A further inquiry concerning constitutional irritation, and the pathology of the nervous system / [Benjamin Travers].

Contributors

Travers, Benjamin, 1783-1858.

Publication/Creation

London : Printed for Longman, Rees, Orme, Brown, and Green, 1835.

Persistent URL

https://wellcomecollection.org/works/rjqtcuve

License and attribution

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.

wellcome collection

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org



51931/B



Digitized by the Internet Archive
in 2018 with funding from
Wellcome Library

https://archive.org/details/b29288836

A

FURTHER INQUIRY

CONCERNING

CONSTITUTIONAL IRRITATION,

AND

THE PATHOLOGY

OF

THE NERVOUS SYSTEM.

By BENJAMIN TRAVERS, F.R.S.

SENIOR SURGEON TO ST. THOMAS'S HOSPITAL;

ETC., ETC., ETC.

London:

PRINTED FOR LONGMAN, REES, ORME, BROWN, AND GREEN,

PATERNOSTER ROW.

1835.

" Fallax non raro Experientia, si Rationis ductû fuerit destituta : Quapropter, nisi mutuam sibi lucem communicent, æquam erroris ansam præbebunt." BAGLIVI OPERA, CAP. II. SEC. 5.



G. WOODFALL, ANGEL COURT, SKINNER STREET, LONDON.

CONTENTS.

PART I.

CHAPTER I.

PAGE

A Recapitulation. Definition of reflected irritation. Of constitution or temperament. Habits and health 1

CHAPTER II.

Illustrations of reflected irritation. Pre-existing organic disease. Metastasis. Diseased actions set up in other parts by injuries and inflammations. Cases..... 10

CHAPTER III.

Of the connexion between direct and reflected irritation. Their reciprocity and mixed operation; the system re-acting on the part, and the part on the system. Cases..... 42

CHAPTER IV.

Of local changes of structure not essentially inflammatory. Of local inflammation supervening on constitutional diseases. Of local inflammation generating constitutional disease. Cachexia. Of scrofula, cancer, syphilis. Cachectic ulceration and gangrene. Cases..... 66

CHAPTER V.

PAGE

Of constitutional inflammations as examples of reflected irritation. Erysipelas. Cases. Gangrenous inflammation. Carbuncle and malignant bubo. Cases..... 117

CHAPTER VI.

Supplement to the foregoing chapters..... 204

PART II.

CHAPTER I.

Of the nervous system and its pathology. Sensation and volition. Sympathy. Morbid sensation. Morbid action... 227

CHAPTER II.

Of nervous affections consequent upon local injury or irritation, as examples of reflected irritation. Morbid affections of the sensitive nerves. Hysteria. Neuralgia. Morbid affections of the motive nerves. Spasm. Tetanus. Cases. 264

CHAPTER III.

Of nervous affections consequent upon læsion or alteration of texture of the nervous organ..... 339

CHAPTER IV.

PAGE

Of the operation and effects of poisons on the nervous system..... 388

CHAPTER V.

Summary. Conclusions, pathological and practical..... 424

CORRIGENDA.

Page 37, 15th line, *for* '4th Nov.', *read* '4th Dec.'
133, 2d line, *dele* 'u'.
135, 7th line, *for* 'most', *read* 'many'.
145, 14th line, *for* 'could', *read* 'can'.
147, in the Note, *dele* inverted commas at 'altered': the whole paragraph is quoted.
174, in the Note, *for* Dr. 'Hennan', *read* Dr. 'Hennen'.
233, 5th line, *dele* 'the use of'.

Page 89 & 90. 86 & 87

PREFACE.

In offering this Further Inquiry to the professional world at so long an interval from its commencement, I do not deem it necessary to vindicate myself from the imputation of having pursued an idle speculation, because I have no novelties of practice to submit to its notice. So impressed have I been in the progress of the investigation with the importance of the subject, that my only regret has been that it had not fallen to abler hands, in which I am satisfied it might have been so treated as to have risen to the dignity of a Discourse on the philosophy of Surgery. But notwithstanding the great advances made of late years in pathological science, and the enlargement of our knowledge of the constitution and economy

of the nervous system, the influence which it exercises in disease is imperfectly estimated, and the design of the present work, long since contemplated, has not hitherto been executed.

I request of my reader to bear in mind that it professes to be only an "Inquiry," seeking and supplying illustration from facts, and reasonings thereupon, not aspiring to guide his views so much as to unfold my own, and thus to indicate the direction in which, as it appears to me, his also may be usefully applied. For the rest, I bespeak his patience and his candour;—the first, that he may duly appreciate the extent and importance of the subject; the second, that he may judge of the manner in which it is treated with forbearance, and lenity to its admitted defects.—"Res enim ardua vetustis novitatem dare, novis autoritatem, obscuris lucem, dubiis fidem; omnibus Naturam, et Naturæ sua omnia."*

* Thomæ Bartolini Præfatio in Anat. Reform. 1669.

A

FURTHER INQUIRY,

ETC.

CHAPTER I.

A RECAPITULATION. DEFINITION OF REFLECTED IRRITATION. OF CONSTITUTION OR TEMPERAMENT. HABITS AND HEALTH.

In a former work * I considered the tendency of various severe injuries and of operations, performed either for recent injuries or for chronic diseases, to induce one of two opposite and peculiar states of the system, which states I denominated prostration without reaction, and prostration with excitement and excessive reaction; exemplifying the symptoms by numerous cases. I endeavored to analyse and exhibit the pathological character of that series of phenomena constituting the state termed by surgeons constitutional irritation; and shewed the effect of inflammation following injuries and operations to set up similar modes of disturbance in the system. Lastly, I adduced many examples of the same kind from slight wounds in dissection, and discriminated between such as properly belonged to the class of

* "An Inquiry concerning that Disturbed State of the Vital Functions usually denominated Constitutional Irritation." 1827.

simple injuries, the phenomena of which were to be referred exclusively to the inflammation so set up, and those which owed their origin and often destructive character to the admission at the same time of an animal poison into the system.

I drew a distinction between irritation and inflammation in a local sense, and irritation and fever in a general sense; shewing at the same time, that though the combination in both senses was frequent, it was far from invariable; and that, upon the whole, the most formidable, because the least controllable forms of constitutional irritation existed in the absence of inflammation and fever.

The nervous system I shewed to be the source of these morbid actions, and pointed out the direct agency of some causes of excitement, and the indirect agency of others, and thence established the distinction between direct and reflected irritation. It was my object, in the former work, to delineate the direct, and in the present I shall consider the reflected irritation. It is essential to premise, that I confine my view to such diseases as have sooner or later external and local demonstration, and are therefore strictly in the province of surgery; although such demonstration may be trivial in appearance, or in point of time separated by a considerable interval from the constitutional disturbance, whether anterior or subsequent to it. To recapitulate.—

"Constitutional irritation I consider to be of two kinds, direct and reflected, by which arbitrary distinction I mean to imply, that the first is wholly and immediately derived from the part, commences and is

identified with the local mischief, and the constitution has no share in its production. The second, on the contrary, originates in a peculiar morbid state of the constitution, to which the injury or inflammation has given birth, or it may be, previously existing. The first is truly symptomatic; never originating spontaneously, and being immediately induced by the local irritation, is capable of being essentially mitigated or arrested by its removal. The second is occasionally idiopathic, and being as often the cause as the effect of the local action, is less influenced by local treatment. In the first, the local changes are depending on local causes, in the second they depend on constitutional causes. Cases are of no uncommon occurrence, in which after an interval the reflected supervenes upon the direct irritation, or the direct is superadded to the reflected, already established, which may therefore be regarded as examples of mixed irritation, the part and the constitution acting and reacting alternately upon each other."

In this chapter, as preliminary to my subject, I shall shortly consider the influence of constitution and habits upon local disease.

Among the many valuable observations which have descended to us from the earliest records of medicine, of which time has served only to confirm the truth, are those touching the effects of air and climate, season of the year, period of life, varieties of food, exercise, &c., in influencing the physical character of man, as preserving health or predisposing to disease.

Although the doctrine of habit or temperament, derived from these and similar agencies, was obscured by being mixed up with false and now obsolete notions respecting the humors, (as the blood, the pituita, and the bile of different qualities were called, which were supposed to determine the habit by their properties and relative proportions in different individuals,) yet the natural varieties of habit or temperament are so marked, as to be acknowledged at the present day by every man of discernment, and to exercise a very material influence over his practice. Who, for example, honestly requires an explanation of such terms applied to the habit as phlegmatic or leucophlegmatic, indolent or irritable, robust or delicate?

If at the dawn of medical knowledge, an erroneous physiology bewildered with its numberless conjectures and combinations the results of observation, Richerand and other modern physiologists have surely refined overmuch in professing to individualize the temperaments with minute precision. Nothing can be more idle than the attempt to restrict within definite boundaries features of distinction, whether physical or moral, which by their constitution are, and ever must be, variable and adventitious; and can only be regarded as modifications, infinitely diversified, of a general or parent principle. Surveying the extreme types in their fullest breadth, we may deduce certain physical and moral associations which may serve as standards of character, but if they have the merit of fidelity, they will be limited to two or

three. The varieties of each will necessarily be so blended as often to make it problematical to which of these standards, from the predominance of either, they can be said to belong, and the further pursuit of the philosophical speculation adds nothing to its practical value. We know that there exists a general accord among experienced professionalists about constitution —its characters, its influence, however derived: we also know that, in one sense, it is hereditary, viz. that the vices of scrofula, of gout, of cancer, and of insanity, are continually appearing in the offspring of a parent afflicted in the same way. That occasionally even the same local malformations run through families, or several members of the same family; yet to this, though we cannot question its foundation in fact, we should yield a very restricted assent, if assumed in support of a general principle, for the exceptions would infinitely overpower it.

