived “at the most decided conviction that the cystic worms are strayed tape-worms which have remained undeveloped and become degenerated, and of which the body grew out in the foreign soil into a vesicle, without developing sexual organs.”

30. In 1850, VAN BENEDEEN, the Belgian zoologist, declared the vesicular worms to be larval-like, or young states (*scolices*) of *Tæniæ*, and compared them with the larvæ of *Tetrarhynchus*. According to him, the head of the tape-worm (*scolex*) is produced from the egg of the tape-worm. If an egg of a tape-worm reaches the intestinal canal of an animal in which it may be farther developed without interruption, the jointed mature tape-worm (*strobila*) immediately grows from the egg in uninterrupted succession; but if it does not reach an intestine of this kind, a longer or shorter period of rest ensues in the farther development as soon as it has arrived at the evolution of the head of the tape-worm (*scolex*); in this case the anterior part of the head sinks into its inflated hinder part, and it becomes a *Cysticercus*, or a cysticercal animal form. KÜCHENMEISTER, however, finds two errors in this inference. 1st. It is not proved that a tape-worm can pass through all the phases of its development in the intestines of its host; and, 2d. And just as little as the caudal vesicle is produced subsequently by dropsical degeneration (DUJARDIN and VON SIEBOLD), does the ready-formed head sink into its inflated hind part, in order to become a *Cysticercus*.

31. As GOEZE had suggested in 1780, KÜCHENMEISTER, in 1851, administered various cystic worms to different animals. For this purpose the latter selected the *Cysticercus pisiformis* of the rabbit, and also the *C. fasciolaris*, and gave the former to the dog and the latter to the cat, and in the intestines of both these animals he “succeeded in rearing *tæniæ* rapidly approaching maturity.” From these experiments he makes certain deductions, of which the following are the most interesting: 1. The caudal vesicle occurs in all individuals of all species of cystic worms, even though they live in the most various zones and different animals. 2. The universal loss of the caudal vesicle has its analogue in the metamorphosis of many animals. 3. All cystic worms, in the earliest period of their existence, have the head constantly inverted towards the caudal vesicle. 4. The state of rest in which the cystic worms must live in the interior of their caudal vesicle, in order to their development, would be inconceivable, if they had to collect the nutritive fluid for themselves, and did not contain it in them. 5. The cystic worms are not strayed dropsical tape-worm nurses, but tape-

worm larvæ furnished with a provisional organ (caudal vesicle), probably being a reservoir of nourishment, and incapable of sexual multiplication, for which there is neither room nor sufficient nutritive material. 6. The cystic worms constitute a necessary step in the development of the *Tania*. 7. We cannot speak of dropsy or degeneration, and not even of straying, because we do not yet clearly perceive how the brood could get to the dwelling-place of the cystic worm. And, 8. *Cysticerci*, when transferred to the intestines of other animals, do not become developed into jointed tape-worms, unless the species of *Cysticercus* is suited to the intestines of particular animals; thus, the *Cysticercus pisiformis* was not developed in the intestines of the cat, but it was fully developed in those of the dog. KÜCHENMEISTER asserts that all eminent German zoologists now agree with him in believing "that every cestode worm, and not merely the *Tania*, pass through a cysticercal state; that the cysticercal larva lives in various parenchymatous organs, and the free scolex (*strobila*) usually in the intestine of a different host; and, lastly, that the tape-worm head (*scolex*) is produced in the interior of the previous embryonic body (*i. e.*, the caudal vesicle), and remains enveloped by this until it gains the situation for which it is ultimately destined."

32. But to place beyond all doubt that the cystic worms were necessary steps in the development of *Tania*, it was also requisite to prove their production from the embryos of the tape-worm brood. "It is true that the six characteristic embryonal hooklets have not yet been detected upon true vesicular worms, but we shall shortly see that the laws of analogy, as well as experiment, afford us a glance into this process." After various experiments, KÜCHENMEISTER proceeds to state that, he resolved to resume those experiments with the *Tania Canurus* in order to obtain the remarkable phenomena of the vertigo in sheep. On the 15th of May, 1853, he obtained the cystic *Canuri*; on the 25th of July mature proglottides of the *Tania* were passed by the dog to which the *Canuri* were administered; and these, in order to make the experiment under the most unfavourable circumstances, were administered to a perfectly healthy two-year-old wether, a description of sheep which are usually free from *Canuri*. On the 10th of August the sheep was vertiginous; and on the 13th it was necessary to kill the animal; and in the brain he found fifteen young vesicles of *Canurus*, partly on the surface of the brain, which was reddened by inflammation, partly in the substance of the brain, and even in the ventricles. In January, 1854, six lambs were fed with *Tania Canurus*. Of these five became vertiginous in about eleven days. LEUCKART fed, in October, 1853, a colony of white mice with *Tania crassicolis*. In January, 1854, he examined his mice, and found them infested by cystic worms. KÜCHENMEISTER subsequently proved that, by the administration of mature species of *Tania*, as far as they were accessible to him, to suitable animals, only the cystic worms belonging to these species can be reared; but not any kind of cystic worm at pleasure. From the concordant experiments of HAUBNER, LEUCKART, VAN BENEDEN, MÖLLER, and himself, KÜCHENMEISTER considers that this much is established:

33. "1. Mature *Tania* have hitherto been rear-

ed successfully from all vesicular worms administered when a suitable host was selected; thus, from *Cysticercus pisiformis* the *Tania serrata vera* was obtained; from *Cyst. tenuicollis*, the *Tania ex Cyst. tenuicollis*; and from *Canurus cerebralis*, the *Tania Canurus*; all three in the intestine of a dog; from *Cyst. fasciolaris*, the *Tania crassicolis*, in the intestine of the cat; from *Cysticercus cellulosæ*, the *Tania solium*, in the human intestine; from *Echinococcus veterinorum* (*Scolicipariens* of KÜCHENMEISTER), a *Tania Echinococcus*, in the intestine of a dog; and from *Cysticercus longicollis Hyperdæi*, the *Tania crassiceps*, RUD., in the intestine of the dog (LEUCKART)."

34. "2. From the eggs of *Tania solium* in pigs, from those of *T. Canurus* in sheep and cattle, of *T. serrata vera* in rabbits, of *T. crassicolis* in rats and mice, of *T. ex Cysticercus tenuicollis* in sheep and lambs, the corresponding vesicular worms have been reared. The experiments with the eggs of the *Tania* of *Echinococcus* have hitherto remained unsuccessful."

35. Up to a recent period it was the most general opinion, still entertained by some, that the tape-worm (tape-worm chain) was a simple animal, with numerous segments. Nevertheless, some older physicians correctly perceived that tape-worms were not simple, but compound animals. By many the several segments of *Tania* were regarded as separate worms; and what DUJARDIN has recently called *proglottides* are described by them in the human tape-worms as "*Vermes cucurbitini*." At the same time they fell into the great error of not regarding this chain as produced by a successive formation of joints placed one behind the other from the head, but expressed the remarkable opinion that the tape-worm was produced by the adhesion of the individual "*Vermes cucurbitini*" one after the other, by which means the many-jointed body was formed. The opinion that the tape-worm was a compound animal—an animal composition—was first expressed by LEUCKART. Soon afterward, ESCHRICHT and STEENSTRUP expressed this opinion more strongly, and VAN BENEDEN proved it, after DUJARDIN had described the segments of tape-worms which occur isolated, as peculiar animals, under the name of *proglottis*.

36. i. *The mature Animal, or Proglottis.*—"From the moment that the hindmost segment or segments of a tape-worm colony has become so far developed as to contain the six-hooked brood ready formed and enclosed in the egg-capsules, this segment seeks to break loose, either by itself or in company with several others, in order to continue an independent existence, either in the same place (the intestine of its previous host) or in a different one (in the external world). All this varies according to the species. In *Tania*, *Tetrarhynchus*, &c., each joint usually breaks loose; in *Bothriocephalus*, a series of joints." In those in which no regular formation of segments exists, no single proglottides or segments can break loose, but only single brood-places, or fragments of the body of the cestode worm with such brood-places; or the eggs must escape singly. The proglottides have for the most part a flat quadrangular form, very similar to the *Trematoda*, and usually a white or yellowish, rarely a reddish or brownish colour; they have neither mouth, anus, nor intestine. "As the eggs possess a much greater diameter

than the vagina, they cannot pass through this, but can only escape out of the proglottis when the vagina acquires a larger opening, by tearing, &c. This takes place sometimes even in the intestine of the first host, and the eggs escape separately into the outer world with the excrements, which then appear as if sprinkled with fine white sand; or immediately without the intestine, where the progress of the proglottis is seen indicated by a white milky streak. Sometimes the proglottis does not burst in either of the above-mentioned places, but gets uninjured into the intestine of a new host, in which case it distributes its brood only after it has been destroyed by digestion. According as the eggs reach the intestine of their host in this way separately, or enclosed in the proglottis, and therefore in a mass, solitary or numerous specimens of a cystic, or of the analogous state, are produced within one and the same host." The proglottides thus perform an *active* migration from the intestine of their previous host, and are *passively* or contingently transferred into the intestinal canal of a new host. With the dissemination of their brood their function ceases.

37. ii. *The six-hooked Brood, enclosed in separate Egg-capsules.*—These are called eggs, although their development differs greatly from that of ordinary eggs. The embryos enclosed in the egg-shells are globular naked vesicles, unlike their parents; the smallest of them measure only 0.022 mill., and the largest 0.05. They are destitute of any organs, possess an epidermis with a double outline, and usually bear six, but in the *Tetrarhynchi* only four, very small microscopic hooklets on their anterior extremity, so that they carry their destination, that of boring forward through the tissues, as it were, written on their foreheads. The bodies of these small but very dangerous vesicles, whether armed or unarmed, are always capable of motion. The embryos which are destined to migrate into cold-blooded animals are much larger, possess larger hooks, and exhibit distinct movements in the usual temperature of a room. Those destined for warm-blooded animals are much smaller, with smaller hooklets, and exhibit distinct movements only about the temperature of the stomach. (KÜCH.)

38. iii. *The Destiny of the six-hooked Brood when set free.*—A. *What is the fate of this brood until it reaches its settled dwelling-place external to the intestinal canal?* As soon as the embryo becomes free in any part of the digestive canal of an animal which suits it, according to VAN BENEDEN, it brings together the central pair of its embryonal hooklets like a wedge, and at the same time, by thrusting and twisting, begins to force them forward. Having in this way made a little progress, it assists itself farther with the two lateral pairs of hooklets. KÜCHENMEISTER supposes that, having thus penetrated into the tissues, they pass into the blood-vessels, and thus they are conveyed either into the liver by the *vena porta*, and remain fixed in the finest ramifications of the blood-vessels, or into the brain, or into other parts. The migration of the young of the *Cestodea* to the places where we meet with them as vesicular worms, or in analogous states, takes place in the following way:

39. 1st. A portion of the six-hooked brood, in all species of *Cestodea*, may reach their dwelling-place directly and by active migration, by boring their way. 2d. Others, by an uncertain duration

of this migration, reach the vessels of the new host, penetrate these, and are conveyed with the blood to the smallest ramifications, where they (a) either become developed in these ramifications, the walls of the vessel becoming their envelopes; or (b) they migrate passively into the neighbouring tissues, after the rupture of the walls of the vessels, in consequence of the swelling of the embryo; or (c), after being detained in these ramifications, they enter anew upon an active migration, passing into the tissues by means of their hooklets, and increasing in size.

40. B. *What farther takes place with the embryos when they have come to rest in their new dwelling-places?* The third stage of the development of the *Cestodea* consists of the so-called vesicular worms and their analogous asexual forms, "which, in accordance with the alteration which the embryonal vesicle undergoes in the different species of tape-worms, and with the different animals infested by them, may be divided into *cysticercal* (vesicular worms), *platycercal* (forms with a flat, inarticulate, tail-like appendage), and *acercal* (or tailless) forms. It is a common peculiarity of all the three forms here mentioned, that they are *cestode-heads* produced from the embryonal vesicle, which occur still in the interior of the embryonal vesicle, or upon it in a state of rest. We may therefore best comprehend this stage under the name of *resting scolices*." The metamorphosis or transition of the embryos to the resting, and usually *cysticercal* scolices, may be stated as follows:

41. 1st. "The embryo, still furnished with its six hooklets, begins to swell by the reception of fluid (liquid nourishment) which is secreted from the place in which it has established itself: this is at first a fluid similar to protoplasm, but after the formation of the enveloping cyst, or after the cessation of inflammation, when the creature lives free in the interior of serous cavities, it does not agree so much in its composition with the serum of the blood as with the ordinary products of the secretion of serous membranes." (LUSCHKA.)

42. 2d. As soon as the embryo has in this way rather rapidly enlarged to a certain size, and arrived at a state of repose, the round vesicle thus formed, when it does not project freely into a serous cavity, and has not fallen into one, surrounds itself with an envelope, which protects it and assists it in procuring repose. These enveloping cysts constitute an absolutely new formation, which is analogous to serous membranes, and which constantly increases in size with the growth of the young cestode vesicle. When, however, the brood of a cestoid worm gets freely into serous cavities, it either never attains to this formation of an enveloping cyst, or does so at a rather late period, and at a time when the young embryo has become a vesicle of very considerable size, and often exhibits the *Tenia* head in an advanced state of development. In places where the young cystic worm again falls into repose, a fresh exudation of plastic matter adapted to the formation of cysts takes place, the walls of the cyst being rich in blood-vessels. (KÜCHEN.)

43. 3d. By the reception of the secretion of the serous membranes, the young cestoid vesicle swells up. At its anterior end, and at the point where the six embryonal hooklets are situate, a funnel-shaped pit is at first formed, and this gradually penetrates more deeply into the parenchyma of the embryonal body. In the bottom

of this pit the first traces of the head appear, while the lateral walls of the depression become converted into the body—the central body—of the future cystic worm, and the remaining portion of the embryonal vesicle, which is not inverted, or not implicated in the metamorphosis, becomes the so-called caudal vesicle. This inversion and first formation of the head most frequently commences at the anterior surface of the vesicle, and are seen distinctly in the cestodes of *Arion empiricorum*, for in these the six small hooks are placed in pairs at the point of transition of the central body into the caudal vesicle of the worm. The central body and the head are always developed in the interior of the embryonal vesicle, and during the whole period of the vesicular state the head always has its apex directed towards the caudal vesicle, even when the central body, which encloses the head in the form of a hollow canal, has not sufficient room in the embryonal vesicle, but is pushed out of it. (KÜCHEN.)

44. 4th. From the experiments of HAUBNER, KÜCHENMEISTER, LEUCKART, ROLL, VAN BENEDEN, ESCHRICHT, &c., with the various *Tænia* which pass through a vesicular condition, the following appears: According to LEUCKART, at least in experiments with *T. serrata*, we find twenty-four hours after administration the six-hooked embryos in the blood of the large abdominal veins, especially the vena portæ; and on the fourth day, in the livers of rabbits to which they have been administered, small, white, clear vesicles of 0.3 millim. in diameter, but rapidly increasing in size, which on the sixth are already 1 mill. in diameter. In *T. serrata* the actual embryo, after the lapse of fourteen days, measures 1.5 millim.; in *Cænurus* it is about the size of a grain of millet at this period. The small vesicle (the worm), after it has begun to grow clear, acquires, in its interior, numerous large, clear enucleate vesicles, which, according to LEUCKART, are similar to sarcode drops. In the parenchyma we recognise a cortical layer, which becomes thinner, and the cells of which are converted into muscular envelopes by fibre-formation, and a medullary layer, in which elastic vesicles or cells occur in great quantity. From the appearance of the medullary substance, the growth of the little worm, which is capable of motion even before the muscular layer is developed, advances with rapidity. Even in the first fortnight, and shortly afterward, the form of the young cestoid worm varies according to the species. Some, such as the younger *Cænuri* and *Cystic. cellulosa*, *tenuicollis*, and *fasciolaris*, are spherical; others, such as *Cystic. pisiformis*, and probably also *Cystic. longicollis* and *fistularis*, are oval. Many of those seated upon the surface of organs, projecting into closed serous cavities, wander for a time in the organ, and finally fall into these cavities, the oval forms appearing to wander more than the round ones. About fourteen days after administration, the above changes take place almost universally and in all places. But those individuals which have not found a situation favourable to their development undergo a retrograde metamorphosis, passing "to the state of caseous, granular, or atheromatous masses, in which we may seek in vain for any remains of the embryo, although this certainly is present. Many cases of miliary tubercular disease of particular organs may indeed consist of noth-

ing else than the dead, fatty, and calcified young of worms."

45. 5th. In the third or fourth week, when the young brood of *Cysticercus pisiformis* measures about 2 millim., and that of the *Cænurus* is of the size of a pin's head, we may see, according to LEUCKART, beneath the epidermis a layer of muscular fibres. Then follows a fatty structure, and then the medullary substance. At the point where the head is to be formed, a turbidity is produced by the aggregation of small nucleated cells, in the interstice between the muscular and medullary layers. This is the first foundation of the head of the tape-worm. Opposite to this turbidity a pit is observed externally, the inner wall of which is formed by the inverted epidermis, and which passes through nearly the whole depth of the globular foundation of the head; this latter appearing like a peg attached to the inner wall of the worm. In the central mass of the head, especially in its upper half, calcareous deposits appear, at first sparingly. Two or four vessels are also observed rising in a tortuous form through the upper part of the lobe, and passing over on the external sac-like envelopes. The vesicle now becomes larger and clearer, and the medullary layer, pushed against its peripheric layers, grows thicker, while vessels and calcareous corpuscles make their appearance, especially in the anterior part of the body, between the muscular and epidermic layers, but not in the former, in some cases before, in others after, the formation of the cephalic process. From the time when this process commences, the caudal vesicle ceases its activity in the true *Cysticerci*; its functions are then only passive, serving as a reservoir of nutriment, or as a protection to the head, which requires repose for its farther development, and preserving sufficient room for this end. I cannot follow the descriptions of KÜCHENMEISTER and other helminthologists farther, as respects the development of the head and its hooklets, &c., but must refer the reader to Dr. LANKESTER's translation of the work of the former, and to the other works referred to in the Bibliography. I may, however, notice the following conclusions of this observer:

46. 6th. In the progress of the metamorphosis of the six-hooked cestoid brood into scolices, it has been shown that a portion of the *Tænia* pass through a true *cysticercal* (bladder-worm) state, while the other part, without ever arriving at this state, furnish exactly the same structure (cestoid heads—scolices). This latter part KÜCHENMEISTER has divided into *platycercal* and *acercal* forms.—(a) True *Cysticerci* occur only in warm-blooded animals, especially mammalia; and *cysticercoid* forms principally in cold-blooded animals.—(b) The eggs of all *Tænia* which pass a *cysticercal* stage are distinguished by the small size of the embryo, and its six hooks, and by their brown, hard shell beset with asperities. The eggs of the *Tænia* with only a *cysticercoid* phase of development have softer, colourless, transparent shells, are much larger, and contain a much larger embryo, furnished with larger hooks.—(c) *Tænia* with a *cysticercal* phase of development are inferior to the *platycercal* and *acercal* forms in regard to the length and cylindrical form of the rostellum.—(d) *Tænia* with a *cysticercal* stage possess during this a highly developed *receptaculum capitis*, which forms a part of the future neck, in which, as long as this stage lasts,

the head is introverted. The allied platycercal and acercal forms are destitute of the accumulation of fluid, and of the *receptaculum*.—(e) If the six-hook cestoid brood gets into animals which are not suitable to it, or into such organs in an animal otherwise suitable, it is destroyed in a very short time, even in the few first days of its immigration; the form of miliary tubercular disease of the organ may thus have frequently occurred. This may be demonstrated by administering mature proglottides to various animals.—(f) A great number of the cestoid embryos which become developed to the scolex state die, and are destroyed either by a natural or a pathological death. We only know that their life may extend even to several years, but inflammatory processes and alterations of the secretions extending to them from the organs they inhabit may destroy them more or less rapidly, and change them into masses consisting of cholesterine, calcareous, fatty, suety, and similar substances.

47. iv. *The Scolex passing into activity*.—On this topic I must refer chiefly to recent writers, more especially to KÜCHENMEISTER, and notice merely a few of the more prominent parts of their descriptions. As a general proposition, it is inferred "that the animal infested by cystic worms is usually the source of food, or the prey, of that infested by tape-worms." The host of the cystic worm is devoured by a carnivorous predaceous animal, and by this means the cystic worm arrives, together with his previous host, in the stomach of the carnivorous animal. During the process of digestion, the enveloping cysts in which the cystic worms were enclosed, or, if the animal lived free in cavities, these latter, perhaps both, are digested, or opened previously by the teeth of their devourer, when the cystic worm escapes into the cavity of the stomach. Here the worm extends itself; its caudal vesicle collapses. On the caudal vesicle and the middle of the body of the cystic worm digestion begins to act perceptibly. The body at the same time elongates and extends itself, but the head and the short neck are still inverted, as during the cysticercal state. But now the head and neck extend themselves. The head, the hooks still exhibiting the position of cysticercal existence, their apices being directed backward towards the suckers, and their shafts towards the apex of the head, draws itself, as it were, outward through the neck, by turning itself inside out. As a matter of course, the whole worm is thus turned inside out; and the margins of the head and neck which were previously turned in, become the free outer sides of the worm. A portion of the *receptaculum capitis* is then cast off, with the body and the caudal vesicle, and a portion wraps itself into the funnel-shaped constriction of the young *Tænia*.

48. At various times, sooner or later, according to the evolution and age of the cystic worm, the formation of segments commences, and with this, consequently, this stage of development is concluded. It should be recollected that *Tænia* cannot be reared from such scolices as do not exhibit perfectly-developed hooks. They die immediately. The first transformation of all cystic worms introduced into the intestines of a warm-blooded animal takes place in the same way; but the process stops before the commencement of segmentation, in those cases in which the intestine of the animal in which the vesicular worm

has arrived is unfavourable for it and its future development. Thus circumstanced, it lasts but for a short time, no trace of it remaining a fortnight after. The transformation of the platycercal forms into mature Cestoidea takes place exactly like that of the cysticercal forms; in the acercal forms no casting off of a portion of the former embryonal vesicle takes place, but the whole of it is retained, and the formation of segments commences immediately upon it. It still remains to consider—*How the scolex, after entering upon its activity becomes converted into a tape-worm colony—Strobila*.

49. v. *The Strobila, or the so-called Tape-worm Colony*.—"Immediately after the healing of the cicatrix on the neck and on the former *receptaculum capitis*, there commences between the posterior end of the head and this cicatrix a budding forth of the body, produced without sexual propagation, and which becomes constricted into segments by transverse furrows or wrinkles. By the constant production of new masses on this place, that previously formed is continually pushed farther back, so that this cicatrix is at last removed to a considerable distance (varying according to the species) from the head. During this time the individual segments increase, and grow in the same ratio as their removal from the head: they at the same time acquire sexual organs, male and female, in each segment, and which are very rarely, and probably never wanting in the colony. Finally, when they have attained a sufficient size and maturity, they produce the embryos (§ 41, 2), and last of all cast themselves free in the form of the proglottides (§ 36). If we were to give a definition of the strobila—it is a series of joints, or individuals, which are formed from the active scolex in the space between the part of the latter that must be called the head proper, and its cicatrized extremity, by a sexual reproduction; which are in direct union with the scolex, and which, when examined from the anterior to the posterior, present asexual segments, half and fully formed sexual segments, and segments engaged in sexual retrogression, the last of which have become truly independent individuals." (KÜCHENMEISTER, *Op. cit.*, p. 84–5.) Thus we have seen how the segments with their ova and embryonic structures, are developed; and, when they have become the hindmost of the colony, cast themselves loose.

[Five different conditions, then, may be distinguished in the development and history of the *Tæniæ*: 1. *The embryo*, with six tenaculi; 2. *The Cysticercus*; 3. *The Scolex*; 4. *The jointed Tæniæ*; 5. *The independently living and sexually developed joint or section, proglottis*. The development of the cestodæ presents us therefore, as described by our author, a true instance of alternation of generation. Three different generations succeed each other in these animals: the embryo, with six tenaculi, as great-nurse; the scolex, as nurse; and the isolated living proglottis, as the generic animal. The great-nurse is the product of sexual development; she has her origin in the germinated ovum; while the two other generations are the products of budding or sprouting; the nurse from the grand-nurse; the generic animal from the nurse. The intermediate conditions of cysticercus and strobila must be characterized as polymorphous colonies. The strobila might be compared to a colony of polypi, in which each individual is growing out of the posterior body of the scolex, their native soil, thus forming

but one and a continuous line. Such a treble alternation of generation is also found in other animal organisms. It is to be understood that by the alternation of generation the generic animal produces only an unsexual race which is dissimilar to its parent, and remains so; and this generation produces, by budding, generations of new animals which, either themselves or their offspring, return to the original form of the stock.]

50. My limits admit not of a full description of the minute structure of the fully-developed *Tania*. It will be found in the work just quoted. I may, however, briefly state that no digestive apparatus has been found in these animals. Most writers assert that up to this time no nerves have been detected in them; but HUXLEY states that a single ganglion is situated in the axis of the head, and that it sends off nerves to the suckers in some *Tania*. The most important points are the dissemination of calcareous corpuscles in their structure, and the formation of circulating vessels. With the development of the scolex it was seen that a union of four principal lateral vessels takes place in the head, and that smaller branches are given off from these trunks. These vessels probably open outward near the *receptaculum capitis* or neck, or about the situation of segmental production; but the ultimate structure, connexion, and termination of these vessels have not been precisely determined. The muscles consist of transverse and longitudinal fibres, which may be recognised most readily in the neck. The suckers, peculiarly muscular parts, present radiate fibres uniting in the middle of the sucker, under which lies a layer of circular fibres, and the *rostellum*. It has not been ascertained whether or no muscular fibres run to the hooklets of the embryo. The hooks of the *Tania* appear to ride upon the skin or integument, or in slight impressions. The movements of the hooks seem to be produced by changes in parts of the head, particularly of the *rostellum*. The sexual organs, both male and female, exist in each segment, in which numerous eggs are produced. A very minute description of these organs—the penis, testes, vagina, uterus, &c.—is given by KÜCHENMEISTER.*

* The developmental history of the Cestoidea may be understood, if considered as follows:

"i. The mature sexual animal, which is produced by asexual gemination, separates from the colony as soon as it has attained its majority, migrates actively from the intestinal canal of its host into free nature, and thence passively into the stomach of another usually herbivorous animal. It bears within it,

"ii. The grand-nurses or embryos produced by sexual, and perhaps by asexual, reproduction, furnished with four or six hooks, which are destined to enter passively into the stomach of an herbivore, and thence to migrate through the body of the latter, either actively, or by the intervention of the vessels, active—passive—actively. (The asexual propagation of the brood in the Cestoidea is rendered improbable even by the fact that, in the whole developmental series of these Cestoidea, a sexually mature animal has never been met with.)

"iii. The resting scolex (nurse), produced by asexual gemination in and by the large six-hooked embryo, still concealed within this embryonal vesicle, or lying beside it enclosed in peculiar cysts, or in closed serous cavities. In its non-gemiparous part the embryonal vesicle acquires, according to the species of cestoid worm, and according to the different hosts (cold or warm-blooded), sometimes the form of a globular vesicle, sometimes that of a flat band-like strip, and sometimes is only just sufficient to cover the scolex, lying quite close upon it, when it really forms nothing but a *receptaculum capitis*. Thus we obtain three forms allied to each other in their degree of development: the cysticercal forms (*Vermes cystici*, including *Cœnuri* and *Echinococci*); the platycephal (similar to Stein's cestoid worm of *Tenebrio molitor*, and Von

51. THE CESTOIDEA, or Cestode worms, occur in man either in the mature state, and then in the intestines only (*Bothriocephalus latus*, *Tania mediocanellata*, *Tania nana*); or in the larva or scolex state (*Cysticercus visceralis* seu *tenuicollis*, *Echinococcus veterinorum*, seu *scolicipariens*, and *E. hominis* seu *altricipariens*); or, lastly, in all known stages of development (*Tania solium* and *Cysticercus cellulosa*).

52. Genus 1. BOTHRIOCEPHALUS = DIBOTHRUM.—This division is abundantly represented in predaceous fishes, more sparingly in piscivorous birds, especially the marine *Raptores*, and rarely in a few mammalia. Of the terrestrial mammalia inhabiting inland places, man only harbours *Bothriocephali*. KÜCHENMEISTER defines this genus,* and the species here to be considered, as subjoined,† and gives the following as the synonymes of the species, *Bothriocephalus latus* or *Dibothrium latum*; *Tania lata*, *T. grisea*, *T. vulgaris*, *T. membranacea*, *T. dentata*, *T. inermis*; *Ténie à anneaux courts*, *T. large*, *T. à épine*; *Lindwurm*, *Baandwurm*, *Baandelorm*: the tape-worm, jointed worm, the short-jointed worm.

53. i. GENERAL DESCRIPTION.—The colour of the living worm is bluish white. Specimens preserved in spirits change greatly in colour. The active scolex, or head, is obtusely conical. The two lateral pits (analogues of the sucking disks of *Tania*) are fissuriform, and appear, like the sucking disks on the feet of flies, rather to effect adhesion than to draw nourishment, which is probably introduced through the entire skin. The neck

Siebold's from *Arion emporicorum*); and the acercal (certain embryos of *Tetrarhynchus*). Every one of these is a normal form; even the cysticercal forms are neither morbidly degenerate, nor become dropsical, nor strayed.

"iv. The resting scolex, transferred into the intestine of an animal, becomes converted into the scolex passing into activity. The latter is distinguished from the resting scolex by the extension of the entire body, by the altered position of the adherent apparatus (suckers and hooks), by the attachment in the intestinal canal, and in the cysticercal and platycephal forms, by the casting off of the barren portion of the embryonal vesicle, and the formation of a cicatrix on this spot. In the acercal forms nothing is cast off, nor is there a cicatrix formation.

"v. The strobila—equal the tape-worm colony, budding immediately from the scolex, which has become active by asexual propagation (gemination), is more or less distinctly jointed, and becomes sexually mature posteriorly. Its last segments, which are cast off, and lead an independent existence, are called *proglottides* (i.), and bear within them the embryos produced by sexual reproduction (ii.)." (KÜCHENMEISTER, Transl. by Dr. LANKESTER, p. 93, 94.)

* "Cestoidea, 2 osculis suctoriis, aut 2 forcis marginalibus, oblongis aut longitudinalibus oppositis instructa. Capite subtetragono, depresso, articulo plerumque inermi. Pori genitales omnium articulorum in linea mediana animalis et in ejus superficie abdominali siti. Scolex extra tubum intestinale in cystidibus peculiaribus ad vermium platycercorum modum, aut in tubo intestinali animalium minorum aquaticorum statu immaturo viventes; Strobilæ in tubo intestinali animalium aquaticorum rapacium, avium marinarum et mammalium viventes; Proglottides veræ interdum absunt, interdum adsunt, sæpiissime in longa articulorum serie conjunctæ dehiscences. Embryones sex hamulis armati; ovulorum testæ sæpiissime coloratæ.

† "i. BOTHRIOCEPHALUS LATUS = DIBOTHRUM LATUM.—Caput oblongum, inerme, 2 bothriis-forcis marginalibus, formam rimæ aut fissuræ (fente) adplantibus; collum subnullum; articuli numero circa 2000, maturi omnino latiores (ad 27 millim.), quam longi, socialiter decedentes; pori genitales in linea mediana siti, masculus major et superior, ex quo penis lavis et brevis prominet, femineus minor, posterior inferiorque. Scolex quiescens ignotus; scolex activus cum strobila in hominis tubum intestinale incolens, longitudinem 7-8 ulnarum, secundum Dujardinum ad 20 'metres' (?) exhibet.

"Embryones 6 uncinulis (?) armati, in ovulis 0.023—32 mill. longis et 0.002 mill. latis, ellipticis, flavo-fuscis, operculo dehiscendis inclusi."—KÜCHENMEISTER.

is more distinct in young than in old specimens, the transverse wrinkling, i. e. segmentation, commencing immediately behind the head. The *strobila*, or jointed body, presents a ventral surface, on which the sexual apparatus opens, the opposite being the dorsal surface. Each segment has four margins—two free lateral margins, slightly undulated, and an anterior and posterior margin, articulated with the upper and lower segments in the colony. The form varies according to the preponderating contraction of the longitudinal or transverse fibres, the breadth, however, being much greater than the length—as three to one. In the central line the segments are thicker (up to 1") and darker; the lateral margins flatter and whiter. The vascular system consists of lateral longitudinal cords, which contain a limpid fluid. A respiratory system and organs of sense are wanting. The sexual organs generally are single in each segment, but they are sometimes double.

54. *A. The Ova and Embryos.*—The former exhibit an external hard brittle shell, which often breaks so as to represent operculated ova, like those of the *Trematoda*. From the opercular opening a limpid vesicle emerges, in which, however, KÜCHENMEISTER did not find the six hooklets which VON SIEBOLD considers similar to those in the cirrati of the *Tænia*. Possibly a part of the eggs of the *Bothriocephali* are not produced with undeveloped embryos, so that the latter are perfectly formed only when free in nature, as the eggs of the *Ascarides*. The resting scolex exists in the fishes, especially marine fishes. In these certain cestode worms live, having a band-like, inarticulate appendage, but exhibiting no commencement of sexual development. These become converted into mature *Bothriocephali* in the intestines of higher fishes, or of the marine birds of prey. Whether the cestode worms are developed in the intestines of fishes in which they are found, or are conveyed there in one or other of the animals on which these fishes feed, in which they had been converted into scolices, after the animal had swallowed the eggs of the mature *Bothriocephali*, is still undecided. Probably the ova and scolices are developed as already described (§ 37-47). As the host of the *Cysticercus* is devoured by an animal, in the intestine of which the scolex, being set free, immediately develops itself.

55. *B. We have no data as to the production of the Bothriocephalus latus in man.* This worm has been found in the cat, but is extremely rare in all terrestrial animals. The cat has evidently obtained it from the intestines of fishes, which in sea-ports and on the sea-coasts are left in large quantities, and are used as manures. It is difficult, notwithstanding, to account for the presence of this animal in man. The ova from the proglottides of this worm may, however, be introduced into the human intestines by means of vegetables, where the intestines of fish have been used as manures, or where they have been conveyed in sewerage water. The passive migration of the embryo into the intestine of another animal, and its conversion in this intestine into an asexual band-like scolex, is much more probable than the development of all the grades in the same intestine, on account of the dissimilarity existing between the embryo and its parent.

56. *C. The physiological relations of Bothriocephalus* are chiefly its weaker vital manifesta-

tions, and the smaller number and less perfect development of its sucking organs, than those of the *Tænia*, which explain its easier expulsion from the intestines. The power of imbibing fluids by the bodies of the *Bothriocephali*, and all *Cestodea*, has been proved by ESCHREICH and others. Transudation takes place in small, pellucid, oleaginous drops (sarcode). While the *Nematoda* and *Echinorhynchi* swell up by imbibition, the *Cestodea*, owing to an abundant exudation, experience only a slight swelling from imbibition. Whole series of segments of the *Bothriocephali* pass off spontaneously, but never single segments, as in the *Tænia*. The duration of the life of the former is not known. More than one or two worms of this genus are rarely found in the same intestine, and their length seldom exceeds twenty feet.

57. Genus 2. TÆNIA.*—i. TÆNIA SOLIUM, and its Scolex-nurse = *Cysticercus cellulosa*.

SYNONYMES.—*Tænia*, Aristotle; *πλατεία ἑλμινς*, Hippocrates; *Lumbricus latus*, Pliny; *Tænia solium*, Linnæus et Auct. permulti; *T. cucurbitina*, Pallas, Goeze, &c.; *T. vulgaris*, Wer-

* "Second Order (KÜCHENMEISTER), TÆNIE.—*Caput subglobosum aut tetragonum; acetabulis oculis suctorilis 4, rarissime 6, muscularibus, orbicularibus, symmetricis oppositis, valde contractilibus; rostellum imperforatum, retractile, in scolicebus quiescentibus inverso, in activis s. Tæniis maturis propulso, hamulorum simplici, duplici, aut multiplici corona armato; corpore plerumque albo, plano, depresso, bilaterale aut triquetrum, articulat. (Strobila); articulis maturis androgynis, aut non sexualibus (?), sponte et alio post alium dehiscens, Trematode cuidam similis (Proglottides); systemate vasculoso perclaro; poris genitalibus lateralibus, plerumque alternantibus, masculo majore et anteriore, femineo minore et posteriore; genitalibus perfectis. Scolices quiescentes et immaturi formam cysti-, platy-, aut acercam ineuntes. Scolices activi cum strobila longitudine et latitudine valde variantes. Embryones 6 hamunculis armati, parvuli, perivivaces; ovula in illis qui formam cysticercum ineunt, minima, pileata, flavescens, in ceteris majora, leviora et clariora."*

I. TÆNIE WHICH OCCUR IN MAN IN THE MATURE STATE.—i. "Tænia solium, and its scolex nurse = *Cysticercus cellulosa*.—Tænia matura = *Scolex activus cum strobila*: longit. 4—5 metres = 6—8 ulnarum, latit. ad 13 millim. Caput = scolex sensu strictiore, breve, antrorsum planum, 0.56—0.75—1.0 mill. lat., acetabulis validis, prominentibus 0.192—0.231" = 0.434—0.521 mill. long., et 0.182—0.224" = 0.410—0.505 mill. lat.; rostellum parvulo 0.4 mill. ad latera nigrescente; hamulorum 22, 24, 28, 30, plerumque 26, duplici ordine, longit. 0.167 quoad majores, 0.11 mill., quoad minores hamulos (secund. Leuckart), 0.18 et 0.12 secund. meas mensuras, ungue et stylo hamulorum ex longit. fere similibus, formâ hamulorum omnino vastâ; loculis hamulorum perclaris, nigrescentibus; collo parvulo, fere nullo; corpore antrorsum maxime attenuato, deorsum ad 10—14 mill. lato, articulat., poris genitalibus alternantibus, interdum irregulariter; utero ramis 6—10—13, irregulariter alternantibus, denus ramificatis instructo; corporibus calcareis in capite rarioribus (0.004" = 0.009 mill. long. et lat.), in corpore crebrioribus et majoribus (0.005" = 0.012 mill.). Proglottides ad 16 mill. longæ et ad 6 late, ad inferiorem partem crassiores, margine magis toroso et angulis magis prominentibus, quam ad superiorem partem, ut in aliis Tæniis, oculis 0.016" = 0.036 mill. long., 0.016" = 0.036 mill. lat.; testâ ovulorum crassiore (0.0063 mill.). Embryonibus 6 hamulis ornatis, 0.023—0.032 mill. long. et lat., migratione indigentibus.