Hippocrates, to whose claims as an observer of nature the reason and experience of mankind during a period of more than two thousand years have set their common seal, affirms, that there are as many causes of health and disease as there are natural objects external to the body capable of acting upon it, and upon the conduct and circumstances of man during his whole course of life. Thus health and disease in general depend upon the air respired, the food and drink, sleep and watching, exercise and rest, the things admitted, rejected, and retained, and, last not least, the passions of the mind. To these may be added, the action of foreign objects, sometimes beneficial and sometimes noxious.

Celsus, the accomplished physician of the Augustan age, thus opens his second book, in which he treats very fully of the signs of health, the prognostics of disease, and its termination in death. "Instantis autem adversæ valetudinis signa complura sunt. In quibus explicandis non dubitabo auctoritate antiquorum virorum uti, maximeque Hippocratis.—Sed antequam dico, quibus præcedentibus morborum timor subsit; non alienum videtur exponere, quæ tempora anni, quæ tempestatum genera, quæ partes ætatis, qualia corpora maxime tuta vel periculis opportuna sint, quod genus adversæ valetudinis in quoque timeri maxime possit. Non quod non omni tempore, in omni tempestatum genere, omnis ætatis, omnis habitus homines, per omnia genera morborum et ægrotent et moriantur: sed quod frequentius tamen quædam eveniant; ideoque utile sit scire unumquemque, quid, et quando maxime caveat."

As there is no human condition free from trouble in a moral sense, no man who has not "his peacock on the wall", so there is not an individual in existence who has an organization of equal perfection. That he has never been the subject of illness, forms no exception to this remark; a happy combination of constitution and habits of life, with an even mind, may postpone the development of disease to a much more advanced period of life in some than in others; the disposition, as well as the occasion to make the discovery, varies.

Against the host of hypochondriacs may be set off a considerable array of persons who are constitutionally blind to their own microcosm, protected by a sort

of mail armour with which nature, education, and habits of life have invested them. When such persons are in their turn assailed by disease, they exclaim loudly, pleading their uninterrupted immunity up to the present moment from ache or pain, as if the enjoyment of a long lease conferred a claim to a freehold. Sickness might possibly have been further deferred, but they might with more reason be thankful that it has been stayed so long. Its severity will almost always be found to square with its tardiness of appearance, and often proves fatal ; and thus has originated the vulgar saying, that " creaky vessels last the longest." Is the fault of the constitution original, it may be asked, and transmitted, subject to endless modifications, from parent to child ? It will be most consistent with all we see and know, to believe that it has been both acquired and accumulated by the unceasing operation of deteriorating causes upon the human body, from which our first parents were as far exempt as was compatible with the condition of perishableness by age and slow decay. Plato carried this notion so far as to insist that diseases, and consequently the employment of physicians, are an artificial graft upon the vices of civilized society; that surgeons were in fact the only practitioners required by the wants of man, since casualties, as fractures and dislocations, for example, would occur from the earliest dawn of his existence ; and he therefore deprecates the exertions of medical skill, in full reliance that they, who leading reputable lives are uninjured by excesses,—in short, worth saving to the community,—will get through by their own natural

powers *. The conceit is amusing, but the argument conclusive enough as evidence of the higher antiquity of surgery, which is confirmed by the earliest records of the healing art.

Independent of the well known instances of idiosyncracy, or peculiar irritability of various organs in individuals, as of the skin, the stomach, the heart, &c., the natural temperament, modified by the existing state of health and habits of life, exercises the chief influence over the consequences of local injury. It is obvious that certain physical conditions, which frequently prevail, as habitual irregularity in the functions of the stomach and bowels, or of the heart and lungs, a corpulent or bloated frame, a delicate and over-mobile nervous system, are circumstances so unfavorable to health, as to be waiting but the occasion of change to fall into disease. Irregular or intemperate habits, as regards nourishment, sleep, exercise; especially the use of ardent spirits; a vitiated atmosphere, a recent and perhaps imperfect recovery from acute disease, dejection of mind from pecuniary embarrassment, hurt pride, or domestic affliction, which are of themselves sufficient to drive some men to self-destruction, diminish the natural power of resistance to casualties.

It might need some apology to insist upon a subject so obvious and so universally admitted, but that the secondary effects of injuries and constitutional maladies, which it is my present purpose to consider, are perhaps even more influenced by such circum-

* De Republicâ, Lib. III.

stances than those which are direct. The stun of recent injury assimilates all conditions of the body by its overwhelming force, but the morbid process instituted by a slight and often disregarded accident, which not until after a lapse of time is discovered to have placed life in imminent peril, is continually traceable to diathesis or to the pre-existing state of health; so membranous inflammation, erysipelas, phthisis, carcinoma, and tetanus may be set up.

If I were called upon to mention the most influential predisponents to disease, I should say, of the time of life, youth or age; of temperaments, the scrofulous; of habits of life, those of poverty in the aggregate; of moral causes, anxiety and the depressing passions; of external and adventitious circumstances, the abuse of liquor, the operation of cold, and the action of mercury. But it is in combination that these latter, which may be called occasional causes, act with most fatal severity.

CHAPTER II.

ILLUSTRATIONS OF REFLECTED IRRITATION. PRE-EXISTING ORGANIC DISEASE. METASTASIS. DISEASED ACTIONS SET UP IN OTHER PARTS BY INJURIES AND INFLAMMATIONS. CASES.

I HAVE selected the important subjects forming the title of this chapter as illustrations, pathological and practical, of reflected irritation.

I. PRE-EXISTING ORGANIC DISEASE.

In adverting to the sinister influence of constitution and impaired health, I have considered it entirely distinct from organic change, even in its embryo state. Such a change is for the most part insidious in its origin, and liable to be overlooked, being the result of one or more of the causes of constitutional deterioration just enumerated. The interstitial deposits in the liver and spleen, the earthy deposits in the cardiac and arterial systems, the loss of elasticity in the venous and diminished calibre from thickened coats of the absorbent canals, the semi-opacities and partial adhesions of serous membranes, the excessive relaxation of the mucous membrane, cartilaginous deposits upon the fibrous, and accumulations in synovial sacs and excretory ducts

of glands,—are changes which, though for the most part climacteric, or incidental to wear and tear, are liable to occur at an earlier period under favouring circumstances. But the hypertrophy, or over-growth of organs, their preternatural softening, the enlargement and induration of lymphatic glands, the formation of tubercles and tumors, encysted and solid, in situations not directly interfering with any vital function, as in the walls of the uterus and the ovaria, the mammæ, and the cellular membrane of all parts of the body, sarcomatous and osseous growths,—each and all acquire a vast additional importance when the system is tried by the shock of severe injury, or capital operation peremptorily called for, as the removal of a shattered limb, or the release of a strangulated hernia.

Upon examination of the bodies of persons dying from disease or accident after the middle of life, it is rare not to meet with some palpable evidences of organic change not previously known, or at best only vaguely surmised to exist. I could cite many instances of this, and also of chronic states of disease, explaining the adverse results of operations, contrary to the expectation of the surgeons. Diseases sometimes lie hid, as if they had by slow introduction and encroachment inured the system to bear with them; or the symptoms have been masked, perhaps neutralized, by combination with others. I have known a stone in the bladder discovered after death in the body of a man otherwise diseased, in whom no complaint during life had led to a suspicion of its presence.

On the other hand, the pain attending some very slight and superficial morbid change is sometimes excessive, and very difficult to comprehend.

The extent to which the deterioration of organs, as life advances, is evinced in their interstitial deposits and general loss of transparency, sharpness, and firmness of texture, constitutes a sort of microscopic morbid anatomy, which for the most part escapes observation. It is most perceptible in the bodies of persons of middle age; the cases of premature decay, in which people are vulgarly said 'to die of a broken heart.' Anxiety and alcohol are the chief exciting causes, especially when, as too often happens, they co-operate. The effect is a preternatural flaccidity, or general loss of tone, with effusion from the extreme vessels. This slow and silent work of deterioration begins earlier in some constitutions than in others, and varies in families as in individuals, notwithstanding wide differences in the habits and modes of life, as if from an original conformation; and it is thus we must account for the well known and well established fact, that, barring accidents, the general duration of life tallies in families, with few exceptions; some reaching threescore years only, others five years over that, and others again reaching seventy, and from thence longevity. But it is unnecessary to urge this argument further than to show, that minute organic changes, scarcely discernible in detail, because not actually inducing illness, compose in the aggregate an amount of mischief which clogs the machine, when called upon by extraordinary

emergencies; and which, as a whole, we recognise by experience, and consider to be the disadvantage of age or habit, and not erroneously, though we cannot analyse and discriminate its parts.

We are not unfrequently restrained from offering the chance of operation, by the actual demonstration of internal disease; and in some of those cases in which visceral disease is discovered after death, it is probable that it may have been coeval, or even pre-existing. I have mentioned in my former work * two cases, in which the lungs were found sprinkled with small tubercles, upon examination of the bodies of men, one of whom died suddenly on the third day after the amputation of a diseased wrist joint, of an effusion on the brain, and the other on the fifth day after the removal of a warty fungus of the prepuce and glans penis. I have notes of cases in which small operations have proved fatal in a week or ten days, in a manner quite inexplicable but upon the presumption of a pre-existing morbid diathesis, or an actual morbid change; when the friends of the parties, in their vexation at so unexpected a result, have immediately removed the body, and obstinately refused inspection. A morbid condition of the lungs or liver, and effusion into the chest or upon the brain, have generally been indicated in such instances. In other cases, however, where examination has been obtained, no actual change has been detected beyond a gorged condition of the blood-vessels of these organs, partial depositions from their extremities,

* "An Inquiry," &c., p. 24, 2d Edition.

opacities, and old adhesions of the lining membranes, extreme flaccidity of the muscular fibre, &c.

CASE. A brew-house porter, æt. 54, athletic and of corpulent habit, who had been formerly in the Coldstream Guards, and lost an arm in the Peninsula, had an hydrocele, with slightly enlarged testis. The fluid was drawn off by a lancet puncture, on the 1st of April, 1834. On the 8th, he felt chilly and feverish, and a slight erythematous blush was observed over the now again tense scrotum and groin of the same side. The scrotum was freely incised, and an abscess discharged. The cellular membrane was, to my surprise, in a state of slough. Aperients and salines, fomentations and yeast poultices.

11th. His bowels were costive, and he had a troublesome cough. Took the salts and rose infusion thrice a day, and Dover's powder at night.

18th. His skin turned yellow, and he became very drowsy. Took calomel pills in addition to the saline mixture, and aided their operation by enemas. Wound healthy.

21st. The bowels, which had till now acted tardily, suddenly gave way. He was rapidly reduced by a copious fluid purging of a dark color.

22d. Countenance pinched and altered; pulse intermits; surface cold and clammy: this morning had a severe rigor of an hour. The wound, which had been indolent, and shewed no tendency to heal, turned gangrenous; and a state resembling emphysema, was observed in the groin.

23d. He now took quinine and wine, but became

delirious, and seemed quite incapable of rallying. He died the next day, the twenty-fourth from the puncture.

This man had almost lived upon porter, drinking many pots daily.

Examination. The tunica vaginalis was sloughy, but the affection of the groin was confined to the skin: the testis and chord sound, and a small hydrocele of the latter. There was a gorged condition of all the viscera. The liver was brittle and granulated. Some chronic adhesions were found in the chest.

Severer operations, or those implicating or bordering on parts of importance to life, as in hernia, or in which morbid poisons are concerned, as in scirrhus, may be viewed with suspicion when cited to illustrate this principle, but are in some instances very fair and forcible examples of it.

Case. A woman, æt. 25, was tapped for an ovarian dropsy, in April, 1805, when about a wash-hand bason and a half of brown sanious fluid was drawn off. It had begun on the left side, and had been seven months collecting, having first appeared two months after delivery. Symptoms of inflammation with bilious retching followed the operation, and she died in forty-eight hours.

Examination. The peritoneum was acutely inflamed. Another cyst partially adhering, and still full, was found in the left ovary, and a small fungus of a malignant aspect was seen sprouting from the enlarged and hardened substance of the right.

Case. A girl, æt. 18, delicate in health, had a bursal abscess of the patella extending to some distance around it.

On the 26th December, 1822, it was opened, and an ounce of pus discharged. Vomiting, purging, and pain in the epigastrium followed the operation, for which she was cupped on the part, and on the succeeding evening delirium ensued. On the third and fourth days she was restless, with hurried respiration and quick small pulse; on the evening of the latter she became comatose, with dilated pupils and slight strabismus of the left eye. Early in the morning of the fifth she died.

Examination. The tumor was purely bursal, and not communicating with the joint, which was sound. The chest and abdomen were healthy, but the mucous membrane of the bowels was ecchymosed in several places. The right lobe of the cerebellum was morbidly soft, and about an ounce of blood was shed over the surface of the left hemisphere of the cerebrum beneath the dura mater. The girl had formerly been subject to epileptic fits.

Case. One of the large muscular men in the employ of Messrs. Barclay and Co., was struck down by a blow with a cudgel in a Southwark election squabble, 23rd November, 1830. Though stunned at the moment, he was perfectly sensible when admitted at the hospital close adjoining; he was bleeding from three contused wounds of the occipital scalp, not injuring the aponeurosis.

24th. He had slept little, had some nausea, the

wounds which are poulticed were beginning to suppurate, pulse 100, bowels open. He was drowsy and restless by turns, and was blooded from the arm.

25th. A quiet night; edges of the wound looked sloughy; bowels open. Tongue clean and moist; still drowsy, or restless, if awake.

26th. Same report; countenance pale and distressed. The wounds pallid and dry, their edges dark and unhealthy.

27th. Had no sleep last night; slept some hours this morning; very low spirited. Pulse 100, and has a weak stroke; is thirsty; bowels open.

29th. Erysipelatous inflammation is observed spreading from one of the wounds, the largest of the three, from the occiput to the eyes; ears also affected. Pulse soft, but its beats vary in fullness; cries out for porter in his delirium. An incision to the bone was made through the puffy part of the scalp, by which a little pus and several ounces of blood escaped.

30th. No relief to the symptoms; profuse perspiration during the night; continued muttering; difficult breathing, pulse scarcely perceptible, cold extremities. Took some hot brandy and water, which rallied him; feet wrapped in hot flannel, slept, and awoke free from delirium.

31st. Sensible, but fast sinking.

December 1st. Died at half past nine this morning, ninth from the accident.

Examination. The scalp wounds were sloughy, and the

surrounding integument thickened. No injury to the tendon, pericranium, or bone. Pia mater very vascular. Sinuses turgid. Tunica arachnoides transparent from a copious effusion beneath it.

In the chest were found old pleural adhesions and the right lung was tuberculous throughout.

II. METASTASIS.

This very remarkable principle of the economy was known to Hippocrates, by whom a doctrine, very similar to our sympathy and local congestion, was suggested to explain it. The healthy functions exhibit its prototype in the changes of puberty in both sexes, and in the supply of nutriment to the fœtus on its birth. And here I may mention a very curious proof that the principle of metastasis is, in effect, the same as that of sympathy. If a child dies at the seventh month; from the period of its death, though the woman be not delivered for days after, the mammæ are furnished in the same plenitude as if the child was born and alive. Now this is directly contrary to what writers on midwifery have generally asserted, viz. that the falling of the breasts, and the failure of the milk, are never-failing signs of the child's death. This was misplacing the sympathy, the secretion being determined not as this statement would lead us to suppose by the life of the fœtus or the birth of the child; but vicarious with the diminished supply of blood to the womb on its death, or after delivery. Nature never contemplates death—and therefore, when the blood of the

uterus ceases to be demanded, the child, in the language of sympathy, is born, and the want of the born infant is supplied.

The principle of metastasis is still more strongly exemplified in pathology, in the morbid effects of sudden obstruction and arrest of natural functions, whether of the skin, the bowels, or the uterus; but its operation is never more striking than upon the sudden disappearance of cutaneous eruptions, whether spontaneous or artificially promoted, the retrocession of gouty inflammation, the rapid healing of extensive ulcers, and the stoppage of preternatural secretions become habitual; indeed it is familiarly exhibited, though in a more limited sense, in the action of counter-irritants.

Of several instances in which I have witnessed the fatal operation of this principle, I should mention as among the most marked, serous apoplexy from retention of urine and the sudden reduction of swollen testes; palsy of the retina from the sudden retrocession of a skin rash, from a tumor obstructing the bowels, the irritation of worms, engorgement of the liver, and suppressed catamenia; and erythema, erysipelas, and even diffused gangrenous inflammation from the healing of wounds upon distant parts. But the case most strongly impressed upon my mind happened many years ago, in which I encouraged one of my dressers to a trial of skill in accomplishing the healing of a very extensive and ancient ulcer of the leg, within a given time. Almost immediately upon its complete cicatrization, a diffused

swelling arose in the pectoral region of the same side, the parietes took on extensive gangrenous inflammation, and the patient died in less than a week.

Case. A man who had a thecal and palmar abscess of the hand, following a puncture of the ring finger, and was recovering a partial motion of the fingers, the tumefaction having subsided and the discharge nearly ceased, was attacked suddenly with acute inflammation of the chest, which resisted active treatment, and proved fatal in nine days.

Case. A man had an irritable ulcer on the skin of the right leg, of six months' standing, which was cured on Mr. Higinbotham's plan, in the interval between the 1st January and the 20th February. He was on this day seized with acute laryngitis, for which he was actively treated with venesection and mercury, but died in forty-eight hours. The mucous membrane of the pharynx and larynx were highly inflamed, an abscess was found at the back of the pharynx, and extensive deposition of lymph in the surrounding cellular texture.

Case. A man of full habit had a slough of the glans and part of the body of the penis, following chancre, with phymosis, contracted three weeks prior to his admission, on the 8th December, 1830.

20th January. He was going on well, and the sore healing till this morning, when he was attacked

with dyspnœa, and died on the morning of the 22nd of acute bronchitis, though very large bleedings and active mercurial treatment were employed.