"Habitat.—Solitarie aut sodaliter (ad 40 usque) in tubo intestinali hominis, inque terris diversissimis; vix in Cane domestico.

"Scolex quiescens = *Cysticercus cellulosa*, vesicâ caudali haud magnâ (ubi plurimum 15 mill. in diametro) transverse ellipticâ; corpore inverso, transverse rugato, 8—10 mill. longo. In tubum intestinale translatus intra 3 menses maturescit. Habitat in telâ cellulosa totius corporis et nonnullis corporis cavitatibus clausis (oculis, cerebro, &c.) imprimis in homine, Sue scrofâ domestica, rarius ferâ, Simiâ, Cervo, Capreolo, Cane domestico (Arachnoid. et muscul.) valde dubiosus in peritoneo Canis domestici et Muris Ratti. Per injuriam a nonnullis Cœnurus cerebri hominis nominatus."—KÜCHENMEISTER.

ner; *T. dentata*, Gmelin, Nicolai; *T. osculis marginalibus solitariis*, Bradley; *T. armata humana*, Brera; *T. lata*, Reinlein; *T. fenestrata*, Delle Chiaje; *T. stigmatibus lateralibus*, Bonnet; *T. secunda*, Plater; *T. solitaria*, Leske; *T. articulos demittens*, Dionis; *Halysis solium*, Zeder; *Pentastoma coarctata*, Virey; *Vermis cucurbitinus*, Plater: Kürbiswurm, Kürbisformiger; bewaffneter Bandewurm; Kettenwurm, Germ. Ténie à longs anneaux; T. sans épines; T. de la seconde espèce; le solitaire; ver solitaire; T. bandelette, &c. The following names are also given it, in common with *Bothriocephalus latus* and *Tænia mediocanellata*: le ver plat, Bandelorm, tape-worm, jointed worm.

58. *Tænia solium* presents five steps of development. 1st. The sexual animal—*Proglottis*; 2d. The grand-nurse—six-hooked embryo; 3d. The resting Scolex—*Cysticercus cellulosus*, in the parenchyma, areolar tissue, and cavities of the body; 4th. The active Scolex-nurse, that is the *Cysticercus cellulosus*, which will become a *Tænia solium* in the intestines; and, 5th, the Strobila, the series of segments of *Tænia solium* produced by gemmation from the fourth step.

59. A. THE MATURE *TÆNIA*.—The name *Tænia solium* is incorrectly applied to this worm, inasmuch as frequently two or three occur in the same person. Dr. PFAFF has seen seven expelled, KÜCHENMEISTER ten, HELLER thirty, and KLEEFELD counted forty expelled from one patient.

60. (a) The Strobila.—The head, although varying somewhat in size, is seldom larger than the head of a common pin. It is of a blackish-brown colour, especially around the base of the short rostellum, and in the sacs around the base of the hooks, and in and around the sucking disks. The hook-sacs, as well as the hooks, are placed in a double circular series. The one series does not materially differ from the other. As in all the *Tæniæ*, the points and spines of all the hooks fall in the same circle, or in two circles lying close together, the number and position of the hooks corresponding with the sacs, and varying from 22 to 28. The sucking disks are nearly circular, or somewhat oval, and surrounded by a circular collateral branch of the longitudinal canals, by which a sort of vascular net is formed. Close behind the sucking disks, and near the head, the vessels collect in four main branches, which are united quite at the front of the head by a common transverse branch, thicker than they. In the vessels of various *Cestoidæ*, VIRCHOW, WAGENER, and others, have seen a sort of ciliary epithelium projecting into them, and moving in the fluid. The calcareous corpuscles reach about to the middle of the sucking disks. They are few and small on the head. The slender neck, of about 6" in length, exhibits no traces of transverse striæ or segmentation. The calcareous corpuscles are somewhat more abundant, and also larger than in the head. Behind the neck commences the true jointed body of the *Tænia*, in which KÜCHENMEISTER counted 825 segments in one specimen ten feet two inches in length. The proportionate size of the segments gradually increases posteriorly, or as they depart from the head—in length from 1-12" to 7". In this species, as in all *Cestoidæ*, contact with water causes the emission of DUJARDIN's sarcode, in oleaginous drops. The sexual organs appear from about the 280th to the 300th segment, and onward, from the

head, in the median line of the *Cestoidæ*, at first as a simple brownish-yellow canal, with short lateral offshoots, towards which two transverse slightly coloured lines (seminal cord and vagina) run from the sides. The alternating *pori genitales* first appear about the 317th segment, and become distinct in the 350th. The sexual organs are more and more developed from the 350th to the 600th segment, where ova commence, which become mature from the 650th to the 700th segments. Both male and female organs generally exist in the same segment, and are minutely described by KÜCHENMEISTER. Each joint, when divided, presents, 1st. *Epidermis* of a chitinous structure, without calcareous corpuscles; 2d. *Longitudinal fibres*, with calcareous corpuscles; 3d. *Transverse fibres*, with few calcareous corpuscles; 4th. Sexual organs.

61. B. SCOLEX OF *TÆNIA SOLIUM*.—*Cysticercus cellulosus*.—The former is identical with the latter, as proved by the identity of the head in both; by the general and particular circumstances under which *T. solium* occurs, and by converting, by experiments in feeding, *Cysticercus cellulosus* into *Tænia solium*, and the eggs of the latter into *Cysticercus cellulosus*.

62. (a) The ordinary habitation of the *Cysticercus cellulosus* is the flesh of the pig; and *Tænia solium* is almost entirely unknown where the use of this flesh is avoided, as among the Jews and Mohammedans, who strictly adhere to their religious precepts. On the other hand, *Tænia solium* is abundant wherever the breeding of pigs occurs, as in Poland, Hungary, Pomerania, Thuringia, England, &c., "and especially among those engaged in trades which bring them in contact with raw pork, and therefore with raw *Cysticerci*, as butchers, cooks, sausage-makers." KÜCHENMEISTER found *Cysticerci* in the water used in washing sausages. The direct proof of the identity of this cystic worm and *Tænia solium* is shown by the following experiment upon a murderer condemned to death. Exactly 72, 60, 36, 24, and 12 hours before his execution, 12, 18, 15, 12, and 18 specimens of *Cysticercus cellulosus* were administered to him partly in rice or vermicelli soup of a blood heat, and partly in blood-puddings. The *Cysticerci* had already lain seventy-two hours in a cellar before KÜCHENMEISTER discovered them. The last administered had consequently lain about 130 hours out of the living organism, and he hardly believes that those *Cysticerci*, which had lain more than eighty hours, were still capable of development, any more than he can believe this to be the case with the *Cysticerci* contained in smoked sausages and hams. On dissection forty-eight hours after execution, he found ten young *Tæniæ*, of which six were deprived of their hooks, but four distinctly showed the hooks of *T. solium*. The little *Tæniæ* were 4 to 8 millim. in length, and had attached themselves by their hooks and proboscis to the intestine, and possessed a small band-like appendage, 2 to 5 millim. long. The preceding experiment is proof of the conversion of the cystic worms into *Tæniæ* in the human intestine, and also of the mode of infection. KÜCHENMEISTER is convinced that the scolex of a *Tænia* retains its power of development in its dead host only as long as no putridity occurs.

63. (b) The farther proof of the identity of *T. solium* and *Cysticercus cellulosus* is derived from the structure of the head of the latter. "This

cystic worm, like all others, forms a vesicle the size of a pea or very small bean, with a little white head in its interior, from which the true scolex may be evolved by pressure. This scolex bears a head with four, and sometimes six, sucking disks (the latter especially in the human brain), round which the vascular system runs, and collects into two longitudinal canals on each side. The short rostellum bears from twenty-two to twenty-eight hooks, placed in a double crown. Besides these, the head exhibits a sparing brownish-yellow, or blackish-brown pigment,* and five sacs round the stems of the hooks. The neck is very short, poor in calcareous corpuscles, opaque, and colourless; the body is wrinkled, abounds with calcareous corpuscles, and the head is inverted into it as long as the caudal vesicle is alive and uninjured. After the death of the worm the head becomes everted. (See also § 46, *et seq.*)

64. (c) *Proofs of the Conversion of the six-hooked Embryos enclosed in the Eggs of Tænia solium into Cysticercus cellulosæ*.—KÜCHENMEISTER, in 1851, expressed the opinion that the pig infects itself with *Cysticercus cellulosæ* when it meets with the eggs and proglottides of *Tænia solium* upon the pastures; and in 1853 VAN BENEDEN administered *T. solium* to two pigs, and thereby rendered one pig measly. The following year KÜCHENMEISTER fed three sucking-pigs, on the 7th, 24th, and 26th of June and 2d of July, with segments of tape-worms, partly given off spontaneously and partly artificially expelled. On the 13th of July they were again fed with artificially expelled segments. "One of the pigs was killed on the 26th of July, and exhibited young *Cysticerci* corresponding with the days of administration, of which the largest individuals formed vesicles of the size of a hemp-seed, with a central turbidity, i. e., the commencement of the head. The second pig was killed on the 9th of August, when thousands of *Cysticerci* were found in all parts of the body; the largest individuals were as large as peas, and exhibited a distinct head, while the smallest were only of the size of a hemp-seed. The third pig, which was killed on the 23d of August, was uniformly set, throughout all parts of the body, with *Cysticerci* of various degrees of growth and development. The largest were almost perfectly developed; others resembled those last described. He undertook the examination of a weighed piece of the flesh, and found 133 *Cysticerci cellulosæ* in $4\frac{1}{2}$ drachms of it. If we calculate from this quantity the number of *Cysticerci* which would have existed in 1 stone, or one fifth cwt. of the pork, we obtain the great number of 88,000 individuals in this weight. A fourth pig of the same litter, to whom no *Tænia* had been administered, exhibited no traces of *Cysticerci* on dissection." (KÜCHENMEISTER, *Op. cit.*, 121, 21.)

65. LEUCKART repeated and confirmed the above experiment, and recognised, in the mode in which *Cysticercus cellulosæ* is developed from the embryo of *T. solium*, exactly the same type as that above described as the type of the formation of the so-called *Cysticerci* in general. It may, however, be noted that this worm acquires the vesicular form, and becomes covered with a vascular net, rather early, and at a time when no trace of the head can be observed. The first appearance of the head commences in *Cyst. cellulosæ* soon after the seventh week, at which time the embryo is about 2.5 millim. in diameter.

66. (d) *The Scolex of Tænia solium, Cysticercus*

cellulosæ, has hitherto been found in the most various muscles; in the muscles of the heart, in the cellular tissue, in the brain, and in the eye of man. In these it acquires various forms and sizes, according to the space afforded for its development. In the ventricles of the brain and eye, its caudal vesicle attains even the size of a walnut, and remarkable forms. The size and form of the *Cysticercus* are determined chiefly by excess of nourishment, and by softness, looseness, and other properties of the tissues in which it occurs. The form is not material, the nature of the worm is the same.

67. (e) The symptoms it produces differ with its seat or position. It is almost harmless in the sub-cutaneous cellular tissue. In muscles it often occasions but little inconvenience. In the muscles of the heart, however, it may cause softening and other organic lesions. But its situation in the deeper muscles, even in the muscles of the heart, admits not of diagnosis. The situation of this *Cysticercus* in the eye is very important.—a. It has been found between the conjunctiva and the sclerotica, where it is of least serious occurrence, as it may easily be removed by operation, as in cases recorded by HÖRING, ESTLIN, BAUM, and others.—b. In the anterior chamber. It was first seen in the living subject by SOEMMERING and SCHÖTT, and in the posterior chamber by VON GRAEFE.—c. In the vitreous humour by the last-named writer and others.—d. In the retina and under the retina in very rare cases. In these latter situations this cystic worm has been detected during life chiefly by means of the ocular speculum of HELMHOLTZ. In most of these cases, partial or complete loss of sight by the affected eye, squinting, movements of the worm, inflammation of the structures, followed by partial disorganization, and a greenish tint of the vitreous humour, were the symptoms chiefly observed. In rare instances only were tape-worms present, or *Cysticercus* present in other parts of the body.—e. *Cysticercus cellulosæ* in the human brain seldom occurs, and as seldom can be recognised during life, unless conjoined with cerebral symptoms, vertigo, &c.—f. *Cysticerci* are observed in other parts of the body, or *Tænia solium* has existed at an earlier period of the life of the patient.

68. ii. *TÆNIA MEDIOCANELLATA** (KÜCHENMEISTER).—DESCRIPTION. (a) The epidermis of the animal is distinct, soft, consisting of delicate decussating lines, without calcareous cor-

* "*Tænia* matura.—*Species longissima* (ad 12—14 ulnas longa), latissima, crassissima. Capite inermi, permagno, ad 2 millim. lat., valde nigrescente; acetabulis 4 permagnis (ad 0.367'' = 0.829 millim. long. et 0.259'' = 0.711 millim. usque lat.).

"Systemate vasculoso: in capite simpliciore, quam in *T. solium*; Corpore calcar: ad 0.012 millim. in capite, ad 0.018 millim. in articulis magnis, magisque numerosis, quam in *T. solium*. Rostellum nullum. Collum perbreve, sed distinctius, quam in *T. solium*. Articuli posteriores latissimi, ad 17 millim. lat. et ad 9—14 millim. long. crassi: poris genitalibus irregulariter alternantibus. Proglottides permagnæ et perricaces, serpiissime sponte et sine fœcibus humanis ex ano demissa, ægrotumque valde perturbantes; in maxima sua extensione 25—30 millim. long. et ad 7 millim. lat.

"Uterus permultos ramos (ex utroque latere usque ad 30) in margine libero claviformes, non amplius denticulæ, ad summum bifurcatim diviso, inter se parallelæ. Ovula magis ovalia, leviora, et clariora, quam in *T. solium*, ad 0.036 millim. longa et 0.028—33 lata. Testa crassa uti in *T. solium*. Embryones 0.028—32 millim. longi, 0.023—26 lati.

"Scolex quiescens ignotus. Fortasse in sue aut bove, fortasse in animal. inferior. ordinum."—KÜCHENMEISTER.

puscles. Underneath are longitudinal fibres, running through the whole body of the animal; these, as well as the next layer of transverse fibres, contain the calcareous corpuscles embedded in them. The size of the sucking disks, which are quite black, gives the head of this *Tænia* a considerable bulk. Transverse vessels run through the space between the sucking disks, and from these a branch runs to and around the disks, until the four longitudinal vessels are developed from them in the neck; these vessels becoming thicker as the segments increase in size. The segments, which have a great tendency to increase in breadth, are at first 1 millim. in length, and about three in breadth. Afterward, also, the breadth predominates over the length for a considerable space. But this proportion does not continue downward, and segments of 1—1½ in. of length and only 3—4 lines in breadth are met with. That the last segments or proglottides have a tendency to pass away without fæces is beyond a doubt; but this also takes place with *T. solium*, although more rarely. The segments usually pass when the patient is standing, and passing along the thighs, occasion a moist and cool sensation, and are found creeping over the surface.

69. (b) This *Tænia*, when artificially expelled, breaks off close to the neck. After the lapse of about ten weeks from this expulsion, a fresh passage of proglottides takes place. From the spontaneous passage of these without fæces it may be inferred that the reproduction and growth of the segments are extremely rapid, and that the animal must be more injurious to its host than *T. solium*. KÜCHENMEISTER mentions a case in which the number of proglottides, which passed almost daily, amounted, in the aggregate, to upward of 100 feet in 80 days; and that in the course of this time 1½ foot of tape-worm was passed and regenerated each day. The internal irritation of the rectum and anus, produced by these segments when forcing their passage, and the unpleasant clamminess they occasion, especially by the deposition of their eggs, which often also occurs at this time, and which appear like to a white moist sand, are very distressing to the patient. In the case just referred to, from 5—15 proglottides passed daily from the patient with the fæces; and as these immediately laid their eggs, the fæces looked as if sprinkled with white sand.

70. (c) The *Scolex* is unknown. In Dresden it cannot be rare, as this *Tænia* is not uncommon there. It is not improbable that the cystic worm belonging to this species may occasionally occur among the specimens pronounced to be *Cysticercus cellulosæ*. This point might have been determined by feeding pigs with the eggs of the *Tænia*. An intelligent patient, from whom KÜCHENMEISTER expelled this *Tænia* by means of his preparation of the extract of pomegranate root, states that he had observed his *tænia* soon after dining frequently, at an eating-house, on raw beef-steaks and green salad and radishes. The scolex was either seated in the beef, or in mollusca in the salad or on the radishes. "The embryos resemble in size and structure those of *T. solium*. Their migrations are unknown." Its habitat appears to be in Europe and Africa.

71. VARIETY* from the Cape of Good Hope.—

* "Nihil notum, nisi Strobilæ pars posterior. Articuli per totum corpus, cristâ longitudinali præditi, crassi, et longi. Pori genitales marginales alternantes. Uterus et

A number of segments of this *Tænia* were expelled by pomegranate bark, and, like *T. medio-canellata*, were very difficult of expulsion. They were destitute of head and neck. Its total length must be at least 6—10 yards. Its segments are very thick, white, and fat; in the mature state more than one inch in length, and 3—5" in breadth, and extremely massive. They are distinguished by having a longitudinal ridge along the whole of the mature and immature segments. This *Tænia* is rich in cholesterine. Mr. ROSE, who sent the segments to KÜCHENMEISTER, states that the migrations of the six-hooked embryos and the scolices are unknown, that it is impossible that the latter should live in the flesh of pigs, as the worm was obtained from a Hottentot, and the Hottentots, like the Jews and Mohammedans, eat no pork. A thick *Tænia* occurs in Abyssinia, among Mohammedan inhabitants. The Hottentots probably brought this tape-worm with them from the Caffre wars, in which they enjoyed themselves among the cattle of the Caffres. The scolex probably lives in their cattle and sheep. May not the scolex have been a *Cysticercus tenuicollis*?

72. iii. *TÆNIA NANA*† (BILHARZ; VON SIEBOLD).—This small filiform *Tænia* has broad and perfectly developed segments, and a large quadrangular head, at the angles of which the round sucking disks are placed upon globular eleva-

ovula simillima illis *Tæniæ* medio-canellatæ. Verisimilimum est, strobilam mihi notam proliferatam esse a *Tæniæ* medio-canellatæ scolice quodam 6 oculis ornato."—KÜCHENMEISTER.

* [In a recent work by Mr. PARKYNS, entitled "Life in Abyssinia" (New York, 1845, 2 vols.), we find it stated that the whole population in Abyssinia are affected with tape-worm; that out of above forty persons, male and female, employed by the writer as servants only two were exempt from it. It is in that country ascribed generally to eating raw meat, which is a universal custom. Mr. P. states that the Abyssinians are in the habit of taking physic regularly once every two months to relieve themselves of the malady; that they also use the *kaupo*, both the flowers and seed, besides the bark of another tree whose botanic name is not given; although the *kaupo* is always preferred, when it can be had. The dried flowers are ground or powdered as fine as possible, and a strong infusion made, of which the patient drinks half a pint, fasting: about six hours after, a good quantity of beer is drunk. Mr. PARKYNS supposes, as many white persons who visit the country are infected with *tæniæ* who do not eat raw meat, that the cause is to be sought for in the climate or in the use of bread made of a species of millet. Vol. ii., p. 224, 5. KÜCHENMEISTER, however, has proved by his experiments that individuals fed on pork tainted with measles, and containing the cysticercus, become subject to tape-worm. Various German writers have supposed that these entozoa are destroyed by boiling, salting, and smoking the pork. Dr. RIECKE, of Nordhausen, has published a paper in which he recommends the prohibition of the sale of pork unless it has undergone these processes; and, in support of these views, he states that *tænia* is an exceedingly frequent complaint in the neighbourhood of Nordhausen, where there is a large consumption of raw pork by the people; and, on the other hand, that at Altmark, where this practice is not prevalent, he has only seen six cases of this disease among about ten thousand patients who have been under his care during a period of fourteen years.—Ed. Med. Jour., Dec., 1855, p. 560. Also, for June, 1855. The same subject, the production of *tæniæ* by eating raw pork, is also ably treated by Professor ALLEN THOMPSON, in *Glasgow Journal*, July, 18, 1855. Professor BENNETT entertains doubts whether the salting of pork is capable of destroying the vitality of the cysticercus.—Ed. Med. Jour., Feb. 18, 1855. See, also, HENKE'S Zeitschrift, 3, 1855.]

† "Corpus filiforme, depressum; Caput antice obtusum, collum versus sensim attenuatum, acetabulis subglobosis, rostellum pyriformi uncinulorum bifidorum corona armatum. Articuli transversî; cirri unilaterales, ovula globosa; testa laevi simplici 6 instructa 1-100" magna. Longitudo totalis 6-10". Patria Egyptus, in hominis intestino tenui semel reperta numero permagno."—KÜCHENMEISTER.

tions. The head is flat in front, and gradually diminishes in breadth, and passes into a long slender neck, which is followed by segments which become broader, until at last the hinder segments are three or four times the width of the head. These *Tæniæ* occupy only a limited space of the ilium. The ova are globular. The six hooklets of the embryo *Tæniæ* are distinctly seen in the fresh ova. From the number of the *Tæniæ* found, and their very small size, KÜCHENMEISTER has believed this worm to be a *Tænia echinococcus*.

73. iv. SYMPTOMS AND DIAGNOSIS OF THE MATURE CESTOIDEA OCCURRING IN THE HUMAN INTESTINE, OF BOTH BOTHRIOCEPHALI AND TÆNIÆ. —KÜCHENMEISTER remarks that the stronger the patient is, the less the irritability of his system, the more regular his appetite and food, the fuller and richer his nourishment, the fresher his colour, the less he is inclined to diarrhœa, to anæmia, and chlorotic symptoms, the less does he complain of tape-worm. According to most writers, chlorotic or anæmic symptoms are increased by the great appetite of the tape-worm for proteinic substances, calcareous salts, and fat; and according to the degree of the symptoms are also the complaints of the patient. SEEGER gives the following statement of the frequency of particular symptoms in 100 cases of tape-worm: In 68 instances nervous affections and general or partial convulsions occurred—epilepsy, hysteria, abdominal spasms, convulsive cough, dyspnœa, melancholy, and hypochondriasis. In 49 cases nausea, with faintness and vomitings, was present; in 42, various pains in the abdomen; in 33, disordered digestion and irregular states of the evacuations; in 31, irregular appetite and voracity; in 19, habitual or periodical hemicrania; in 17, sudden colic; in 16, sensations of undulatory movements in the abdomen up to the chest; in 15, vertigo, delusions of the senses and defects of speech; and in 11, shifting pains in various parts. These symptoms are deceptive; many of them will be often experienced after the worm has been completely expelled; and even viewed in connexion with the patient's habits, occupations, and residence in a locality in which the *Cestoidea* are known to be prevalent, are not of themselves diagnostic of the existence of tape-worm. It is only by the discharge of segments of the worm that the nature of the disease can be satisfactorily recognised. The passage of the segments *per anum*, either with the fæces, especially when there is diarrhœa, or without this accompaniment, is the most frequent. The discharge of them by the mouth is extremely rare, and can occur only when there is violent vomiting, and when there is dangerous obstruction of the bowels. The passage of them through the intestines into the peritoneal cavity, or into the urinary bladder, or through fistulæ opening on the surface of the body, can occur only when ulceration of the intestines has been followed by perforation and a fistulous communication in either of these directions, or after wounds penetrating into the bowels. These several ways by which segments of tape-worm were passed externally were known to the older writers, and were ascribed by them to the mechanical or perforating action of the worm. But it is singular that, whenever ulceration and perforation of the bowels occur coincidentally with the presence of worms, an instinctive desire of the latter to es-

cape from the bowel, through either the morbid opening or the natural passages, is observed.

74. v. IMMATURE TÆNIÆ FOUND IN THE HUMAN BODY EXTERNALLY TO, BUT NOT WITHIN, THE INTESTINES.—These form the *CYSTICI* and *ACEPHALOCYSTIDES* of older writers. The *CYSTICERCUS CELLULOSÆ*, being identical with *Tænia solium*, has been noticed when treating of that tape-worm (§ 62, *et seq.*). I shall only briefly notice the other immature *Tæniæ* occasionally found in the human body externally to the intestines.

75. A. *CYSTICERCUS TENUICOLLIS* (ESCHRICHT), *CYSTICERCUS VISCERALIS* (AUCT.).—As the mature *Tænia* of this cystic worm is not found in man, but chiefly in the dog and wolf (*Tænia marginata*), I shall not occupy any part of my limited space by describing it, but refer the reader to Dr. LANKESTER's translation of KÜCHENMEISTER's work (p. 178).

76. (a) The *Scolex* or immature state* of this *Tænia*, however, being sometimes formed in man, especially in former times, requires a brief notice at this place: it forms the *Cysticercus tenuicollis* of recent writers, and the *C. visceralis hominis* of earlier authors. The rarity of this scolex in human subjects in modern times has induced VIRCHOW and DIESING to doubt its occurrence, while ESCHRICHT has proved its rare appearance in man, especially in the liver.

77. (b) The structure of this cystic worm is rendered remarkable by its frequently enormous caudal vesicle, which in animals may attain the size of a child's head, by the concentric wrinkles or rings, visible externally, which pass round the worm, and which are crossed by very fine longitudinal striæ, so that when it is laid upon a plate, and held on the same plane with the eye, the animal has a finely checkered appearance. In the dead *Cysticercus tenuicollis*, incrustated with calcareous matter, these concentric rings may be recognised, and the calcareous deposit often forms a plastic-like cast of the form and structure of the cystic worm. The parietes, also, when a transverse section of the dead *Cysticercus* is made, present a structure consisting of concentric strata, analogous to that of the *Echinococci*. Here, however, it is so extremely fine and delicate, that there is great trouble in detecting it.

78. B. *ECHINOCOCCI*.—Some naturalists admit only of one species or variety of *Echinococcus*, others of two, and others of even a greater number. VON SIEBOLD divides this species into *E. hominis* and *E. veterinorum*; but, from the accounts of various writers, both varieties have been found in the human subject.

79. 1st Var. *ECHINOCOCCUS SCOLICIPARIENS*†—*Echinococcus veterinorum*, of authors.

* "*Scolex quiescens*=*Cysticercus tenuicollis*. Vesicæ caudali tenui permagna (1, 2, 4, 6" et ultra); Corpore 14—30 millim. et ultra longo, 5—10 millim. lato, cylindrico; Collo 8—15 millim. longo; Capite uti in *Tænia filis* 2 gelatinosis, pone collo ex receptaculo capitis aut scolici in vesicæ cavitatem emissis. Metamorphosis in *Tæniæ* 10—12 hebdomadis post partum peracta.

Habitat. Rarius in hominis abdomine (mesenterio et hepate), sorpius in Ruminantium, Equi, Suis Scrofarum Sciuri, Simiæ, &c., cavitare abdominali."—KÜCHENMEISTER.

† *Tænia matura*.—*Tænia minima*, ad 3 millim. longo, corpore 3-aut 4-articulato. Capite subgloboso, 0.3 millim. lato; rostellum parvulo, rotundato, 0.125 mill. longo; osculis suctoriiis magnis 0.13 mill.; hamulis in duplici ordine positus 28—36, quorum majores ex Leuckartii mensura 0.045, minores 0.038, ex meis mensuris 0.034 et 0.028 habent. Collo longiusculo. Articulis 3—4, quorum ultimus toto corpore longior (2 mill. long. 0.5 mill. lat.) est. Utero medianâ loculis et stolonibus nec ramis propriis

SYNON.—*Tænia visceralis granulosa*, GÖZE; *T. granulosa*, GMELIN; *Vesicaria granulosa*, SCHRANK; *Hydatid erraticus*, BLUMENBACH; *Polycephalus hominis*, GÖZE; *Pol. granulosa*, ZEDER; *Pol. Echinococcus*, ZEDER; *Echinococcus veterinorum*, RUDOLPHI; *Echin. giraffæ*, GERVAIS; *Echin. simiæ*, RUDOLPHI, aliique; *Echin. granulosa*, RUDOLPHI; *Echin. infusorius*, LEUCKART; *Echin. polymorphus*, DIESING; *Echin. scolicipariens*, KÜCHENMEISTER.

80. (a) The mature *Tænia* has hitherto not been found in the human subject. VON SIEBOLD in 1852, and KÜCHENMEISTER in 1854, bred this *Tænia* by giving *Echinococci* to dogs. The description in the subjoined definition gives all that is required to be known of it; but the eggs and six-hooked embryos must occur at some period in the human intestines, in the water and raw articles of diet, especially vegetables, fruits, roots, &c. Like the embryos of other *Tæniæ*, however, they escape the human eye. "Their migration is certainly performed, like that of the embryos of other *Tæniæ*, by their perforating the intestine and getting into the abdominal cavity, where they prefer attaching themselves to the liver or the kidneys, or to the organs in the thoracic cavity. A portion of them, however, may migrate along the ductus choledochus to the outer surface of the liver." They take up their position in the same way as the other *Cestodea*, the envelopes formed around them being similar, but much thicker.

81. (b) The *Scolex* forms a vesicle which, according to ESCHRICHT, measures $2\frac{1}{2}$ to 3 inches, and is firmly attached to the organ in which it dwells. The enveloping cyst is like others, but more concealed and more abundantly permeated by proteinous unorganized substances, by which its walls are thickened. It may be partly separated into layers, the inner being smooth, like a serous surface. A second vesicular body fits exactly to the inner surface of the innermost layer of this enveloping cyst, and is the true cystic worm, the so-called mother vesicle of the *Echinococci*, that is, the six-hooked embryo, which, continually increasing, has attained an extraordinary size. It is almost impossible to get the cystic worm uninjured out of its cyst, to which it adheres so firmly. The walls of this worm are elastic, and tremble like jelly, when touched, even after they are empty. They never collapse altogether as seen in *Cysticerci*, nor lie, like these, even when dead, at the bottom of the envelope cyst. Their cut margins roll themselves up, and present a gaping appearance. The transverse section of this cystic worm shows a structure of more or less numerous consecutive circular strata, varying according to age.

82. c. The structure of this cestode has been described by ESCHRICHT, VON SIEBOLD, and oth-

instructâ; Ovulis ovalibus, 0.034 long. et 0.030 lat., testa 0.0019 mill. crassa, cavitate interna 0.027 lat. et 0.030 long. Habitat. In Canis domesticus, imprimis in Canis lupi, tubo intestinali.

Scolex quiescens.—*Echinococcus scolicipariens*. Vesica minus pellucida, membranacea, in pariete ad 1—2 mill. crassa, ex pluribus 0.005—0.01 mill. crassis lamellis concentricis composita, parvulas gemmas (brood-capsules) stylosas gignens, in quibus scolices singuli proliferantur, magnitudinem 30 mill. et ultra exhibens. Scolices sociales gemmis disruptis libere in vesicam emissi, parvuli, capite *Tæniæ* modo dictæ. Metamorphosis in *Tæniam* post 7—8 hebdomades peracta.

Habitat. Interdum in homine, plerumque in aliis animalibus plerumque domesticis ex ordine ruminantium et herbivorum. —KÜCHENMEISTER in Op. cit., p. 192, 3.

ers, who say that its parietes consist of two similar membranes, loosely connected, the outer being firm and cartilaginous, and the inner thin and smooth, resembling a mucous surface, which is beset with small elevations of a size up to $\frac{1}{4}$ ", which are partly very young scolices in the act of development, partly farther developed scolices of 1-10", and partly the points on which such scolices formerly sat. In the fluid contained in these vesicles there are also free scolices, part of which are still furnished with the remains of the stalk. For other minutiae of structure I must refer the reader to Dr. LANKESTER's translation of KÜCHENMEISTER's work.

83. This cestode worm is found chiefly in the liver of man and ruminating animals. It has been detected also between the choroid coat and the retina of the human subject. When present in the liver, this organ is generally swollen, especially posteriorly, pale, or of a uniform greyish-brown colour. Its surface presents larger or smaller spots of a whitish-yellow colour, of a regular form, and very slightly raised. This species is generally seated so deeply as hardly to project above the level of the surface of the organ, unless it is very largely developed.

84. d. The symptoms caused by this *Echinococcus* are usually slight, limited, and equivocal. The vesicles seldom exceed the size of a walnut or hen's egg. Even when they are present in numbers, their diagnosis is most difficult. When they are small or few, the disturbance of the functions of the liver may be slight. When more numerous or more fully developed, there are generally pain and uneasiness in the hepatic regions, with increased pain on pressure and percussion; the dull sound on percussion being more extensively heard, and the liver being often felt from one to two inches below the false ribs. There is also irregularity of the bowels, the evacuations being unhealthy, and often deficient in bile. Jaundice is sometimes observed. But all these symptoms may be caused by other lesions of the liver.

85. B. ECHINOCOCCUS ALTRICIPARIENS. *Echin. hominis*, Auctorum.

86. KÜCHENMEISTER* believes that this species has been confounded with the preceding.—a. Its mature *Tænia* is unknown. Nevertheless, he thinks that it probably occurs in the human intestines, and indeed in the intestines of those individuals who suffer, or have suffered, from the species of *Echinococcus* belonging to it in some part of their bodies, and in whom such a colony of *Echinococci* has opened towards the intestine. This *Tænia* may also develop itself in the intestines of domestic carnivorous animals. That the eggs and embryos must occur at some time

* He gives the following definition of its *Scolex*: "Vesica animata Echinococco scoliciparienti similis sed omnino eo multo major (ad $\frac{1}{2}$ ped. in diamet.). Scolices singuli quiescentes majore hamulorum minorum numero (46, 52, et ultra) armati parantur, aut ex modo Ech. scoliciparientis, aut in gemmis aut capsulis a vesicæ matris superficie interna solutis in quibus iterum scolices et vesicæ secundariæ scolices gignendi si præditæ gignuntur (mother-, daughter-, and grand-daughter-vesicles); aut fortasse in vesicis, quæ divisione quadam aut sectione ex vesicæ matris in vasis animalis hospitis repente et serpente formantur. Vesica mater nihil aliud est nisi vesicula embryonalis 6 hamulis armata, et valde amplificata; vesicula filia et neptis hamulis 6 destituta, quia ex vesicula embryonali rectâ viâ non exortæ sunt.

Habitat. Non solum in homine, sed etiam, auctoribus Haubnero et Creplino, in mammalibus majoribus domesticis, et quidem in diversissimis et hominis et illorum animalium corporis regionibus. Ovula, hucusque ignota."

or other in the human body must be admitted, although they escape observation from their small size.

87. *b. The Scolex*—the *Echinococcus altricipariens*—occurs not only in man, but also in the larger domestic animals, especially herbivora. It is very prevalent in Iceland. Dr. SCHLEISSNER states that he saw fifty-seven human patients suffering from *Echinococcus* in that island; that it occurred more frequently inland than on the coast; and that it constituted one eighth of the diseases of the place. Dr. THORSTENSOHN, of that island, says that every seventh living human being in it suffers from *Echinococci*; that females are more liable to them than males, and that their abundance increases with age, men being most frequently attacked by them between their thirtieth and fortieth, and women between their fortieth and fiftieth years.

88. *c. The characteristics of this species of Echinococcus*, as distinguished from the preceding, appear to be as follows: (a) The enveloping cyst, and the mode of annexation of the inner wall of this cyst to the primary vesicle of the *Echinococcus*, derived from the six-hooked embryo, are similar in this and the foregoing species; but the cyst formed by *Echin. altricipariens* is much larger than that of *Echin. scolicipariens*, and hence projects far above the level of the organ in which the colony exists.—(b) Owing to its much greater bulk a proportionately increased interference with the functions of the organ results, and eventually with the whole organism.—(c) As regards the animal itself, we find not only single scolices or a single vesicle in such a colony, but the constant production of fresh vesicles with young (daughter and grand-daughter vesicles), sometimes with, and sometimes without, the production of separate scolices adhering directly to the walls of the vesicle. According to THORSTENSOHN and SCHLEISSNER, the hydatids occurring in Iceland exhibit this structure. "The hydatid sacks," they state, "are formed not only in the human liver, but also in many parts of the abdomen, and are often of enormous size. Hundreds of hydatids are frequently evacuated through the external opening of the sac, or with the stools, and in vomiting. They do not, however, occur only in the interior of the body, but also very frequently in the skin, where they appear like large saccular swellings. The course of the disorder is very chronic." KÜCHENMEISTER states that the vesicles produced do not, like the original mother-vesicle, bear six embryonal hooklets, as they never have occasion for them. The six hooklets may be sought for in vain, even in the mother-vesicle, as, although certainly present, they must, from their extreme minuteness, escape detection on such a large vesicle. The smallest of the grand-daughter vesicles are but just visible, and enclose four, five, or more scolices, which adhere peripherally, by a small stalk, to the inner wall of the common cyst, but converge with thin free ends towards the centre of the cavity of the small vesicle. In very large daughter-vesicles scolices also swim about freely.—(d) The scolices produced or nursed by the mother-, daughter-, or grand-daughter vesicles are in general more slender than those of the preceding species: they have the head with the double circlet of hooks, more frequently protruded during life, at least within the larger daughter-vesicles, exhibit distinctly

marked sucking-disks, and bear a greater number (46 to 54) of hooks, which appear more slender than in the preceding species.—(e) The dwelling-places of this species are not limited. They may occur in the liver, the lungs, the kidneys, the sheaths of the testicles, the spleen, the ovaries, the breasts, the throat, in the sub-cutaneous tissues, in the bones, &c.—(f) With the increase of the secondary and tertiary cysts in the mother-cyst the swelling advances; and the more rapidly this takes place, the recognition of the malady and its natural cure are facilitated; inasmuch as the mother-cyst is often burst by the distention, and probably in many cases becomes destroyed. Sometimes, however, the burst colony appears to heal and to recommence the production of fresh daughter-vesicles.

89. *d. The prognosis of this species is more unfavourable than that of the preceding*, "although the diagnosis is easier, on account of the more rapid growth and greater bulk of the swelling, the occurrence of the hydatid-buzzing, and the more distinct sensation of fluctuation. The structure of the walls of the mother-vesicle is the same in both species, and is characterized by the numerous parallel concentric layers in the substance of the walls, which appear more distinctly marked in the daughter-vesicles, and make their appearance with remarkable clearness after treatment with caustic potash, with the addition of a drop of red ink." (LANKESTER'S *Transl. of KÜCHENMEISTER*, &c.)