Case. A sailor, lately returned from the West Indies, of sallow complexion, but by his own report, good health, with regular bowels, unimpaired appetite, clean tongue, and steady pulse, had a large deep sloughy ulcer on the outer side of the right foot, and another on the left leg; they were of two months' standing, and had been much neglected on shipboard.—Bark, and a small allowance of wine and porter. A stale beer poultice to each sore.

August 8th, 1818. Extraordinary improvement. Sloughs had all disappeared, and healthy granulations rising, so that the edges and surface are becoming level.

15th. Complained of some enlargement of the abdomen.

26th. Sores wonderfully improved. The abdomen considerably distended, no fluctuation evident.

September 12th. Paracentesis. Ten quarts of limpid fluid drawn off; sores nearly healed.

25th. Fluid again accumulating.

October 15th. Second operation—about the same quantity of colourless fluid drawn off by the trochar. The ulcers are healed.

29th. Has filled again to distention; pain in the right side. Considerable dyspnœa.

November 15th. Abdomen very full, pain removed by medicine, suffers from dyspnœa owing to distention.

18th. Sinking.

20th. Died.

A gentleman of dissipated habits, had a great parenchymatous enlargement of both testes, for which he applied a suspensory, and a strong solution of acetate of lead. The volume of the testes was suddenly reduced, and he was as suddenly attacked with a fit, resembling apoplexy; he never perfectly recovered, and eventually, though some years afterwards, died of a return of the stroke.

III. DISEASED ACTIONS SET UP IN OTHER PARTS BY INJURIES AND INFLAMMATIONS.

In the works of various authors and collectors of cases, will be found examples of the post mortem discovery of a morbid state of other and distant parts of the body, bearing every character of recent formation, and of the existence of which, prior to the injury in one case, and the external disease in another, there was neither sign nor ground for conjecture. These have sometimes been of a directly fatal character, as acute inflammation and effusion into the cavities. Sometimes, and more frequently, they have been of a chronic kind, opposing insurmountable obstacles to recovery by change of structure in vital organs, as tubercles in the lungs, liver, &c.; in other cases, they have operated by their diffusedness rather than their nature to oppress the powers of life, and thus aggravate the malady, as extensive inflammatory actions upon the skin and cellular membrane. Lastly, internal organs have assumed a character of disease in a more advanced stage, or a

more important position, similar to the first or external malady, whether scrofulous, or belonging to the morbid poisons, as the scirrhous and medullary cancer, lues, &c.

The attention of the profession has been more particularly called to this important subject, so far as regards recent injury, by my much valued friend, the late Mr. Rose, surgeon to St. George's Hospital, in the fourteenth volume of the Medico-Chirurgical Transactions *.

The improved physiology of the present day, compared with that which existed at the date of Morgagni's labours, enables us to reject, as absurd, Marchetti's explanation of pus having descended from the head into the cavity of the chest, in a wound of the former part; and also Bertrandi's, of obstruction to the return of blood into the right auricle of the heart by the inferior vena cava, owing to the additional quantity returned from the head by the superior cava, and hence abscess of the liver,—but it does not invalidate the numerous accounts of abscesses in the viscera, chest and abdomen, consequent upon wounds of the head, no previous symptoms having occurred of disease affecting these cavities.

After mentioning M. Quesnay's case of abscess of the liver, following a fracture of the parietal bone †, Mr. Rose states the following occurrence, under the

* Observations on the Deposition of Pus and Lymph occurring in the Lungs and other Viscera, after Injuries of different Parts of the Body.

† Memoires de L'Academie Royale de Chirurgie. Tom. I., Obs. par M. Boudou.

observation of an eminent surgeon in one of the London Hospitals.

"A dustman was brought into the hospital, in consequence of having received a blow on the side of his head, which had detached a large flap of the scalp, and denuded a considerable portion of one of the parietal bones. The man was for a day or two extremely noisy and delirious, but these symptoms gradually left him, and he appeared for a fortnight to be recovering favorably. After that period, febrile symptoms came on, with violent rigors, which were followed by profuse sweats. The formation of pus being clearly indicated, it was judged advisable to remove a part of the parietal bone, where the pericranium had been most detached. This was done; but the inner table of the bone was found adhering to the dura mater, which was perfectly healthy, and the operation of course afforded no relief. After the patient's death, it was ascertained that a very large collection of matter had formed in the cavity of the pleura, and that the brain and its membranes were free from disease."

The following is one of many cases which I have seen, in which the first insight into the real nature of the disease was afforded by that of the body.

CASE. A young lady, whose illness occupied a period of two years, was treated with great attention by several of the most eminent of the profession, in the departments of physic, surgery, and midwifery. Opinions were divided on the point, whether the brain was

affected in its organization, or only in its function; the symptoms being, circumscribed fixed pain over the left limb of the lambdoid suture increased by pressure; pain in the extremities, and great loss of muscular power, nearly amounting to hemiplegia of the same side. Signs of great depression of the whole nervous system were alarmingly indicated, and the disturbance of the external senses and mental faculties was such, as accompanied with obstinate obstruction and continued wasting, left no one in doubt as to the seat and result of the malady; although an uneasiness approaching to pain at the lower margin of the chest on the same side and dyspnœa, supposed spasmodic, called for the occasional application of three or four leeches, which gave temporary relief to these symptoms. The prostration and distress from motion of any kind were excessive. Was it organic disease of the brain, or aggravated hysteria?

Examination. The brain and its membranes, and all the viscera, were healthy, with the exception of the lungs, which were filled with tubercles in various states of progress. No apprehension of this fact had been entertained through the whole progress of the malady, so completely had the metaphysical or functional masked the physical or organic condition.

It is remarkable that what Desault regards as one of the most common effects of injury of the head, viz., abscess of the liver, should have been unnoticed by Pott and other eminent English writers; the more so, as the fact had not escaped the notice of the French surgeons, as appears from a passage in the

memoir of M. Quesnay*, before cited. Its discovery is more like a result of repeated casual observation than of theory.

Mr. Rose observes, "Nor is it after injuries of the head alone, that such abscesses are formed. They equally follow wounds of other parts of the body, and during the Peninsular War I met with several instances of their occurrence in the lungs, particularly after amputations, and after other wounds of the extremities. I communicated these circumstances to Sir James Macgrigor in 1813, being then with our troops in Spain, requesting that he would inquire if similar affections of the lungs and different viscera had been observed by others. I pointed out to Sir James, as an excellent illustration of the disease in question, a case given by M. Larrey in the first volume of his 'Memoires de Chirurgie Militaire,' in which case abscesses, both in the liver and in the lungs, followed amputation of the arm. The case is that of General Caffarelli, and occurred during the occupation of Egypt by the French. The General died on the nineteenth day after he had undergone the operation, the wound from which was going on very favorably, and on the sixth day after the attack of those febrile symptoms which, as was ascertained after death, had indicated or led to the derangement of the internal organs.

"In the fourth volume of the same work, which was published after the peace of 1814, he gives an instance of a large abscess of the liver, in a Prussian

* Vid. Remarques sur les Plaies du Cerveau. Mem. de l'Acad. Tom. I. p. 330.

soldier, occurring after a compound fracture of the arm. With a view to destroy in this case an artificial joint, M. Larrey introduced a seton between the fractured portions of bone, which, after a few days, was followed by enormous tumefaction and suppuration of the arm, and by an abscess in the liver, which burst into the cavity of the abdomen. The period of the man's death is not stated. M. Larrey observes that no doubt could be entertained of this abscess of the liver being attributable to the irritation and inflammation of the arm, as the man had not previously experienced any indisposition which could lead to the suspicion of his having hepatic disease.

"I have seen repeated instances of the disease," says Mr. Rose, "in the lungs, liver, and spleen, and after various accidents. I have not been able to discover any peculiarity of constitution which could be regarded as predisposing to it. In all cases which I have seen, these abscesses took place at some period between the end of the second and that of the fifth week after the accident which gave rise to them.

"These affections of the viscera have a peculiar character, and it appears to me that this may in some degree be accounted for by the rapidity wherewith, in the state of the constitution in which these abscesses occur, any congestion or inflammation, in whatever part it took place, would be followed by effusions of purulent fluid and lymph. It is at the time when the parts, in which the injury took place, are in a state of suppuration, and in particular when, from the nature of these parts after the confinement

of the matter, great irritation of the system has been for some time kept up, that such internal abscesses are apt to form; and it often happens, as is remarked by Bertrandi, that they have not been discovered until a post mortem examination. The disease consists apparently of depositions in the cellular texture of the affected organ, partly of a white or yellowish-colored lymph, and partly of pus. These depositions vary in size, from beyond the bulk of the largest walnut to something less than a common pea; where the lymph is most abundant they may be described as a soft white tubercle of irregular shape, not contained in a cyst, but imbedded in the cellular substance of the part, and gradually blending with its natural structure. When pressed, some pus exudes from them. When the pus collects in greater quantity, it is lodged in an irregular cavity, probably in the middle of some of the tubercles; and the walls of the abscess are formed of flakes of lymph. The number of these tubercles and abscesses vary in different instances, there being sometimes only one or two, and sometimes the whole viscera being filled with them."