90. *e. The Diagnosis of Echin. altricipariens*.—The symptoms produced by a colony of these parasites vary with the organ in which it is located, and with the size and pressure of the tumour it develops. At an early stage of their growth these animals generally occasion little inconvenience, and when largely increased in bulk they produce phenomena which vary little from those occasioned by tumours of the same size in similar situations. Their superficial or deep-seated positions, and their vicinity to, and pressure upon, nerves and blood-vessels, will also modify effects, or even indicate their existence. But it is comparatively rare to obtain certain evidence of the presence of a colony of *Echinococcus* in the body, unless the passage of the gelatinous vesicles already described from the cavities after the bursting of such a colony, or from the punctures or incisions made into tumours. At the same time, the little scolices of the *Echinococcus* must be found in the vesicles, part of these retaining, others wanting their hooks, their sucking-disks being often indistinct. When the vesicles passed have an opening, the little scolices slip out very easily, and if the structures just mentioned be not found, it is doubtful whether or no a steril colony or an acephalocyst be present.

91. Before perforation or bursting of the cyst has occurred, the tumour produced by it being very considerable, an examination of it should be made by palpation and percussion, and if there be an obscure or sensible fluctuation, and when aneurismal symptoms are wanting, and when the general health is either good, or not injured to the extent that might be expected from the size of the tumour, if it were of a malignant nature, then an explorative puncture should be made to complete the diagnosis, and the evacuated fluid examined by the microscope in order to ascertain the presence of *Echinococcus scoliceis*, or of albuminous gelatinous shreds of *Echinococci*. By

these means only can the nature of a cystic or sacculated, fluctuating or elastic tumour be determined, and the existence of these parasites ascertained.*

92. Without these proofs the diagnosis can never be brought beyond one of probability. A sacculated or cystic swelling filled with fluid can alone be inferred. The most useful objective symptoms are the existence of such a tumour, which is elastic to the touch, and of a peculiar consistency and form, in places where swellings do not usually occur; but when these do make their appearance, they are generally *Echinococci*. The highest degree of probability that an unopened tumour belongs to a colony of *Echinococci* is attained when the swelling occurs in places such as the liver, spleen, kidneys, lungs, breast, testicles, throat, &c., where *Echinococci* are otherwise brought to light, either artificially or naturally. On percussion, the finger, placed over the swelling, often feels a trembling or oscillation of the mass underneath it, especially when several gelatinous tremulous cysts are enclosed within a larger vesicle; these being set in

motion by the percussion, appear to produce this trembling or oscillation, which, however, frequently is not felt.

93. *f. The etiology of the Echinococci* is manifestly the ingestion of one or more of the eggs or six-hooked embryos of the *Tania Echinococcus altricipariens* at some time of the life of the patient. The mode of life of persons in some localities and in some circumstances may be favourable to the passage of the eggs of this *Tania* into the stomach; and it is now well understood that certain *Cestodea* often have a very limited habitat. "The duration of the life of the *Echinococcus* does not appear to be very short. According to ESCHRICHT, one patient must have borne his colony eighteen years."

94. *g. The prognosis of the Echinococci* varies according to the organ in which they are seated, to their situation in that organ, and to the primary and consecutive injuries caused by them to the organ and to the whole system. But the prognosis is upon the whole more favourable than is generally supposed, especially when the general health and the powers of vital existence are duly promoted. "The tumours, when they are accessible, are among the number of curable tumours; they may cure themselves by bursting, and when they are once got rid of relapses in the same colony are rare and exceptional cases, and every *Echinococcus* produced usually owes its existence to a new immigration of embryos. But for this very reason the continuance of the mode of life in endemically affected places furnishes a more unfavourable prognosis. The natural cure by the bursting of the colony, and the passage of daughter-vesicles, may be accompanied by symptoms dangerous to life, or, if it take place in the direction of the larger bronchi, by difficulty of breathing, or may even lead to actual suffocation." (*Op. cit.*, p. 227, 228.)

95. *B. Sub-order, TREMATOIDEA.—SYNON.—Myelmintha, DIESING; Egelwürmer; Platyelmintha isolata, Isolated flat-worms, KÜCHENMEISTER.*

DEFINIT.—"*Animalia solitaria, plerumque hermaphrodita, rarissime sexu distincto, et poris plerumque suctoriis, medianis aut lateralibus instructa. Canalis cibarius furcatim divisus aut ramosus, rarissime simplex. Evolutio fit plerumque metamorphosi et sapissime generatione alternante, rarissime sine illis.*"—LEUCKART.

96. This sub-order is divided by KÜCHENMEISTER into two Families, the *Monostoma* and the *Distoma*.

97. (*a*) *MONOSTOMA.*—SYNON.—Cucullanus; Festucaria; Fasciola; Amphistoma; Distoma; Monostoma; Monostomum.*—It is very doubtful whether or no any species of *Monostomum* has been found in the human body. Professor JÜNGKEN was said to have found eight *Monostoma* in

* *ACEPHALOCYSTS.*—LAENNEC, in 1804, viewed these structures as independent animal organisms. VON SIBOLD and KÜCHENMEISTER more recently opposed this view; and very lately the last of these writers, in consequence of his experiments with the eggs of *Tania*, considered that *Acephalocysts* are six-hooked cestode embryos, the growth of which has proceeded without hinderance, but which, nevertheless, have remained barren; or, more correctly, which have never attained to proliferation and the production of scolices." If *Acephalocysts* occur where normally-developed *Echinococci* usually have their abode, they cannot be called strayed cestode embryos, but only cestode embryos which have been disturbed in their normal development and remained barren. KÜCHENMEISTER considers the following to be the characteristic marks of *Acephalocysts*: 1st. A vesicle adhering to the inner walls of a larger cyst from which it is capable of being detached, or is already detached, in particular spots, but never all over, and collapsed in wrinkles, and which presents very sparing calcification in its white and scarcely discoloured walls. 2d. The transverse section exhibits walls consisting of distinctly developed, parallel, concentric layers. 3d. The walls have a peculiar elastic gelatinous trembling. 4th. The contents consist of a watery fluid, or of a substance of a purulent consistence, and contain the microscopic elements of calcifying encysted protein masses in the act of resorption. 5th. The vesicle sometimes conceals, in its interior, secondary cysts, with gelatinous walls, in which, however, we seek in vain for scolices of cestodea or their remains, especially their hooks. "The *Acephalocysts* which are referred to here belong to the following three species of *Tania*: 1. *Acephalocysts* derived from *Tania Echinococcus scolicipariens*. Many of these *acephalocysts* which bear no daughter-vesicles in their interior must be referred to this species. 2. *Acephalocysts* derived from *Tania Echinococcus altricipariens*. These are *acephalocysts* with a formation of daughter-vesicles. 3. *Acephalocysts* derived from *Tania ex Cysticercus tenuicollis*." KÜCHENMEISTER remarks respecting these last that what ESCHRICHT regarded as possible has since proved to be the case; for that in one administration of eggs of *T. ex Cyst. tenuicollis* to a lamb, he found a sterile *Cysticercus tenuicollis* in the midst of other equal-sized and fully-developed *Cysticerci* of this species. This sterile individual bore perfectly distinct indications of life. All structures, he adds, which are really *acephalocysts*, and which are living sterile specimens of *Cysticerci* and *Cenuri*, are distinguished from those derived from *Echinococci* in that the walls of the latter consist of very distinct concentric layers, tremble like jelly, and are extraordinarily elastic; while the walls of the analogous structures derived from *Cysticerci* are considerably thinner, have not the elastic consistence of jelly, and consist of such fine and delicate concentric layers as hardly admit of detection. Such being the origin and nature of *Acephalocysts*, it is obvious that the phenomena produced by them cannot be materially different from those caused by the two species of *Echinococcus*.

The subject of *Acephalocysts* has been already treated of under the article *HYDATIDS*; but instead of viewing them as in that article, as independent organisms, the more recent Continental microscopists and experimenters have shown them to originate as now stated.

* "*Corpus depressum vel teretiusculum. Caput continuum, vel collo discretum. Os terminale vel anticum, ut plurimum acetabuliforme, integrum, crenulatum, interne vel armatum. Apertura genitalium perclara, duplex; mascula infra os, interdum acetabuliformis, pene protractili; feminea pone masculum, minima, ut plurimum inconspicua. Porus excretorius supra caudæ apicem antico margine caudali. Animalia mammalium, avium, amphibiorum et piscium corpora, i. e., præter tractum intestinale organa varia inhabitantia, libere aut folliculis inclusa.*" (DIESING.) *Metamorphosis et generatio alternans inter evolutionem, uti in Distomis.* The ventral sucker is therefore deficient, and DIESING gives a warning, "Cave, ne Bothriocephalidearum articulum solitarium pro 'Monostomum' habeas, aut porum genitalem, interdum callosum, cum acetabulo confundas."

an incipient cataract; and hence VON NORDMANN named the species *Monostomum lentis*.

98. (b) *DISTOMA** (KÜCHENMEISTER); *Distomum* (DIESING).—a. *Distoma hepaticum*†—*Distomum hepaticum*—The fully-developed *Distomum hepaticum* has been minutely described by KÜCHENMEISTER, but I must refer the reader for his description to his work, or to its excellent translation by Dr. LANKESTER.—a. I may, however, briefly state that its skin and parenchyma consist of muscular layers—of longitudinal, transverse, fusiform, and short fibres; that its organs of sense are wanting, and its nervous system has not been described; that its alimentary apparatus presents a mouth, pharynx, and excretory organ; that its female sexual organs lie towards the ventral surface of the animal, and consist of a germ-stock, with its efferent duct, two vitellines, a short oviduct, a sac-like uterus, and a vagina; that its male sexual organs consist of testicles, a ductus spermaticus, a vesica seminalis, and a penis; and that “the *Distoma* are hermaphrodites, with the following sexual actions: self-impregnation with and without copulation, and impregnation and copulation with a second individual.” This *distoma* occasions great devastation in the livers of herbivorous and domestic animals, especially in wet seasons; but it very rarely occurs in man.

99. b. *Diagnosis*.—*Distoma* in the liver causes dilatation and inflammation of the gall-ducts, and destruction by pressure and disappearance of large portions of the parenchyma of the liver in the vicinity of the enlarged ducts. These changes, however, cannot always be recognised, or referred to their true source in the human subject, as several lesions of the biliary organs and apparatus occasion the same symptoms as they produce. The *distoma* may even cause many

of the phenomena of gall-stones passing along the ducts, with or without more or less of jaundice; but these cannot assist in establishing a diagnosis, the passage only of the animals with the faeces or with the matters vomited being the only proof of their presence in the human subject.

100. c. It is obvious that no prognosis of the *Distoma* malady can be formed unless the animal be discharged and recognised. When this takes place, although the prognosis is upon the whole unfavourable, yet there may not be any immediate danger. The life of the patient may be prolonged, or even a recovery ultimately obtained, by promoting the secretions and excretions by suitable means, and by supporting vital force and resistance.

[Several years since we prescribed for a railroad engineer in the State of Ohio, who complained of a sensible movement in the epigastric region, with considerable derangement of the digestion, loss of appetite, pain, anorexia, bilious symptoms, &c. He said he was positive there was a living animal in his stomach, which he had probably swallowed while drinking at some of the stagnant pools while pursuing his vocation as surveyor and engineer. Meeting him some months after, he stated that he had passed the animal after taking a powerful purgative; that it was from three to four inches in length, flat, alive, and of a dark colour, &c. It was evidently an enormous *Distoma*. In the same region of country, the livers of animals, especially the ox and sheep, and frequently the hog, are infested with the same parasites under the name of *fluke-worms*, which frequently prove destructive to life. We have often seen the ox liver perforated by these animals like a honey-comb.]

101. β. *Distoma lanceolatum** (MEHLIS). This species was seen in the human subject by BUCHOLZ, CHABERT, and MEHLIS. It is narrow and elongated, and distinguished by its long neck, by the want of any spinous coat, and by the female organs especially occupying the abdomen, and the testicles the anterior part of the body. SCHAEFFER, RUDOLPHI, and MEHLIS established this as a distinct species of *Distoma*, and showed that GOEZE, ZEDER, and BREMSER were wrong in re-

* “Corpus depressum vel teretiusculum, armatum vel inerme. Caput continuum, vel collo discretum. Os terminale, vel anticum, ut plurimum acetabuliforme. Acetabulum unicum ventrale sessile, vel pedicellatum, medianum, ab extremitate postica plus minusve remotum. Aperturæ genitales approximatae, saepissime ad exitum conjunctæ (cloacæ instructæ), supra vel infra acetabulum sitæ. Animalia plerumque hermaphrodita, rarissime sexu distincto. Ovíula embryones parentibus rarissime similes, plerumque dissimiles aut fimbriatos, aut fimbriis destitutos continentia, quare evolutio fit metamorphosi et generatione alternante.

“Statu immaturo aut libere in natura vagantia, aut in organorum parenchymate, imprimis in animalibus inferioribus inclusa. Statu maturo ectoparasita animalium propriis vertebratorum, aut libere in variis organis et cavitatibus apertis et clausis viventia, aut in folliculis inclusa.”—DUJARDIN et DIESING.

† “Corpus plenum, armatum, saltem in juventute, ætate magis profectæ adhuc in collo. Individua juniora 4”=9 mill. longa, 1½”=3.3 mill. lata; adulta 8–14”=18–31 mill. longa; 3½–6”=8–13½ mill. lata.

“Collum subconicum, breve. Os hauri nodulosum, terminale, triangulare, 1.4 mill. latum. Acetabulum 1.5 mill. latum, ore majus superum ad colli basin, aperturæ triangulæ, 3–4 mill. pone os situm.

“Orificia genitalia fere contigua, mediæ in parte inter os et acetabulum sita. Penis cylindricus, 3 mill. longus, 0.5 mill. latus, falciformis, prominens, uncinulis parvulis armatus. Testiculi maximæ ex parte mediæ in corporis posterioris parte siti, ex trunco mediano et ramificationibus, ad finem cæcis, compositi. Organa vitellina ad latera animalis sita, inter se horizontali quodam et transverso ramo conjuncta et statim in uterum simplicem magnitudine crescentem, multifarie volutum transcurrentia. Ovíula flava, mitra quadam parvula aut obtegulo, dehiscentia, 0.056–0.063” (V. et Par.)=0.126–0.144 mill. longa, et 0.035–0.038”=0.079–0.086 mill. lata.

“Embryones Cercariarum utriculi aut Rediæ, nec minus Cercariæ libere, si omnino hæc forma præbetur, ignotæ. Migrationum modus nondum cognitus. Distomum juvenile immaturum semel sub cute humanâ inventum.”—KÜCHENMEISTER.

* “Corpus læve, lanceolatum, planum, aliquid pellucidum, aut oculis flavofuscum, 4.5–12 millim. seu 2–6” longum, 2 ad 2.2 millim. aut 1–2” latum in anteriore parte tenuius, acetabulo finitum, in posteriore aliquid obtusum. Collum continuum, conicum, planum, longius quam in *D. hepatico*. Os fere terminale, globosum, 0.48 mill. latum, acetabulum orbiculare, 0.48 mill. latum, 1.1 mill. pone os situm, ore majus. Œsophagus 0.48 mill. longus, bulbosus Œsophagi 0.10 mill. latus; intestinum bifurcatum, rectum, simplex, non amplius ramificatum, 0.04 mill. latum.

“Genitalia inter os et acetabulum ventrale sese aperientia, inter intestini bifurcationem sita. Vesica seminalis exterior=cirrus claviformis; funiculus spermaticus flexuosus; penis longus, cylindricus, plerumque rectus; testiculi 2 majores et tertius minor vesicam seminalem internam exhibens; unus pone alterum et pone acetabulum ventrale siti, vix lobati. Organa vitellina multo minora, quam in *D. hepatico*, albida, lateralia, ramificata, 1–1½ mill. longa, in ovarium et uterum intrantia, longiora quam in *Dist. hepatico* et tenuiora, sed colore obscuriore prædita, multifarie voluta. Ovíula multo minora, quam in *Dist. hepatico*, 0.041 mill.=0.018” Par. 0.0185” Vienna longa, et 0.0246 mill.=0.0108” Par. 0.011” Vienna lata, sed in statu maturo multo obscuriora quam in *D. hepatico*, et nigro-rubra.

“Systema excretorium: Vasa litoralia, ad collum usque prominentia, ibique recurrentia et intumescentia minore, ad animalis apicem sita, finita.”—KÜCHENMEISTER.

garding it as a young *Distoma hepaticum*. It is stated by KÜCHENMEISTER to be less injurious to the structure of the biliary apparatus than the *D. hepaticum*. The diagnosis is possible only when it passes off. The prognosis is probably more favourable than in the case of the other parasite.

102. *γ. Distomum heterophysys** (VON SIEBOLD).—This parasite has hitherto been found only in two instances, but in very great numbers, in the small intestines, by BILHARZ. Its influence on the animal economy is unknown. It is unnecessary to give a farther description of it than that contained in the subjoined definition.

103. *δ. Distomum hamatobrium*† (BILHARZ).—*a.* This parasite was first found in 1851, in the blood of the portal vein. It appeared as a white elongated entozoon, resembling a nematoid worm when examined with the naked eye; but was found to be *Distomum*, with a flat body and a cylindrical tail ten times as long as the body. This tail was no loosely attached, deciduous portion of the body, as in the *Cercaria*, but a continuation of the body of the worm itself, which was flat and rolled towards the ventral surface. This first animal found was clearly recognised as the male; another subsequently found in one of the mesenteric veins of the same subject was ascertained to be the female. For a minute description of the sexual organs, eggs, and development of this animal, I must refer the reader to KÜCHENMEISTER's work. It may, however, be stated that, according to Professor GRIESINGER, this parasite is so extraordinarily abundant in Egypt as to have been found 117 times in 363 dissections. It would appear that the *Distoma*

get into the blood-vessels and lay their eggs, which at last escape from the ruptured vessels in the intestinal and urinary mucous surfaces. Dr. REINHARD saw, hanging out of a vessel accidentally opened by KÜCHENMEISTER, one of these *Distoma*, which bore his female with him. The action of their eggs and embryos on the mucous coat of the intestines and urinary organs, and on the biliary apparatus, is of a very dangerous nature.

104. *b. In the intestines* are found deposits upon and beneath the mucous membrane, verrucose and lobate fungous excrescences, and also the aggregations of the eggs in the vessels of this membrane, "where the eggs are often fixed in rows in the mucous and sub-mucous tissues, in and beneath the croupous exudations upon the intestinal ulcers; and, lastly, after the rupture of the vessels upon the free surface of the mucous membrane."

105. *c. Action on the Liver*.—"The entire trunk of the portal vein is sometimes filled with mature animals, with eggs in the substance of the liver; and it is not impossible that the *Distoma* situated in these places may give rise to a tough, dry, anæmatous consistence of the liver, or perhaps even to abscesses."

106. *d. The alterations in the urinary bladder* produced by *Distoma hamatobrium* are at first circumscribed spots of hyperæmia, with bloody extravasation and swelling of the mucous membrane, or tenacious mucus, with grayish-yellow masses of exudation, in which the eggs are imbedded. "It is rare that the whole inner wall of the bladder is injected and ecchymosed. The urine is mucous, but pale and clear; and BILHARZ found eggs in the urine passed." In later stages, yellowish discoloured elevations, mixed with many pigment spots. These elevations often form a soft coat, sometimes a line in thickness, mixed with bloody extravasations, firmly attached to the mucous membrane. Sometimes calcareous incrustations of the egg-shells, the deposition of the salts of the urine, and the aggregation of eggs, give the whole a sandy texture. Very rarely this coating covers true ulcers with loss of substance. At other times, single or aggregated vegetations, varying from the size of a pea to that of a bean, of a yellowish colour or ecchymosed with blood, are found on the vesical mucous surface. In the smooth-edged spaces of these vegetations, sitting in the sub-mucous tissue, formed by the diverticula of its vessels, and only constituting productions of the vessels, BILHARZ first found the *Distoma*, and in the mucus and exudation over these spots their eggs. We may conclude from this that the *Distoma* collect there, and in similar situations, to lay the eggs which are to be passed off.

107. *e. The mucous membrane of the ureters*, either alone or with that of the bladder, or even with that of the pelvis of the kidney, in rare cases, is attacked in a similar manner. A gravelly matter, in molecular masses of imbedded eggs of *Distoma*, either empty or containing embryos, with blood, exudation corpuscles, and crystals of uric acid, is sometimes passed in the urine. Individual embryos also occur free, but GRIESINGER found these in a dead state only. In consequence of the thickening of the inner coats of the ureters, complete or partial occlusion of these ducts with dilatations above it, with retention of urine and its consequences, sometimes supervene.

* Descriptio.—"Dist. heter., hermaphroditum. Corpus ovato-oblongum, depressum, subtus planum, supra leviter convexum. Acetabulum oris subapicale, infundibuliforme, parvum. Acetabulum ventrale paululum ante medium situm, magnum (acetabulum oris decies et ultra superans), globosum. Pharynx muscularis, globosa; canalis cibarius ante acetabulum ventrale in 2 partes cæcas divisis. Cirrus post acetabulum ventrale situs, et oblique cum sinistra ejus parte coarctatus, globosus, acetabuliformis, circulo incompleto setarum 72 minutissimarum, ramulis 5 secundis instructum coronatus, testiculis organoque germinifero globosis. Longitudine $\frac{1}{2}$ — $\frac{3}{4}$ lin.; latit. $\frac{1}{4}$ lin."

† Patria.—Egyptus; in hominis intestino tenui bis reperiuntur, numero permagno."—KÜCHENMEISTER.

† Descriptio vermis secundum BILHARZ.—"*Distomum hamatobrium*, sexu distincto. Maris corpus molle, albidum, filiforme, parte anteriore totius longitudinis octava vel nona ('truncus') depressa, lanceolata, subtus plana vel concava, supra leviter convexa, superficie lævi, reliqua corporis parte ('cauda') terete, margine corporis ab acetabulo ventrali retro utrinque versus faciem ventralem conflexo, eoque modo canalem 'gynæcophorum', efficiente, apice postico, attenuato, superficie externa tuberculis piligeris conferta, superficie canalis interiori linea mediana lævi et partibus lateralibus aculeis minutissimis scabra. Acetabulum oris apicale subinferum, triangulare. Acetabulum ventrale sub finem 'trunci' insertum, orbiculare eadem magnitudine cum acetabulo oris. Superficies utriusque acetabuli granulis crebris minutissimis scabra. Canalis cibarius sine pharynge musculari ante acetabulum ventrale in 2 partes divisis, in posteriore 'cauda' parte denuo unitus, cæcus. Porus genitalis inter acetabulum ventrale et canalem 'gynæcophorum' originem situs.

"Femine forma dissimilis, tenerrima, gracillima; corpus tæniæforme, læve, hyalinum, antice sensim valde attenuatum, cauda canali nullo apice angustata. Acetabula et canalis cibarius, ut in mare. Porus genitalis cum margine posteriore acetabuli ventralis coarctatus.

"Longit. 3—4 lin.; mas feminam latitudine multo superans.

"Patria.—Egyptus; in hominis vena portarum ejusque ramificationibus et in vesicæ urinariæ parietibus. In venis mesentericis reperiuntur mares feminam in canali gynæcophoro gerentes, in venis intestinalibus et hepaticis, in vena lienali semper vidui."

The kidneys are somewhat swollen and congested with blood, and the mucous membrane of the pelvis is much injected. The kidneys, in rare instances, ultimately degenerate in a fatty or suetty state. "The aggregation of eggs of the *Distoma* are not unfrequently the nuclei of deposits of gravel and stones, consisting chiefly of crystals of uric acid in the kidneys, ureters, and bladder, and thus give rise to the well-known consequences of stone and gravel. This is the *Lithiasis* of the Egyptians, described by PROSPER ALPINUS in "*Medicina Egyptiorum*."

108. The seasons appear to have some influence upon the frequent occurrence of this worm, as it has been observed to be more abundant from June to August, and more rare in September, October, and January. This difference is probably owing more to the kind and quality of the food in these months, than to temperature or season.

109. *f.* The symptoms of this parasite are manifested chiefly in the urinary apparatus, and in the urine itself, at an early period of the lesions produced by it. Causeless hæmaturia, especially if frequent, and attended by anæmia, emaciation, and disordered bowels, should be a cause of suspicion, especially in tropical countries. The diagnosis, however, during life, can be certain only when the eggs are found in the bloody urine and in other evacuations, as they were by BILHARZ.

110. *e.* *Distomum ophthalmobium** (DIESING).—This parasite was found in the eye of an infant, between the lens and the capsule, by GESCHEIDT. The infant was five months old, and was born with *cataracta lenticularis*, with partial suffusion of the capsule. Four specimens of this *Distoma* were found, and were recognisable by the naked eye.

ii. Order, NEMATELMIA—NEMATOIDEA.—Thread worms, Round worms.

111. The worms now to be treated of are the First Order of RUDOLPHI.—"*Nematoidea: Corpus elongato, tereti, elastico*." DIESING, in his "*Systema*," arranges them as the Sixth Order of his first sub-class, and defines them—"Nematoidea: Corpus elasticum, cavum, subcylindricum; tractus cibarius simplex; caput in proboscidem haud protractile. Endoparasitica, tandem rarius extus libere vagantia." They form the second order of KÜCHENMEISTER's second sub-class, and he defines them as follows: "NEMATELMIA: Corpus teres, elasticum, sæpe attenuatum, filiforme; ore centrali, vel sub-centrali; canalis cibarius aut distinctus aut obsoletus, anoque destitutus. Metamorphosis in paucissimis. Migrationes activæ aut passivæ in permultis."

112. Mature Nematode worms are met with in the human subject in the cavities of the body, having mucous surfaces, in the sub-cutaneous cellular tissue, with an artificial external communication, and during their youth, and in an immature state, in various muscles, especially primitive muscular fasciculi. The division of this order of worms into numerous genera and species has been attempted by DUJARDIN, VON SIEBOLD, DIESING, and others, but without sufficient agreement to admit of farther reference to it than is made by KÜCHENMEISTER, who does not adhere to a strict classification, but rather re-

views them in accordance with their dwelling-place in the human body, and selects for them the name most generally employed. It was formerly thought that the *Nematoidea* were the most accurately known of *Entozoa*, but at the present day we have more positive knowledge of the history and development of the cestode worms, and even of the *Trematoda*, than of this, the order of round worms.

113. "The distinct presence of a digestive apparatus, divisible into mouth, œsophagus, stomach, intestine, and anus, the separation of the sexes into two individuals, the certain detection of a nervous system in some of them, and the apparently jointed structure of the round worms, bring them near to the articulata. In the human subject we must take into consideration: 1, the *Trichocephali* and *Trichinæ*; 2, the *Oxyuri*; 3, the *Strongyli* and *Ancylostoma*; 4, the *Filariz*; and, 5, the *Ascarides*." (*Op. cit.*, p. 289.)

114. A great part of the nematode worms appear to reach maturity only after they have undertaken various immigrations and emigrations during their youth. One species of round worm common to man is to some extent capable of migration also in the mature state. The migration in the early stage of development consists of the escape outward of the eggs of these worms with the human fæces, with which they get into dung-hills, sewers, &c., and experience the transitions described above (§ 7, *et seq.*). My limits admit not of an account of the sexual and other organs of this order of worms, and of the various stages of their development; sufficient reference to these topics for practical purposes has already been made, and the reader may farther peruse the minute descriptions of KÜCHENMEISTER and VON SIEBOLD, and of other recent observers, to whom I have referred.

i. TRICHOCEPHALUS.*—SYNON. *Trichuris*, RÖDERER; *Ascaris*, LINNÆUS; *Mastigodes*, ZEDER; *Trichocephalus*, GOEZE, DIESING, DUJARDIN, &c.

115. 1st. *Trichocephalus dispar*,† with its prog-

* Descript. Systemat.—"*Corpus longissimum, ex 2 partibus formatum, quarum anterior tenuior, filiformis, posterior crassa, organa sexualia continens*."

"Mas: tenuior quam femina; penis simplex; organon copulatorium auxiliare spinosum, ex 3 branchiis compositum."

"Femina: mare major et crassior; vagina muculosa in abdomine sese aperiens; uterus simplex; ovarium simplex. Animalia ovipara, vix aut rarissime vivipara."

"Ovula oblonga, subfusca, in utraque extremitate collo quodam parvulo prominente ornata (en une sorte de gonolot court, Dujardin)." —KÜCHENMEISTER.

† Systematic description of *Trichocephalus dispar*.—

"Cutis transversa striata, marginales rugas ad anum versus magnitudine adductas exhibens. Caput 0.02 mill. latum, retractile, obtuso-acuminatum, interdum per parvæ papillæ instructum. Tractus intestinalis constituitur ex œsophago ab initio recto, angustissimo paulo post toruloso, sensim per totum collum intumescente; ventriculus pyriformis, ad latera sua glandulas 2 perparvas aut appendices albas aut nervorum ganglia gerens. Animalia facibus humanis pro nutrimento ventia. Mas: omnino colore clarior, fusco-albior; circiter 37 mill. longus (caput et collum 22; truncus aut abdomen 15); in trunco 0.5 mill. — 1.0 mill. latus; formam spiralem amans. Testis et funiculus spermaticus simplex ad intestini tenuis formam volutus; und cum tubo intestinali ante anum in cloacam communem apertus. Penis simplex; 3.35 mill. longus; 0.042 mill. ad extremitatem infundibuliformem, 0.037 mill. ad apicem versus latus; vaginæ lævi cylindricæ instructus. Extremitas caudalis organo copulatorio auxiliario, spinis armato, subcylindrico ornata, cujus longitudo 0.451 mill. — 0.198 mill. Par. = 0.203 mill. V., latitudo in parte libera 0.090 mill. = 0.039 mill. Par. = 0.047 mill. V., in parte opposita fere 0.049 mill. = 0.0216 mill. P. = 0.022 mill. V. est. Cloaca communis musculosæ in maribus longitudo circiter 4 mill. = 2 mill. P.; latitudo 0.261 mill. = 0.116 mill. P. = 0.119 mill. V.; latitudo fora-

* "*Corpus ovato-lanceolatum, depressum, variabile. Collum breve subcylindricum. Os terminale orbiculare. Acetabulum ore ½ majus, subcentrale, apertura circulari. Longitud. ½ — 1 mill.; latitud. ¼ mill.*" —DIESING.

any known as *Trichina spiralis*,* OWEN and LUSCHKA.

SYNON.—*Trichocephalus dispar*, GOEZE; *Trichuris*, ROEDERER and WAGLER; *Ascaris*, LINNÆUS; *Mastigodes*, ZEDER; *Trichina*, FILARIA, Auct.; *Trichure*, Fr.

116. A. This worm was first discovered by MORGAGNI in the cæcum and vermiform appendage of typhous patients; and ROEDERER and WAGLER, in 1761, recognised it as a distinct worm, in the "*morbis mucosus*," or mucous fever, so prevalent in Germany in the middle of the 18th century. It was long supposed to exist only in the intestines of typhous patients, but it is now fully ascertained to have no particular relation to any disorder of the human bowels. It is found chiefly or only in the lowest region of the small intestine, near the ileocæcal valve, in the cæcum, and colon. From the dingy colour of the worm, it is liable to escape detection, and only is detected with ease when the lower intestines are free from their thick and coloured contents, as in disorders attended by diarrhœa. If carefully sought after, these worms will be found more frequently and in greater numbers than is commonly believed. RUDOLPHI found many hundreds in the situations just named. BELLINGHAM saw upward of 100 in the cæcum only of one patient in Dublin. They occur in both children and adults, and in Europe and Africa. KÜCHENMEISTER'S work and its translation by Dr. LANKESTER, contain very minute descriptions of the organization of this parasite. The subjoined systematic description is sufficient for all practical purposes.

117. B. *Trichina spiralis* (OWEN and LUSCHKA), as the brood of *Trichocephalus dispar*, engaged in migration.—This asexual worm was first described by OWEN in 1835, although previously seen by TIEDEMANN in 1822, and by HILTON and WORMALD in 1833. It was afterward seen and described by PAGET, KNOX, and others. The seat of this worm is, as is well known, the muscles of voluntary motion, and indeed all the muscles excepting the heart and the sphincter ani, where it has not yet been found. In the places where capsules of *Trichina* are seated, fatty tissue is constantly inserted, chiefly at their

minis cloacæ ipsius—(the lumen of the canal formed by the cloaca) 0.130 mill.=0.58" P.=0.059" V. *Spermatozoïda globuliformia ad 50 mill. longa.*

"*Femina: in trunco rectior, minus curvata, mære aliquid latior, minusque elastica et flexibilis, ob ovulorum in utero et in ovarii copiam, eaque de causa colore magis fusca; extremitate caudali obtuso acuminata.*

"*Ovula fusca cum generis speciminibus: 0.054 mill.=0.022" P. et V. longa; media in parte 0.025 mill.=0.0112" P. et V. in apicibus 0.01 mill.=0.0048" P. et V. lata. Embryonum migrationes adhuc ignotæ. Verisimilimum est, Trichinas, quas dicunt spirales, Trichocephali disparis embryones esse.*"

* Description of *Trichina spiralis*.—"Corpus plerumque in spiras 2 retortum, ad anum versus crassius et obrotundatum, ad caput attenuatum; tubus intestinalis, uti apud Trichoc. disparem, ab initio multifarie retortus, ventriculus pyriformis cum lateralibus 2 appendicibus aliosis (lobulis aut glandulis aut nervis), intestinum rectum post coarctationem quandam iterum incrassatum, rectaque viâ ad anum in extremitate posteriore cæque crassiore apertum profectum. Funiculus quidam secundus in utraq. extremitate cæcus et semilunaris genitalium primordia format (?).

"*Longit. vesicularum 0.2—0.5—0.7"=0.4—1.0—1.5 mill.; latitudo fere mediam partem exhibet.*

"*Longitudo vermiculi ex cystide liberati et evoluti secundum LUSCHKA 1—1.5"=1.15 mill.=0.59" P. et 0.518" V.; latitudo in capitis apice 0.008 mill.=0.0036" P. et 0.0037" V.; latitudo extremitatis posterioris seu ani 0.024 mill.=0.0168" P.=0.111" V.*"—KÜCHENMEISTER.

anterior and posterior extremities; the fat being apparently deposited to fill up the space produced by the *Trichina* having penetrated between the muscular fibres.

118. a. The development of *Trichina spiralis* seems to be as follows: "When a human being has swallowed the eggs, or the youngest brood developed into ready-formed embryos which occur in the eggs, or perhaps also when any female *Trichocephali* residing in the small intestine scatter their eggs with the ready-formed embryos in them, and when in either case the egg-shells are burst, and the embryos set free in the intestinal canal, the desire of migration awakens in them, and they set out, like the embryos of many other *Nematoda*, in the shortest and easiest way towards the tissues which they prefer as their resting-place." That in this case, as in that of the *Cestodea*, the digestive canal may be the place of immigration from the exterior, is shown by the fact that the muscles of the tongue, pharynx, and œsophagus, as well as the sphincter ani internus, are visited by the *Trichina*. In some cases the blood may be the bearer of the migrating brood. MEISSNER found the young attached to the inner walls of blood-vessels and of the heart; and both he and LEUCKART think that the circumstance of the brood of cestode worms being found so abundantly in the blood-vessels shows that the blood is their most usual course of migration. KÜCHENMEISTER believes that both courses of migration are followed by penetrating the tissues, and by the blood. The *Trichina* having found a resting-place, a cyst closely adhering to the tissues is formed around it. This cyst consists of concentric layers of a fibrous or lamellar substance, with imbedded cell-nuclei. The brood reposing in this cyst approximates the head and caudal extremities in spiral turns, without, however, contracting a part of the head, and is then perhaps surrounded, even on the part of the worm, with a peculiar layer, but certainly enveloped on the part of the host with a capsule and cyst, in which the worm increases in size; and, besides the intestinal canal, develops the primitive foundations of an organ which belongs to the generative apparatus. The material for the capsule or cyst enveloping the *Trichina*, according to LUSCHKA, is formed from the inflammatory exudation produced by the passage and site of the worm; and hence the cyst varies in appearance with the time which has elapsed since the immigration, the oldest cysts exhibiting granules of lime-salts combined with an organic substance, this deposition of lime-salts increasing with the age of the cyst. SANDERS and KIRK state that there are around the worm—1, an external fibrous envelope; 2, a tolerably thick layer of a white, transparent, homogeneous substance; and, 3, an internal round capsule.

119. b. The contents of the cyst consist of one or more animals, and a small quantity of fluid, which keeps the inner envelope extended (which envelope KÜCHENMEISTER and LUSCHKA believe to be derived from the animal itself); the fluid is sometimes clear, especially in the comparatively young *Trichina*. In cysts with worms recently dead or destroyed, it showed traces of organic decomposition. In cysts with worms which have been long dead, or in those which contained no worms, which are rare, is found a clear, thickish fluid, with small formative elements, or only a

few elementary granules. These wormless cysts probably had previously enclosed a *Trichina*, which had died, and that a complete solution of the worm had taken place, or which had migrated from the cyst, and wandered to some other situation, where it had again become encysted.

120. As to the destination of the *Trichina*, there is no doubt that a great number, if not all, of those which occur in the muscles of man become abortive and die. The latter then lie in their cysts, in the midst of the cyst-fluid, which is in course of sebaceousification, desiccation, and calcification, rolled in spiral convolutions, in the same way as the *Trichina* seen in a living state. These spiral structures are, however, broken up into fragments, which indicate a ringed appearance or a segmentation of the bodies of these animals. "But how these encysted nematode worms, with our present state of civilization, can reach, before the period of their death—which, however, only occurs very late, perhaps in 30 to 40 years, or after a still longer period in particular cases—places in which they are in a position to pass through their farther and higher development, is beyond my power to divine" (KÜCHENMEISTER). On this subject the experiments of this writer, and of ZENKER and LEUCKART, have thrown no light.

121. c. The reasons which have induced KÜCHENMEISTER to regard the *Trichina* of OWEN and LUSCHKA as the young brood of *Trichocephalus dispar*, and to consider both these nematode worms, hitherto placed separately, as belonging to one species, are the following: 1. The skin of both has a peculiar ringed and jointed structure, which presents itself more distinctly than in many other *Nematoda*. 2. In both, a longitudinal stria runs down the sides, indicating the limit to which the contractile parenchyma of the worm, in which its internal organs are imbedded, reaches. These striae are certainly the points of attachment of the parenchyma to the inner wall of the integument of the *Trichina*. 3. The alimentary canal is organized in exactly the same way in both. The mouth and anus are situated exactly in the centre of the two extremities of these bodies, the anterior and posterior; this circumstance excluding the *Ascarides*, *Oxyurides*, and *Strongyli*, and most of the *Filariae*, from any relationship with *Trichina spiralis*. 4. The second tube which occurs in the abdomen, together with the intestinal canal, favours the identity of the two worms; the course of this tube admitting of being so developed as to produce either female or male *Trichocephali*. For these reasons KÜCHENMEISTER regards the *Trichina* as the brood of *Trichocephali* engaged in migration, by swallowing which we infect ourselves with the *Trichocephalus dispar* of both sexes. The symptoms produced by these worms have not been observed or stated. Even the immigration of the brood of *Trichina* appears to take place without any general reaction, and is also borne without injury for many years.

122. ii. OXYURIS = sharp-tail (from ὀξύς and οὐρά). This name applies only to the female, but by no means to the male. This worm is differently classed by DUJARDIN and DIESING, whose classifications are too artificial, and too subdivided to admit of notice at this place. The *Oxyuris*, according to DUJARDIN and most other authors, is a genus of *Nematoda* separated from

Ascaris. This writer gives the subjoined systematic description of it.*

123. A. *Oxyuris vermicularis*, BREMSER, DUJARDIN, VON SIEBOLD, GOEZE, RUDOLPHI, DIESING, &c.; *Fusaria vermicularis*, ZEDER; *Kinder-, Mastdarm-, Madenwurm*; Thread worm.†—a. Three forms as to size, sex, &c., of these worms are met with: 1. The mature females, which are

* "*Corpus cylindricum aut fere fusiforme, sublongum, in feminis retrorsum subulatum; caput inerme; os rotundum (in statu contractionis) aut triangulare (in statu actionis), trilabiatum; oesophagus musculosus cylindricus aut clausiformis et canali triquetro perforatus; ventriculus globosus cavitate triangulata; intestinum in feminis ante apicem caudae acutae, in maribus in centro caudae apertum.*"

"Mares: fere microscopici; plerumque spirales in fine posteriore obtusi; penis simplex, uncinatus.

"Feminae: cauda acuta; vagina semper in parte vermiformi sita; uterus bilocularis cum ovaris 2. Ovuula laevia, oblonga, non symmetrica, multo longiora quam latiora, omnino magna: 0.064 mill. 0.136 longa."

† "*Corpus album; cutis transverse striata, in margine utroque cum duplici ordine dentium acutiorum et obtusiorum, secundum Dujardini mensuras 0.018—0.023 mill., secundum meas in feminis 0.024—0.030 mill. 0.0108—0.014" P.=0.011—0.015" V., in maribus autem 0.008 mill.=0.0036" P.=0.0037" V., inter se distantium; caput 2 appendicibus lateralibus, vesiculosus epidermidis duplicaturâ; os rotundum, antice margine trilabiatum et angustum; oesophagus carnosus, musculus longitudinalibus et transversis, canali triquetro; ventriculus strictura; oesophago sejunctus, globosus, cum cavitate interna triquetro, et valvularum apparatu; epithelio polyedrico cum nodulo pellucido sparsim instructus.*"

"Mas: 2.05 mill.=0.90" P.=0.25" V. ad 2.5 mill. ad 3.37 mill. longus (si caudam semper curvatam tanquam lineâ rectâ extensam mensus est); in capite una cum appendicibus 0.094 mill.=0.041" P.=0.042" V., sine appendicibus 0.024 mill.=0.0108" P.=0.011" V., medio in corpore 0.123 mill.=0.054" P.=0.055" V., in cauda 0.023 mill.=0.0144" P.=0.0148" V. latus. Oesophagus a 0.024 mill.=0.0108" P.=0.011" V. ad 0.041 mill.=0.0108" P.=0.011" V. ad 0.041 mill.=0.018" P.=0.0185" V. latitudo intumidus est, circiter 0.311 mill.=0.137" P.=0.141" V. longus. Oesophagus sequitur brevis tubi intestinalis strictura 0.008 mill.=0.0036" P.=0.0037" V. longa, et 0.016 mill.=0.0072" P.=0.0074" V. lata. Postea sequitur ventriculus 0.115 mill.=0.050" P.=0.052" V. longus, et 0.065 mill.=0.0288" P.=0.0.96" V. latus, cum valvularum apparatu cognito; tubus intestinalis paulo post ventriculum latitudinis 0.057 mill.=0.025" P.=0.026" V. est, ad anum vero 0.008 mill.=0.0036" P.=0.0037" V. Penis simplex, 0.057 mill.=0.025" P.=0.026" V. longus, ad basin 0.008 mill.=0.0036" P.=0.0037" V., in apice vero semper ad hamuli instar recurvato, latitudinis (adultiorum 0.003 mill.=0.001" P. et V.). Punculus spermaticus et testis simplex; spermatozoidia epitheliorum imaginem simulantia. Cauda apex in foveam suctoriam mutabilis.

"Femina: 7.84 ex aliis ad 10 mill.=3.48, ex aliis ad 4.337" P.=3.57, ex aliis ad 4.56" V. longa; in capitis apice cum appendicibus 0.196 mill.=0.087" P.=0.089" V.; sine appendicibus 0.065 mill.=0.025" P.=0.0298" V.; in medio corpore 0.49 ad 0.59 mill.=0.21—0.26" P.=0.22—0.27" V.; extremitas caudalis acutissima. Longitudo caudae (i. e., partis inter anum et apicem) 1.798 mill.=0.797" P.=0.819" V.; latitudo caudae ad anum ipsam 0.26 mill.=0.116" P.=0.119" V., inde diminuta. Oesophagus 0.65 mill.=0.22" P.=0.298" V. longus, in capitis apice 0.065 mill.=0.029" P.=0.298" V., in parte posteriore 0.098 mill.=0.043" P.=0.044" V. latus. Strictura tubi intestinalis pone oesophagum uti in maribus perbrevis et 0.028 mill. seu 0.128" P. et V. lata. Ventriculus 0.172 mill.=0.0768" P. et V. et longus et latus, interdu latitudine aliquid minor. Vagina ex Dujardini mensuris 1.8 mill. ex meis ad 1.64 mill.=0.7" pone caput sita; in vivis 1.06—1.2 mill.=0.46—0.54" longa et 0.11 mill.=0.049" lata; cum foramine latitudinis 0.13 mill.=0.06" longitudo 0.15 mill.=0.07" V.; uterus duplex, cuius ramus posterior 2.0 mill.=0.9" cuius anterior 1.35 mill.=0.6" longus; ramosum ovulis impletorium latitudo ad 0.4 mill.=0.18" et ultra ovulis expulsi, 0.2 mill.=0.09" V.; ovarium duplex, in transitu uteri in anum 0.03 mill.=0.015" latum.

"Ovuula fere oblonga non symmetrica; ex Dujardini mensuris 0.055 mill. lata et 0.064 mill. longa, ex meis media in parte ovulorum 0.029 mill.=0.012" P.=0.015" V., in apicibus circiter 0.012 mill.=0.005" P.=0.006" V. lata et 0.05 mill.=0.022" P. et V. longa. Embryones viventes in ovulis nondum vidi."—KÜCHENMEISTER.

remarkable for their size, thickness, and whiteness, for their acute capillary tail, and for an obtuse, broad head. 2. *The young immature females* resemble the pale-gray colour of the males, but they are somewhat larger than they, and are recognised by their acute tails, and by the female sexual organs in grades of development varying with their age. 3. *The mature males* are remarkable by their pale silver-gray colour, and their obtuse anterior and posterior extremities, as also by the penis. All the three forms occur abundantly in one and the same intestine. The skin, head, and œsophagus, and intestine are similar in both sexes. The nervous system of the *Oxyurides* is, according to WALTER, greatly developed, although hitherto overlooked. They have both cephalic and caudal ganglia, with other ganglia, plexuses, and lateral filaments, which are minutely described by WALTER and KÜCHENMEISTER. The primitive nervous filaments are produced from the processes of the ganglionic cells; by the union of several primitive filaments of this kind, narrower or broader branches are produced. The skin of the oxyurides consists of an external epidermis, and beneath this a delicate but densely fibrous corium. The *parenchyma* of the body does not extend into the tail. The muscular system is highly developed. The alimentary apparatus consists of a mouth, œsophagus, stomach, intestine, rectum, and anal cleft. For a minute description of these and of the sexual organization, my limits oblige me to refer the reader to the works of the authors just named, who ascertained that the males of the oxyuris vermicularis are much more numerous than was formerly supposed.

124. *b. The locality* of these worms in the human body is the lower portion of the intestinal canal, especially the rectum. They occasionally stray upward, but rarely higher than the lower part of the small intestine. They wander, however, out of the anus and into the vagina of females. Although most frequent in boys and young persons, yet they are not uncommon at all more advanced ages, even in the most aged, in whom I have repeatedly found them the most tormenting. They are gregarious, forming balls in the large intestines, frequently along with other worms, especially the *Ascaris lumbricoides*. J. P. FRANK found them in the intestines of an infant so young that the umbilical portion of the cord had not separated. They are, of all the *Helminths*, the most frequent tormentors of every age and of every people; for they are not limited to particular parts of the world.

125. *c. Symptoms.*—These vary with the number of the worms and their position. A few hardly occasion any marked symptoms; but when numerous, in the lowest part of the rectum, they occasion extremely distressing itching and an irritating annoyance, difficult to be described, extending to adjoining parts. Certain articles of diet, as onions, carrots, fruits, &c., render the worms more restless and irritating during the whole day; but they are generally most annoying when the patient goes to bed. When the patient falls asleep, grinding of the teeth, excitement of the sexual organs, and restlessness are caused by them. The consequences of this local and constant irritation are, especially at, and subsequently to, the period of puberty, increased sexual irritation, masturbation, &c., in both sexes, and in the female sex most distressingly when

the worms wander into the vagina, when they occasion not merely pruritus, but also leucorrhœa, &c. The loss of rest and the irritation they produce ultimately impair nutrition, give rise to pallor, anæmia, and loss of flesh; irritation of the nostrils, sneezings, discoloration of the countenance, or a dark circle around the eyes, dilated pupils, and various sympathetic phenomena.

126. *d. The diagnosis*, however, of these thread worms can be established with certainty only by examining the fecal evacuations, especially after the administration of an enema. The prognosis, although the complaint is unattended by danger, is not favourable as respects either a speedy or a permanent cure.

127. *iii. STRONGYLI* and their Allies*—This genus of worms has been often described; but, of the less recent writers, more especially by RUDOLPHI and BREMSER. The species which most particularly interests the physician is,

128. *A. The Strongylus gigas*—*Ascaris visceralis aut renalis*, Gmelin; *Lumbrici in renibus*, Blasius; *L. renalis*, REDI; *Fusaria visceralis aut renalis*, ZEDER. KÜCHENMEISTER remarks that BREMSER has shown this worm, which occurs, although rarely in the abdominal cavity, the omentum, but especially in the kidneys and urinary bladder, more rarely in the lungs and liver, and only when strayed in the intestinal canal of martens, dogs, wolves, seals, otters, oxen, and horses, is still more rare in man; and that a number of those accounts of worms passing off through the urinary passages are delusions. Since a minute knowledge of the pathology of the kidneys has been acquired, it may be inferred that many of these cases would be recognised as fibrinous casts thrown off in the urine during disease of these organs. That these worms are extremely rare, even in the kidneys, must be admitted, since KÜCHENMEISTER has never met with a case in his own practice. He has, moreover, thrown rational doubts on the authenticity of most of the cases on record, showing that these cases, at least some of them, may have been instances of mistaken diagnosis. Dr. LAN-

* "A. *Strongyli veri*. Corpore subcylindrico, utrinque attenuato; capite nudo rarius alato, 2 appendicibus lateralibus armato; ore terminali, nudo vel sex papillis instructo, vel orbiculari; œsophago triangulari, musculosos; cute tenui. Mas: appendice multilobata aut radiata; penis simplex vel duplex, multilobatus, ad digitum instar. Femina: caudâ obtusâ, rectâ; ano in parte caudali; vaginâ antrosum sitâ; utero simplici aut biloculari; ovulis magnis (0.06—0.12 mill.). Animalia ovi- aut vivipara."—KÜCHENMEISTER.

DUJARDIN arranges the *Strongyli veri* as the xvth Genus of his *Nematoides*. DIEBING places the two species, *Str. gigas* and *Str. longirostris*, in his Gen. liv., *Entstrongylus*, thus defined by him: "Corpore subcylindrico, utrinque sensim attenuato, capite corpore continuo, ore terminali, orbiculari, papilloso; bursa maris terminali, integra; pene filiformi longo, haurâ vaginâ; vaginâ aut antrosum aut retrorsum sitâ. Systemati gangliorum distinctissimo. Animalia ovi- aut vivipara, extra tubum intestinale habitantia."

† "Corpore rubro, cylindrico, longissimo, utrinque attenuato, striis aut annulis transversis interruptis et 8 fasciis fibrarum longitudinalium instructo; capite obtuso, truncato; ore orbiculari 6 papillis aut nodulis planiusculis, appropinquantibus; œsophago 15—22 mill. circiter longo, tenui et angustiore quam canalus intestinalis."

"Mas: corpore antrosum magnis attenuato, 140 ad 140 mill.=10"—1' longo, 4—6 mill. lato; caudâ obtusâ cum bursâ membranaceâ patelliformi, circa 3 mill. latâ, truncatâ; pene tenuissimo simplici."

"Femina: corpore utrinque attenuato, 2 decim. ad 1 metr.=5"—3' longo, 5—12 mill. lato; caudâ magnâ rectâ, obtuso-rotundatâ; ano triangulari, oblongo, sub extremitate caudali sitâ; vaginâ antrosum sitâ; utero simplici; ovulis fere globulosis."—KÜCHENMEISTER.

KESTER, however, states that there is a fine specimen of this worm taken from a human kidney in the Museum of the Royal College of Surgeons of England.

129. *a.* When fresh, this worm has a reddish colour. In spirit this colour fades, and the worm assumes a grayish leaden hue. Four longitudinal stripes are observed on it. The total length of a female specimen was 19 Saxon inches. DUJARDIN states that the vagina opens 1 to 2 inches from the caudal extremity. DIESING says that the ganglial system of nerves is most manifest in this worm, a remark which is confirmed by BLANCHARD, OTTO, and VON SIEBOLD.

130. *b.* The symptoms of this worm are equivocal, for there can be no evidence of its existence to be relied upon until it is discharged, thereby demonstrating its existence. Another species of *Strongylus*, the *S. longevaginatus* of DIESING, has been said to have been found in the human subject, but without sufficient proof.

131. *iv.* *ANCYLOSTOMUM.*—*Ancylostoma*, DUBINI; *Ancylostoma*, CREPLIN.—This worm was found by DUBINI in Milan, in 1838, in the duodenum and upper part of the jejunum; and subsequently also by PRUNER, BILHARZ, and GRIESINGER, in the countries watered by the Nile. According to VON SIEBOLD, it has never been found in Europe to the north of the Alps. DUBINI established this as a distinct genus from the *Strongyli*, by the symmetrical arrangement of the dental apparatus. We are, however, at present acquainted only with a single species of it.

132. *A. Ancylostomum Duodenale.*†—BILHARZ, having had his attention called to this worm by VON SIEBOLD, in consequence of PRUNER having found it in Egypt, observed it in every body he examined after death in that country, sometimes in small numbers, sometimes in hundreds, less in the duodenum than in the jejunum, between the transverse folds of the mucous membrane. One male is found to three females. At the oval end, a large, obliquely truncated horny capsule, furnished with four strong teeth on the projecting portion of the upper margin, is seen. The oval orifice is turned to the surface opposite to the

sexual and anal orifices. The animal attaches itself by its mouth so firmly to the mucous surface that the mouth is torn away when it is detached by force. Its nourishment is blood, as proved by its intestine being filled with this fluid.

133. *a.* *Pathology.*—This worm is of great interest and importance, and is often fatal to those afflicted with it. GRIESINGER, the best chemical observer of this worm, states that this worm attaches itself firmly by biting into the mucous and sub-mucous membranes; and that the spot on which a worm has been attached is indicated by an ecchymosis of the size of a lentil, in the centre of which a white spot the size of a pin's head appears, which is pierced by a hole penetrating into the sub-mucous tissue. From these wounds the blood enters freely into the intestine of the worm, which is filled with blood from the punctured places. Frequently the mucous membrane of the intestine is studded with flat, livid, brownish-red elevations of the size of a lentil. This is owing to the collection of the blood between the mucous membrane and muscular coat. In some cases a specimen of the worm is found lying in the cavity thus formed, covered with blood, with which it has completely engorged itself. The manifest consequence of this infliction is *anæmia*. GRIESINGER imputes the "*Egyptian chlorosis*," which he had previously described, and which, he avers, attacks one fourth of the population, entirely to the presence of this worm.

134. *b.* *Symptoms.*—At an early period, pallor of the face, general surface, lips and gums; palpitations of the heart, especially on any exertion, sounds in the jugular veins on auscultation, lassitude, debility without emaciation, are the chief phenomena. Subsequently disordered digestion, irregularity of the bowels, and *Catarrhus intestinalis* are complained of. These symptoms may continue an indefinite time; but if not removed by a decided treatment, the consequences are most serious, and generally fatal. Emaciation often does not commence until late in the disease. *Cedema* of the extremities and eyelids; a pale yellowish or greenish yellow hue of the general surface; a withered, dry, flabby, and cold state of the integuments, and a remarkable pallor of the outlets of mucous canals; remarkable apathy, and sense of exhaustion; constant and distressing palpitations, the sounds of the heart being often heard at the distance of several feet; murmurs in all the larger arteries, and a rushing or purring sound in the jugulars, slowly supervene. The pulse is uncommonly quick and small; the respiratory movements are weak, frequent, and short; the urine is abundant, pale, and rarely contains albumen. Giddiness and headache are commonly experienced. Constant hunger, singular appetites, and slight febrile movements, sometimes with enlargement of the spleen and atrophy of the liver, are observed. With indulgence and full diet this state may last for years; but in very many cases the progress of the malady is rapid. Even in the best circumstances the patient is pallid, sickly, and miserable, exhibiting a high degree of *anæmia* and *hydræmia*. Various acute affections often supervene and complicate the disease, and a chronic diarrhoea or dysentery ultimately carries off the patient. Fatiguing labour, a lowering or antiphlogistic treatment, and debilitating agents hasten dissolution. A restorative regimen, change of climate, and

* "*Vermes subcinerei, vivipari, corpus cylindricum; caput aliquid attenuatum; pharynx infundibuliformis, colore subfusco, parietibus resistentibus. Os acclabuliforme, subcorneum; apertura oris ampla circularis subdorsalis; dentes in fundo oris intra aperturæ marginem abdominale 4, uncinati (os in altitudine infundibuli 4 uncinis intus recurvatis munitum et in fundo cum eminentiis conicis, in tabularum explicatione 'unguli tegumentarii' nominatis, in uncinis versis, utriusque generis communibus, Dubini); oesophagus carnosus, qui ad clavæ instar inter descendendum largitur; cutis transverse striata, unde 2 eminentiæ conicæ prominent, uno alteri opposita, inter sextam anteriorem partem longitudinis vermiculi totalis et inter reliquas posteriores vermiculi partes, quæ quinquies sextam longitudinis totalis partem exhibent; anus lateralis et aliquid ab extremitate caudali remota. Extremitas caudalis maris bursam terminalem integram subtus excisam multiradiatam exappendiculatam; penem duplicem longissimum exhibens; femina obtusa, aperturam genitalem retrorsum sitam præbens.*"

—DIESING et DUBINI.

† "*Caput apicæ rotundatum; oris limbi papillis conicis inæqualibus, duabus minoribus, uncinis papillis impositis apicibus convergentibus. Corpus subrectum v. parum curvatum, anteriore parte transparens, ventriculo globoso nigrescente, posteriore flavido-fuscum, maris antrorsum attenuatum, extremitate caudali inflexa; bursæ cyathiformi bilobâ 11-radiatâ, cujus radii ita sunt positi, ut triplicem eorum ordinem conspiciere possis, in utroque enim latere ordinem quatuor, media in parte trium radiorum (radiis lateribus utriusque 5 simplicibus: Diesing); radio dorsali apicæ furcato; femina extremitate posticâ acute conicâ. Longit. mar. 3—4''; fem. 4—5''; crassit. ad 1''.*"—DIESING et VON SIEBOLD.

judicious treatment, often arrest the complaint. All the phenomena consequent on the presence of these parasites are characteristic of a very slow but continued loss of blood, which, if not arrested, goes on until the quantity and the quality of this fluid are no longer sufficient to sustain life; death supervening with faintness, dyspnoea, and fatal syncope.

135. *c.* On examination after death, the organs and structures generally are wasted, pallid, and softened. The spleen is often enlarged; the liver is pale and atrophied; the veins are nearly empty; the heart and large venous trunks contain only soft, small brown coagula, with very little fibrin. In many even of the large venous trunks there is only a dark serous-looking fluid, with a few pale, large, and colourless blood-globules. The substance of the heart, especially the inner layers of muscles, are very pale and even fatty. This organ is generally large, thick, hypertrophied or dilated, particularly on the left side. The endocardium and valves are often irregular, as if thickened in parts. The brain, the lungs, the muscles, the digestive mucous surface, &c., exhibit remarkable pallor and anæmia; the cellular tissue and muscles being softened, flabby, and in parts exhibiting a watery infiltration (§ 134).

136. *v.* THE FILARIE.—These form the seventh genus of the first-class "*Nematodes*" of DUJARDIN, and the fortieth genus of the sixth order, "*Nematoidea*" of DIESING. From the *Gordii* they are distinguished by structure, mode of life, the nature of the youngest brood, and by the circumstance that they readily burst in water, like other *Nematoda*, which is not the case with the *Gordii* (DIESING).

137. *A. Filaria Medinensis*.†—PLUTARCH refers, in the ninth question of the eighth book of his "*Symposiaca*," to the statement of AGATHARCHIDES of Cnidus, the geographer and philosopher, "That the people on the Arabian side of the Red Sea suffered many strange diseases; among others, worms, like little snakes (*δρακόντια μικρά*), came out upon them, which gnawed their legs and arms, and when touched retracted themselves, coiled themselves up in the flesh, and gave rise to the most insupportable pains; but that this evil has been found only then, and nei-

ther before nor since among any other people." Many authors, with much appearance of justice, believe that the fiery serpents, which MOSES states to have been so destructive to the Israelites when journeying in the vicinity of the Red Sea, were *Filaria Medinenses*, and consequently that MOSES is the first writer to notice this worm, and that the fiery inflammation produced by it gave rise to the appellation bestowed upon it by the Hebrew writer.* That the *Filaria* was considered a species of serpent by the ancients, is proved by the Greek name *δρακόντιον*, *dracunculus*, which was given it, and by the inflammation, pain, and swelling which occurred with the breaking out of the worm. The mortality among the Israelites may be explained by their ignorance of the proper treatment, and of the danger consequent upon the breaking of the worm. AVENZOAR states that, in his country, "*Æger in continenti post dolorem vehementem in parte affecta exortum moriatur*." The distemper being endemic in the place where the Israelites were sojourning (in Arabia Petræa), in circumstances of great difficulty and even distress, and during the hygienic privations of encampments in a barren country, it is not surprising that it then and there assumed an epidemic and fatal character.

138. *SYNON.*—The *Filaria Medinensis* has received a variety of names, viz., the *Dracunculus*; the *Drac. tiliarum*; the *Drac. Persarum*; the *Guinea-worm*, or *G. thread-worm*, from its frequent occurrence on the coast of Guinea; the *Guinea dragon*; the *Guinea hair-worm*; *Pharaoh's worm*; the *Skin-worm*; the *leg-worm*; *le Dragonneau*, *le ver de Guinée*, *le ver Cutané*, by the French; *Guinischer Fadencurm*; *Guinische Drache*, *Pharaohswurm*, by the Germans.

139. *a.* Our knowledge of the natural history of this worm, and of the early stages of its development, is very deficient. KÜCHENMEISTER states that it is of the thickness of pack-thread, its anterior extremity obtuse, the mouth circular, without lips, but beset with four hooks, or more correctly with four styles, or acute straight spines; the vagina opens in the vicinity of the mouth, and the vagina and uterus are probably double, as in most *Filaria*. The length of the worm

* Diagnosis: "*Vermes albi, subfusi, aut rubri, corpore filiformi, elastico, cylindrico, ut plurimum longissimo; capite corpore continuo, inermi aut spinulis rectis et corneis (dentibus seu papillis prominentibus Autorum) armato; ore terminali non labiato, vel labiato rotundo, aut triangulari; œsophago brevi, tubuloso, rectiore quam intestinum; ano terminali aut ante caudæ apicem sito; cute levi aut leviter oblique striata.*"

"Mas: caudâ plerumque obtusâ, interdum membranam accessoriam alosam exhibente; spinulis filiformibus in vagina tubulosa aut liguliformi, ex Dujardino inaequalibus, curvatis (?). Femina: vagina antrosum proxime ad os sita, plerumque duplici (*Filaria rigida*) aut multiplici (ex quinqueloculari in *Filaria labiata*, Nathusius); oculis ellipticis aut globosis, laceribus. Nunc ovi-nunc viviparæ."

† "*Mares omnino ignoti aut potius ab auctoribus neglecti et omitti, quia ob minorem magnitudinem minores efficiunt et molestias et dolores et vix unquam majores tumores; sed uti Diesingius ipse enarra, a Clellandio in Calcutta Journ. Nat. Hist., l. 359, Pl. X., fig. 1, delineati.*"

"Femina: corpore longissimo (ad 3 ulnas et aliquod supra), subalbo, filiformi, subæquali, secundum Dujardinum antrosum, sicut secundum Diesingium et quidem quod ipse affirmare possum retrorsum, sensim attenuato, ad 1" seu ad 1—2½ mill. lato; ore orbiculari, spinulis 4 cruciatim oppositis; caudâ ad apicem uncinatâ, subacutâ, in apice 0.065—0.088 mill.=0.023—0.036" Per.=0.029—0.037" V. latâ, interdum in vermibus ipsius cute ita affixâ, ut vix apicem liberum facere possis; vagina ovalis; embryonibus 1" longis, vix ¼" latis. Species vivipara."—KÜCHENMEISTER.

* Upon referring to a translation of the Bible from the Hebrew into Latin, with very copious annotations, by IMMANUEL TREMELLI and FRANCIS JUNIUS (the former a learned Rabbi converted to Christianity, the first and second editions of which, published in London in 1579-80, and 1584, in quarto, are in my library), I find that he translates the Hebrew description as follows: "Tum immisit Jehova in populum illum serpentes presteres, qui morderunt populum: ita moriatur populus multus ex Israele." Here TREMELLI translates the Hebrew into venomous serpents; but in a note he states that according to the original they were fiery serpents. To this translation of the Bible and to its copious annotations, the translators of King James's Bible, and modern annotators, are more indebted than has been made to appear. Upon referring farther to the very rare edition of the Vulgate, also in my possession, which was printed in 1481, and known by the term "*Fontibus et Græcis*," &c., the serpents are called "fiery serpents (*Misit Deus ignitos serpentes*)—which inflicted wounds and death on many." This edition of the Bible is in folio, on a thick, beautiful paper, the ink being a bright jet-black, without the name of either printer or publisher, and without the verses being numbered, but with the initial letters illuminated and coloured. These translations vary only in the term "venomous" being used by the former for "fiery;" while the statement in the latter, that these serpents "inflicted wounds and death on many," may be considered as nearer the truth, as the infliction of wounds does not imply that death was always the result. Some translations, which retain the appellation "fiery," very justly explain it by stating it to refer entirely to the inflammation and pain produced by these animals.

varies from several inches to three yards. Statements of greater dimensions are probably founded in error. The whole surface of the worm and its tail exhibits the well-known fine rings, placed at a uniform distance. The substance of the body is homogeneous, finely granulated, and exhibits no traces of muscular fibres. Its œsophagus, intestinal canal, uterus, &c., require no description.*

140. *b.* The worm is indigenous only in the hot zone, and, even when transported into colder climates, does not appear to propagate itself. Even in the hot zone it does not occur everywhere, but only in particular countries, like all the *Helmintha*, and is entirely in certain places in affected countries; as, for instance, in the Gambia, Angola, Canlabah, &c. The places in which the *Filaria Medinensis* more particularly occurs are Senegal and the coast of Guinea, the East Indies, Persia, Arabia Petrea, the coasts of the Red Sea, especially towards the south, the shores of the Ganges, Bombay, the Caspian Sea, Upper Egypt, Abyssinia, Nubia. It was introduced into America by negro slaves, especially into Surinam. Throughout the countries now mentioned it attacks aborigines and foreigners without distinction. According to PRUNER the worm often becomes epidemic, in wet seasons and in marshy districts. BREMSER states that it is most frequently seen in the East Indies from November to January (the rainy season); and in Upper Egypt, according to BILHARZ, shortly after the inundations of the Nile.

141. *c.* The mode of production of the worm is still enveloped in obscurity. English officers, who never went about with the feet and arms uncovered, remained free from this worm. PRUNER thinks that the germ of the worm is an independent marsh animal, which is converted into a *Dracunculus* within the human body. FORBES believes that he found the brood of the *Dracunculus* free in the red, ochrey mud of the drying marshes. However, the aborigines think that it comes from the marshy grounds into the skin. The ordinary seat of the worm is the sub-cutaneous cellular tissue, especially of the lower extremities, around the ankle. It may, however, occur under the skin and muscles in all other parts of the human body. Instances of its occurrence in other parts of the body besides the extremities are recorded by KÄMPFER, BAJON, BAILLIE, PERÉ, and have been seen by myself in Africa. M'GREGOR, in 172 cases, states that it occurred 124 times in the feet, 33 times in the lower, 11 times in the upper part of the thigh, twice in the scrotum, and twice in the hands. PRUNER found a specimen behind the liver, between the layers of the mesentery. Sometimes the worm lies coiled up in a small space, sometimes it is extended; and in the latter case, if it lies on the surface, it feels as a varicose vein. PERÉ saw it lying in a snake-like form under the whole of the skin of the abdomen and a part of that of the chest, and similar cases of its extension are on record. "These examples will suffice to give a clear idea of this worm, of which, moreover, as many as twenty-eight, thirty, nay

even fifty specimens have been observed in one man." (KUCHENMEISTER.)

142. *d. Diagnosis.*—If the worm is superficial, with a hard substratum, its growth is seen to take place with extraordinary rapidity, from 4" it becomes several inches long in a couple of days. It is then easily killed by poultices of boiled garlic, after which it is absorbed without injurious consequences. Frequently the worm occasions little or no annoyance for a long time. DAMPIER and ISERT had quitted the district of these worms for 6 to 8 months, and WENGLER's patient for 4 to 6 months before the worm betrayed itself. According to KÄMPFER and others, this latent state may continue 12 to 15 months, and in rare cases even until the third year. In other instances, emaciation, notwithstanding a good appetite and absence of fever, takes place, terminating at last in fatal exhaustion. When the worm is making its way out, a small pustule appears at the point where it will break through, sometimes with, and sometimes without, preliminary annoyance, or headache, pain in the stomach, nausea, fever, &c. At the point where it breaks through, inflammation, swelling, and supuration occur several days previously, and continue until the worm is extracted. If it lies over or near to a joint, the use of the limb is prevented, and the symptoms are still more severe. In the case of DRUMMOND, after pain and stiffness of the leg, a reddish swelling, with a black point in the centre, was formed above the inside of the ankle; and at the same time he felt a firm, round, catgut-like substance twisted under the integuments. About three weeks after the first sensation of stiffness, he was seized with a sudden insupportable itching over the whole body, with fever, violent colic, vomiting, and purging; after which, shiverings without perspiration followed. In the mean time the swelling had burst, and a hard white substance appeared, but so deep that it could not be laid hold of, the animal having buried itself deeper among the muscles. The catgut-like twisted substance formerly felt was not now present. In the following night the ankle and vicinity were much inflamed; and three days afterward a thread was passed round the animal, and a bloody ichorous discharge continued for six or seven weeks from the wound, which healed up gradually to a small point, when the worm again came forth, and was fastened with a thread, rolled upon a stick, and drawn out twice a day. In twenty days the extraction was completed. Two or three days after the formation of vesicles on the inflamed part these open up, or are opened by a lancet, when matter, blood, and sanies, and two or three inches of the anterior end of the worm come forth. If this end be carefully pulled, several inches more often follow. All this is coiled around a little roll of linen or a small stick, and fastened over the wound with a compress and adhesive plaster; and the worm is thus wound out by repeated, careful operations, twice daily. The worm rarely comes away on the first attempt, several days, or even weeks, being required before this is accomplished. Mr. BUSK, in the *Transactions of the Microscopical Society*, has given one of the best descriptions of this worm.

[There are several species of *Filaria* not described by our author:

1. *Filaria Medinensis*, or Guinea-worm, above described. This is the most common and best

* BREMSER gives the following systematic description of this worm: "Longissima cylindrata, elastica, ferè equaliter crassa, capite attenuata, ore minimo, circulari, cauda maris medium sui finis ad locum, quintali spirali, prominente, subulata, inflexa; feminae semitereti, acutiuscula, incurva prædita; in hominis tela cellulosa subcutanea, præsertim pedum; in regionibus tropicis figi solita."

known species, being found chiefly in warm climates, where it is often seen in the morning dew, sometimes 10 or 12 feet long, and not thicker than a horse-hair. BACON states that he saw two instances where it had burrowed under the mucous membrane of the eyeball. As yet, only females have been observed in the human body—*viviparous*.

2. *Filaria Bronchialis*.—This species is described by TREUTLER, and so named from its occurrence in the lungs of persons labouring under phthisis. It has also been called *Hamularia lymphatica*; and by RUDOLPH, *Haularia sub-compressa*. This is also met with in the lungs of the inferior animals, especially when affected with tubercles. Dr. HODGKIN states that he often found the filaria in the lungs of the *boa constrictor*. They are usually about an inch long, roundish, blackish-brown, sometimes spotted white; and at one extremity, two projecting hooks. This species of filaria is probably allied to those worms which are not unfrequently found in the bronchi and lungs of animals belonging to the genus *Mustela*.

3. *Filaria Gracilis*, found in apes and monkeys in great abundance, grows to a length of 10 or 12 inches, about as thick as a fine thread, head obtuse, and tapering slightly at both extremities.

4. *Filaria Attenuata*, found in the abdominal cavity of crows, and in the cornea of the eye of fishes; from one to six inches long, and obtuse at both extremities.

5. *Filaria Obtusa*, inhabits the intestines of swallows; head somewhat acute, tail obtuse, body comparatively thick and elastic; has been found 12 inches in length. RUDOLPH has traced out its intestinal canal and ovaries.

6. *Filaria Truncata*, about 5 inches long, head truncated, tail somewhat thick, obtuse, terminated by a very sharp point; inhabits the larva or caterpillar of certain species of moths (*Tinea padella*).

7. *Filaria Ovale*.—This species went formerly under the name of *Gordius piscium* (hair-worm of fishes), because it is found in the liver of the carp, &c. It is 3 or 4 inches in length, head oval, tapering forward; tail round.

8. *Filaria Capsularis*; from half an inch to one inch long, and resembles in thickness a middle-sized thread. Borders of mouth recurved, tail obtuse, papiliform, ending with a sharp point. Often met with in the herring in large quantities; very tenacious of life, as it will live for many days in a dry place, and even revive after having been long frozen in masses of ice. This species has been formed into a genus by ZEDER, and other naturalists, under the name of *Capsularis*.

9. *Filaria Papillosa*.—The *Filaire equi* of GMELIN, and the *Gordius equinus* of other writers—the species which inhabits the eye of the horse, from 1 to 7 inches in length, and one third of a line in diameter—of a yellowish-white or ash colour, sometimes of a brownish hue; head slightly obtuse; mouth orbicular; neck studded with papillæ; tail slender and curved. It occurs in different parts of the horse, chiefly in the muscles and intestinal canal, though it has been detected in the brain, as well as the aqueous humour of the eye. They often occur in the eyes of horses in the East Indies, as well as the muscles of the loins, causing paralysis. The Transactions of the American Philosophical Society, vol. ii., contains two communications on this subject, one by F. HOPKINSON, Esq., entitled "Account of a Worm

in a Horse's Eye;" the other by JOHN MORGAN, M.D., describing the same phenomenon. Similar cases will be found in the *Ed. Med. and Surg. Journ.* for June, 1826, and the *Bulletin des Sciences Medicales*, Feb., 1826. See, also, "An Account of a Filaria in a Horse's Eye, with Remarks on similar Phenomena, and the Mode of their Origin," with a plate, by C. A. LEE, in *Amer. Jour. of Science and Arts*, No. II., vol. xxxix.]

143. vi. ASCARIDES.—These worms are arranged by DUJARDIN as the nineteenth genus of the *Nematoda*; and by DIESING as the twentieth genus of the sixth order of the *Achathelmintha elastica*, but the *Oxyuri* are also introduced by him into this genus. The classification of DIESING is so involved that more confusion than elucidation is the result. Refining, hair-splitting, and drawing distinctions, which are either observed with difficulty, or not at all, are not the least faults of some modern observers. I subjoin DUJARDIN's systematic description of this genus.* The only species to be here noticed is the,

144. A. *Ascaris Lumbricoides*.—SYNON.—*Ascaris gymnoascaridæ*, DIESING; *Ascaris lumbricoides*, LINNÆUS; *A. gigas*, GOEZE; *Lumbricus teres*, AUCT; *Fusaria lumbricoides*, ZEDER; but the Linnæan name is very generally retained.†

145. a. Description.—The head of the worm is distinctly composed of three papillæ, which can undoubtedly be spread out upon the intestine, in a broad, circular, sucker-like surface, in

* "Ascarides: corpore albo aut subflavo, subcylindrico, utrinque attenuato, fusiformi, 4 striis longitudinalibus subalbis, opacis, linearibus, instructo; cute transverse striatâ; capite tubus, valvulis (labiis) convexis aut semilunaribus, interne fenestratis; œsophago valde musculoſo, cylindrico aut clavaformi; ventriculo cavitatem triangularem præbente.