I can add no example more illustrative and convincing than those above referred to, of this curious phenomenon, which I consider as a well-established fact, though by no means so common as Desault represents. Two possible sources of fallacy are so obvious that it is scarcely necessary to point them out. The first being Richerand's mode of explaining it, viz., the consentaneous injury of remote parts; secondly,

the previous existence of disease. For the first, the physical impossibility of the occurrence in the majority of cases, and for the second, the previous absence of symptoms are sufficient to silence scepticism.

The natural sympathy is equally remarkable, in most cases, between the brain and liver, whichever organ is first affected, and explains why this is the most frequent, and was the first noticed instance; but the partial symptoms vary in individuals according to their temperament and habit; so that in a person of phthisical diathesis, the weight of the injury would fall upon the lungs, whereas in one subject to hepatic congestion it would probably fall upon the organs included in the system of the vena portæ; but the variety of the casualties and the diffusedness of the mischief plainly shew, that in the case of recent injury it is by the medium of the universal sympathy that the site and extent of the morbid action are determined. But the result is not limited to recent acute injury; it is a chronic state of continual occurrence. Let any candid observer watch the progress of white swelling, of scrofulous swelling of the testis, of slow and extensive glandular swellings of the neck and groin, which suppurate deeply and imperfectly, of psoas and lumbar abscesses, and, in short, of all such local diseases as have induced a chronic cachexia, and keep up an habitual hectic,—and he cannot fail to observe their tendency to produce visceral disease. If the case be one which admits of a palliative plan, and occurring in a child, he will probably see it sink into phthisis at puberty, or by dint of incessant watchfulness, live a cripple

and exotic. If the state of the part demands amputation, and over-anxiety to preserve it leads to a postponement of the operation beyond a certain time, the hectic continues, and the system succumbs before the wound is healed, instead of instantly rallying, as having cast aside its burden.

The cavities, or viscera of the chest or abdomen, will invariably be found so diseased as to have precluded the possibility of recovery. Sometimes effusion on the brain with tubercles of the lungs; in other cases purulent effusion in the chest or belly; mesenteric abscesses, or such patches in the liver or spleen as Mr. Rose has described; or complicated morbid changes produced by adhesions between contiguous surfaces and adventitious membranes are found, forming insulated pouches, or nests of matter, communicating by ulceration with the substance of the lungs, or some part of the alimentary tube, or the kidney and urinary bladder. I am confident that I am describing what is familiar to surgeons who have had opportunities of inspecting these cases. It would be as impossible to comprehend, in a description, the varieties of external disease leading to them, as of internal changes produced. It is enough for my purpose to lay down, as an axiom, the fact, that the hectic produced and maintained by sympathy with an external disorganization long enduring, as, for example, a diseased knee or ancle joint, becomes an exciting cause of various structural changes in the visceral organs, and offers the best apology for early, the strong objection to late operations. The local condition, productive of the greatest constitu-

tional irritation, is that in which matter is confined, which led doubtless to the old hypothesis of the noxious qualities of pus absorbed or thrown back upon the system; and the free discharge of matter sometimes puts an end to the irritation. The same mode of explanation as that by which the tendency of acute injury to set up remote disease is illustrated, applies to these cases, viz., sympathetic irritation, congestion, the result of irregular circulation, and inflammation, determined as to place, character, and consequences, by the circumstances of the particular case.

These secondary actions I divide into contiguous and remote. The continuous sympathy of parts is illustrated by ordinary examples, being a direct oftener than a reflected irritation. The affection commonly called erysipelas, in which the cellular membrane of the entire arm becomes progressively the seat of inflammation, from an injury to the tip of the finger, presents the most apposite and familiar instance. Such is the following.

Case. A washerwoman who had been employed to wash the foul linen of a female labouring under a cancer uteri, was compelled to apply to a surgeon on the 15th October, 1822, in consequence of an extended swelling and inflammation of the hand and fore arm. She said that about a fortnight previous to the inflammation, she had wounded her little finger with a splinter, in breaking wood. The upper part of the

fore arm was much discolored, and several vesicles appeared in different parts of it. Her pulse was 110, her countenance feverish, she suffered extreme pain, and could get no rest at night. She was purged with calomel and salts, and a stale beer poultice applied to the wound of the finger, which was sloughy; a lotion of lime water and milk was applied to the arm, and a grain of opium given at night.

16th. Pulse 120, pain excessive, no rest, two grains of calomel and one of opium ordered every fourth hour. Bowels relieved.

17th. Complains of head ache and depression, inflammation of the arm less, wound cleaner, pulse 120, bowels open: bread instead of beer poultice, pill continued.

18th. Pulse 120, slight delirium in the night, occasional hiccough; inflammation has reached the shoulder.

19th. Has had some hours' sleep, pulse 110, frequent hiccough; surface of the inflamed arm generally blistered, inflammation extending over half the breast and back to the loins, bowels much relaxed, no complaint of pain. Ordered carbonate of ammonia with opium and aromatic confection at intervals. Takes gruel only.

20th. Pulse the same, blisters appear on the back. Does not feel so low. Dozes.

21st. Slept three hours this morning, cuticle separated, a free serous discharge from the fore-arm, wound of the finger clean.

22d. Inflamed surface has become shrivelled,

and itches; no pain, pulse 100, considerably better. Continues the ammonia and opium.

23d. The blistered surface is drying up. Cerat. resinæ, instead of poultice.

27th. The wound clean but stationary; improved diet, porter.

The wound in a few days healed, and the patient recovered.

Of the contiguous inflammatory action, the following are the titles of some fatal cases in my note book.

Case. A girl whom I saw in consultation with the late Dr. Babington, died of inflammation of the dura mater and effusion into the ventricles of the brain, consequent on the sudden arrest of an habitual purulent discharge from the meatus auditorius.

Several similar instances are authenticated by different practitioners now living, and among them is the case of a late eminent Political Economist.

Case. A man whose eye ball was extirpated for a supposed malignant fungus, was attacked with symptoms of meningeal inflammation at the distance of a week from the operation, and died within the fortnight from a suppuration of the dura mater on the same side of the head.

Cases. Two females died of acute pleuritic inflammation on the same side, after the extirpation of scirrhous breast, one on the third, the other on the fifth day from the operation; the former was at the time suckling.

CASE. A man who was the subject of a chronic abscess beneath the scapula, which had been emptied by a deep puncture, and filled again, had a silk seton passed through it from side to side on the 13th April 1816, and died, in seven days after it was established, of acute inflammation of the pleura on both sides of the chest.

CASE. A deeply situated steatomatous tumor was extirpated from the axilla. The man died on the eighth day from acute pleurisy of the same side. No suspicion was entertained of the inflammation of the thorax, although the right lung was covered with patches of recent lymph, and a copious effusion had taken place in the cavity.

The cases of remote sympathetic action are by comparison rare; the larger proportion is furnished by the injuries of muscles and nerves, as in tetanus, and by the morbid poisons, especially carcinoma and syphilis. It would be supererogation to detail these, as it is the common law of their actions; only we may observe, that both tetanus and the morbid poisons also exhibit the contiguous as well as the remote sympathy, as in trismus from a wound of the poll or nape of the neck, or integument of the face, and the frequent termination of the scirrhous breast in tubercles of the surrounding integument, and of the pleura. The neuralgic affections present the most remarkable examples of the remote sympathy, as sensation, their nature and essence, is always reflected, whether the pain be actually caused where it is referred, or at a

distance from its apparent seat. To this subject we shall have occasion to return in a future chapter.

The following are instances of the remote inflammatory action.

Case. A man was struck on the head and got a scalp wound two inches in length, on the 11th November, 1827; on the third day inflammation commenced around the wound, and in spite of free bleeding and purging, quickly spread over the entire scalp and upper part of the face. Free openings were made, and pus and shreds of dead cellular substance discharged, and in the first week of December, the action had so nearly subsided, that he was reported daily improving; some of the wounds were healed, and others granulating healthily. On the 15th, he was attacked with diarrhœa, which was difficultly checked, and greatly reduced his power. His pulse was small and weak, and his general appearance that of prostration. On the 28th the diarrhœa returned, and he sunk and died on the 1st January.

Examination. There was still some pus diffused beneath the scalp, and the pericranium was easily detached. The ventricles of the brain were fuller than natural, and there was effusion beneath the arachnoid. The lungs were healthy and free from adhesions, but the pericardium was distended with a sanious serum. The interior of the pericardium was lined by a false membrane of a bright scarlet color, and easily separated, and the whole surface of the heart was honey-combed with the same adventitious deposit.

Case. A man whose leg was amputated above the knee for a fungoid tumor of the calf of the leg on the 16th October, 1821, was suddenly attacked with violent pain in the abdomen, accompanied with sickness and purging, on the 15th December following, and died on the 13th of January, 1822.

Examination. The disease was found to consist of abscesses, formed between the agglutinated viscera and the peritoneum, and ulcers of the large bowel communicating therewith.

Case. A girl with chronic disease of the knee joint, for which issues were made, and discharging, had been one month in the hospital, when she was attacked with slight rigors followed by perspirations and acute pain in the right side, with cough and dyspnœa. Up to this time, 25th September, 1816, though she had lost flesh, the health was unimpaired, bowels and catamenia regular, appetite good, and the limb being at rest, she suffered no pain.

10th October. She has emaciated rapidly, and has now a permanently quick pulse, flushed cheek, with loss of appetite.

22d October. Constitutional sympathy severe, the local disease materially influenced by it, extreme debility. Anasarca of the entire leg and foot from the knee.

16th November. Amputation above the knee.

The inner condyle of femur and opposed surface of the tibia in a state of ulceration, no vestige of ligament or cartilage. The front and outer side of the joint slightly affected, and small patches of absorbed membrane and absorbed cartilage.

18th. Pulse unaltered, bowels open, skin warm and moist; has passed a pretty good night, and is free from pain.

20th. Pain in the stump, which is swollen and oozing; the lips of the wound, though fully sufficient to cover, pale and gaping.

24th. Discharge purulent, and not too much; constitutional symptoms all improved. Takes bark and three half pints of porter in the day. Pulse the same in frequency, but soft and fuller; no complaint.

26th. The ligatures came away. The same report.

31st. Wound uniting, but discharge somewhat profuse; quite easy, except at dressing.

4th Nov. Wound much contracted. Thinks her appetite improved, and sleep refreshes her.

10th. Has had diarrhœa, but it is now checked; a slight inflammatory blush upon the stump, about an inch of which remains open.

18th. Loss of appetite, restlessness; hectic returned; cough, with copious purulent expectoration; extreme debility from night perspiration; stump easy.

21st. Diarrhœa has returned; confirmed symptoms of extensive pulmonary disease.

25th. Died exhausted.

CASE. A man, aged 32, had his ancle jammed by a weight falling on the joint on a ship's deck, on the 10th December, 1814. A uniform swelling of the joint was succeeded by successive abscesses, and fistulous sinuses communicated freely with the joint, when, his health decidedly failing, am-

putation was performed at his own request on the 10th of June following. Until a few weeks prior to the operation, his appetite and sleep had remained good. He was now emaciated, and had a troublesome cough, and quick pulse. His system was very little disturbed by the operation, but his cough continued without abatement.

15th. The stump was dressed; the edges were in apposition, but no sign of healing.

24th. The ligature came safely off, but the union was little advanced; the cough continued, with free purulent expectoration, night sweats, &c.

On the 26th of August, he died of confirmed phthisis.

CASE. Piper, æt. 32, navigator, five years ago trod on a nail, which penetrated the heel. In the evening of the same day the foot became painful and swollen, and he was laid up by the accident for seven weeks. He then resumed his work for a month, and was again laid up for two months—from which time up to the present, 3rd of April, 1834, he has occasionally suffered from the foot, though still continuing his labor.

Upon examination of the heel, the probe was found to strike upon the denuded tuberosity of the os calcis; there was a great swelling immediately below either malleolus, into which free openings were made, and a quantity of fœtid pus, containing flakes of sloughy cellular membrane, was discharged. Catapl. Lini; gentle aperient medicine.

8th. Is considerably easier; discharge copious;

tongue furred, pulse 92 and feeble, perspires much, bowels regular.—Quinæ Sulph. gr. ij. ex Inf. Rosæ ter die—Cerev. oj quotidie.

12th. Discharge very copious; health somewhat improved; operation proposed.

14th. Hæmorrhage from the external wound.—Omit the medicine.

18th. Had a rigor this morning, followed by perspiration; pulse 109, bowels open.—Amputation performed at one o'clock.—Evening, perfectly easy, pulse 112, slight cough.

19th. Has slept several hours; has no pain; dry cough; pulse 96; great thirst: diaphoretic draught.—Evening, had a rigor at six o'clock for twenty minutes; perspires much; tongue becoming dry; pulse 126, intermittent; great thirst; no pain.—Resume the quina.

20th. Has slept very little; no change.—Evening, rigor at twelve o'clock, profuse sweats, less cough and thirst; pulse 120, regular, though feeble; bowels moved once, motion white and frothy.

21st. Passed a better night, stump easy.—Evening, a rigor at three this afternoon, less cough.

22d. Has passed a restless night, having had two rigors; slight head ache, the first complaint of pain; tongue pale and moist, pulse 130, small and feeble.—Stump dressed to-day; no adhesion, but free suppuration.

23d. Countenance sunken, rigors more frequent, cough more troublesome.

24th. Slept better; rigors at irregular intervals, about two in the day: pulse 126, small and feeble,

tongue dry, bowels relaxed, motions white and frothy.—Pil. Hydr. c. Opiō. h. s. s. Quina to be increased to five grains.—Beef tea.—Brandy ℥ij daily.

25th. Has passed a very restless night; stump languid; diarrhœa continues.

26th. Has vomited twice during the night; pulse 130, intermittent, tongue dry, brown in the centre, red at the edges and tip.

27th. Vomiting and purging continue.

28th. Died at eight a. m.

Examination. The os calcis was denuded of periosteum and in some parts carious; there was a cavity in its tuberosity an inch deep, corresponding to the original wound: the astragalus also, and both malleoli were denuded, and discoloured: extensive absorption of the interarticular cartilages.

Head.—Arachnoid opaque, substance of the brain firm and bloodless.

Thorax.—Lungs firmly attached by chronic adhesions of the pleura to the whole extent of the parietes.

Abdomen.—Stomach highly inflamed. At the smaller curvature, near the pylorus, were observed four small ulcers, each about the diameter of a pea, abrupt at the edges, and penetrating the mucous and muscular coats: intestines sound: liver very much enlarged, having the character of the nutmeg liver, firm and grating under the knife: gall bladder containing merely its own mucous secretion: spleen much enlarged, and its substance pultaceous, softened down in appearance to grumous blood.

The Stump.—Arteries perfectly closed by adhesion, one only of the ligatures separated; the wound in a state of ulceration.

It is useless to add cases of this description, which I have detailed, not from any peculiarity attending them, or with any reference to the treatment adopted, but simply as illustrations of the habitual tendency to secondary disease in the viscera under severe and protracted local affections.

Thus the local diseases succeeding to fever destroy; the state of the system being so reduced as to be incapable of supporting a healthy action, they perpetuate the irritation, and tubercles are deposited, or the congested mucous surfaces ulcerate sympathetically.

CHAPTER III.

OF THE CONNECTION BETWEEN DIRECT AND REFLECTED IRRITATION. THEIR RECIPROCITY AND MIXED OPERATION; THE SYSTEM REACTING ON THE PART, AND THE PART ON THE SYSTEM. CASES.

SYMPATHY, healthy and morbid, in its most comprehensive sense, comprises the whole mystery of irritation. If an irritation, strictly local in its origin, produce a certain degree of reaction, the determination to the nerves and blood-vessels of the part presents a series of phenomena, constituting inflammation; these are uninterruptedly carried through, and thus the action begins and terminates in the part. This happens so continually that it would be idle to object to the term 'local,' whether the explanation be, that the system at large is ignorant of its existence, or that it is unroused by it to any demonstration of sympathy. If the action of the part be of such a character as to excite the sympathy of the system, a fever follows, proportioned to the occasion, and is allayed by such obvious measures as are commonly employed for the purpose, with little perhaps no hindrance to the consummation of the local action. Although this is, properly speaking, a constitutional as well as local irritation, it is one, the absence of which in such circumstances would indicate a torpid, irresponsive, and unhealthy system, and it must therefore be considered as serving

a salutary purpose. The reaction of the system upon such local irritation is a special preservative from worse consequences, being indispensible to the recovery of the part.

When the injury, from its nature or its seat, is one of extraordinary severity, the constitution is affected to great febrile excitement or depression, as acute inflammatory, or typhoid fever, but still presenting the type of fever. In extreme cases, however, as those of complicated injury, although neither involving vital organs nor the loss of blood, it loses that character altogether, and the system is permanently sunk beyond recovery, or is stunned and prostrated for a time, and recovers only to display new and anomalous modes of excitement. These, it will be remembered, are the two forms of direct irritation which I have formerly described,—"prostration without reaction," and "prostration with excessive reaction," as taking the place of fever in cases of grave local mischief, whether occasioned by violence or inflammation.

The ordinary case of reflected irritation is that in which the system operates upon the part, or upon any remote part prejudicially, or in a manner destructive to its own safety. This is exemplified in the untoward actions of erythema, erysipelas, gangrenous inflammation, supervening upon injuries; the insidious inflammation of remote parts, as the membranes of the brain, chest, or abdomen, or some visceral disorganization; and lastly, in the preternatural actions of the nervous system, as trismus and tetanus. These consequences are sometimes anticipated,

or met in time to avert a fatal result; sometimes not. To illustrate the fact, it is necessary to select cases that have run their course to a fatal issue, and have thus furnished opportunity for the observation.

It will be obvious to reflection, that the direct irritation ensuing upon injury or inflammation, tends, if continued, to the production of the state of constitution above described; as when the injury, which acts as an exciting cause, though soothed, is unredressed, and the system is, by the aid of time and circumstance, restored to seeming tranquillity, though still oppressed by a sense of inequality to sustain the demands made upon it for support and repair. In this critical position it continually happens, that the constitution of the robust, which is unused to confinement, and of the weak, which is scarce adequate to maintain health, betrays a condition of morbid irritability which impedes the process of recovery, and lapses, sooner or later, into a wasting hectic, generally producing pulmonary or other visceral deposit. In those chronic changes of structure which arise independent of any assignable local cause, some of which we denominate constitutional diseases, as, for example, scrofula, scirrhus, &c., a similar passive morbid state of the system is gradually established, which, if aroused by any suddenly altered condition of the part, frequently assumes a degree of activity destructive to life. The irritation of a change, abstractedly beneficial, as for example, the removal of a tumor, or of a limb which we have vainly attempted to save, or the discharge of a large abscess, annihilates the benefit which, in different circum-

stances, it would have afforded. Had not the powers of the constitution been already overstretched, they would have rallied on the occasion, as they have often done from a state of almost hopeless depression; but the shock incidental to the change of condition oversets it, so exquisitely delicate has the balance become by gradual adjustment between the weight imposed and the sustaining force. If fatal results are exceptions to general experience, it is because experience has impressed caution; but they occur; and it has appeared to me that a more distinct solution of the question, why they occur, than has yet been given, may render them still less frequent.