† "Mas minor quam femina; extremitate caudali aliquid curvata, et involuta, nunc nuda, nunc membranâ alata duplici, aut duplici tuberculorum et papillarum ordine aut rarissime acetabulo instructâ caudâ breviori, obtusiori, quam in feminis; spiculo aut pene duplici plus minusve longo et arcuato.

"Femina caudâ rectiore et longiore; vaginâ simplici antrosum sitâ; utero bi-aut multiloculari; ovaris filiformibus, longissimis, duplicibus aut multiplicibus; ovula elliptica aut globulosa, extus lævia. Species aut oviparæ, plerumque in tubo intestinali viventes."

† "Vermes albi aut rubro-pallidi, cylindrici, in extremitatibus attenuati, fusiformes elastici; cute transverse subarticulata striis transversis 0·02 mill. inter se distantibus, ex duobus stratis composita, 4 lineis lateralibus longitudinalibus subalbis majoribus, capite distincto, parvo (0·7 mill. lato), tribus valvulis semilunaribus, prominentibus, ad margines hyalini armato, interne denticulatum muscutorum stratum ad galli jubar modum præbente; œsophago musculoſo, 6—8 mill. longo, filiformi, triquetra, ventriculo clavaformi (0·7 mill. lato, 2—3 mill. longo) parvulo, intestino simplici valculis aut villis et epithelio polyedrico sparsim instructo.

"Mas: 150 ad 170 mill.—4 ad 6" long., 3·2 mill. lat., cauda aliquid depressa, conica, inflexa et curvata, spiculis 2 planis, subensiformibus, fere rectis, 1·8 mill. ad 2·12 mill. longis, 0·18 ad 0·23 mill. latis. Organo spermatico simplici, 1·200 mill. longo, testiculo cæco parvulo, retortiformi, funiculo spermatico albo-intumido, ductu ejaculatorio angustiore ad ani latus sese aperienti. Spermatozoidia globuliformia, granulosa, in feminae vagina maturescentia.

"Femina: 200 ad 275 mill. et supra longa=8 ad 18"; media in parte 4 ad 5·5 mill. lata; caudâ conicâ obtusâ; aut aliquid ante caudâ apicem sito (1 mill. circiter); vaginâ simplici ante corporis dimidium sitâ, ex magnitudine feminarum variabili (ex c. 85 mill. pone caput in femina 245 mill. et 103 mill. in femina 214 mill. longa); utero ab initio simplici, bipartita aut biloculari. Ovaria filiformia, sensim attenuata, retrorsum usque ad anum, et antrosum supra vaginam aliquantulum pergentia. Totalis utriusque ovarii longitudo ad 44' Lips.

"Ovula immatura subtriquetra, numero 4 ad 8 conglomerata, matura isolata, rotunda, ad 0·087 mill. lata, cum testâ tenui, lævi; in natura libera sensim embryones evolventia."—KÜCHENMEISTER.

the sucking act of the worm. BREMSER has seen the opening and closing of these papillæ, and described the mechanism. He even reports that at the moment of opening he saw a little tube protrude from the centre, which is the true oral orifice. WEDL thinks that this is the cleft proboscis, which is everted from the oral aperture for the reception of nourishment. The true oral aperture is, however, formed by the opened lips or papillæ; the small tubule in the centre represents the *introitus faucium*. Its protrusion is probably as much by its own muscular structure as by the contraction of the general muscular structure of the body. The males and females may be distinguished by their form and external appearance. The abdomen of the female is slender, and fusiformly pointed. The male is bent like a hook, and sometimes presents, a short distance from the tail, a pair of white, delicate, projecting hairs, which are the protruded penis. If the female be pressed, or allowed to swell in water, a prolapsus of these tubes (ovaries), and a discharge of a milky substance (eggs), takes place in the anterior half of the animal from the vaginal orifice. If the male be pressed, a milky juice (seminal globules) flows out in the vicinity of the anus, without the occurrence of a prolapsus. The intestinal canal is whitish and muscular at its commencement; the œsophagus is composed of thick layers of longitudinal and transverse fibres, and passes rapidly, and without any marked constriction, into the intestinal canal, the parietes of which are thin, internally covered with epithelium, and shines through, of a brownish colour, from the brown excrement. This intestine has a muscular coat, which is connected with the cutaneous longitudinal and circular muscles. The external integument consists of six layers. Under the outer layer are two layers of fibres crossing each other obliquely, and two laid at a right angle over each other, and between the former and latter two a sixth homogeneous layer, which appears to contain a peculiar odorous fluid of an oily and reddish appearance, and exhibits refractive phenomena (KÜCHENMEISTER).

146. *b. Symptoms.*—Very generally the host and his guests, the *Ascarides*, agree very well together, until, owing to causes affecting these animals, or the digestive organs of their host, a disagreement between them takes place, and various disorders or symptoms ensue. When these worms are few in number, notwithstanding their size, they often occasion but little disorder, and live amicably with their entertainer on unelaborated chyme, until their numbers, changes of diet, and other occurrences produce more or less ailment. In most cases, when their numbers are not great, a good, or a too good appetite, is the chief injury they do; and in this respect they are much less noxious than the much smaller *Ancylostoma*. Great numbers of these worms in the intestines, and a firm aggregation of them into coils and knots, sometimes with the small threadworms intervening, often occasion much disorder, according to the mechanical obstacle and the irritation they may produce. Colic, ileus, constipation, diarrhœa, flatulency, congestions of the brain, especially in children, and various reflex phenomena manifested in distant parts, and on voluntary muscles both of the trunk and of the lower extremities, are then not unfrequent occurrences. Besides the influence of inordinate numbers—of 200 to 350—knotted into balls,

which I have expelled from the bowels of both children and adults, the irritation and the consequent effects produced by even small or moderate numbers are often serious; for, owing to states of the digestive organs of their host, to the influence of certain kinds of food, or of change of diet upon them, or to the agitation arising in them from the influence of season, and to the periodical seeking of the females by the males, much disturbance may ensue, or the worms may travel or stray into parts of the digestive canal not usually visited by them, and thus induce very serious effects, which may even terminate in death. These effects, however, will depend much upon the irritability and other circumstances of the patient, the number of the wanderers, and the parts which they have reached. When irritations of the intestinal canal occur, and produce watery diarrhœa, cholera, &c., these worms are thereby affected; they swell up, lose their powers of adhesion, and are often carried away *per anum*. But one or more worms may pass unusually high in the intestines, may rise through the pylorus into the stomach, and occasion retching, vomitings, &c., irritation in the œsophagus, fever, delirium, and upon the discharge of the worm all rapidly disappear. But before rising so high in the digestive canal, one or more may pass into the common duct, or even into the cystic, or the hepatic, or the pancreatic ducts, and produce symptoms similar or approaching to gall-stones, or inflammation, spasm, and disease of these ducts. These latter occurrences are, however, very rare; for generally the secretions passing along these ducts into the duodenum are not much relished by these worms, and these routes are not pursued by them. When the worm passes into the stomach, it may rapidly rise into the upper part of the œsophagus or into the pharynx, and even get entangled in the larynx and produce the most distressing effects. But such occurrences, although observed, are very rare. After long periods of abstinence or inanition they have been found to migrate and escape from the anus, mouth, and nose; and such migrations are not uncommon in the course of continued and remittent fevers.

147. The symptoms produced by *Ascarides*, while they continue in the intestine, are mechanical, direct, and reflex. The former are the phenomena of the usual catarrhal affections of the stomach and intestines (gastro-intestinal irritations) in every grade; costiveness, tormina, colic; a sense of weight, of irritation, or of a ball, or gnawing and itching near the umbilicus; disordered, craving, and irregular appetite, and digestion, &c. The latter are hiccough, subsultus of the abdominal muscles, cramps of the lower extremities, yawning, increased secretion of saliva, snuffling or tickling of the nose, but rare of the anus, unless upon the passage of a worm.

148. The question has been often entertained as to the possibility of these worms perforating the parietes of the healthy intestines, and making their way into places more or less distant from their usual residence. That these worms can never perforate the healthy intestine, the structure of its head and its thin lips being adapted only for suction and not for boring, is the opinion of RUDOLPHI, BREMSER, ROKITANSKY, BEMBERGER, J. P. FRANK, KÜCHENMEISTER, and myself, in opposition to that of VON SIEBOLD and MONDIÈRE. Therefore it may be concluded that when these

worms are found in situations external to the digestive canal, they have reached it by some pre-existing ulceration, perforation, or fistula.

149. Many, especially of the older authors, have attributed a prognostic and generally an unfavourable import to the discharge of worms during febrile diseases, and more especially during typhoid fevers; and this opinion is not limited to the *Ascarides*, but is extended to the flat worms, and they have argued that the worms in these circumstances are like the rats, and have the presence of deserting a sinking ship! But as the discharge of worms from a fever-patient does not occur until after the seventh day, according to ZIMMERMANN, it is much more probable that they travel from the intestines, owing to the food obtained by them being insufficient or not suited to them, and to the secretions of the intestines being injurious to them, and in search of more abundant or more suitable aliment. The ulcerations of the intestines and the morbid matter from these ulcers in the advanced stages of continued fevers, will also tend to expel or to occasion a discharge of these worms, which, when observed, may be justly viewed, both as an indication of the existence of these lesions and of the extreme danger of the malady.

150. VI. A GENERAL VIEW OF THE SYMPTOMS PRODUCED BY WORMS IN THE DIGESTIVE CANAL.—Most of the symptoms produced by worms may arise from other causes; but a careful recognition and observation of these symptoms, of their successions, grouping, &c., are requisite for the due regulation of the treatment, and for the ascertaining of the species of worm which is present. The symptoms produced most commonly by the individual species of worm have been noticed with reference to each; but recent writers have been more intent upon the microscopic descriptions of these parasites, and upon drawing minute distinctions, &c., than upon more useful and practical considerations connected with them. It is justly argued that the discharge of the more common species of worms infesting the intestinal canal is the only true *diagnosis* of verminous diseases; but this discharge, even in the most serious cases, may not occur without means being used to effect it; and it is by a knowledge of these symptoms, independently of such discharge, that we are led to administer the means most likely both to establish this diagnosis and to effect a cure.

151. A. The more direct and local symptoms, or those more immediately caused by worms, are—a capricious and variable appetite—at one time a craving and insatiable hunger or an unsated desire of food; at other times, nausea, or cardialgia, borborygmi, loathing, retching, or vomiting, being present; a sense of weight in the abdomen, with distention, gnawing, or erosion; a feeling of cold internally, or of emptiness or inanition, often with palpitations, or leipothymia, or faintness; a dragging, twisting, or lancinating pain in the abdominal regions, especially near the umbilicus, or tormina, spasms, colicky attacks, tenesmus, constipation, or irregularities of the intestinal functions; leucorrhœa, and itching, or a mucous or watery exudation from the anus, sometimes a mucous diarrhœa, tenesmus, and bearing down pains in adult females, or derangements of the catamenia, or even abortion; and in children more especially tormina, colic, constipation, and intus-susception of the bowels, with various cerebral symptoms

about to be noticed. In both sexes “manustupratio” is not unfrequent, even at an early age.

152. B. The symptoms caused in more distant parts by sympathy with the seat of irritation, or by direct and reflex sympathy, are chiefly a frequent, dry, and tickling cough; hiccough, anxiety at the præcordia, or pungent pains passing under the false ribs and at the epigastrium; a sense of something in the œsophagus, sometimes with tickling in the pharynx; partial amaurosis and dilatation of the pupils; sneezings, itching and dryness of the nose and nostrils, sometimes epistaxis, itching of the skin, without eruption; grinding or grating of the teeth, and sudden startings when asleep; subsultus and spasms of the abdominal muscles; partial or general convulsive movements without complete loss of consciousness; chorea or twitchings, or irregular contractions of particular muscles, especially those of the face and lower extremities; and more or less fully developed, general, or epileptic convulsions. The urinary excretion is sometimes disordered, and dysuria or frequent micturition complained of, the urine being whey-coloured, turbid, &c., with or without a sediment.

153. C. A general verminous cachexia is not unfrequently present, manifested by a pale, tumid, or livid state of the features; by a sunken appearance of the eyes and a leaden hue beneath them; a general pallor, and more or less anæmia of the surface of the body, lips, &c.; a perverted state of the sense of smell, or the entire loss of smell; a strawberry hue of the tongue, or mucous sordes on the tongue, and about the teeth and gums, stridor of the teeth, and a peculiar fœtor of the breath, sometimes a more or less evident affection of the voice and speech; a morose, irritable state of temper, vertigo, frightful dreams, timidity, somnolency; slight or low delirium, risus sardonicus, and prostration of strength. The biliary secretion is sometimes scanty, and in some cases even jaundice is observed. The abdominal secretions are very often disordered, and the functions of excretion generally impeded. These and other effects—local and sympathetic—are manifestly produced: 1st, by the irritation of the digestive mucous surface, which may, in the cases of certain worms, and in susceptible constitutions especially, go on to inflammation and its consequences; and, 2d, by the changes these animals produce in the chyme and chyle derived from the ordinary food, and upon the secretions of the gastro-intestinal surface, and upon those of the liver and pancreas. The former of these effects, namely, those consisting of gastro-intestinal irritation and its consequences, will also contribute to the production of the latter; but it cannot be doubted that much of the nourishment which should be taken up by the intestinal surface is intercepted by these parasites, while a portion of the fluids, lacteal or serous, are removed from this surface by the suction exerted by these animals.

154. All the symptoms now enumerated are not observed in the same case, but many of them either coexist or appear in succession, and are variously grouped in different subjects, so as to render a diagnosis very difficult between this and other complaints. When the cachexia, debility, and sympathetic disturbance of the brain and its functions are considerable, more especially when the circulating fluids are diminished in quantity from deficient aliment, or impaired in quality by

imperfect assimilation and depuration, the symptoms may assume a febrile character, sometimes mistaken for a form either of low fever, or of gastric fever, but more correctly recognised by some of the older writers by the term worm or verminous fever. (See also § 73.)

155. vii. THE CAUSES OF WORMS may be inferred from what has been stated above; yet it may be of use to notice some particulars too generally overlooked by the recent writers, who have insisted upon the propagation of worms by means of ova, &c., and who may be considered as having disproved the doctrine of equivocal generation, or, more correctly, of spontaneous formation. A knowledge of the *predisposing causes* furnishes important indications in both the prevention and the treatment of verminous diseases; for, although the obsolete doctrine of spontaneous formation rendered this knowledge of the greatest interest, inasmuch as it was founded upon antecedent changes in the constitution, yet these changes are by no means devoid of influence in favouring the development of the ova and embryos of parasitic animals. There can be no doubt that children of weak, aged, and vitally exhausted parents; the female sex, debilitated males; and persons of all ages, who have been insufficiently or improperly fed in early life, or of a relaxed fibre or asthenic diathesis, are much more subject to worms than those who are otherwise circumstanced. A tender and delicate state of health in early life; the use of crude, viscous, gelatinous, and vegetable food; whatever tends to lower the organic nervous force and vital resistance; a relaxed and asthenic habit of body; hereditary conformation; a residence in crowded and insufficiently drained cities and towns, or in cold and moist situations, especially in those which are abundantly covered with vegetable productions peculiar to the country, and a scanty use of such condiments, as salt and hot spices, as the climate may require, predispose to the generation of worms. In places where salt cannot be obtained in quantities requisite to the wants of the economy, as in some intertropical countries, the hot spices are used in its place by the natives. Those who contend, and, from recent researches, with manifest truth, that the presence of ova is necessary to the generation of human parasites, consider that the predisposition produced by these causes favour this generation, and that robust health and a sound constitution are subversive of their development. Those who argue for their spontaneous formation believe that these causes not merely predispose to this formation, but also directly produce it; and that, owing to a weak and imperfect chylification and assimilation, or to a metamorphosis of the secretions, a material is evolved which, under the favourable circumstances in which it is placed, and owing to a vital emanation from the body in which it lodged, assumes an organized and separate existence. These doctrines, however opposite—the former assuming, as predisposing causes, merely what the latter contends to be direct and exciting, or efficient, causes—agree in that which is of the greatest importance to the physician: they both point out the best indications for preventing the continued or the future generation of worms, where they already exist or have existed, and for guarding against their invasion in circumstances which render such invasion more or less probable.

156. IV. TREATMENT OF WORMS.—The treatment of worms should have reference, 1st. To their *prophylaxis*, or prevention; 2d. To their *expulsion*; and, 3d. To the *prevention of their recurrence*.

157. i. PROPHYLAXIS.—A. As to the *first of these intentions*, it must be admitted that the accomplishment of it is always difficult, and often impossible. Our knowledge, also, of the modes and channels by which these parasites are conveyed into and propagated by the lower animals and human subjects is imperfect. Admitting that they originate in ova which experience the changes in the processes of their development above described, we still find it difficult to account for the presence of these ova, and for their passage into the human stomach. That the ova, as stated above, may attach themselves to raw vegetables and fruit, is not improbable. The feeding of domestic animals also upon the garbage or viscera of fish, fowls, or the mammalia, certainly favours the production of worms, especially those of the cystoid order, in these animals; and the ova from these, where perfect cleanliness in all respects is not observed, may be conveyed in the food or drink, or by the hands, especially unclean hands, into the human body. The amount of knowledge as to this topic appears to be limited to the observance of perfect cleanliness in all its bearings, including the utmost care as to the purity of the water used, and as to the use of raw vegetables and fruits. Marsh, stagnant, and even river water ought not to be used; or if the latter be taken, it ought to be previously boiled or filtered. Vegetables and fruits should be carefully washed, especially fallen fruit, if eaten in a raw state; and the domestic animals ought to be confined to their proper places, and neither petted nor fondled. The diet is also of some consequence; and no kind of animal food should be taken unless it be sufficiently cooked. The raw flesh of animals, especially of pigs, and imperfectly cooked viscera of animals, and all unnatural modes of living, and neglect of the strictest attention to cleanliness in respect of diet and modes of living, should be most carefully avoided.

158. B. But it is not only the *prevention of the ingestion of ova* into the human body that should be studied, but also the *means of rendering these ova inert, or rather of preventing their development* in the digestive canal. As with the former, so with the latter means of prevention, our knowledge is very imperfect. We may, however, infer that those *predisposing causes* of worms enumerated above should, as much as possible, be removed or counteracted. Without a due attention to the removal of the predisposition, which favours the generation and development of the entozoa, the treatment of verminous diseases will prove inefficient as regards the issue, and empirical in practice, especially when viewed in relation to the scientific application of the resources which the progress of knowledge and the discoveries of our contemporaries have placed within our reach. In furtherance of this indication, the diet and the treatment should be adopted that are most efficacious in promoting the organic nervous force, and the tone of the digestive organs, and in removing tenacious mucus and pituitous sordes, which often adhere to the digestive mucous surface, especially in asthenic, leucophlegmatic, and debilitated subjects, and

which often form the nidus in which the ova of parasites are lodged and hatched. It will generally be noticed that the secretions and excretions, which in all persons form the principal part of the faecal discharge, are seldom thrown off from the secreting surfaces so quickly and entirely in the delicate and debilitated as in the robust and healthy; but remain or are retained in the former class of subjects, and become the soil in which these animals are reared.

159. C. Persons who are, or who have been, subject to verminous diseases, ought to adopt that kind of food, and to have recourse to those medicines which their feelings and observation indicate as being calculated to distress, injure, and ultimately to destroy or eject intestinal worms. A due attention to such means is required not only for the expulsion, but also for preventing the future generation of these parasites. Another object, and one, indeed, which is the basis of the prevention and of the treatment of worms, is to determine in as accurate a manner as possible, from the character of the symptoms, and from the examination of the faeces, the *species* of the animal which is to be dislodged. While, however, this diagnosis receives its due attention, care must be taken not to mistake other diseases, which possess many of the same features, for those proceeding from the presence of worms. This error is likely to occur frequently, since the one class of disorders often reciprocally bear the relation of cause and effect to each other. Nor, in many cases, will it be attended by any serious consequences, farther than from wanting appropriate direction, the treatment must be inefficient, and redundant and superfluous. It should also be kept in recollection that worms are more apt to be generated during fevers, and during convalescence from fevers, especially such as are epidemic, adynamic, or nervous, or are gastric or exanthematous, than in robust health, or even in other circumstances. The generation of parasitical animals in these maladies is not confined to the surface of the intestinal canal only. It is not unusual to observe the parasites usually produced, in favourable circumstances, on the external surface of the body, become remarkably abundant during and after these fevers, especially when the diseased secretions are allowed to accumulate from a neglect of ablutions and of frequent change of linen. The appearance of animal parasites on these occasions was explained by the supporters of spontaneous formation, in the way above noticed (§ 6, *et seq.*); while it was viewed, by the believers in generation from ova, as the result of a more favourable occasion being furnished for the development of the ova during these diseases.

160. One of the earliest methods of preventing and of curing verminous diseases, resorted to by many physicians, is to remove or attempt to remove, by purgatives or drastic means, the tenacious mucus adhering to the digestive mucous surface, and which, as they believe, forms the nidus or lodgment of worms; and they believe that the quantities of mucus dislodged from the bowels during and for some time after the exhibition of vermifuge, and other purgatives, are proofs of the accumulation of this mucus on the intestinal surface. That this mucus or sordes may be excessive in many cases, may be admitted; but it may also be allowed that the greater portion of this mucus is produced by

the irritation of the intestinal mucous membrane by these purgatives. This method of prevention and treatment, when moderately and appropriately prescribed, may be of service in many cases; but it should not be overlooked that the rough operation of these medicines often leaves a debilitated state of the intestines after their operation, which disposes them to generate, and prevents them from throwing off the mucous sordes and worms which these medicines were employed to remove. They cannot by any mechanical property, or by any chemical or other influence on the intestinal secretions and excretions, always remove them from the extended surface covered by them in the manner or so completely as contemplated; and, even when the proposed end is completely attained, the intestinal functions are left in a more favourable condition than before, to reproduce both mucous sordes and worms, especially if any of the ova still remain unexpelled. Therefore, instead of trusting to the medicines usually employed as anthelmintics, vermifuge purgatives, alterants, &c., our attention ought to be directed (in some cases instead of these medicines, in others in addition to them, and subsequently to the use of them) to the adoption of remedies which promote the organic nervous forces, and the digestive and vital energies in general, thereby increasing the healthy and vigorous discharge of the various functions, and the due evolution and evacuation of the secretions and excretions from the digestive organs. (*See also the treatment after the expulsion of worms.*)

161. ii. DIRECT AND CURATIVE TREATMENT.—J. P. FRANK, whose experience of the treatment of worms, when he wrote on the subject, had extended to half a century, considered that drastic purgatives and anthelmintics at the commencement of the treatment were seldom so serviceable, especially against tænia, as more gentle measures, which, in his opinion, should be first adopted, and be followed by more energetic remedies. But the diversity not only of these medicines, and of the combinations and methods of prescribing them, bewilder the inexperienced, until repeated opportunities of observation enable him to select those means and combinations upon which confidence can be placed. KÜCHENMEISTER justly remarks that, if the multitude of remedies recommended for any disease is an evidence of their want of power against it, the therapeutics of worms are extremely defective. In truth, the treatment of these parasites leaves much to be desired as respects the efficacy of the medicines prescribed for them, the pleasantness of the most efficacious among them, and the disagreeable effects which often accompany and follow those most to be relied upon.

162. A. THE TREATMENT OF TAPE-WORM will *firstly*, and more especially, occupy attention, as it will comprise the most efficacious medicines and methods which have been employed, not only for these worms, but also for many of the others which have been noticed above; and when the treatment of these latter comes under consideration, then a brief reference to what has already been stated will be sufficient. KÜCHENMEISTER tested a great many of the medicines recommended against tænia, by placing live tape-worms in a mixture of the particular medicines with white of egg, and by determining the time in which they died by the assistance of the rotation apparatus, the two poles of which he introduced into

the mixture. According to these experiments, the *tæniæ* lived for many hours, or even for days, in the mixture containing the *cuprum oxydatum nigrum*, in that containing *dotichos pruriens*; and for several hours in *castor-oil*, and in a salad made with pickled herrings, onions, garlic, &c. Tin has little or no effect, or merely the same effect as the cow-itch. Electricity has no destructive action on *Tæniæ*. "It is otherwise, however, with *koussou*, in the infusion of which, mixed with milk, the *tæniæ* died within half an hour of their introduction; and with oil of turpentine, in a mixture of which with white of egg, they died in 1 to 1½ hour. In a decoction of *Bruyera* (*koussou*) mixed with white of egg, the *Tæniæ* died in 1½ to 3 hours. In a decoction of *rad. puniceæ granatorum*, mixed with white of egg, in 3 hours; and with the same decoction, mixed with milk, in 3 to 3½ hours. In a mixture of *extract. filicis maris æther.* with white of egg, the *Tæniæ* died in 3½ to 4 hours. The so-called *filicine* (*filicic acid* of LUTZ), mixed with white of egg, also has an energetic action on the *Tæniæ*, which die therein in the course of a few hours, and exhibit œdematous swellings in various parts." The particular methods of expulsion, arranged according to the remedies, have been enumerated by MEYER, SEEGER, and KÜCHENMEISTER; but the faults which this last-named writer finds with his two predecessors, viz., that in the enumeration of methods these are thrown together in a disorderly manner, may also be imputed to himself, although in a less degree.

163. a. METHODS WITH TIN.—FRANK commences the treatment with the powder of *tin*, or its filings, given in a simple sirup, either alone or with sulphur, or the *extractum absinthii*. After having pursued this plan during three or four days, allowing only a spare diet, he prescribes, in addition to the tin, a moderate dose of *jalap*, low diet being still observed. DUPUIS prescribes, without any preliminary treatment, at six and at half-past six in the morning, each time a powder of *Stann. rasp. Angl.*, ʒss.; *Tannini puri*, ʒi.; *Gigutti* (*cambogæ*), gr. vi.; *Elæosacchari cajuputi*, gr. ijss.; and after each dose the patient drinks two cups of black coffee. In two hours the worm is expected to pass off, usually with colicky pains, on the occurrence of which strong black coffee is immediately given. For the subsequent treatment, a tincture of iron is advised. BECKER recommends the chemically precipitated tin. According to him, it is certain in its action, does not irritate the intestines mechanically, and is preferable in doubtful cases. It is, however, difficult to be obtained. KÜCHENMEISTER protests against the administration of tin-filings, as being, in his opinion, a much too irritating medicine. But he has twice prescribed tin, precipitated from chloride of tin, in an extremely fine powder, making it into an *electuary with honey*, a little *extr. puniceæ granat.*, *extr. filicis maris æther.*, and *camboge* or *jalap*. Even young and weakly children support this remedy very well. On one occasion the entire worm passed, dead, on the second day. In the other case, an adult, several yards passed after this medicine, but the remainder of the worm was expelled by his ordinary mixture (§ 181). He considers the medicine to be uncertain, but suitable to children and persons who are much reduced. Tin, in various combinations, has been prescribed, also, by ALSTON, MAYER, MATTHIEU, HAUTESIARK, and AU-

TENRIETH; but its operation, as they have prescribed it, is often either ineffective, or too irritating to the digestive mucous surface.

164. b. METHODS WITH THE MALE FERN.—The *Aspidium filix mas*, which is always efficacious against the *Bothriocephali*, is much less so against *Tæniæ*. BUCHHEIM prescribes a soft resin, obtained from this plant, with good effects. The most efficacious preparation, according to KÜCHENMEISTER, is the *æthereal extract of Filix Mas*, the powder being mixed with the extract, so as to increase the surface of contact of the medicine; or the extract being mixed with pomegranate root, which latter he prefers.—(a) WAWRUCH's method is a preliminary treatment of three to four days, consisting of strong beef-tea with white bread, three times a day, taking at the same time the following resolvent: *R Rad. taraxaci et cichorei*, āā, ʒj.; *decoque per ½ horæ: colaturæ* ʒvj.; *adde ammon. chlor. præcip.*, ʒj.; *syrupi cichorei cum rho.*, ʒss. M. Two table-spoonfuls every two hours. With this, daily laxative clysters of milk, linseed, herb. althææ, flor. verbas., and flor. papaver. are ordered, and on the evening before the expulsion, a very rich gruel (½ lb. of water, and 2 to 4 ounces of butter and wheat bread). The *expulsion* is attempted by taking, "in the morning, fasting, a thick gruel; and about five, six, and seven o'clock a clyster of linseed and milk; about eight o'clock, two table-spoonfuls of castor-oil; at half past eight, pulv. rad. filicis maris ʒij.—Div.; at nine o'clock, two table-spoonfuls of castor-oil; at half past nine, the fern-powder again; at ten o'clock, two table-spoonfuls of castor-oil; and at half past ten, the third powder. After each dose the patient washes his mouth with tea made from flor. tilie, and summitat. millefolii; and in the intervals he chews flavid. cort. aurantior., of which a dose of ʒss. is prescribed. At one o'clock he takes a powder of camboge and calomel, āā, gr. v.—vj., with ʒss. sacch. albi, and applies emollient poultices over the abdomen. If the worm be not expelled, castor-oil is again given in half an hour; in a second half hour, camboge powder; then castor-oil again; and possibly, if no inflammation occurs, the powder of camboge and calomel again at half past four. At the same time, a clyster is administered every hour!" The subsequent treatment consists of the removal of the inflammatory state of the intestines by leeches, mild diet, &c.

165. (b) *Weisshaar's method* is a modification of the above. On the second, third, and fourth day of preliminary treatment, a pickled herring diet; and on the following day he attempts the *expulsion* of the worm nearly as advised by WAWRUCH, excepting that he gives the castor-oil in meat broth, and, instead of orange-peel, candied calamus. Of the fern-powder he gives only xv.—xx. gr. *pro dosi*, with 15 to 20 grs. olei filicis maris; and even the latter only to irritable subjects. Recently he prescribes 60 to 80 drops ol. filicis maris with ʒss. ol. ricini; in half an hour, two table-spoonfuls of castor-oil; in an hour, the first powder of camboge and calomel; in half an hour, oil again; in another half hour, the second powder of camboge and calomel, and so forth. He states that he easily expels *T. solium* by this method; but that *T. mediocanellata* (§ 68 to 70) requires strong doses of oil of turpentine.

166. (c) The *Wurtemberg method* is one ounce of fern-root boiled for an hour with three pints of

water; one drachm of fresh *cort. mezerei* is added to the hot decoction, which in ten or twelve minutes is strained, and then mixed with two or three drachms of finely-powdered fern-root. This is taken in the morning fasting, either at once, or in three portions at intervals of an hour. In three or four hours sickness and disorder of the stomach cease; and then calomel, freshly prepared sulphate of iron, aa , gr. x.— vj ., according to age, are administered, and repeated if vomiting occur. The worm is said to be generally expelled in the evening; when this is not the case, a rich gruel is given on the same evening; and on the following morning, fasting, rhubarb and jalap, aa , gr. x.—xv.— ss .

167. (d) *Alibert's and Dubois' methods* are nearly the same, and as follows: After a preliminary treatment for eight days, to which garlic, roasted under the ashes, is added, the abdomen is to be rubbed several times a day with a liniment of camphor, with balsams and nut-oil, and with crushed bulbs of garlic, also a pisan of *helminthocorton* and *filix mas*, and a nightly enema of marsh-mallow water are prescribed. Without this preparation, ALIBERT prescribes,

No. 330. R Rad. Filicis Maris, z iv.; Coque cum Aq. Font., lb ij ., usque ad remanentiam lb ij .; Colaturæ adde Syrupi Helminthocort. ss ij. M.

This is to be drunk in cupfuls during the day. After three hours of repose, calomel and corn. cerv. ust., of each gr. ij ., made into a bolus with conserv. rosæ q. s., are given. In the evening, ss ij. of oil of sweet almonds; and on the second day the following purgative:

No. 331. R Scammonii, gr. xvij.; Rad. Filicis Maris, ss ij.; Cambogiæ, Calomel., aa , gr. xij. M.

To be taken in three portions in sugar and water. DUBOIS, after the preliminary treatment just noticed, prescribes, early in the morning, ss ss. of *filix mas* in broth; and every half hour one of the following:

No. 332. R Res. Jalap., Scammonii, Cambogiæ, aa , ss ss.; Syrupi Rhamni Cathart., q. s., ut fiant Boli, sing. gr. vj.

168. (e) *Biching's and Seeger's Methods*.—The former commences with draughts and clysters of cold water, and with full diet and cold baths. With this diet, but without the cold water, according to SEEGER, a saturated decoction of ss ss. of fern-root is drunk cold after every meal, when the worm will be expelled in from three to fourteen days. SEEGER's plan, according to KÜCHENMEISTER, is suited to irritable and weak persons.

169. (f) *Nuffer's and Odier's Method*.—The evening before the treatment the patient takes a thin gruel with two ounces of butter; a quarter of an hour afterward, a glass of wine, and, if necessary, a clyster. The next morning, fasting, ss ij. pulv. fil. maris in ss iv.— vj . aq. tilia. If vomiting occur, this is to be repeated; and if sickness be felt, black coffee is taken. Two hours after this the following bolus is given:

No. 333. R Calomel., Scammonii, aa , gr. x.—xv.; Cambogiæ, gr. v.—vij.—vij.; Confect. Hyacinth., q. s. Misce.

For weak patients and children, in two doses. If the bolus be thrown up, or not have operated in four hours, or if the worm hangs out of the anus, ss ij. of Epsom salts, dissolved in warm water, are given. If the worm be not expelled by this, the gruel and powder are to be repeated, but the Epsom salts are to be given instead of the bolus. ODIER directs a table-spoonful of castor-oil in meat broth every half hour instead

of the bolus. This treatment is said to be certain against *Bothriocephali*.

170. (g) *Blossfeld's and Rapp's method* is much praised. The previous evening a thick mixture of bread and milk is taken; and in the following morning ss ij. pulv. rad. fil. maris is given every hour, in an ounce and a half of nutmeg tea. After six or eight doses the worm is expelled. RAPP directs the root to be fresh, and administers ss ij.— ss ij. of it one dose.

171. (h) *Mayor's Method*.—MAYOR, of Geneva, regards the root of *filix mas* as specific against *Bothriocephalus*, and tin and pomegranate root against *Tænia solium*, and states that the powder of the fern-root should appear quite green, as it is otherwise inefficacious. He gives ss ij.— ss iv. in a mixture of balm tea and ss ij. of gum sirup. This draught is to be taken at night, and ss ss. of castor-oil the next morning. MAYOR, in some cases, instead of the powder, prescribes the *oleum filicis maris* in the form of pills—thirty to fifty drops in twenty-four pills, of which twelve are taken at night and twelve in the morning, and an hour afterward ss ss. of castor-oil. In other cases he gives the fern-oil, either pure or mixed with castor-oil, in doses of ss ss.— ss ij.; but usually the castor-oil afterward.

172. (i) *O. Bang's Method*.—"For three days the patient takes only one basin of meat broth, with white bread. At night he has a clyster of warm milk. On the fourth day he takes also eight cups of black coffee with plenty of sugar, and two to three large pickled herrings in the form of salad, with plenty of vinegar, pepper, oil, and onions. On the fifth day he takes alternately, every two hours, one third of a herring, and a heaped-up tea-spoonful of pulv. rad. filicis maris, and with this two to three cups of coffee. At night a milk clyster and a dessert-spoonful of castor-oil. On the sixth morning, fasting, two tea-spoonfuls of fern-powder; an hour afterward, two table-spoonfuls of castor-oil, and the same quantity every two hours until the worm is expelled. During this he drinks tea; and, lastly, for the subsequent treatment, iron is used."

173. (k) *Ullersperger's Method*.—Without any previous treatment, he gives ss ij.— ss iv. of the bark of the roots freshly peeled, treated with alcohol the day before, and lets the patient lie in bed. When no vomiting takes place within two hours, an aperient of 6 gr. calomel and ss ij. of sapo jalap. in pills is given. This method is said to be rapid and efficacious.

174. (l) *J. P. Frank's method* is to commence either with the exhibition of tin, as above, and to follow with the male fern, or to begin at once with this latter, giving about three drachms in a draught of cold water, and to give frequently cold diluents, allowing the most rigorous abstinence. A dose of castor-oil may be taken the following day, and repeated every two hours until copious evacuations are procured.

175. (m) *Mayer's and Karsten's Methods*.—On the day when fragments pass off spontaneously, the patient takes a herring salad at night. At six o'clock next morning, ss ij. of fern-powder in ss ij. of aq. flor. tilia. is taken in tea-spoonfuls without stopping, and immediately after this a table-spoonful of castor-oil, and then a cup of thin broth. The oil is then continued every half hour until ss ij. are taken. For any sensation of fulness and nausea, hot black coffee is given. About twelve o'clock the greater part of the

worm is expelled, and the head passes at one or two o'clock. Bitters are prescribed subsequently. KARSTEN'S method consists of a mild aperient and scanty diet the day before; and early in the morning, $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. of fern-root in teaspoonfuls. If sickness be felt, thin broth is given. Between eleven and one o'clock the worm is expelled without any farther treatment. Several other methods of employing the male fern root have been enumerated by KÜCHENMEISTER, generally premising various means, the modus operandi and utility of which are not very apparent. I shall next notice two other preparations of this root—the *extract* and the *athereal oil*, which have been used with great benefit. The *compound decoction of male fern*, for which I have given a *Formula* in the APPENDIX, will be found one of the most efficacious modes of prescribing this remedy. (See *Form.* 62.)

176. (n) The *extractum filicis maris* has been prescribed by several physicians. PESCHIER administers it as follows:

No. 384. R Extr. Filicis Maris Æther., $\mathfrak{O}\mathfrak{j}$.— $\mathfrak{z}\mathfrak{s}\mathfrak{s}$.; Pulv. Rad. Fil. Maris, q. s., ut fiant Pilulæ xx.

To be taken in two portions half an hour before bed-time, after fasting from five o'clock in the evening; next morning an aperient. Several physicians have adopted this preparation and its mode of exhibition with success. KIESER and HILLER gave the extract, for several days together, to the total amount of $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. with good results. After several days of spare diet, MÖSING gave fifteen of PESCHIER'S pills to the fasting patient at nine o'clock, and again at half past nine. His prescription is as follows:

No. 385. R Extr. Filicis Maris Æther., $\mathfrak{z}\mathfrak{j}\mathfrak{s}\mathfrak{s}$.; Pulv. Rad. Fil. Mar., q. s., ut fiant Pilulæ xxx.

After the last dose, he gave $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. infusi sennæ compos. at once. FUNK administered the extract night and morning with sirup and gum, and afterward gave castor-oil every hour until it operated freely. NOSS prescribed an aperient on the preceding day, and the extract to the fasting patient with sirup— $\mathfrak{O}\mathfrak{s}\mathfrak{s}$.— $\mathfrak{z}\mathfrak{s}\mathfrak{s}$. of the extract twice with an interval of an hour; then castor-oil every hour. ALBERS, after a restricted diet for one to three days, and on the day before the exhibition of the extract, prescribed a purgative of Glauber's salts; and on the following morning, $\mathfrak{z}\mathfrak{s}\mathfrak{s}$. of extract of male fern while fasting, and the same quantity an hour afterward; one to two hours afterward, castor-oil. RAYER gave seventy-two drops of PESCHIER'S thin extract of fern made into pills with the powder of the root, of which eight are to be taken at night, and eight in the morning; two hours afterward, castor-oil. MAGENDIE prepared a *tincture* from the buds of the fern, and made it into pills with the powder of the bark of the root, each containing a drop of the tincture. From eight to twenty were said to be sufficient for expulsion of the worm. The circumstance of no farther accounts of the employment of this tincture having appeared is not in favour of its efficacy.

177. (o) The *athereal oil of male fern* has been much employed and praised by Dr. JENNER. He caused the patient to be kept without food for sixteen or eighteen hours before he gave the oil; and he farther recommends the following mode of administering it: "For an adult, two pills may be taken at bed-time, containing three grains of calomel, and eight of compound colocynth pill; the following morning, a dose of castor-oil. A lit-

tle broth only should be given till the bowels have been thoroughly cleared out. As soon as that object is effected, one drachm and a half of oil of male fern is to be given on an ounce of some aromatic water; and the dose of oil of male fern is to be repeated in six hours, if the first dose has not proved effectual before the expiration of that time. For a child, calomel and jalap may be substituted for the colocynth and calomel. The dose of the oil of male fern must be as large, for the child as for the adult; seeing that its action is on the parasite, and not on the patient, I have never seen any unpleasant results follow its employment in the child." I have, in several cases, given the male fern successfully, when connected, many years ago, with public medical institutions; and since the publication of Dr. JENNER'S interesting paper on the use of the *athereal oil* of male fern, I have prescribed it in two cases—in one with complete success, but in the other it failed. In this latter, the oil of turpentine and the kouso had been prescribed separately and after considerable intervals, and both had failed, portions of the worm only having come away. An opportunity, however, was not afforded me of persevering in the treatment beyond the exhibition of two doses of two drachms each. The oil was procured from an undoubted quarter. I give, in the subjoined note, Dr. JENNER'S account of his experience with this oil.* In a case re-

* "The anthelmintics chiefly employed in cases of tape-worm in this country are turpentine, kouso, pomegranate, and male fern. The objection to turpentine is its horribly nauseous flavour, and its very unpleasant effects on the head, and occasionally on the kidneys. It is a remedy which should be used only as a last resource. Kouso is expensive and bulky. Pomegranate is bulky and nauseous, and, as ordinarily obtained in this country, not very certain in its action. Male fern has the advantages of being inexpensive, only moderately disagreeable in flavour, so that children take it readily, of small bulk, perfectly innocuous to the patient, and more certain than the other agents in its action on the parasite. It is one of the oldest of the remedies for tape-worm, and one of the very best. The preparation I have used is the *athereal oil*. An aperient was given in the morning, the patient was kept without food for sixteen or eighteen hours, and then one or two drachms of the oil of male fern were administered on a little cinnamon water.

"I have notes of twenty-four cases to which the oil of male fern was given. Sixteen of these cases were cured by a single dose. In three of these sixteen cases the head was found; three of the remaining thirteen were ascertained to be well two years after the administration of the oil, one a year after, one seven months, two six months, three four months, one three months; and before the other two ceased to be under observation, a second dose was given by way of precaution, as it was to all the patients when the head was not found, without any tænia coming away with the stool.

"Three required two doses of the drug; in one of these three, some yards of tænia were expelled by the first dose; for two months after this no joints were found in the stools, then a few appeared, and a second dose was given, and was followed by the expulsion of nine yards of tænia; the patient continued well two years after this. In the second case, three yards were expelled by the first dose; and a month after, five feet by a second dose; at the expiration of four months and a half, the patient continued well; in the third case, five and a half yards of tænia were expelled by the first dose, and seven yards by the second, given two months after the first.

"Three doses were required in two cases. The first dose of the oil, however, given to one of these cases, was not of good quality. In one of the two three days elapsed between the first and second dose, and four hours between the second and third. In the other two days elapsed between the first and second dose, and one between the second and third. In both cases the head was obtained.

"In one case, viz., that of a child five years and six months old, between the 15th of July and the 4th of August inclusive, five doses of castor-oil, and as many of oil of male fern, were administered without a decided effect; a few joints of tænia only being expelled. On the 17th of August, twenty grains of the extract of male fern,

corded in the same journal (August 30, 1856, p. 733) by Mr. SYMPSON, two drachms of the æthereal oil of male fern, given without preparation, brought away the *Bothriocephalus* in three hours after their exhibition, the worm being voided in two portions with its head connected with the part last voided.

178. c. METHODS WITH POMEGRANATE BARK.—DIOSCORIDES, CELSUS, and PLINY mention the *radix punicea granati* as a vermifuge; and in the East its reputation as an anthelmintic remedy has been great from time immemorial. It was introduced into Europe early in this century by BUCHANAN, BRETON, FLEMING, and others. SEEGER states that of 419 cases treated with it up to 1852, 371 are reported as complete cures, 24 as doubtful, and 24 as unsuccessful. KÜCHENMEISTER adds that he could considerably increase the number of successful cases, partly by his own observations, and partly by those made by others, according to his method—this appearing to be his favourite remedy. The following inferences are stated by him as to the preparation of the bark: 1st. All experiments to ascertain the active principle of the bark of the *radix punicea granati* have failed. 2d. This bark is often adulterated, or contains much impurity. 3d. The bark of the root is more active than the bark of the trunk; $\xi iij.$ of the former = $\xi iv.$ of the latter. The bark of the branches has no action. 4th. The fresh bark acts more gently than the dried bark, but more of it is required; $\xi iij.$ = $\xi ij.$ of dried bark. 5th. According to several authorities, the East Indian bark—which is thicker—should be preferred to the European. 6th. "After maceration for at least twelve to twenty-four hours, the bark is well boiled; and, according to CENEDELLA, it is better made in earthen than in metallic vessels; it is filtered while hot, as, on cooling, active substances appear to be thrown down again. The decoction was formerly most generally used, but I prefer the extract. The best method of preparing this is as follows:

No. 356. R Corticis leviter contusi Rad. Puniceæ Granati, $\xi iv.$; macerentur per horas xxiv. cum aquæ destill. lbj. ;

obtained from Duncan and Floekhart, of Edinburgh, were given without effect. On August 23d, one pint of infusion of pumpkin-seeds; on September 1st, decoction of pomegranate; and on September 5th, infusion of kouso; all produced copious evacuations, but no tape-worm. The child now left the hospital. In November he was readmitted, and, during my absence, was treated with success, by my friend Dr. BALLARD, with the oil of male fern. This time the child was kept for forty-eight hours with little, if any, food, before the oil was given. The child was free from tape-worm some months after he left the hospital.

"One man took the oil two or three times without any good effect; but then large quantities of solid feces were discharged from its action; and before it could be administered in a more effectual manner, the patient escaped observation.

"Among those cured by a single dose, and well two years afterward, was one man who had taken kouso three times, and oil of turpentine twice. Several of the others had taken turpentine and other remedies with permanent good effect. In three cases (children), the patients rejected the oil by vomiting; with one exception, all admitted that it was much less nauseous than castor-oil. In no case did it cause griping or other unpleasant symptoms. The shortest time after taking the oil in which the worm was expelled was half an hour; the longest twelve hours; the ordinary time four hours. A large quantity of tenacious yellow mucus was usually expelled either with or before the worm, and often, also, when no worm was present, as when the oil was given to ascertain that no worm remained, the head not having been found.

"In no case was the worm alive when expelled, and in no case was it expelled entire."—(*Association Med. and Journ.*, Aug. 23, 1856, p. 718.)

posthac coque in leni calore per horas xij., ad remanentiam, $\xi vj.$ et cola.

To be taken in three to four doses at intervals of from half an hour to an hour." 7th. According to German physicians, the fresh bark, or the extract prepared in the East Indies from the fresh bark, is to be preferred. Even the fresh bark cultivated in Germany and in green-houses is more efficacious than the dried bark. WAITZ's extract, prepared from the fresh bark in the East Indies, is very active, the dose of it being $\xi j.$ — $\xi ij.$ 8th. "The most efficacious form, under all circumstances, is the solution of the extract in a certain quantity of water. The extract itself, made into an electuary with honey, or administered in pills, is to be recommended where there is great tendency to vomit; but, on the whole, its aqueous solution is the best. 9th. An alcoholic extract is also recommended by DESLANDES, and recently by MARTINS, and an æthereal extract has been prepared by WAITZ in Java. Of the latter $\xi iij.$ — $\xi iv.$ are administered in $\xi v.$ of fennel-water with syrapi corticis aurant. $\xi j.$, in three doses, at intervals of half an hour." 10th. Although boiling water is, to a certain extent, sufficient for the preparation of the active substance of the bark, yet the addition of caustic potash or soda, or of a little white wine to the water employed in the maceration, and afterward in the decoction, of the bark, greatly increases the efficacy of the extract. 11th. Bark which has been long kept is to be rejected as inefficacious. 12th. KÜCHENMEISTER has recourse to another method of preparing the decoction and extract beside that advised above (6th.) It is as follows:

No. 357. R Cort. Rad. Puniceæ Granati, $\xi vj.$; Pulv. Rhamni Cathart., $\xi j.$; Aquæ Destillat., lbj. ; Liq. Kali Caustici Concent., ℥x. Macera per horas 12—14; coque leni calore in balneo vapor. per horas 24 ad remanentiam extracti.

The woody parts are to be removed by washing and pressing some time before the conclusion of the evaporation, the washing water being evaporated with the rest. A quantity of this extract, corresponding with the dose of the pomegranate bark prescribed, is to be dissolved in $\xi vj.$ — $\xi vij.$ of hot water; and, before administration. $\xi j.$ — $\xi ss.$ extracti filicis maris æther. may be added, when it is desired to combine the two extracts. (See § 176.)

179. d. METHODS OF PRESCRIBING POMEGRANATE BARK.—(a) Recent Bark.—BUCHANAN prescribes $\xi vij.$ of fresh bark of the root to be boiled with three pints of water until two pints remain, and drunk in cupfuls, at short intervals, until the worm is expelled. KÜCHENMEISTER says that by this violent vomiting, colic, and purging are produced. BRETON recommends $\xi ij.$ of the fresh bark to be boiled down from $\xi xvij.$ to $\xi ix.$, or, according to GOMEZ, from lbjss. of water to lbj. , and this decoction to be taken by cupfuls. MÉRAT advises $\xi ij.$ of fresh bark to be infused at night in lbjss. of water, and left to macerate through the night, and to be boiled down to lbj. in the morning. After being filtered and well pressed, this decoction is to be taken in three equal parts within two hours. If vomiting occur after the first dose, this should not prevent the following doses from being given; but if the patient vomit these the treatment must be desisted from. According to SCHMIDTMÜLLER, after one day's fasting, and the administration at night of $\xi ij.$ of castor-oil, $\xi iij.$ of fresh bark are macerated for twelve hours in $\xi xij.$ of water, and concentrated to $\xi vj.$; this is taken in three doses within an

hour. KÜCHENMEISTER remarks that "in all these methods evacuations take place without purgatives, as the fresh bark usually acts as an aperient itself; and in this lies the great advantage of the fresh bark, and a principal cause of the great uncertainty of most of the previous methods, in which the dried bark was employed. To produce the aperient action with certainty, the dried bark needs the addition of purgatives. According to my experience, the neutral salts and the true drastics, such as jalap, are greatly to be preferred to the oils." The decoction of fresh pomegranate bark may also be prescribed as stated in the APPENDIX. (See Form. 69.)

180. This writer prefers the extract. radice punice granati, prepared according to the prescription given above (§ 178, No. 387), to all other remedies for tape-worm with which he is acquainted; for, in almost every case of expulsion by this medicine, the worm was passed in one piece with the head, or unbroken and in a single coil—sufficient reason, in his opinion, for endeavouring to make the administration of this remedy more agreeable, and its results still more certain.

181. (b) *Combinations of Pomegranate Bark and Male Fern.*—This was attempted by VON KLEIN, and afterward by KÜCHENMEISTER. The latter prescribed it as follows:

No. 388. R Extracti Radicis Punice Granati Aquosi quantum est ex Rad., ℥iv.—℥vj., solve in Aq. Destill. Ferride, ℥vj.—viii. Adde Extr. Filicis Maris Æther., ℥j.—℥ss.; Extr. Tanacetii Vulgaris, ℥ij.; Cambogiae, gr. iv.—vj. ad x. Misce.

A cupful to be taken in the morning, fasting; a similar dose in three quarters of an hour. The third is kept in reserve. If the worm be not expelled in an hour and a half after the second dose, the last portion is also to be taken. If vomiting occur, a table-spoonful of the medicine is given every ten minutes; and, to alleviate the tendency to vomit, the patient is recommended to gargle, after every dose, with fresh milk, without swallowing any of it. Small pieces of candied citron or lemon-peel are allowed between the doses. If no evacuation have occurred three hours after the first dose, and the worm have not been expelled, an aperient is administered. "With *tania solium*, castor-oil is usually sufficient; one to two table-spoonfuls every half hour or hour; or,

No. 389. R Cambogiae, gr. vj.—viii.; Pulv. Rad. Jalapæ, gr. x.—xv.

To be repeated in two hours, if required." With *T. mediocanellata*, this writer has found the best results with the following aperient:

No. 390. R Calomelanos, gr. iv.—vj.; Pulv. Jalapæ, gr. x.—xv.

To be taken at once. After the expulsion of the worm, he advises no treatment, excepting tonics in cases of great weakness.

182. (c) *The preliminary treatment, advised by KÜCHENMEISTER*, is as follows: At the seasons of fresh strawberries and grapes, he gives half a pint of these fruits every morning, fasting, for six to eight days; and on the evening before the expulsion, a herring salad with plenty of vinegar, onions, raw and boiled ham, and plenty of oil; and to very costive persons, ℥j. of castor-oil; after which the patient may drink a large glass of light Rhenish wine, or a glass of bitter beer. If the fresh fruits are not to be had, the salad alone will suffice. In very obstinate cases

of *Tania mediocanellata*, he allows the patient to take as much confection of senna with extr. tana-ceti vulg. (℥ij. to the ounce of the confection) as will produce two soft motions daily; he then takes the mixture, and not before. Fasting the night before is not advised, as the medicine does not agree well with an empty stomach.

183. e. METHODS WITH OIL OF TURPENTINE.—I have prescribed this medicine both as a preliminary means variously combined, and as a direct remedy, or after little or no previous treatment. As a preliminary medicine, I have most frequently given it in the following form:

No. 391. R Olei Terebinthinæ, ℥ij.—℥iv.; Ætheris Sulphurici (vel Spirit. Ætheris Sulph. Comp.), ℥iv.—℥vj.; Tinct. Camphoræ Comp. (vel Tinct. Benzoniæ Comp.), ℥ss.; Olei Cajuputi, ℥xij.—xx. Tere cum Pulv. Tragacanth. Comp., ℥ij.; Pulv. Glycyrrh., ℥ij., et adde Syrupi Rosæ et Syrupi Tolutani, aa, ℥ss., Aquæ Destill., ad ℥viij. Fiat mist. ejus capiat cochl., j. vel ij. larga, 4tis vel 6tis horis, prius agitata phialâ.

Cold water, or linseed tea, barley water, &c., may be taken frequently during the continuance of this medicine; and in some cases, as soon as any indication of disorder of the urinary functions occur, a full dose of either castor-oil, or of calomel with camboge or jalap, so as to freely evacuate the bowels, should be given. Frequently a considerable portion of the worm is expelled by these means; but nevertheless the male fern, or its æthereal oil, or the pomegranate bark, should be taken, as prescribed above (§ 164–181), a few hours after the exhibition of the purgative; or in other cases a few hours before, especially if the bowels have not been long confined.

184. KÜCHENMEISTER states that "the dose of this remedy is ℥ij. at once, in the morning, fasting; and if no stools result, another ℥j.—℥ij. afterward (FENWICK and COPLAND); or ℥j. olei terebinthinæ, made into an electuary with honey, &c., in two doses at night before going to bed (THOMPSON); or ℥ij.—ijss. (SCHMIDTMANN); or with the olei filicis maris (MAYOR). Or the patient for three days is allowed to eat only water-gruel with small portions of white bread, three times a day; and on the next day, when fasting, to take the following:

No. 392. R Olei Terebinthinæ, ℥j.; cum Vit. Ovorum, ij.; Sacchari Albi Subacti, ℥ss. M.

and if the worm is not expelled on this day, the dose is repeated on the following day (MERCK). Some also give ℥ij.—ijss., one half in the morning, and the other at night." This is one of the most effective agents against tape-worms, as LANGE, KÜCHENMEISTER, and others admit. The latter of these writers states that tape-worms laid in turpentine mixed with white of egg, died within one hour and three quarters; and that the touch-stone of a remedy for tape-worms is not whether it expels *Bothriocephalus latus* or *Tania solium*, but whether it is also capable of expelling the *T. mediocanellata*. That the oil of turpentine is efficacious in the latter case, he can prove; for the finest specimen of this last-named worm was expelled by it. In general it acts with tolerable rapidity, and entirely. This latter circumstance he regards as a requisite of a good vermifuge in cases of tape-worm, especially as the doctor and the patient are anxious to ascertain the expulsion of the head of the parasite.

185. The principal objections to this substance are its nauseous taste, the inclinations to vomit, the unpleasant eructations, griping pains, and disorders of the urinary excretion, it often occa-

sions. It more frequently produces these unpleasant effects when taken in the form of an electuary. When prescribed in the form of mixture, as above (§ 183), or suspended by white of egg, or taken either pure in a full dose (ʒj.—ij.), or with the addition of castor-oil, on the surface of coffee, or milk, or on any aromatic water, at bedtime, or early in the morning, it is generally the most efficacious, and least likely to produce any of the above unpleasant symptoms. It is often taken with less discomfort on the surface of Hollands or common unsweetened gin. When castor-oil is not given with it, and when it does not act on the bowels in a few hours, either a full dose of castor-oil, or of some one of the purgatives already mentioned, should be taken without delay.

186. *f.* METHODS WITH KOUSSO.—*Kosso*—*flores kouso*—the dried and powdered flowers of the *Brueya anthelmintica*, has lately been much in vogue against tape-worm. It has been supposed by several physicians to have been adulterated. KÜCHENMEISTER supposes that it is not so much adulterated as mixed with other Abyssinian medicines against tænia, as with the powder of the root of *Verbascum ternacha*, and with the powdered leaves of *Jasminum floribundum*. The dose of the powder of kouso is ʒvj.—ʒj. I have prescribed this remedy in four cases. In the first, successfully in the case of a medical man in Hertfordshire, the entire worm with the head having been brought away after turpentine and some other anthelmintics were said to have failed; but in two cases with only a partial benefit; and in one case without any effect. The writer just mentioned states that he has always been more or less unlucky with this remedy, which, in the ordinary mode of administration, shares all the defects of the other remedies for tape-worms, and easily produces sickness and violent pains in the intestines; and that the worm has generally been expelled by it in numerous fragments, and at most the worm up to the neck; but that he never found the head, excepting once, after a second dose of the kouso, which caused violent pain in the abdomen. Several attempts have been made in Germany to isolate the active constituents of this substance, and to prepare infusions, decoctions, and infuso-decoctions of it, with and without the flowers being retained in them; but although the effect appeared to equal or to approach that of the powder of kouso itself, yet little was gained, excepting when the quantity (ʒvj.—ʒj.) of kouso usually employed was macerated in cold water for twenty-four hours, and then boiled for half an hour, and the whole taken—without straining—with the flowers in it, in two portions; ʒj. to ʒij. of castor-oil having been given two hours after the second portion. This infuso-decoction was said to have been well borne, and to have acted with certainty.

[To avoid the nauseating effects of kouso flowers, however different the mode of administration, the resin of the flowers, extracted in the same manner as the resin of jalap, has been recently recommended. Two scruples to one drachm of the resin are dissolved in about three drachms of alcohol. This solution is then poured on a piece of sugar weighing about half an ounce. After the sugar has dried by evaporation of the alcohol, it is powdered, three drachms of powdered sugar being added. The whole is then divided into five doses, four of which are given at six, seven, eight,

or nine o'clock in the evening; the remaining at six o'clock in the morning; an hour later, six to nine drachms of Glauber's salts are given, dissolved in water.]

187. *g.* NOTICES OF SEVERAL OTHER MEDICINES AND METHODS AGAINST TAPE-WORMS.—(a) The *Spigelia anthelmintica* has been employed, according to NOVERRE, in the West Indies; but its effects are unpleasant, and it not easily admits of use in Europe.—(b) *Sabadilla* has been given in a dose of half a drachm of the powder in the morning, the patient having been purged on the previous day with rhubarb and Glauber's salts. The sabadilla powder is given with the same quantity of fennel sugar, and the patient afterwards drinks one to two cups of chamomile or elder-flower tea. If vomiting be produced, worms in the stomach are thrown up. On the second day the same dose of sabadilla is taken; and if no more of the worm appears, half the quantity of this medicine is taken morning and evening of the third and fourth days. On the fifth morning, while fasting, a purgative is administered, and the living or dead worm is brought away. For children from two to four years, two grains of sabadilla powder is a sufficient dose. This medicine is of service against *ascarides*.—(c) The *schebdi*—the *Phytolacca dodecandra* or *Abyssinica*. The fruit of this plant has been tried in Europe, and fragments of the worm have been brought away; but sufficient trials have not been made of its efficacy.—(d) The *fructus saoria*, the fruit of *Masa picta*, HOCHSTETTER, has been given in doses of ʒj.—ʒjss. with uncertain results. This remedy is easily taken. Its taste is less repulsive than that of other remedies. Nausea, vomiting, and slight pain in the abdomen are often experienced from it. In two cases the worms were expelled by it up to the head, but always in fragments. This remedy appears to be deserving recommendation for *ascarides* and *oxyurides*.—(e) The *Mucuna*—*cortex mucunæ*—from *Mucuna anthelmintica*. The dose of the powder is ʒvj., and is usually, in the East, given with honey in a stiff paste. Single fragments of the worm were brought away by it, but the medicine was probably injured by keeping.

[The *petroleum* has been found very successful in the treatment of tape-worm. The mode of administering is to combine half an ounce of the petroleum with six drachms of the tincture of asafetida, and give forty drops three times a day.

The seeds of the pumpkin (*Peponis semen*) have recently obtained considerable reputation for the cure of tape-worm. They have the very remarkable property of being bland and almost tasteless, while at the same time they yield to few, if any, anthelmintics in point of efficacy. Two ounces, or even more, as they are perfectly harmless, may be given for a dose. They should be taken upon an empty stomach in the morning, before breakfast; first depriving them of their outer covering and rubbing them into an electuary or paste, with sugar and a little water; or a larger quantity of water may be added, forming an agreeable emulsion. The whole should be taken in successive draughts, and in two hours after followed by a full dose of castor-oil.]

188. *h.* DRASTIC PURGATIVES WITH AND WITHOUT CALOMEL.—BREMSEYER'S and SCHMIDT'S methods of employing these medicines are too severe, and are often productive of inflammation of the digestive mucous surface, which may not be al-

layed for some weeks. I will not, therefore, mention them. According to ETTMÜLLER's plan, the patient takes, at seven o'clock in the evening, calomel, gr. xij., lapid. cancror., ʒj.; and about nine o'clock, olei amygdal. dulc., ʒjss.; which usually operate twice in the night. At seven and nine o'clock next morning he takes cambogiæ, gr. xij., rad. valerianæ, and sem. cinæ, ʒā, gr. iv., when the worm is afterward expelled. I much doubt this result. It is quite unnecessary to state the various modes in which the changes are rung upon the purgatives believed to be most appropriate in cases of tape-worm, by writers of no mean reputation, and the several ways these medicines may be combined and successively administered. Calomel, camboge, jalap, castor-oil, the sulphates of potash, soda, magnesia, &c., variously conjoined or administered in succession, with or without valerian, oleum tanacetii, &c., are the chief medicines advised. But, in order to be efficient, their doses and the repetitions of them are such as to risk the supervention of inflammation; and in a large proportion of cases they fail altogether.

189. *i.* INFERENCES.—(a) Simple methods of treatment with the *filix mas* and its *æthereal oil* and *extract* (§ 176, 177), are sufficient to remove the *Bothriocephali*.—(b) For the expulsion of *Tenia solium*, the combination of the aqueous extract of the bark of the pomegranate root, with the addition of the *æthereal* extract of male fern, is considered by KÜCHENMEISTER as the most efficacious, camboge, gr. iv.—viii., being preferable to the saline addition mentioned above.—(c) The *Tenia mediocanellata* is generally expelled by the same combination, especially when a powder with calomel and jalap, or camboge, is given afterward.—(d) In very obstinate cases, the methods with tin, or those with turpentine, or with these latter following the former, may be employed with care and circumspection.—(e) The kousso does not promise any advantage over the above remedies, if, indeed, it be equal to any of them.—(f) When the worms depend from the anus, the German physicians advise a cup of strong black coffee with plenty of sugar to be given immediately. A dose of calomel and jalap, or this followed by castor-oil, appears to be more efficient.

190. *k.* TREATMENT WITH KAMALA (*the red powder obtained from the capsules of Rottlera tinctoria*, Roxburgh).—This substance, long known in India as a valuable dye for silk, has been much employed against tape-worm, which is very prevalent in the Punjab and Northwestern Provinces of India, and has recently been prescribed with success in this country by Dr. LEARED and others. This peculiar red powder may be prescribed in doses of half a drachm to three drachms suspended in water. "A single dose is often found sufficient, and in general it is not necessary to give any other medicine before or after. In some cases, however, where a small dose of kamala has been administered, castor-oil has been afterward given with good effect. Dr. GORDON has prescribed kamala in the dose of one drachm, repeated at intervals of three hours. Kamala may be given also in the form of tincture, the formula for which, recommended by Dr. ANDERSON, is as follows:

No. 393. R Kamalæ, ʒvj.; Spiritus rectificati, ʒxvj. Marccera per bîdium et cola.

An *æthereal* tincture may be prepared of the

same strength; but it is said to offer no particular advantage over the alcoholic. The dose of *tinctura kamalæ* is from ʒj. to ʒiv., diluted with some aromatic water." (Dr. HANBURY, in *Pharmaceutical Journ.*, Feb., 1858, p. 405.)

191. Drs. C. MACKINNON, ANDERSON, CORBYN, and GORDON have praised the anthelmintic powers of this medicine. Dr. MACKINNON states that the results have been so satisfactory, that he has continued to employ this whenever a case of *tænia* presented itself, and that he has given it in sixteen cases without a single failure. In none of his cases, excepting one, did he ever exceed, for a single dose, three drachms. This dose usually purges from five to seven times; and the worm is usually expelled, dead, in the fourth or fifth stool. In about half the cases some degree of nausea and slight griping were experienced; in the remaining half no inconvenience whatever was felt. Dr. MACKINNON states the following as the results of his experience of this medicine: "1st. That kamala is a safe and efficient remedy for tape-worm, and more certain than either turpentine or kousso. 2d. That, to a strong European, three drachms may be safely given as a dose. 3d. That to a person of feeble habit, or to a female, one drachm and a half, followed, if necessary, by half an ounce of castor-oil, is a sufficient dose." Since the above was published, Dr. MACKINNON has administered this medicine to nearly fifty patients, and in two instances only was no worm expelled. (*Medical Times and Gazette*, Dec. 19, 1857, p. 628; and *Indian Annals of Med. Science*, vol. iii., p. 86.)

192. Dr. ANDERSON states that, "after three drachms of the powder (of kamala) have been administered, the worm is usually expelled in the third or fourth stool. It is generally passed entire, and almost always dead; and in all the cases I have examined (about fifteen) I was able to detect the head. In only two cases do I know of the worm being passed alive. The advantage of the tincture over the powder consists in its action being more certain and milder, and in its being rarely accompanied by nausea and griping. In two or three cases, only two or three stools followed the dose usually given, and the worm was expelled in the second stool; in one patient, only one stool was caused by the medicine, and in it the worm came away dead." (*Ind. Ann. of Med. Sc.*, vol. iii., p. 82.) Dr. ANDERSON alludes to ninety-five cases of tape-worm in which kamala was prescribed, and of this number (eighty-six were European soldiers) he was aware of only two in which no worm was expelled. Dr. C. A. GORDON remarks that "with this medicine there is no unpleasant effect. It is not even necessary to take a dose of purging medicine as a preparative; and, beyond a trifling amount of nausea and griping in some instances, no unpleasant effects are experienced; while by far the greater number of persons to whom it is administered suffer no inconvenience whatever beyond what they would from a dose of ordinary purging medicine." (*Med. Times and Gaz.*, May, 1857, p. 429.)

193. Dr. ANDERSON and Dr. GORDON agree in stating that the frequency of *tænia* in the Northwest and Upper Provinces of India arises from the free use of animal food of a very unwholesome character by the European soldiers; while among the Hindoo natives, whose food is entirely vegetable, this parasite is unknown. Foul-feed-

ing and half-starved pigs, cattle and sheep, as well as ducks, turkeys, fowls, pigeons, equally foul-fed and diseased, are often made articles of diet by the European soldiers, and are justly viewed, by the physicians mentioned above, as the causes of the prevalence of tape-worm in this class.

194. iii. TREATMENT OF THE OTHER WORMS.—*A. Echinococci, cysticerci, and acephalocysts* rarely admit of treatment, and only of surgical treatment. This subject is sufficiently noticed in the article HYDATIDS.

195. *B. The comparative rarity of the Distoma hepaticum* (§ 98–100), and the difficulty of its diagnosis, render the prophylaxis and treatment of this worm, in some respects, matters of subordinate importance. The prevention is either difficult or impossible, owing chiefly to our imperfect knowledge of its developmental history. As far as this history may be inferred from the subjoined remarks of KÜCHENMEISTER, the prophylaxis must be founded on it, and be viewed as conformable with what has been stated above.* (§ 157–160). The direct treatment of *Distoma hepaticum* can rarely be ventured upon with success, owing, first, to the almost impossibility of its diagnosis, unless its presence be inferred from the passage upward or downward of some individuals of this species; and next, from the serious nature of the lesions produced by it. Even granting, then, the detection of the malady, medicines can be exhibited only with great uncertainty as to their beneficial effects. As, in many of these cases, the biliary functions are more or less interrupted, and organic vital force impaired, it becomes necessary to attempt the restoration of the former, and the development of the latter, by suitable means. To remove biliary obstruction, calomel and other mercurial preparations combined, according to the peculiarities of the case; the nitro-muriatic acids internally and externally; the preparations of taraxacum, and the mineral waters of Carlsbad, Marienbad, Kissingen, and similar springs. DURAND's medicine against gall-stones and obstruction of the gall-ducts has also been recommended. This medicine consists of equal quantities of oil of turpentine and sulphuric ether. It may be given in moderate and frequent doses; or the oil may be conjoined with alcohol, or with nitric ether, or with the sweet spirits of nitre. These appear to be appropriate for this

parasite, as the efficacy of the turpentine against other worms, and the rapidity of the absorption of it into the circulation, are indications in favour of the use of it in cases where the existence of this animal is inferred. KÜCHENMEISTER states that the principal ingredient of the remedy of DURAND has been successfully administered for *distoma* of some of the lower animals; and that, upon his recommendation, turpentine was administered to several sheep, and followed by a purgative; but the results were not fully ascertained when he wrote. The propriety of enabling the constitution to throw off the parasitic animal by the exhibition of tonics conjoined with alteratives and deobstruents, such as the bichloride of mercury with preparations of cinchona; the extract of taraxacum with the solution of potash, and with tonic and bitter infusions or decoctions; and the nitro-muriatic acids with these latter and with taraxacum, cannot be reasonably doubted.

196. *C. The Distoma hæmatobium*, so remarkably prevalent in Egypt (§ 103–109), cannot be encountered with any means of prevention or of cure, upon which any reliance may be placed. GRIESINGER, who has furnished the chief amount of information respecting this parasite, considers that—1st, the waters of the Nile used without filtration; 2d, the bread, grain, and dates employed for food; and, 3d, the use of half-putrid fish, being the chief causes of its existence—the prevention of it must be based on the avoidance of these causes, and of the circumstances connected with them, which admit of avoidance. As regards the cure, calomel and turpentine are chiefly recommended by GRIESINGER, the latter being readily absorbed into the circulation, as first shown by me in a memoir on this remedy, published in the *London Medical and Physical Journal* for 1821. He also advises the use of onions, garlic, &c. The tinctura ferri muriatis, and other preparations of iron, of camphor, asa-fetida, &c., variously combined, and long persisted in, may also prove of benefit, especially as anæmia and chlorosis form a marked characteristic of these cases.

197. *D. The Oxyuris vermicularis* (§ 123–126) is always treated with difficulty, and, according to my experience, with greater difficulty in old than in young subjects. KÜCHENMEISTER states that internal remedies in general are but little to be recommended. I am of a very different opinion, based upon very considerable experience. This writer advises the long-continued use of a tea made from the *flores verbasci*. The flowers are left in the infusion, and used with it. The fine hairs appear to irritate and disturb the worms mechanically. The remedies already noticed for the cure of tape-worm, especially turpentine, the pomegranate root, the filix mas, &c., often bring away the thread-worms, but they are soon regenerated. The permanent removal of them cannot be effected by these or by similar means. Medicines calculated to act upon the lower bowels, and to restore the tone of the digestive mucous surface, and to correct the state of the intestinal secretions and excretions, are especially required against these worms. Dr. POCKELS recommends the powder of filix mas and jalap in some suitable vehicle; KÜCHENMEISTER, the preparations of the semen cinæ—the santonicum, or semen contra vermes—internally for two days, and afterward strong purgatives, followed by clysters; DUJARDIN advises enemata with valerian, or garlic, or

* "Although it is still unknown to us how the embryo becomes metamorphosed, and into what *cercaria-sacs* or *redia* it is converted, and where these *cercaria-sacs* or *redia* live; although we do not know whether the brood of *D. hepaticum* is tailed or tailless, and where it encysts itself, whether free in the water in the manner of *Monostomum*, in aquatic mollusca or insects, or in higher animals which occasionally visit stagnant waters, yet there is much probability that the herbivorous or omnivorous domestic mammalia infect themselves with free encysted young *Distoma*, either by devouring snails which adhere to the grass of the meadows, especially in moist pastures, or by drinking from impure, stagnant waters (marsh or pond water). Exactly the same thing would then take place in man, by means of snails adhering to salad, fallen fruits, radishes, turnips, and other roots. Nay, such small snails might even be introduced with dry fodder into the stomachs of our domestic animals during the winter, by their eating the small species, passing their winter sleep in their closed shells, or the shellless slugs adhering to roots protected from frost in warm cavities or cellars. Whether the production of *D. hepaticum* in the human liver may take place by drinking impure water, must remain quite undecided. The finding of a young *Distomum* in the sole of a woman's foot appears to be in favour of an immigration, and a mode of existence similar to the *Cercaria*."—(Op. cit., p. 270, 1.)

wormwood, with the addition of aloes; and many administer clysters of salt water, or a solution of salt in water with olive or castor oil. When the patient is distressed by these parasites during the night these or similar enemata should be administered at bed-time or shortly before. Numerous preparations of the santonicum, and various combinations of this seed with other substances, as the powder (3j.—3ij.), the infusion, the decoction, the extract—in the form of electuary, mixture, confection, bolus, &c.—with valerian, or jalap, or calomel, or aloes, or rhubarb, or sulphate of potash, or with sulphate of iron, or with alkaline carbonates, are contained in the Continental pharmacopœiæ, and employed against this and other species of worms.

198. The means which I have usually employed, for many years, against the *Oxyuris vermicularis*, with the view not merely of removing them, but also of preventing their regeneration, and of improving the functions of the bowels and the state of the general health, are combinations of preparations of iron with those of aloes, taken internally for some days, or even weeks, according to their effects; and afterward enemata with olive or castor oil, spirit of turpentine, or asafœtida, camphor, salt, &c., in gruel, according to the peculiarities of the case. The mist. ferri may thus be conjoined with the decoctum aloes compos., or with the tinct. aloes; or the pilula ferri comp., or sulph. ferri, may be given with the pilula aloes cum myrrhâ, the pilula galbani comp. and camphor. Electuaries may also be prescribed in other cases, with the carbonates or oxydes of iron, the santonicum and confection of senna, with a small proportion of the confection of black pepper; and, if these do not completely remove the annoyance, the use of the enemata already recommended should be adopted (see FORM. 71, 80, 105, 106, 149, 151, and 153). In some cases where these are required, the long flexible tube should be introduced above the sigmoid flexure of the colon, so that the remedies may reach above this part of the bowel. Having removed the worms, it will be of service, in order to prevent their regeneration, to continue the use of the preparations of iron in conjunction with aperients and the other medicines which the circumstances of the case will suggest. The following pills have been found by me, for many years, to be most successful in removing and in preventing the regeneration of the *oxyuris vermicularis* and the *ascarides lumbricoides*, both of which parasites are often present in the same case:

No. 394. R Ferri Sulphatis; Quinæ Sulphatis; Camphoræ, ʒiij., gr. xvj.; Pilulæ Galbani Comp., ʒijss.; Pilulæ Aloës cum Myrrhâ, ʒj.; Pulv. Capsici, gr. xvj.; Olei Cajuputi, ℥xx.; Mucilag. Acaciæ, q. s. Misce, contunde bene, et divide in pilulas xxxvj., quarum capiat unam, duas, vel tres, bis terve in die.

The aloes, in combination with sulphate of quinæ, acts energetically on the bowels; therefore the dose of these pills should be regulated according to their operation—a larger dose being given for the expulsion of the different species of ascarides; and the smaller doses for the prevention of their regeneration. The enemata already recommended should also be administered after the pills have been taken during two, three, or five days, the repeated exhibition of these latter rendering the former more efficient and generally successful.