This then is the case of the direct superadded to the reflected irritation; so that the reciprocity of the two is evinced in almost all protracted cases of surgery, and indeed their protraction is generally depending upon it. In a case which goes healthily forward without interruption, the constitution and the part preserve their adjustment so equally, that irritation can scarcely be said to exist; and this is the case when, after the first alarm and resistance of the nervous system is past, the circulation quiets down and lends all aid to the work of reparation. But when permanently unfavorable circumstances attend an injury or a disease, an ill-disposed habit or a cachexia is present, a previous organic change exists, or an interference takes place with the operations of nature, whether accidental, unavoidable, or ill-judged,—each of which causes comprehends a variety of conditions in detail,—the part and the constitution

are alternate irritants, one of the other, and eventually co-operate for destruction.

I shall not impose upon my reader's patience the perusal of cases in addition to those already given, and to be found in after-pages of this volume, illustrative of the reflected irritation; actions secondary to the original mischief, and to be accounted for on no other hypothesis than that which refers them to the constitution; which occur at various intervals, some early and others late in the progress of the disease; which are exhibited upon the part or its immediate neighbourhood, or in remote parts, and in all varieties of texture; or which take possession of the sensorial or nervous muscular system, and exhaust the powers of life by the extent of their operation and their violence. But I shall add a case or two to exemplify the superaddition of the direct to the already established reflected irritation, as best illustrating the reciprocity of the two, and shewing how natural and unavoidable circumstances may set it up, how slight and otherwise harmless if not directly beneficial treatment may act destructively through this medium.

Case. On the 16th of November, 1826, a young man of spare habit fell from a scaffold, while at work on a lofty ceiling, and was conveyed to the Hospital, cold, pallid, and prostrate. The right thigh was fractured near the middle, and the upper portion was thrust through the muscle and integument. The reduction was easily effected, and the limb placed in

a fracture box, with the thigh flexed on the pelvis, and the leg on the thigh. A fracture, apparently comminuted, was also discovered, extending obliquely across the base of the external condyle into the elbow joint, which was swollen and painful.

17th. Thigh easy. Pain in the arm. Pulse 110: skin hot; thirst; restlessness.

18th. Complains of the arm only, which is placed on a pillow, at a half right angle with the trunk. Takes a small opiate in his saline draught.

20th. Better in all respects. On inspecting the thigh, the wound looked sloughy, and discharged a foul, sanious matter.

25th. Has a slight rigor, followed by perspiration occasionally, and complains of great pain in the calf of the injured leg. His bowels are open. Tongue clean and moist. No thirst, but little sleep.

29th. His wound is now florid, and the discharge healthy. A pin-hole ulcer has formed in the groin, and discharged a quantity of thick pus: this led to the discovery of a deep sinus communicating with the fracture, of which no suspicion had existed. He takes Cascarilla bark and infusion of roses. Sleeps well, and has a good appetite. House diet and porter daily. The sinus at the groin was dilated and poulticed.

Dec. 4th. The calf of the leg, of which he has complained so long, now presents an abscess. To provide for its easier discharge and for the convenience of dressing, the box apparatus was carefully removed, and Mr. Amesbury's leg and thigh splint applied.

13th. Diarrhœa, profuse perspiration, copious discharge from the leg and thigh: an ulceration of the integument over the fractured condyle exposes the bone; from this also there is a free discharge. Takes, as required, the chalk mixture with aromatic confection and five drops of laudanum. Has a pretty good appetite and sleeps well.

Jan. 5th. The bowels and skin have recovered their tone. Takes bark and opium with port wine. Exulceration over the sacrum.

Feb. 5th. Very free from complaint. Sleeps and eats well. Takes a grain of opium at night, and continues his tonic. During March he continued improving.

April 23d. Complained of pain across the forehead, having previously been for some time in a much recovered state. The discharge from the thigh reduced, and the ulcer at the calf healing. A blue pill and dose of medicine, twice or thrice repeated, removed the pain complained of.

May 21st. A detached portion of bone thrown off in a dead state from the elbow; in other respects the same.

July. It is ascertained that no bony union of the thigh has taken place. Since the exfoliation, the elbow is healed, but stiff; the wound of the calf is also healed: the discharge continues, though in small quantity, from the wound in the thigh. He is placed upon the fracture bed.

Sept. 2d. There is now apparently a firm union, not much irregularity, but considerable enlargement

of the diameter of the bone, resembling a necrosis. The back is excoriated. Cerat. calaminæ.

22d. A portion of dead bone, three inches in length, was drawn out from the wound, from which it appears that the fracture extended transversely through half the shaft, and there split the bones longitudinally and obliquely for a space of two to three inches in the upward direction; by this operation a cavity is left, and the limb is again loose.

24th. Great irritation has ensued. Pulse 120, and sharp: much heat of the skin; discharge copious.

30th. The discharge from the thigh is excessive; the ulceration of the back has rapidly increased, so as to expose the extremities of the spines of several vertebræ, and also those of the scapulæ, at their bases. Chills and flushes alternate; the latter followed by copious perspirations. Appetite entirely fails. Inability to void the urine requires the catheter night and morning. He is sinking rapidly.

Oct. 6th. Died. For some days past albuminous shreds have appeared in the turbid urine.

Examination. The muscles had degenerated to a state scarcely resembling their original texture; and the interstitial cellular membrane was loaded with serous fluid. A sinus extended from the external wound to the opening in the groin. On cleaning the femur, it appeared that a cradle of bone had been formed along the inside of the limb from the periosteal membrane, and in this hollow space was lodged an-

other fragment, consisting of half the cylinder of the bone, corresponding in part to the portion which was deficient in the dead piece extracted before his death. The elbow was firmly anchylosed; the apophysis had been broken off transversely, and an oblique fracture had extended through the external condyle across the joint. The condyles had been pulled inwards, and a little backwards by the action of the muscles during the reparative process, and in this position the fracture had united.

The circumstances in this case were those of severe complicated injury. The young man was spare and rather delicate, and it is probable he might have sunk under the first reaction of the system, the violence of the direct irritation, had he been stout and robust. As it was, he grappled near upon a twelvemonth with the mischief; during a considerable portion of this time he was free from suffering, and enjoyed healthy appetite and sound rest, and was evidently regaining power. There can be little doubt that he would have recovered, had it not been for the sequestrum and the irritation caused by its detachment on the 22d September. But this reproduced the fever of irritation; the discharge, which had ceased, became excessive, the perspirations profuse and wasting, the ulceration of the points of pressure deep and rapid. He was unable to take nourishment, or to void his urine, which became albuminous and fetid, and he died in a fortnight.

Case. A gentleman whose avocations in business had

been interrupted, and his strength impaired by frequent alterative courses of mercury for superficial ulcers of the fauces, rheumatism, papular eruptions, thickened periosteum, and, in short, that state of cachexia which Mr. Abernethy terms pseudo-syphilis, was recently convalescent from these attacks, when, in passing a fire-place, he struck his shin against the head of a poker which lay across the fender. This was followed by indolent inflammation, and at length matter formed beneath the periosteum. As the system was evidently a good deal disturbed, it was necessary to confine him to his bed; the periosteum was freely divided, and a teaspoonful of healthy matter discharged.

From the time of his taking to his room, this gentleman discovered an alarming impatience of confinement, and could with difficulty be kept at home. Though naturally cheerful, he became desponding, owing to his frequent relapses of indisposition, and being a man of a delicate and honorable mind, was not consoled by reflections on the predisposing cause of his malady. The wound assumed a sluggish, unhealthy character, its edges thickened, everted, and painful, and a thin ichor flowing from it. The patient had neither rest nor appetite, and after three weeks' confinement to bed, a blush of inflammation appeared round the wound, and extended so rapidly, that in a day or two the entire limb from the knee downward was an œdematous shapeless mass, fully twice the size of its fellow, and of a dusky red color. While this change was taking place, the patient was seized with sudden delirium, so fierce as to require

restraint, which was broken by intervals of the most obstinate and sullen silence, in which he appeared partially rational. After this state had endured three days and nights, he died exhausted.

It was the opinion of eminent men who visited this gentleman with me, as well as my own, that the extraordinary irritation which the system evinced, and the rapid and unfavorable local changes, were results of the previously enfeebled yet excited state of the constitution.

Case. A gentleman, the subject of caries of the upper lumbar vertebræ, after many months' confinement to his couch, had psoas abscesses on either side of the pelvis. Up to this time doubts had been entertained on the question, whether the vertebræ were actually diseased or not, by some of the surgeons he had consulted, although issues on the seat of pain had been directed. By attention to rest, diet, and the advantage of sea-coast atmosphere, his health had been remarkably supported; he had suffered but little pain, had a pulse and countenance of health, and was cheerful in spirits, being sanguine of recovery, and in fact, under an engagement of marriage.