199. E. The *Strongylus gigas* (§ 128–130).—

This worm, which is found chiefly in the kidneys and urinary bladder, can hardly be inferred to exist during life unless its discharge takes place, which very rarely occurs. KÜCHENMEISTER remarks that if several worms, or one large female, be present, the kidneys will be enlarged, so that the enlargement may be detected by palpation, percussion, and perhaps by inspection; but the cause of this swelling, or any flow of blood from the urinary passages, or of any existing retention of urine, could be referred to the presence of these worms only when any of them are passed from the bladder; and in this case the treatment would be chiefly to alleviate irritation by mucilaginous and oily medicines, and emollients, demulcents, &c. The oil of turpentine internally and externally may probably be of use in some instances.

200. F. The *Ancylostomum duodenale* (§ 132–135) is one of the inflictions on Egypt and some other tropical countries, and to GRIESINGER we are indebted for all we know respecting it. Unacquainted at first with the real cause of the disease which it occasions—with the prevalent anæmia, chlorosis, &c., produced by it—he had prescribed iron, quinine, calcaria phosphorica (phosphate of lime?), &c., with much benefit in slight cases, but never with complete success in those which were severe. KÜCHENMEISTER states that in one of his last dissections a sudden light broke in upon him on this subject, when he found the duodenum, the jejunum, and even the upper half of the ileum, entirely filled with fresh red blood, only coagulated here and there, and thousands of *Ancylostoma* on the mucous membrane of the small intestine, each with its little ecchymosis resembling the bite of a leech. Although he thus left Egypt, and could collect no farther clinical observations, he told the Arabian prosector, “You must now employ calomel and other anthelmintics against these *Ancylostoma* and the *Distoma* of the portal vein; in short, against the tropical chlorosis, as well as against hæmaturia, stone, dysentery, abscess of the liver, and all the undetermined diseases of tropical countries, perhaps even some of the tropical fevers, and investigate the latter illness itself, with reference to the most recent helminthological discoveries.” Above all things, GRIESINGER praises calomel and oil of turpentine *à priori*, the latter, indeed, especially for the *Distoma* of the portal vein, above all for the *Ancylostoma*, as it certainly reaches the worms situated in the uppermost parts of the intestine; in substance, worms die in it very readily, and it also acts as a styptic upon the injured, bleeding vessels. This last remedy, when mixed with castor-oil, or with castor-oil and a few grains of santonicine, or the *natron santonicum*, to which vegetable purgatives are added, must prove particularly efficacious. “None of our colleagues working in the tropics should forget that tropical chlorosis is the consequence of the repeated, small intestinal bleedings, which scarcely betray themselves externally, caused by intestinal worms, especially *Ancylostoma*.”

201. G. The *Filaria Medinensis* (§ 138–142).

—a. The prevention of this worm may be inferred from the causes and circumstances connected with its occurrence, namely, the endemic prevalence of filaria in certain climates and localities, its youngest brood living free in the water, or in wet grass, marshes, or moist soil, &c. Hence,

wading through these places with naked feet, or exposing naked parts of the body to foul or impure water, should be avoided as sources from whence the brood comes in contact with these parts in the native countries of this worm. PRUNER states that an infection of the filaria may occur, as shown by numerous facts, even in those tropical regions in which the worm is not endemic, an actual transfer from one person to another or to dogs and horses taking place. BREMSER says that even in his time the worm had become naturalized in Curaçoa by the importation of negroes. No one, therefore, should use the same vessels employed by the patient in bathing or washing the feet; and that great caution should be observed with the bandages of such patients.

202. *b. Curative Treatment.*—At the commencement of its growth, this worm is said, when superficial, to be easily killed by poultices of boiled garlic. When quite superficial, an incision is made upon it, and the worm pulled out with a hook. Slave-dealers rub in civet and musk on its first appearance. But the worm often produces no annoyance for a long time—six to eight months. When it inflames and ulcerates the integuments over its seat, the part which appears is seized, and carefully pulled and fastened to a roll of linen or stick, and gradually extracted by turning these twice daily. Some writers advise, when the worm is felt, to cut down through the integuments, making an incision of several inches long, and removing the worm in a loop, or wedging into a piece of wood, and then pulling now on one side and now on the other, the muscles being all the while relaxed. If inflammation, swelling, and pain are great, and the worm resists dragging, or breaks off, these symptoms are to be treated in the usual way, by poultices of linseed meal, or of onions and bread, or onions boiled in milk, or of roasted onions, &c. In these cases numerous means have been recommended in addition, but none of them appear very appropriate or successful.

203. From the most ancient periods the breaking of the worm has been considered a very serious accident; and severe inflammation, fever, gangrene, &c., have been, even by some modern writers, said to have resulted from it. According to the observations of most authors, who had themselves suffered from the breaking of the worms, violent swelling, inflammation, fever, sleeplessness had occurred, and were cured only when they were killed. The diagnosis in cases of *Filaria medinensis* should always be correctly made, in order to determine the presence of this worm, and to distinguish between *FURUNCULI* (see that article) and inflammatory swellings caused by it.

204. *H. The Treatment of Ascaris Lumbricoides* (§ 144–149).—*a.* For the prevention of this worm it is necessary to bear in mind the circumstances in which the eggs may occur, and the long period during which they may be preserved. RICHTER ascertained that the eggs may remain in sewerage and foul water for some time, and that they attain their full maturity, and undergo the process of segmentation in this situation. BARRY, BISCHOFF, and others have shown that alkalis and salts do not prevent this process. VERLOREN, that a period of eleven or twelve months is required for the completion of this process in the *Ascaris lumbricoides*. RICHTER and KÜCHENMEISTER state that eggs which had been put in

water had not shown any appearance of embryos several months afterward. As to what becomes of the ready-formed embryos nothing is known positively; they probably get into our bodies with water, and perhaps this is sufficient for their development.

205. *b. The Cure of Ascaris Lumbricoides.*—The number of medicines recommended with this object are so great that the judgment is distracted respecting them. In order to assist the selection, it has been attempted to determine the effects of the most reputed vermifuges upon living intestinal worms from recently-killed domestic animals, by REDI, ANDRY, LECLERC, TORTI, ARNEMANN, CHABERT, and others. More lately, KÜCHENMEISTER has had recourse to similar experiments made in the temperature of the animal, by mixing the anthelmintic in white of egg, and placing the living worm in the mixture, and has given us the following results, "arranged according to the time in which round worms died in white of egg mixed with the various remedies:

206. "1. Death took place in one to two hours in white of egg mixed with creasote, and large doses of common salt and corrosive sublimate.

207. "2. Death took place in two to five hours in white of egg mixed with petroleum, cajuput-oil, oil of turpentine, mustard, weaker solutions of common salt, and washed herring's milt.

208. "3. Death took place in five to fifteen hours in white of egg mixed with garlic, onions, laurel, cloves, wood vinegar, rad. pun. granati, tinct. gallarum, concentr. sol. of sulph. soda.

209. "4. Death took place in fifteen to twenty-four hours in white of egg mixed with camphor, anise, and infusions or decoctions of ginger, gentian, elm-bark, kousso, and hops.

210. "5. Death took place after twenty-four hours in white of egg mixed with infusion or decoction of parsley, rice, milfoil, tansy, valerian, chamomile, wormwood, myrrha, quassia, calamus, ipecacuanha, walnuts, china-bark, willow-bark, oak-bark, catechu, kino, asafetida, gum ammoniac, Peruvian balsam, ol. ricini, aqua picis, creasote water," &c.

211. This writer states that besides the remedies here enumerated he has tested the semina cinæ (santonici) with their preparations. In a mixture of white of egg with coarsely-powdered seeds the worms live for days; and in a mixture of white of egg with a strong infusion of semina cinæ, with repeated additions of unboiled powder, they also lived for days. In a mixture of santonine with water and white of egg, the worms lived for days; and also in white of egg with santonine and a little vinegar. At the same time, however, the total insolubility of the santonine was proved by farther experiments. In white of eggs mixed with castor-oil and santonine the worms died within an hour; but in this experiment the temperature was raised too high. In a mixture of white of egg with natron santonicum (santonate of soda) dissolved in water, ascarides lived more than twelve hours. These experiments form an introduction to the treatment advised for *Ascaris lumbricoides* by KÜCHENMEISTER, and more especially to the use of the preparations of santonine; but he previously notices the employment of the semina santonici by other helminthologists, who generally prescribed this remedy in the form of an electuary.

212. (a) STORCK's Formula:

No. 325. R Pulv. Semin. Santonici (vel Cinæ), ʒij.

Rad. Valerianæ Min. Pulv., ʒj.; Rad. Jalapæ Pulv., ʒss.; Oxy-mellis Scill., q. s. ut fiat electuarium molle.

One tea-spoonful every three hours.

213. (b) SELLE'S Tonic Worm Electuary:

No. 396. R Pulv. Seminum Cinæ, ʒvj.; Ferri-Sulph. Cryst.; Extr. Chinæ Fusæ, ʒiij.; Syrupi Cinnam., q. s. ut fiat electuarium molle.

One tea-spoonful three times a day. This electuary is to be preferred some time after the expulsion of Ascarides, and to ascertain their permanent removal.

214. (c) HUFELAND'S Worm Electuary:

No. 397. R Pulv. Sem. Santonici, ʒss.; Pulv. Rad. Jalapæ, ʒj.; Kali Tartar. depur., ʒij.; Pulv. Rad. Valerianæ, ʒss.; Oxy-mel. Scillæ, ʒvj.; Syrupi Simp., q. s. ut fiat electuarium molle.

One tea-spoonful every two or three hours.

215. (d) CLARUS and other German physicians advised the Semin. Santonici, coarsely powdered, to be sprinkled over bread, and spreading sirup of honey over the powder, administering from ʒss. to ʒj. several times a day in this manner, followed every third or fourth day by a purgative.

216. (e) BREMSER'S Electuary:

No. 398. R Seminum Santonici vel Tanacetii Vulgaris ruditer contusorum, ʒss.; Pulv. Rad. Valerianæ, ʒij.; Pulv. Rad. Jalapæ, ʒjss.—ij.; Tart. Vitriol. (Potassæ Sulph.), ʒjss.—ʒij.; Oxy-mel. Scillæ, q. s. ut fiat electuarium molle.

A tea-spoonful to be taken two or three times a day. After taking two tea-spoonfuls daily for three or four days, slime and worms pass off with more copious stools. If the worms are not expelled, BREMSER administers some more of the electuary twice or thrice. If the first pot of electuary be insufficient, a second is taken, but watery stools must not be produced. He never allowed more than two potfuls to be taken; and he considered it unimportant whether worms passed or did not pass during its use. To relax the bowels once in the midst of this treatment he prescribed the following:

No. 399. R Pulv. Rad. Jalapæ, ʒj.; Pulv. Fol. Sennæ, ʒss.; Potassæ Sulph., ʒj. Misce. Fiat pulvis in partes iij. vel iv. æq. divid.

Half a powder to be taken every half, or every hour, or two hours, until it operates. For leucophlegmatic subjects he often gave CHABERT'S oil (composed chiefly of turpentine rendered still more nauseous), in doses of two tea-spoonfuls in water, night and morning.

217. The Semina Santonici, KÜCHENMEISTER states, have been recently displaced by the preparations obtained from them, and in his opinion with justice. He extols chiefly two of them, viz., Santonine and the Santonate of Soda; all the rest being unnecessary. He considers it to be preferable to administer santonine with fatty oils, in order to bring it into solution as readily as possible; and for this purpose he prefers to give it sprinkled upon bread and butter, or in the yolk of an egg with sugar; and afterward to follow it every three or four days with a gentle purgative (jalap or confection of senna), or to administer it in castor-oil—gr. ij. to iv. of the santonine* in ʒj. of the oil, to be taken in tea-spoonfuls until

* The preparation of santonine is best effected by the employment of ammonia. It must be tasteless, when pure, because it does not dissolve in the mouth. Dissolved in alcohol, it is bitter. It is sparingly soluble in warm water, but is readily in oils. It is inodorous, has a slight acid reaction, combines readily with alkalies, and becomes yellow in the light of the sun. When impure, it still contains resins and essential oils, and is consequently nauseous to the taste. —(CALLOND, in *Pharmac. Centralblatt*, 1849, p. 413; and J. CLARUS, in *Handbuch der Spec. Arzneimittelehre*, 1853, p. 333.)

purgative action commences. In this way the remedy should be repeated, if possible, for some days, or every other day, so that soft stools, rather than actual purging, should be passed. Milk and butter-milk may be taken during this treatment. "Among the santonine lozenges, those prepared from cocoa, undeprived of oil, are most deserving praise." KÜCHENMEISTER remarks that the most troublesome effects of this remedy are spasms, obstructions, with tenesmus, and even bloody stools; but that with a careful employment of the remedy (gr. ij. to iv. with ʒj. of castor-oil) he has never seen ill effects produced by it, the administration of it with castor-oil always preventing intestinal obstructions. The most annoying symptom, to the patient only, is the yellow or blue, or even green appearance of objects, owing probably to the effect of this remedy on the nervous system; but this appears to be only a temporary inconvenience, which soon disappears after the discontinuance of the remedy. This writer adds that "it follows, as a matter of course, to be cautious in the use of santonine, that he would never give more than eight grains of it in two days, divided into doses of two grains each twice a day, and that, on the second day of its use, he would administer an aperient."

218. (f) The Santonate of Soda.—*Natron santonicum* has recently been greatly praised by H. E. RICHTER and KÜCHENMEISTER, for its successful action in cases of *Ascaris lumbricoides*. The latter of these physicians states that he has never seen injurious effects from this medicine, even when administered in doses of eight to ten grains twice a day to adults. "The remedy to be given alone, as every acid decomposes it, and it must not be mixed in electuaries." He adopts nearly the following method: He lets children (or adults) take a powder of santonate of soda with sugar (from two to six grains) on a Friday night, and he repeats the same dose on Saturday morning (fasting) and evening, and again on Sunday morning. On Sunday, half an hour or an hour after the last powder, an aperient electuary (confection sennæ, &c.), or a sufficient dose of jalap, is taken, so that several soft motions may follow. By these means the worms usually pass off alive; or they wander forth singly afterward, and without stools, their residence having become disagreeable to them. Dr. PÖCKELS, who noticed a blackish discoloration of the tongue after santonine, praises, as a remedy for *Ascaris lumbricoides*, the root of *Aspidium filix mas* in conjunction with purgatives.

219. (g) I have found no remedies more efficacious for the *Ascaris lumbricoides* than turpentine, as prescribed above (§ 183–185) and in *Form.* 216, and the infusion of *spigelia* and *santonicus*, as directed in *Form.* 264 in the APPENDIX. For this worm, also, as well as for the *Oxyuris vermicularis*, the preparations of the *semina santonici*, prescribed in the APPENDIX, will also be found successful. (See *Formulae* 71, 80, 105, and 106.) These and other medicines will be frequently as successful without as with the preliminary treatment recommended by the German writers; the exact operation of such treatment often being not very manifest. The great success derived from the powder and tincture of kamala, in India, in the treatment of tape-worms (see § 190–193), and the effects of this substance upon these worms, promise similar results from it, if it were prescribed against the *Ascaris lumbricoides* and the *Oxyuris vermicularis*.

[One of the best remedies against worms is the *Absinthium* (wormwood) tincture, wine infusion, or essential oil. The tincture, made by adding one part of wormwood to eight of proof spirit, is powerfully tonic, stomachic, and anthelmintic, and may be given in doses of from one fluid scruple to two fluid drachms three times a day; or 2 parts wormwood to 50 of wine, digested and filtered, may be used in 2 or 3 drachm doses, several times a day. This is a very useful remedy as a corroborative and preventive, after the removal of worms. An excellent anthelmintic may be prepared after the following formula: \mathcal{R} Seeds of artemisia, extr. of tansy, each six grains; oxyde of iron, four grains; oil of valerian, one drop. *M.* The following, though disagreeable, is very efficient: \mathcal{R} Black oxyde of iron, \mathfrak{zss} .; asafœtida, \mathfrak{zjss} .; oil of tansy, gtt. x.; extr. of wormwood, q. s. *M.* Divide into 90 pills; six three times a day. The *chenopodium* is a safe and effectual vermifuge, used after the following formula: \mathcal{R} Fresh leaves, \mathfrak{zj} .; new milk, \mathcal{Oj} .; orange peel, \mathfrak{zj} . Boil and strain. Dose, a wine-glassful twice a day.— \mathcal{R} Oil of worm-seed, \mathfrak{zj} .; sugar, gum Arabic, each \mathfrak{zjss} .; mix, and add mint-water, \mathfrak{zjss} . Dose, a tea-spoonful four times a day, for two or three days, to be followed by a purge. In cases of lumbrici, the following will be found very successful: \mathcal{R} Cowhage, \mathfrak{zj} .; sirup, \mathfrak{zss} .; mix. A tea-spoonful every morning, fasting, for three days, to be followed by oil; or, \mathcal{R} Cowhage, \mathfrak{zj} .; honey, sufficient to make electuary, given as above. The following vermifuge emulsion is a pleasant and successful remedy for lumbrici: \mathcal{R} Castor-oil, mucilage of gum Arabic, each, \mathfrak{zj} .; sirup of Corsica moss, water of lemon, contra-chamomile, each, f. \mathfrak{zj} .; emulsion of sweet almonds, f. \mathfrak{zviij} . Mix. For tape-worm, a mixture of one ounce of castor-oil and two drachms of sulph. ether, in doses of a spoonful every two hours, is very efficient. Of the *spigelia* (pink-root) the following formulæ will be found useful: \mathcal{R} Powdered pink-root, grs. x.; calomel, grs. iv. Mix. Take morning and evening, and, after four doses, a cathartic of castor-oil.— \mathcal{R} Powdered pink-root, senna, each, \mathcal{Oij} .; savin, grs. xij. *M.* One every morning for three days, followed by a purgative.— \mathcal{R} Pink-root, \mathfrak{zss} .; boiling water, \mathcal{Oj} .; macerate for two hours in a covered vessel, and strain. 4 fl. drachms to one fl. \mathfrak{z} , to children; 4 to 8 f. \mathfrak{z} to adults, morning and evening, followed by a purgative.— \mathcal{R} Pink-root, \mathfrak{zss} .; senna, \mathfrak{zj} .; manna, \mathfrak{zj} .; fennel-seed, \mathfrak{zj} .— \mathfrak{zss} .; boiling water, \mathcal{Oj} . Infuse. Half a wine-glassful to a child two years old, 3 times a day.— \mathcal{R} Pink-root, \mathfrak{zj} .; bruised rhubarb, \mathfrak{zj} .; senna, \mathfrak{zj} .; semen contra, \mathfrak{zj} .; manna, \mathfrak{zj} .; coriander, \mathfrak{zss} .; boiling water, \mathcal{Oj} . Infuse. A small tea-cupful 3 times a day. Besides these, the simple fluid extract of pink-root, prepared by displacement, and the compound fluid extract, prepared in the same manner from pink, senna, savin, manna, sugar, alcohol, and water, will be found extremely convenient and efficacious in tea-spoonful doses 3 times a day, to young children, followed by oil. TILDEN's fluid extract of pink and senna is a very successful preparation.

For ascarides, one of the most successful remedies is an infusion of tansy, as an injection, in the proportion of one ounce of the fresh leaves to one pint of boiling water. The oil of tansy is very effectual against the lumbricoid worm also, as in the following formula: \mathcal{R} Oil of tansy, one scruple; extract of gentian, two drachms; pow-

dered marsh-mallows, sufficient. Mix, and make 60 pills; 3 to 5 every two hours. The following is equally efficient: \mathcal{R} Tansy, \mathfrak{zj} .; wormwood, rhubarb, each, \mathfrak{zviij} .; sherry wine, f. \mathfrak{zj} .; diluted alcohol, fl. \mathfrak{zxx} . Digest for eight days, and filter. Dose, f. \mathfrak{zj} .—f. \mathfrak{zj} ., 2 or 3 times a day. Also, the extract of tansy in doses of from 6 to 20 grs. three times a day.

Of the purgative anthelmintics, the following are some of the best: \mathcal{R} Powdered gamboge, grs. ij.; sulphate of iron, grs. vj.; sugar, \mathcal{Oj} .; oil of peppermint, gtt. iij. Mix. To be taken twice a day against tape and lumbricoid worms.— \mathcal{R} Calomel, grs. iij.; compound powder of scammony, grs. xii. For a dose for lumbrici.— \mathcal{R} Calomel, grs. iv.; powdered pink-root, grs. x. To be taken two mornings in succession, also on afternoon of second day, followed by a mild purgative, for children over 4 years of age. As a fortifying tincture to prevent the recurrence of worms, equal parts of the muriated tincture of iron and tincture of aloes, in doses of 20 drops three times a day, will prove very effectual; or powdered sulphate of iron and aloes may be used in small doses.]

220. iv. AFTER-TREATMENT OF WORMS.—It is often requisite, after the expulsion of intestinal worms has been effected, 1st. To soothe the irritation, and to subdue the inflammatory action produced in the digestive mucous membrane by the vermifuges and drastic purges which had been prescribed. 2d. To remove any stray worms which had become so sickened, or so injured by the treatment, as to be readily thrown off by means which would restore the vital tone of the bowels and farther injure the worms, and render their residence disagreeable or untenable. And, 3d. To prevent the regeneration of these parasites by removing their ova and rendering the digestive mucous surface ungenial to their development. (a) The first of these intentions is best accomplished by emollients and demulcents with small doses of nitrate of potash, of hydrocyanic acid, and sirup of poppies, &c. When sickness is troublesome, and no inflammatory action is present, a pill with half a drop of creasote may be given with each dose of the above, or may be taken in the intervals between each. The diet should be spare, light, and digestible, and the bowels assisted by gentle laxatives, such as magnesia, with or without confection of senna, and by suitable enemata, especially by such as contain castor or olive oil, with oil of turpentine when the irritation is chiefly experienced in the stomach and upper portions of the intestinal canal; at the same time, the warm bath or terebinthinate embrocations, or a recourse to these latter upon leaving the bath, will be found of much service. The drink of the patient should be demulcent, and in small quantity, thirst in these cases being most relieved by sucking small morsels of ice.

221. (b) The second intention presupposes either the non-existence or the removal of those conditions against which the first intention was directed, and consists in the occasional exhibition of a moderate or less irritating dose or doses of the anthelmintic suitable to the expulsion of the worm found to be present, and the combination of it with such other means as the peculiar features of the case will suggest; a recourse to vermifuge clysters, especially to those already suggested, or those advised above (§ 194), being had after the internal remedies had been taken.

222. (c) The third intention is of no small im-

portance, if the permanent cure of the patient be considered. For the original conformation, or the depression of vital power, of the patient; or the irritability and exhaustion of the digestive canal may be so great, in consequence both of the existence of these parasites and of the means taken to expel them, that a tonic and restorative treatment becomes imperative in order to prevent various unpleasant contingencies. Besides, in many instances, anæmia has become so considerable as to require a treatment directed more or less to it, and to the other morbid tendencies. In these circumstances not only should due care be directed to the prevention of intestinal worms, but recourse should be had to those medicines which are calculated to restore the vital tone of the digestive organs, to improve the state of the secretions and excretions of the body generally, but of the intestines in particular, to promote the functions and actions of the bowels, and to render the human intestinal canal an unsuitable and an uncongenial habitation for the ova of worms and for their development. These are objects which should always be entertained after the expulsion of worms of whatever species, and should be attempted by such means as are most likely to accomplish them. It may be asked, however, where are we to find, how are we to combine these means, and how are we to prevail on the patient to persevere in their use, or even to have recourse to them when he believes himself free from his enemy? I cannot say that there are no other means calculated to attain these objects, but I may enumerate* those which I have employed with these views, combining them variously, and exhibiting them in such successions, intervals, &c., and as the circumstances of particular cases appeared to require. The medicines which I have thus employed are the preparations of iron, asafoetida, of cinchona and quina, of myrrh, camphor, aloes, infusions of willow, cascarilla, and cedar bark, berberine, &c. The compound mixture of iron may be given with the decoction or tincture of aloes, &c.; or the sulphate of iron may be prescribed with sulphate of quina, compound galbanum pill, and with the aloes and myrrh pill. Camphor may be conjoined with these latter substances (§ 198) singly or in the combination now stated. The sulphate of quina may be given with dilute sulphuric acid, and sulphuric ether. The infusions of the barks may be taken with tonic and laxative tinctures, or with the mineral acids, &c., and laxative electuaries may be conjoined with sulphur, or antispasmodics, aromatics, or spices.

223. It is obvious that the diet of patients who have suffered from worms should be nutritious, digestible, and restorative; while it ought not to be too rich or full, or calculated to produce general plethora or local congestions, as of the liver, &c. The regimen ought to be regulated so that suf-

ficient exercise may be taken in the open air, and that all causes of debility and exhaustion should be avoided. The remarks already offered for the prevention of the human entozoa (§ 157, *et seq.*) are equally necessary to the prevention of their return after their expulsion.

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* I may here state that the pharmacopœia of the United Kingdoms are very deficient in vermifuge remedies, and in formulæ for the preparation and combination of them—a remark by no means applicable to the pharmacopœia of most Continental countries. But verminous diseases are much more prevalent on the Continent than in the British Isles, in which, however, I am confident that their prevalence has hitherto been much underrated, and their importance undervalued. The very general and noxious vice of smoking tobacco, and of otherwise using this poison—so much extended in recent times—has rendered, and will still more render, verminous diseases more prevalent, by weakening the digestive organs, and disposing them to the generation and development of the ova of worms.

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brain itself, of the size of a pea, suspended by a pedicle from the membrane, or lying free upon and between the cerebral convolutions, and even the substance of the brain and choroid plexus. Five were found in the muscles of the heart; several were found in the gluteal and deltoid muscles. No traces of tæniæ were found in the intestines. Dr. S. relates also the history of another case, a German emigrant, who was seized with dizziness and headache, followed by fatal hemiplegia. The autopsy revealed a cerebral abscess, in which was found a shriveled-up *cysticercus cellulosus*.—H. Bigelow, Case of Worm discharged from an Abscess, *Ibid.*, vol. xxxiii., p. 486; *Ibid.*, vol. iv., p. 179, 194, on the Production of Intestinal Worms, by the Editor; also vol. vii., p. 291. See Stewart, Meigs, Condie, Dewees, and Churchill, on Dis. of Children; also Wood, Dickson, Dewees, Eberle, Hosack, Dunglison, and other Amer. Treatises on the Practice of Medicine; also American Trans. of Hufeland's Enchiridion Medicum.—Charles A. Lee, an Account of a Filaria in a Horse's Eye, *Silliman's Journal of the Natural Sciences*, 1840; also N. York Journal of Med., vol. iii., p. 237. (This filaria was about three inches long, of a white thread-like appearance, with a larger extremity, which was probably the head. It occupied the anterior chamber of the eye, was constantly in motion, revolving upon itself, and twisting into every possible shape. The eye was not materially affected, though the lower portion of the aqueous humour was a little cloudy, perhaps owing to excrementitious deposit. The eye afterward became opaque, and the vision was lost.)—Benjamin Rush, Medical Inquiries and Observations, &c., Worms and Anthelmintic Medicines, 8vo, 2 vols.—G. Hopkinson, Account of a Worm in a Horse's Eye, *Trans. Amer. Phil. Society*, vol. xi.—John Morgan, of a living Snake in a living Horse's Eye, and of other unusual Productions of Animals.—Cloquet, *Arch. Gen.*,

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YAWS. See VENEREAL DISEASES (§ 85, et seq.).

ZYMOTIC DISEASES.—Ζυμωτικός, causing to ferment; ζύμωσις, a fermentation; ἥπατος ζύμωσις, a swelling of the liver, HIPPOCRATES. The term Zymotic has recently been applied by Dr. FARR to epidemic, endemic, infectious, and contagious diseases, and has comprised small-pox, measles, scarlatina, hooping-cough, croup, thrush, diarrhœa, dysentery, cholera, influenza, ague, remittent fever, typhus, erysipelas, syphilis, hydrophobia. Viewing the Greek term to mean a leaven by which the organic nervous system, or the vascular system and blood, may be infected or contaminated either successively or contemporaneously, or nearly so, the term well designates an extensive class of diseases, although its application implies a hypothesis; but it is well suited to the arrangement adopted by Dr. FARR in his admirable Annual Reports of Deaths, &c., in England (which see).

SUPPLEMENT.

SUPRA-RENAL BODIES.—**SYNON.**—*Glandula ad Plexum, Glandula ad Plexum Nervium*, T. WHARTON. *Glandula supra-renales, Renes Succenturiati*, Auct. *Supra-renal glands, Supra-renal capsules, &c.*

1. **I. STRUCTURE AND FUNCTIONS.**—In the present state of our knowledge the name "*supra-renal bodies*," or that adopted by WHARTON, appears more correct than supra-renal glands, the functions of glands not having been proved in respect of them; and the term capsules is equally inapplicable, even to their more external structure. Succenturiati, or reserved kidneys or bodies, are not less appropriate. The earliest notice of the connexions and nature of these bodies appears to have been taken by WHARTON, who pointed out their relations to the ganglial nerves, as remarked by Dr. GULL. Nevertheless the functions and diseases of these bodies received no attention from physiologists and pathologists (although in several instances organic lesions observed in them had been published in the *Ephemerides Naturae Curiosorum*, and more recently by VETTER and BAILLIE) until very lately, when the structure and functions of these bodies were remarked upon by NAGEL, BERGMANN, ECKER, KÖLLIKER, LEYDIG, and GREY; and their diseases, especially in connexion with a bronzed discoloration of the skin, were first investigated by Dr. ADDISON, and subsequently by Mr. HUTCHINSON and others. It is chiefly, however, to Dr. ADDISON that the distinction of having first directed attention to these lesions is due. Although several cases have been recently observed and recorded—not always, however, with due care and precision—still the number of those in which a bronzed state of skin appeared more or less intimately connected with, and most probably caused by, disease of these bodies, is so great as to induce a presumption that where the former appearance exists the latter lesion will be found. In order, however, to form correct views as to the phenomena by which diseases of the supra-bodies are indicated, as well as to the nature and consequences of such disease, it becomes requisite that we should previously briefly inquire into what is known of the structure and functions of these bodies. Unfortunately opinions on these topics have been, and, notwithstanding the frequency of microscopic research in modern times respecting them, still continue to be, very unsatisfactory. Dr. WHARTON, about the middle of the 17th century, first noticed their connexions with the ganglia of the solar plexus, and suggested a name for them, which appears more appropriate than any other which has more recently been given them.

2. **i. STRUCTURE.**—KÖLLIKER has very recently described the microscopic appearances of these bodies, and noticed what appears to be their func-

tions, and Dr. HARLEY has still more recently examined their structure.—*A.* The cortical structure of these bodies is described by the latter observer as consisting of cells, arranged in irregularly-sized rows, in a fibro-areolar matrix, the rows of cells appearing like a number of dark-yellow columns placed perpendicularly to the surface. The cells, when examined individually, seem to be composed of a homogeneous cell-wall, filled with granules, pigment, and some fat globules. Each cell has a well-marked nucleus, although not always visible. The cells are arranged in a number of larger and smaller masses, which are placed in regular rows, and thus give rise to the columnar appearance. In some cases a column is composed of several cell-masses of different lengths, placed end to end; in others it consists almost entirely of one long cell-mass. Each column, as well as each cell-mass, is separated from the others by delicate fibrous tissue, in which are included the vessels and nerves. Sometimes the cell-masses present the appearance of long tubes, enclosing a single straight row of quadrilateral cells. Each cell-mass is closed at the extremities, and is surrounded by a delicate homogeneous membrane.

3. *B.* The medullary substance, according to KÖLLIKER, also has a stroma of connective tissue, which, prolonged from the cortical lamellæ, pervades the whole interior, for the most part, in more delicate fasciculi, constituting a net-work with narrow, rounded meshes. In this net-work lies a pale, fine-granular substance in which, in man, and in recent preparations, pale cells of 0.008 to 0.16^m are generally observed. These pale cells occasionally present, in their fine-granular contents, a few fat or pigment granules; their frequently very distinct nucleus with large nucleoli, their angular form, and occasionally their single or multiple, or even branched processes, resembling the nerve-cells of the central organs, although they cannot definitively be declared to be such. Dr. HARLEY states that the dark slate-coloured medullary substance is composed of a net-work of fibres, in the meshes of which are a number of large nucleated cells, which have been described by various writers as ganglion corpuscles; but he thinks that these, like the cells in the cortical substance, are true secreting cells. This great difference of opinion (so frequently observed among microscopists)—the same nucleated cells being considered as ganglial corpuscles by some observers, and as true secreting cells by others—prevents, in the present state of our knowledge, much reliance to be placed upon the results of microscopic researches, each successive observer being liable to the distrust which attaches itself to his predecessors. However, the following is less liable to objection:

4. *C.* The nerves of the supra-renal bodies are, according to BERGMANN and KÖLLIKER, extreme-

ly numerous; arising, according to them, from the semilunar ganglion and renal plexus, and to a small extent from the vagus and phrenic nerves; but most probably intercommunicating with, rather than arising from, the latter. In man, KÖLLIKER counted in the right supra-renal body thirty-three trunks, eight of which were 1.5 to 1.10''; five of 1.14 to 1.20''; seven of 1.25 to 1.33''; and thirteen of 1.45 to 1.50''; and found that without exception, or at all events in a very preponderating proportion, they were constituted of dark bordered, finer and medium-sized, or even thick fibres; were whitish or white, and furnished with isolated larger or smaller ganglia. They are especially apparent on the inferior half and inner border of the organ, and appear to be all destined for the medullary substance, in which, at least in the mammalia, an *extremely rich plexus* of dark-bordered, finer fibres occurs, enclosed in the *trabeculae* and connective tissue, their terminations, however, being nowhere perceptible.

5. ii. FUNCTIONS.—As regards the *functions* of the supra-renal glands, in the absence of all physiological indications, and so long as the course of the nerves in them is not more accurately known than at present, only very general observations can be offered. KÖLLIKER considers the *cortical and medullary substances as physiologically distinct*, and that the former may, provisionally, be placed with the so-termed "blood-vascular glands," and a relation to secretion assigned to it; while the latter, on account of its extremely abundant supply of nerves, must be regarded as an apparatus appertaining to the *nervous system*, in which the cellular elements and the nervous plexus either exert the same reciprocal action as they do in the gray nerve-substance, or stand in a relation as yet wholly unascertained towards each other.

6. According to LEYDIG, the *cortical substance* of the supra-renal capsules of the mammalia corresponds to the yellow, granular, and striped supra-renal bodies of fishes and amphibia; while the *medullary substance* of the mammalian organ, which is abundantly supplied with nerves and cells, very like the ganglion globules, represents the other divisions of the sympathetic ganglia: whence he concludes that BERGMANN'S view, according to which the supra-renal capsules are closely related to the nervous system, is undoubtedly correct, and that those organs bear the same relation to the ganglia of the sympathetic nerves as the pituitary body bears towards the brain. Besides this relation to the nervous system, however, they have an intimate one with the vascular; and are, therefore, always pervaded by a very close capillary plexus.

7. The functions of the supra-renal bodies have been *experimentally* investigated by BROWN-SÉQUARD, HARLEY, and others, but with different results. We know how uncertain these results are in the lower animals, and the amount of confidence which may be reposed in them, not only in those which were so frequently performed thirty and forty years since in order to determine the functions of distinct portions of the nervous system, but also in those more recently made with these and with other views. The former of the experimenters just named removed the supra-renal bodies from fifty-one rabbits, eleven adult cats and dogs, eleven young dogs and cats, eleven adult Guinea-pigs, four young Guinea-pigs, and two mice; and he states that the adult ani-

mals operated on died, on an average, in twelve hours, while the young or new-born animals lived thirty hours. From these experiments Dr. BROWN-SÉQUARD concludes that the supra-renal bodies are more necessary to life than even the kidneys; for animals will live two, or even three days, after the removal of the latter organs. Dr. HARLEY quotes from a later publication of Dr. BROWN, in which the latter states that, of ten rabbits from which he extirpated the supra-renal capsules, six died between the seventh and tenth hour, and four between the tenth and fourteenth hour after the operation, and adds, that the animals died too quickly to admit of their death being the result of peritonitis; and farther, that the extirpation of these capsules is followed by symptoms which do not occur after injuries of the peritoneum or liver, &c., these symptoms indicating that the supra-renal bodies have an important influence on the blood, and that their nerves have a singular power upon certain parts of the central nervous system. He states that this latter influence manifests itself very distinctly in some cases after the extirpation or the puncture of one of these bodies, the animals being sometimes seized a few minutes before death by vertigo and rolling over. Dr. BROWN-SÉQUARD concludes, 1st, "that if these organs are not essential to life, they are at least of very great importance. Secondly, that their functions appear to be at least as important as that of the kidneys, for when they are absent death in general supervenes more rapidly than after the removal of the kidneys." (*Archives Génér.*, 1857, p. 374.)

8. Dr. HARLEY has published experiments which furnish different results from those now stated; and from those he infers that "the supra-renal capsules are not absolutely essential to life;" that "the removal of the right is generally more fatal than the removal of the left capsule;" that "convulsions do not necessarily follow the removal of the capsules;" that, "when death follows upon the extirpation of the supra-renal bodies, it is in most cases in consequence of the injury done to the neighbouring tissues; perhaps more frequently the mutilation of the ganglionic system of nerves;" that "absence of the function of the supra-renal bodies is not proved to have any special effect in arresting the transformation of hæmatin or in increasing the formation of blood-crystals;" and that the suppression of the functions of these bodies is not attended by an increased deposit of pigment in the skin, or its appendages, in certain of the lower animals—the problem of the connexion of bronzed skin and supra-renal capsular disease being more likely to be solved in the dead-house than in the physiological laboratory.

9. Viewing the structure and connexions of the supra-renal bodies as altogether similar to those of the pituitary gland, and considering these organs as very intimately connected, anatomically and functionally, with the ganglia and ganglial plexuses, I have been induced to view them as organs contributing or subsidiary to the organic nervous force or influence exerted by the ganglial nervous system. Thirty-four years ago I published this opinion of the function of the pituitary gland in my *Physiological Notes*, &c. (in 1824), and stated that this gland reinforced the ganglial nervous influence endowing the brain by means of the ganglial nerves distributed to the cerebral organs—that it was a portion of the gan-

glial nervous system contributing to the nourishment and functions of the brain, and imparting a unity of development, of permanent nutrition and of function, to the double organs composing the cerebral mass. It appears very probable that similar offices are performed by the supra-renal bodies as regards the ganglia and ganglial plexuses of the abdomen; these bodies contributing to the functions of the organic nervous or ganglial system, as displayed by the abdominal organs—whether digestive, assimilative, or generative. That both the pituitary body and the supra-renal bodies perform these important functions—important not only as respects the performance of their respective functions, but also as regards the life of the individual—appears to be manifest from the nature and character of the nervous communications existing between them and other parts of the ganglial nervous system; for, instead of describing these communications merely as branches of nerves detached from other ganglia or parts, it would be more correct, taking the size and appearance of these branches into consideration, to describe them as branches sent from the medullary structure of these bodies, to those ganglia, plexuses, and nervous trunks, in order to convey to these the special influences or functions of these bodies; or, otherwise, to reinforce and combine the influence exerted by these several ganglia and parts, with which they are anatomically connected. That these bodies are of the greatest vital as well as functional importance is evinced not only by the consequences following their structural lesions, and by the presumed nature of their functions, but also by the manner and the positions of their lodgments; both the pituitary and the supra-renal bodies being so located as to render them, in their respective situations, farther removed, and better protected from injury, and even from structural or other disease, than any other part of the animal organization.

10. II. STRUCTURAL DISEASE OF THE SUPRA-RENAL BODIES.—*Lesions of the Supra-renal Bodies, and their Associations, &c.*

CLASSIF.—IV. CLASS, I. ORDER (see Preface, &c.).

11. DEFINIT.—*General languor and debility, anæmia, feebleness of the heart's action, remarkable irritability of the stomach, frequent vomiting, and pain in the back and loins, often with a bronzed or dusky hue of the general surface, rapidly increasing exhaustion, emaciation, &c.*

12. Disease of the supra-renal bodies usually commences so gradually as not to admit of the patient's knowledge of the exact period at which he first began to experience loss of health or strength. It is almost always gradual in its early progress, although often rapid in its more advanced course. The slowness or rapidity of its progress must, in the present state of our knowledge, be attributed to the nature and extent of the organic lesion, to the circumstance of one or both bodies being affected, and to the nature and severity, local or constitutional, of the malady

with which structural change of these bodies is complicated.

13. i. *Symptoms.*—Generally the patient at first complains of weakness or more marked debility, of languor, and of indisposition to bodily and mental exertion. The appetite is impaired or lost; the pulse is soft, weak, and often frequent; the whites of the eyes are pearly; the body is sometimes more or less emaciated, or, if not emaciated, leuco-phlegmatic or cachectic, or discoloured, and generally anæmied. Uneasiness or pain, often severe, is referred to the region of the stomach, epigastrium, back, or loins. Nausea, sickness, retchings, and frequent vomitings often occur, especially as the prostration, anæmia, and discoloration of the skin advance. In some cases, complicated with disease of other organs, especially when such disease is acute or disorganizing, the discoloration may either be absent or overlooked. In other cases it is slight, or in patches, consisting of a murky hue; but in others it amounts to a bronzed tint, and is general over the whole surface, but is commonly most marked on the face, neck, superior extremities, penis, and scrotum, in the flexures of the axillæ and limbs, around the umbilicus, &c., varying in deepness from a dingy or smoky appearance to a chestnut-brown, or colour of a mulatto. In some cases patches of a lighter hue occur in various parts; and in many the discolouring may be remarked in some of the internal surfaces, the peritoneum, pleura, &c.

14. With the continuance and progress of disease, the languor, anæmia, loss of appetite, and feebleness of the heart's action are aggravated. The discoloration of skin becomes in some cases more marked, the commissures of the lips much darker, the pulse smaller and weaker, vomiting more frequent and urgent, and pain and weakness of the back and loins more complained of. At last the patient sinks and expires, after a period which is very indefinite, so that the disease may appear almost acute in some instances, and more or less chronic in others, most probably owing either to the severity of the disorganizing lesions affecting the supra-renal bodies, or to the nature of the complications characterizing particular cases.

15. Although lesions of these bodies are often uncomplicated with disease of any other organ—although no lesion or disorder of any important or vital part can be detected, in many cases, during the life of the patient, lesions of these bodies, and a peculiar anæmia, being the only or chief lesions found after death, very frequently accompanied with discoloration—yet they are often associated with other diseases, chiefly of a constitutional and cachectic nature, more especially with general or partial tuberculosis, with cancer, and with disease of the lungs, &c.

16. The following table of cases of disease of the supra-renal bodies comprises nearly all those which have been published up to this time. It is constructed according to that published by Mr. HUTCHINSON; and to it I have added some recent cases.

No.	References.	Sex and Age.	Occupation.	Previous Health, &c.	Early Symptoms.	Bronzing of Skin—its Degree or Absence.
1.	Dr. Addison's Works, p. 9.	Male, 32..	Baker.....	No history. Skin white when in health.	Cough, followed by debility and bronzing of skin.	Colour of mulatto; scrotum and penis darkest.
2.	<i>Ibid.</i> , p. 12....	Male, 25..	Tide-waiter. Married. Exposed to weather.	Rheumatism eight years previously. Health generally good.	Acute attack of fever, followed by debility and bronzing of skin.	Dark olive-brown; also in lining of lips.
3.	<i>Ibid.</i> , p. 15....	Male, 26..	Carpenter. Married. Intemperate.	Very good until three months before the change of colour.	Pain in the back and right leg, followed by debility, wasting, and giddiness.	Dark olive-brown, deepened in patches.
4.	<i>Ibid.</i> , p. 19....	Male, 22..	Stonemason.	No history. Died soon after admission.	Pain in stomach, vomiting, tic douloureux.	Face, axillæ, and hands of bronzed colour.
5.	<i>Ibid.</i> , page 23. (From Dr. Bright's Reports.)	Female, adult.	Not stated ..	No history.....	No history.....	Complexion very dark...
6.	<i>Ibid.</i> , p. 25....	Male.....	Barrister. Of middle age.	No history.....	No history.....	Surface generally dark; face, neck, and arms covered with deep brown patches.
7.	<i>Ibid.</i> , p. 30....	Female, 60	Not stated ..	No history. Cancer of supra-renal bodies; consecutive of cancer of breast.	Cancer of breast	Skin of arms, chest, and face of a light-brown colour.
8.	<i>Ibid.</i> , p. 32....	Female, 53	A servant. Single.	Always thin, but of good health.	Cutaneous eruption four months previously, its cure being followed by stomach symptoms.	Skin generally very dark, with darker patches.
9.	<i>Ibid.</i> , p. 35....	Male, 53..	Sailor. Married. Sober.	Very good. A strong muscular man.	Two months previously began to lose appetite and be generally unwell.	Face of a yellow bronzed tint, becoming still darker.
10.	<i>Ibid.</i> , p. 38....	Female, 28	Not stated ..	Died of cancer uteri. Disease of supra-renal bodies being consecutive.	Those of cancer uteri....	A peculiar dingy appearance.
11.	<i>Ibid.</i> , p. 39....	Male, adult.	Not stated ..	Died of cancer of lungs, &c.	Those of cancer of the thorax.	Face of a dingy hue, with freckles and brown discoloured spots.
12.	Med. Times & Gaz., Dec. 15, 1855. (Dr. Burrows.)	Male, 24..	Hawker. Single.	Had lumbar abscess in childhood.	Pain in the back, followed by emaciation and bronzing.	A dark copper or bronzed colour generally, and lighter patches.
13.	<i>Ibid.</i> , Jan. 19, 1856. (Dr. Gull.)	Male, 24..	Carpenter. Temperate.	Robust.....	Debility, breathlessness on exertion, nausea, &c.	Skin of a sallow olive-brown, darker on inside of lips, knees, &c.
14.	<i>Ibid.</i> , Jan. 19, 1856. (Mr. Bakewell.)	Male, 28..	Labourer ...	Not known.....	Not known	Skin generally dark brown or bronzed, and darker over the thighs.
15.	<i>Ibid.</i> , Feb. 20, 1856. (Dr. Thompson, &c.)	Male, 20..	Baker. Sober	Good.....	Bronzing of skin.....	Skin of a general peculiar dark dirty-brown colour.
16.	<i>Ibid.</i> , Feb. 28, 1856. (Dr. Rowe.)	Male, 20..	Not stated ..	Delicate.....	Delicate health and bronzing of skin.	Skin generally brown, with darker spots.
17.	<i>Ibid.</i> , March 8, 1856. (Dr. Farre.)	Male, 37..	A publican. Intemperate.	A year before had pain in the lumbar regions, which subsided.	Admitted for delirium tremens.	Skin generally of a peculiar yellowish brown.
18.	Dr. Addison's Work, p. 29.	Male, 60..	Not stated ..	No history	No details	Generally dark and bronzed, with blanched patches.
19.	Med. Times & Gaz., p. 233. (Dr. Stocker.)	Male, 55..	Physician ..	Dyspeptic, but not otherwise ill.	General malaise and irritability of stomach, increasing debility and emaciation.	Patches of brown colour, which extended; small patches on the face.

General Symptoms, Complications, &c.	Duration of Disease.	Mode of Death.	Inspection after Death.	Remarks.
Excessive debility, emaciation, demeanour puerile, urine healthy, pain in lumbar region, cough, soreness at the epigastrium.	3 yrs.	Acute pericarditis and pneumonia.	Supra-renal bodies both remarkably indurated and as large as eggs, and quite disorganized; recent pericarditis and pneumonia; no tubercles nor other visceral disease.	A well-marked case. No chronic lesions but those of supra-renal bodies.
Pinched anxious expression, vomiting, pulse very feeble, depression, constipation, tenderness at epigastrium, numbness of extremities.	6 mo's	Not stated.....	Both supra-renal bodies contained compact fibrous concretions; gastric mucous surface inflamed; no tubercles; no other visceral disease.	The deposits in supra-renal bodies resembled tubercle, but there was no tubercle in other organs.
Thin, pale, and feeble; fainting on rising from bed, sickness and hiccup, pain in back, ang. curvature of spine, leucosthymia, &c.	7 mo's	Passed into a torpid state.	Supra-renal bodies completely destroyed and converted into strumous deposits; psoas abscess and caries of lumbar vertebrae; tubercles in lungs; spleen enlarged.	The blood, both before and after death, contained a great excess of white corpuscles.
Vomiting and pain in stomach, great debility, emaciation, extreme prostration, &c.	Seve'l mon's.	From collapse and sinking.	Supra-renal bodies wasted and destroyed, both weighing only 49 grains. No other disease.	The disease of supra-renal bodies was an atrophy, probably consequent on inflammation.
Extreme debility, vomitings, emaciation, abscess in breast, &c.	Not stated.	Slight wandering, gradual sinking, and drowsiness.	Both supra-renal bodies were enlarged, lobulated, and the seat of tubercular-like deposits, both four times the natural size; the left had suppurated.	This case was recorded by Dr. Bright before the importance of dissection of supra-renal bodies was recognised.
Slight emaciation, great anæmia, extreme languor, urgent vomiting, pulse very compressible.	1 year	Speedy sinking ...	Both supra-renal bodies greatly enlarged, of irregular surface, and much indurated; natural structure lost; nucleated cells. No other important disease.	Vomiting had been so urgent in this case as to suggest the existence of malignant disease of the stomach.
No history. Died of ulcerated cancer, the bronzing being remarked at the post-mortem inspection.	Not stated.	Not stated.....	Both supra-renal bodies contained much cancerous deposit throughout their structure.	
Emaciated and feeble, much irritability of stomach.	4 mo's	Died of exhaustion in three days after admission.	Cancer of pylorus; left supra-renal body destroyed by cancer.	The extent of discoloration of skin was proportioned to that of disease of supra-renal body, one being sound.
Sickness without vomiting, weakness and loss of appetite, frequent rigors, no pain, pulse 80, feeble; body irritable.	3 mo's	Sunk gradually ...	Tubercular deposit in one supra-renal body; in the spleen also; and the kidneys were degenerate.	The degree of bronzing appears to have been proportioned to that of disease of supra-renal body, one only being affected.
Discoloration of skin not noticed until the post-mortem inspection, when disease of supra-renal body was foretold. No history preserved.	Not stated.	Died from cancer..	Right supra-renal body healthy; the vein emerging from the left obstructed by cancerous deposit, and the organ itself occupied by recent extravasation of blood.	The degree of bronzing was slight, the disease of one supra-renal body being recent.
No history preserved	Not stated.	Died of cancer	One supra-renal body entirely disorganized by cancer, the other healthy.	One supra-renal body was affected, and the bronzing was slight.
Irritability of stomach with vomiting, pain across the back, great debility, emaciation, urine natural, &c.	8 mo's	Died from exhaustion consequent upon a purgative.	Both supra-renal bodies contained pus and bodies resembling hardened tubercle. There was no other disease.	The chain of morbid phenomena was very complete in this case.
Nausea, vomiting, great malaise, exhaustion, emaciation, urine healthy, blood loaded with white corpuscles.	5 mo's	Sudden exhaustion	Both supra-renal bodies atrophied and destroyed, the left contained cysts, the right solid concretions.	
Weak and low for a long time, not much emaciation.	Unkn.	From exhaustion caused by a short journey.	Both supra-renal bodies completely atrophied, and contained calcareous concretions; emphysema of lungs; fatty degeneration of heart.	
Suddenly languid, and afterward collapsed, and died after three days; tint of skin observed for six weeks.	6 w'ks	Collapse.....	Each supra-renal body enlarged to the size of half a kidney; their structure converted into a firm tubercular-like matter, and in parts softened.	This appears to have been idiopathic disease of supra-renal bodies, no tubercles being found in other organs.
Had also disease of knee-joint, and health rather improved until within three days of death. He remained fat and muscular.	8 mo's	Diarrhœa, followed by succession of epileptic fits, vomiting, &c.; died on fourth day of these.	Both supra-renal bodies destroyed, containing gritty, cheesy, and semi-purulent deposit. No other disease.	In this, as in case 23, a peculiar disagreeable odour exhaled from the patient for three or four weeks before death.
He died in a fortnight from delirium tremens.	3 w'ks or more.	Sunk into a typhoid state, with low delirium.	Both supra-renal bodies were converted into abscesses, but their cortical substance was not wholly destroyed: circumscribed abscess in the liver.	In this case the suppuration and inflammation of supra-renal bodies had probably been acute and recent.
Anæmic, heart's action very feeble, irritability of stomach, œdema of upper extremities.	Not stated.	Died of debility, cancer in mediastinum suspected.	No inspection	The cachexia was precisely that of diseased supra-renal bodies.
Great debility and wasting, but no organic disease but that of supra-renal bodies indicated.	About 6 mo's	From exhaustion..	No inspection	The bronzed patches indicated the patient's speedy death when there were not other alarming symptoms.

No.	References.	Sex and Age.	Occupation.	Previous Health, &c.	Early Symptoms.	Bronzing of Skin—its Degree or Absence.
20.	<i>Ibid.</i> , Dec. 15, 1855. (Mr. Startin.)	Male, 12..	At school. (Irish.)	Had suffered from abscess in the neck, and cough.	Loss of appetite, flesh; increasing languor and debility.	Copper colour general, and deepest on the face and neck.
21.	<i>Ibid.</i> , Dec. 29, 1855. (Dr. Peacock.)	Female, 14	At school...	Healthy	Lassitude, muddy complexion, and slight cough.	A brown muddy tint, deepest on face, arm, and shoulders; no mottling.
22.	<i>Ibid.</i> , Jan. 19, 1856. (Dr. Burrows.)	Female, 28	Married. Temperate.	Delicate	Menorrhagia and debility two years before the discoloration.	A fawny or yellowish-brown tint, most marked on face, arms, thighs, and legs; patchy discoloration in parts.
23.	<i>Ibid.</i> , Feb. 23, 1856. (Dr. Rowe.)	Male, 45..	A carter. Married. Temperate.	Robust	Dark spots in various regions of body. At first no illness.	Skin dusky-brown, resembling that of a mulatto; darker in some parts than in others.
24.	The Associate Journ., Jan. 19, 1856. (Dr. Budd.)	Female, 42	Married	Good	A brown tinge of skin, followed by typhoid fever, after which bronzing became more marked.	Skin like that of a North American Indian; certain parts darker than others.
25.	<i>Ibid.</i> , Jan. 19, 1856. (Dr. Budd.)	Female, 40	Not stated..	Not stated.....	Not stated.....	Very dark general discoloration; large patches in mouth.
26.	Med. Times & Gaz., Feb. 23, 1856. (Dr. Thompson.)	Female, 33	Married	Good	Paroxysmal pain in the abdomen; loss of strength; amenorrhœa.	Skin became suddenly and generally of a dirty-brown tinge.
27.	<i>Ibid.</i> , Dec. 23, 1855. (Dr. Rankin.)	Female, 58	Married	Formerly very stout and of large frame.	Loss of strength and flesh	Face and hands dark-brown—"as brown as a Japanese;" other parts not seen.
28.	Trans. of Path. Society, vol. viii., p. 325. (Dr. Baly.)	Male, 18..	Baker	Headache, pains in the limbs, languor and debility, followed by pain in the loins.	As stated, with bronzing of the skin; pain increased by pressure on the loins; vomiting, &c.	Bronzing deep and general.
29.	<i>Ibid.</i> , vol. viii., p. 330. (Dr. Baly.)	Not stated.	Not stated..	Diseased vertebral column.	Not stated.....	No bronzing of the skin.
30.	<i>Ibid.</i> , vol. viii., p. 330. (Dr. J. Ogle.)	Female, 14	Not stated..	Incontinence of urine, scalding, containing blood and pus.	Consequent on the urinary disorder; symptoms of phthisis, under which she sunk.	No bronzing of the skin.
31.	<i>Ibid.</i> , vol. viii., p. 332. (Dr. J. Ogle.)	Male, 36..	Not stated..	Emaciation, &c. ..	Symptoms of phthisis....	No bronzing of the skin.
32.	<i>Ibid.</i> , vol. viii., p. 333. (Drs. Peacock and Bristowe.)	Female, 18	Tent-maker.	Had a fall, and severe pain in the right side.	Fever, with pains in the lower extremities; œdema, &c.	No bronzing of the skin.
33.	<i>Ibid.</i> , vol. viii., p. 337. (Drs. Peacock and Bristowe.)	Male, 55..	Coppersmith	Good.....	Declined in flesh and strength; pains in back and limbs.	No discoloration of the skin.
34.	Med. Times & Gaz., Nov. 21, 1857. (Mr. Wilks.)	Female, 18	Young lady.	Delicate, but of full habit.	General debility and chronic rheumatism; lassitude and sickness.	A deep bronze tint of skin.

17. Mr. HUTCHINSON has collected a number of the cases which have been recorded, and has given a view of the chief symptoms which have characterized them. I shall notice these symptoms briefly and in succession, but independently of his account of them.—1st. *Bronzing of the skin* was observed in the majority of cases of structural lesion of the supra-renal capsules recorded by Dr. Addison and some others, and this physician was inclined to believe that this symptom was indicative of such lesion. Several cases have

more recently been observed where lesions of these capsules have been found without this change of the colour of the skin, and without any change whatever. Several such instances are recorded in the 8th vol. of the Transactions of the Pathological Society.—2d. *Great debility*, without any evidence of thoracic or organic disease, loss of mental energy, faintness, exhaustion, &c., were very general symptoms.—3d. *Irritability of stomach*, nausea, occasional or frequent vomitings, were also prominently observed.—4th. *Pain* in

General Symptoms, Complications, &c.	Duration of Disease.	Mode of Death.	Inspection after Death.	Remarks.
Some emaciation; great and increasing debility; oppressed aspect; urine healthy.	9 mo's	Sunk from diarrhoea; a succession of convulsions just before death.	No autopsy	Gradually increasing prostration for four months.
Countenance expressive of great languor; emaciation; marked debility; liability to faintings, &c.	18 m's	Suddenly, from an epileptic fit.	A chalky concretion found in the medulla oblongata. The supra-renal bodies said to be free from disease.	
Appetite very bad, thirst, great debility, pain in the loins, menorrhagia, anxious expression.	7 mo's	Not known	No inspection.	
No material loss of health until within a few weeks of death; debility, loss of appetite, irritability of stomach supervened, failure of memory for some months, urine normal.	3 yrs.	From incessant vomitings; delirious before death.	The chief lesion observed was tubercles in the lungs. The supra-renal bodies were not examined.	A peculiar and disgusting odour a few days before death.—See case 16.
About eight months after the first bronzing she began to lose flesh and strength; harassing cough, irritability of stomach, extreme anæmia, and debility supervened.	16 m's	Sunk gradually from exhaustion.	No autopsy	Eight months after the change of colour began the patient had a fine healthy infant.
Anæmic and extremely feeble, sickness and vomiting.	Not stated.	Gradually sank from exhaustion.	No autopsy	This case very closely resembled the preceding one.
Anæmic and feeble, followed by discoloration of skin, and by a peculiar collapse.	5 w'ks	Recovered under the use of tonics, the skin becoming simply pallid.	Recovered	Inflammatory disease of supra-renal bodies may be conjectured.
Sinking at pit of stomach, nausea, loss of appetite, strength, &c.; secretions healthy, heart's action very feeble.	Not stated.	Still living	Living at time of report	The symptoms combine to indicate disease of supra-renal bodies.
Fever; small, feeble, and quick pulse; severe pain in loins, increased by pressure; frequent vomiting; tendency to diarrhoea; abdomen flat, empty, and tender; urine albuminous; peculiar odour of skin.	12 m's	Exhaustion, stupor, unconsciousness.	Both supra-renal bodies atrophied, and their entire structure destroyed. History and inspection fully given, with a plate.	The case very chronic, well marked, and the supra-renal bodies most completely disorganized. A very interesting case.
Disease of the vertebral column, apparently causing death.	Not stated.	Not stated	Both supra-renal bodies contained nodules of firm substance, gray and semi-transparent externally, and yellow and opaque internally. A great part of their proper structure unaltered.	Apparently an earlier stage of the lesions observed in case No. 23.
Phthisis, under which she sunk.	Not stated.	Died from scrofulous deposits and vomicae in lungs.	Extensive deposits of crude tubercular matter in both supra-renal bodies, and in the lungs and left kidney.	No symptoms but those of phthisis mentioned.
Hectic and symptoms of phthisis.	Not stated.	Died from phthisis	Extensive deposit of scrofulous matter in one supra-renal body, the other not affected.	No symptoms excepting those of phthisis mentioned.
Tumour in left side of abdomen, emaciation, prostration, liver enlarged, the spine very prominent at the last dorsal vertebra, &c.	3 mo's	Exhaustion	Cancer of both supra-renal bodies, and cancerous deposits in both kidneys and in other parts.	History, case, and of the diseased appearance full and interesting.
Emaciation, care-worn countenance; retraction of gums, loss of teeth, sordes on the gums, &c.; general want of power, pains in the loins, &c.; anæmia.	4 mo's	Exhaustion	Supra-renal bodies both destroyed, their substance being replaced by a soft white encephaloid deposit; similar deposits in the lungs.	History and morbid appearance fully detailed.
Sickness, feeble pulse; fits of incessant vomiting, returning after short intervals, for seven weeks; emaciation.	12 m's or more.	Exhaustion	Both supra-renal bodies enlarged, inflamed, and contained purulent matter, with gritty matter in the right.	No other visceral disease observed.

the epigastrium, back, and loins, sometimes acute, in some instances dull, or an aching merely, was general.—5th. *Anæmia* was also generally present, this fluid being impoverished and abounding with white corpuscles, the soft solids being flabby.—6th. *Feebleness of the heart's action*, a soft, compressible, feeble, and more rarely a quick pulse, were usually observed.—7th. *A cachectic, leuco-phlegmatic, and unhealthy appearance* of the body, with or without emaciation, were frequently remarked.—8th. *A disagreeable and pe-*

culiar odour was exhaled from the body, in some cases, during life; and, 9th. *Several nervous and convulsive symptoms* were observed in a few instances. The tongue, the bowels, and the urine, did not present much indication of disorder. *Death* appeared to result chiefly from vital depression or exhaustion, with more or less indications of alteration of the circulating fluids. In some cases death was attributable to the disease with which the lesion of the supra-renal bodies was complicated, as to cancer, tubercular disease of the lungs,

&c. The circumstance of one of those bodies only being diseased, and the extent to which the structure of one or both had been destroyed, may be viewed as modifying or altogether altering the symptoms and the final issue.

18. ii. *The chief lesions of these bodies which have been recorded are the following:* (a) Appearances of acute inflammation and its consequences, suppuration, &c.—(b) Atrophy and total disorganization of their structure.—(c) Calcareous depositions, or fibro-calcareous concretions, with or without cysts, some of which contained a fluid puriform matter.—(d) A fibrous degeneration, with great enlargement and induration.—(e) Tubercular deposits, with great enlargement and loss of the healthy structure of these bodies.—(f) Deposits of cancerous matter, consecutively of cancer in other organs, more or less of the normal structure of these bodies being still preserved. Although these structural lesions were more frequently observed in both supra-renal bodies, yet one only was not unfrequently affected, and in a few cases a portion of the healthy structure of the diseased body was preserved. The disease of one body only, or the preservation of a portion of the structure of the organ, may rationally be allowed to modify or more manifestly alter the resulting phenomena.

19. The *diagnosis* of disease of the supra-renal bodies is very difficult: 1st. As respects the certainty with which this disease may be inferred from the symptoms present—of which, bronzing of the skin, the persistence of retchings and vomitings, the anæmia, and the weakness and smallness of the pulse, are the most characteristic; and, 2d. As regards ascertaining during life whether or no the existing discoloration is to be imputed to disease of these bodies, or to one or other of the forms of JAUNDICE, which I have described as *Green*, and as *Cachectic*, or *spurious*, *Jaundice*. (See § 46–57.) In the histories of cases of disease of the supra-renal bodies which I have perused, no such diagnosis has been made or suggested; and the appearances of the stools and the states of the biliary and urinary excretions during life, and even of the biliary apparatus after death, have been either insufficiently investigated or entirely overlooked.

20. The *prognosis* is most unfavourable, as it does not appear that any case has recovered where the skin had become bronzed or much discoloured. The prognosis may therefore be ranked in the same category as the green form of JAUNDICE described in that article. (See § 46, *et seq.*)

21. The *treatment* should be directed according to general principles, conformably with the phenomena and with the complications characterizing individual cases. These will suggest the rational indications, and the means by which they are most likely to be fulfilled, as far as this may be possible.

[In the present state of the question, the following conclusions may be legitimately drawn: 1. Disease of the supra-renal capsules is not necessarily associated with bronzing of the skin. 2. Bronzing of the skin may be produced by other causes than supra-renal capsular disease. 3. Disease, or even complete disorganization of the supra-renal capsules, may exist without giving rise to any special symptom. 4. Peculiar symptoms have been found associated with supra-renal disease in so many cases as to render it probable that the association is more than accidental, and that under certain unknown conditions a real influence may be exerted on the economy by a disease of the capsules. In a case which came under our own observation and treatment recently, the supra-renal capsules were extensively diseased, and one of them disorganized, without any change of colour in the skin.]

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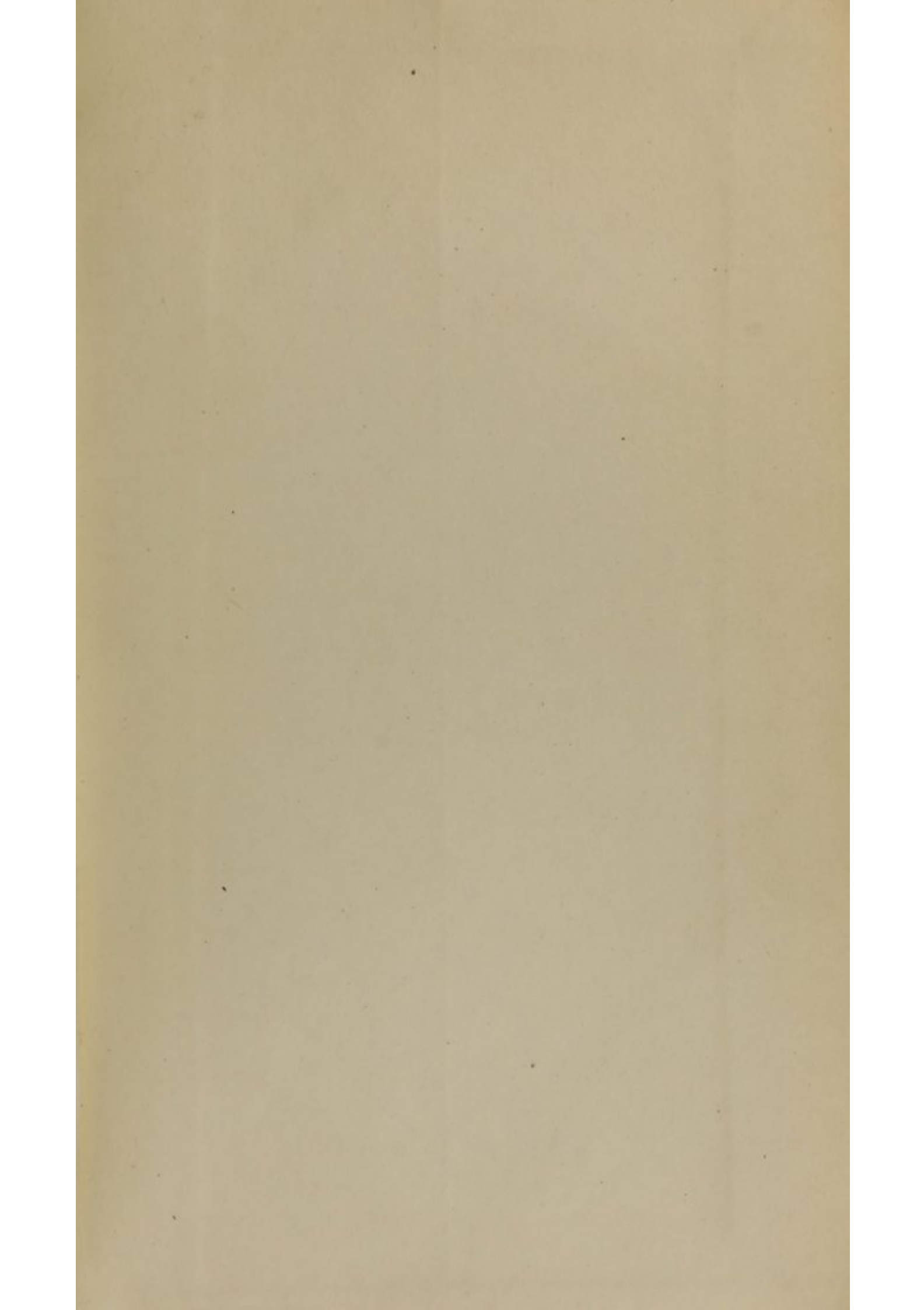
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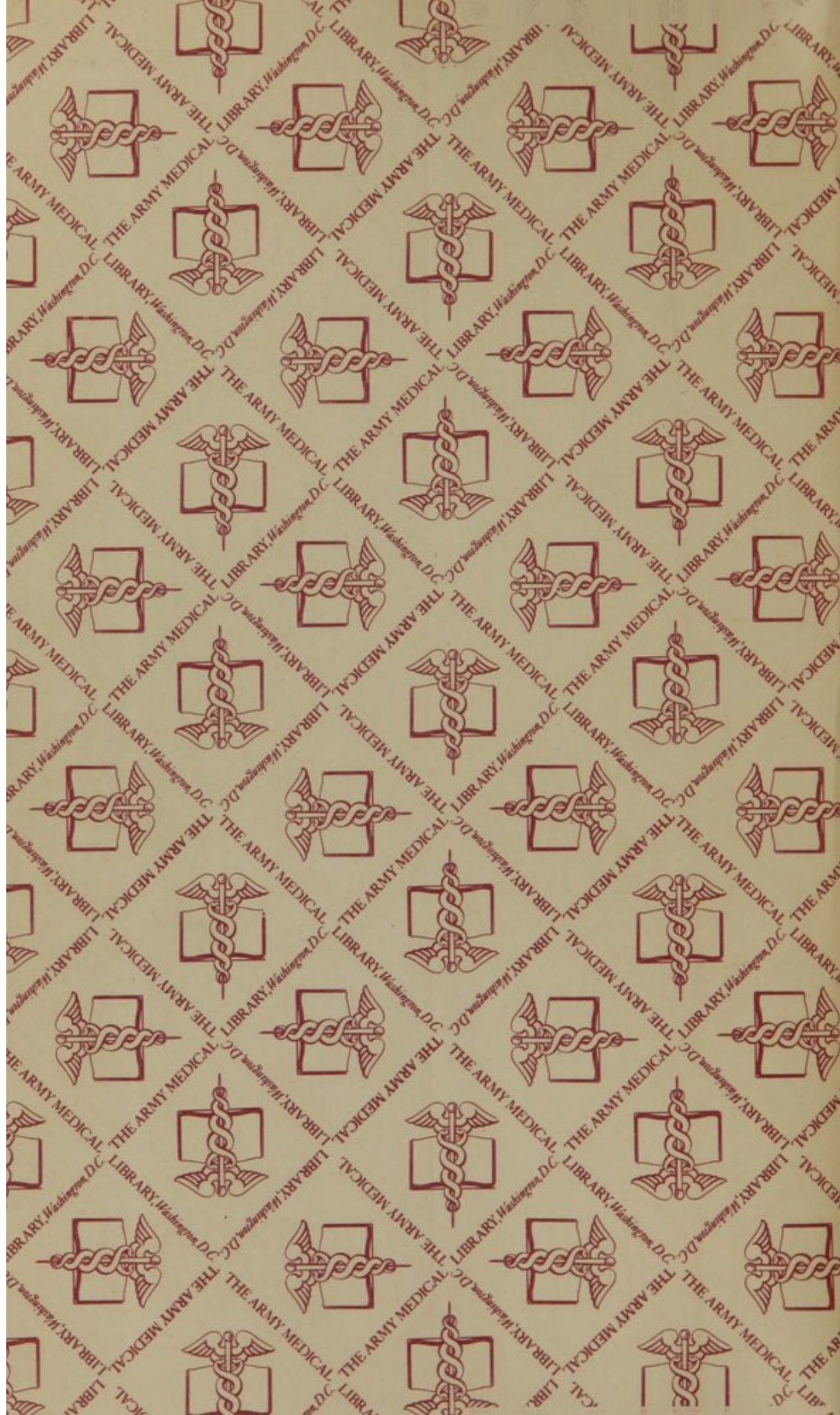
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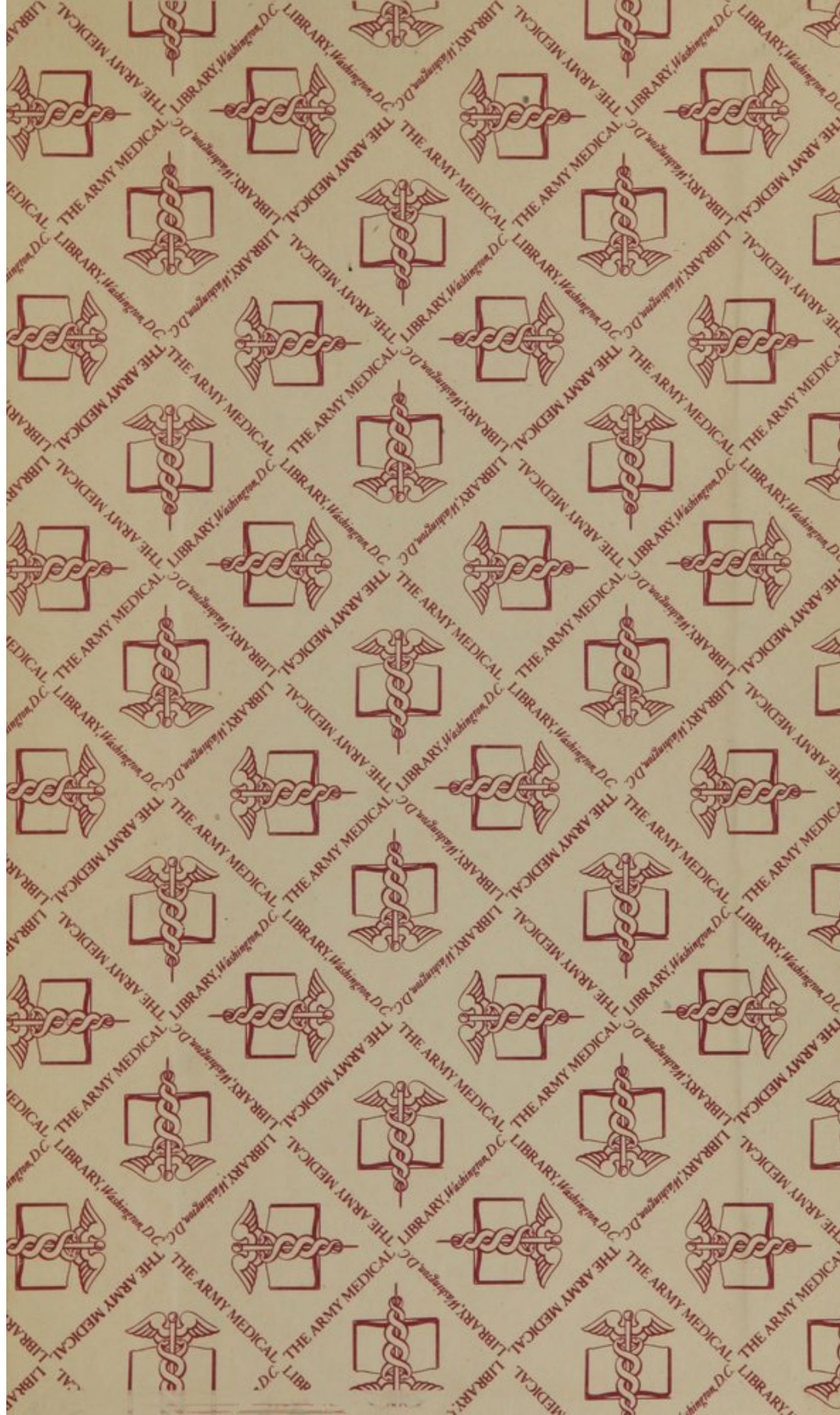
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