The collection on the right side became at length so considerable, that it was deemed advisable to discharge the matter. It took the gluteal side of the os innominatum, following the sciatic fossa, and lying on the corresponding side of that thigh and leg; on the left side, the collection was small, and pointed, as usual, in the direction of the psoas muscle to the

groin. An incision, about an inch and a half long, was made at a convenient part of the swollen integument of the right thigh, and a large quantity of matter was discharged, having a curdly appearance. He expressed relief. A poultice was laid over the wound, and a roller lightly applied round the loin above and the limb below. The next and following day the system remained tranquil and free from fever. In the course of the night succeeding, the patient was attacked with nausea, vomiting, and rigor, and died in a state of collapse at noon on the fourth day.

Examination. An immense quantity of matter was contained in the sacs of the abscesses; the preternatural union of the first and third lumbar vertebræ was effected by buttresses of bony matter, leaving intervals of communication between the sacs respectively, and a membranous pouch or sac occupying the place of the second vertebra, and filled with matter.

The death of this gentleman was quite unexpected. There was no appearance of inflammation on either of the viscera or their cavities, and the artificial union was much advanced. I could only attribute it to the shock occasioned by the free evacuation, and rapid refilling by secretion of so extensive a sac, in a system whose powers had been previously undermined by long confinement.

Case. A young lady, a native of the West Indies, receiving her education in this country, became my patient some years ago for a painful affection of the knee-joint. She had been for some time confined to

her sofa, and had tried liniments, local blood-letting, and the various applications in ordinary use.

Finding the pain obstinate, I opened a large blister, fairly removing the cuticle over the joint, excepting only the part covering the patella. The suppurative inflammation was readily established, and the secretion abundant. The constitution very soon shewed signs of great weakness and distress; nausea and fever followed. She complained of excessive soreness of the part; the raw surface began to ulcerate deeply, and the granulations turned sloughy. Mild cerates and poultices, which had been substituted from the time at which the sore became inflamed, the solution of opium, and other anodyne fomentations, were of no avail to arrest the sloughing process, which completely exposed the ligaments of the joint. The discharge ceased, and the surface presented an appearance resembling dry gangrene. Opium, ammonia, sarsaparilla, bark, and the other remedies adapted to sooth and support the system, with a careful administration of cordials, were employed to no effect; a state of extreme prostration and irritability ensued; the integument of the sacrum took on the same condition; she became typhoid, and died about three months after the application of the blister.

The West Indian constitution is one of feeble powers; though from her infancy inured to this climate, this young lady was of slender frame and strumous diathesis; she had suffered in health from the confinement, being incapable of standing and of moving the joint without pain. The destructive process was similar to what is more frequently seen in weakly chil-

dren. It is the only case in which I have seen a blistered surface fall into gangrenous phagedena in the adult.

In revolving such cases as the preceding, of which I imagine it is not necessary to multiply examples, it is natural and right to inquire if the local treatment, either in doing too much or too little, had not in a measure to answer for the result. And though it is not with a view to recommend the treatment that I bring them forward, I am quite ready to admit, that had I been aware of the advantages attending free incisions in the state called phlegmonoid erysipelas, to which the second case approached, I should have anxiously availed myself of that knowledge, though with what success must remain entirely doubtful. In the third case, the direct mode of opening so large a cyst was a result of consultation, and it is fair to say, was not in accordance with my ordinary practice or preconceived opinions. It was adopted, however, in conformity to those of others, whose authority is amply entitled to the high and universal respect which it enjoys. But I consider the result as influenced by the practice, and cannot approve the direct opening of these collections as common abscesses. The oblique or valvular opening and partial discharge on Mr. Abernethy's plan, whether the wound heals or turns fistulous, is, in my confirmed opinion, the only safe method of proceeding. With respect to the fourth case, I can only say, that the open blister, in synovial inflammation, is one of the most efficient remedies with which I am acquaint-

ed; but perhaps a more matured experience would have led me to employ a blister of less superficial extent, and to have refrained from stimulants to prolong the suppurative action in so delicate a subject. All this, however, does not invalidate the conclusions drawn from the cases in a pathological view.

For the sake of illustration by contrast, I annex a case of direct irritation proving fatal from the same cause, although the blister did not exceed the diameter of a crown piece, and was not sore for more than a week.

Case. A young man, æt. 20, admitted Oct. 9th, 1833, had a firm swelling, the size of a large walnut, above the inner condyle of the humerus; he complained of pain, but the skin was uninflamed, and his health was reported good. A dozen leeches were twice applied, and in the interval poultices of linseed meal; afterwards, the spirit wash.

18th. The size of the swelling somewhat reduced; pain the same. A calomel and opium pill each night; house-physic alternate mornings; a blister to cover the swelling, to be dressed with cerat. sabinæ.

22d. The same degree of pain; blister has drawn well.

27th. The surrounding skin is inflamed. Substitute simple cerate for the sabine; omit the pills at night.

28th. Feverish; hard and quick pulse, hot skin, pain in the head. A purgative given this morning has acted freely. Mist. salin. c̄. liq. antim.

29th. Diffused inflammation of the integumentof the upper arm.

Nov. 1st. The inflammation has surrounded the upper arm and extended over the shoulder. Apply twenty leeches and poultice; two grains of calomel and two of antimony in a pill every six hours.

Nov. 5th. Two considerable abscesses, one on the outer, one on the inner side of the arm; both opened, and a poultice applied. Pills discontinued; tinct. opii ♏.v to be added to each dose of the saline effervescent draught.

6th. Excruciating pain during the night, accompanied with slight delirium; towards morning great restlessness, which increased to raving delirium; laborious breathing, small and frequent pulse, spasms of the lower extremities and some of the muscles of the face.—Enema terebinth. and a blister to the occiput. The injection operated freely on the bowels in an hour, and was repeated in the evening.

7th. The patient had recovered his senses; the pain in his arm was severe; a tranquil manner and pulse, and in the course of the day some sleep.

8th. During the last night a very sudden relapse took place; he had no sleep, his delirium returned, and was greatly increased; his breathing became hurried and difficult; pulse exceedingly quick and slender. At eleven, a.m., he died.

An unusual degree of anxiety was evinced prior to the attack of fever, and he experienced great mental distress from the absence of his relations, who were not until very late aware of his danger.

Examination. Neither of the abscesses extended beyond the cellular membrane; the tumor was subcutaneous, and consisted simply of condensed cellular and fatty substance; some of the axillary glands were enlarged. The vessels of the brain were distended with blood; the viscera of the thorax and abdomen were all healthy.

In this case the malady was considered and appeared trifling; the pain must have been owing to the implication of a cutaneous nerve. There was no correspondence between the local and constitutional disorder. The inflammation was speedily relieved by suppuration; the whole action was superficial. The irritable state of the habit determined the severity of the local action on the small excitement of a crown-sized blister, and I have no doubt that the excision of the tumor would have been equally fatal *.

My friend Mr. Earle obliged me with the case which follows.

Case. "Major C., aged 54, had his leg removed in India about thirty-five years before, from which time he had suffered more or less with irritable stump. The pain increased so much in 1831, that he consulted several medical men, and was for some months under Mr. ——, who promised to cure him with bandages. In September he consulted me respecting the stump, and stated that he was willing to submit to a second amputation, as the pain and irritation were rapidly undermining his health and spirits. On

* Vide case of Anne Pearson, Vol. I. p. 83, 2d edition.

a careful examination, I detected a little fluid under the periosteum of the tibia, near the extremity of the stump, on pressing which part I caused an increase of pain. On pressing in the course of the nerves, there was no sensible increase of pain, and the affection was not like the usual neuralgic affection from enlarged extremity of a nerve. Conceiving that there might be some disease of the bone, I proposed to make an incision through the integuments down to the bone, freely dividing the periosteum. He very readily consented to this, and the following day (Tuesday) I made a perpendicular incision down to the bone, let out a little discolored serum, and on examination found the surface of the bone rough, but not materially diseased. The wound was left open, a linseed poultice applied, and he was directed to keep quiet. In the evening, when I saw him, he thanked me for the great relief I had afforded him, and said that he was sure I was right, and that he had not experienced the slightest pain from the time of the operation; that in fact I had entirely removed that which had so long tormented him.

"I saw him the following day, and found him quite well, and free from pain. I was obliged to leave town that evening, and did not return until Friday morning, when I found a message requiring my immediate attendance. I found that on Wednesday night he had been seized with bilious vomiting, for which Mr. Cox had ordered him some calomel and aperient medicine, and that he had continued to vomit bile, and to be very restless and agitated up to the time of my seeing him on Friday. At this time his pulse was quick, his countenance very anxious,

and complexion suffused with bile. He begged to have more calomel, and said, as an old Indian, that I must give him ten or twelve grains, and that he should soon be well. During the whole of this time he was free from pain in the stump; the wound was beginning to discharge, and there was not a semblance of inflammation in any part of the limb.

" On seeing him again in the evening, his countenance betrayed still greater anxiety, and he was very restless. At this time he complained of pain in the left foot and right elbow, which were swollen, and the integuments slightly inflamed. It appeared to me that he was about to have a fit of the gout, to which he was occasionally subject, and I left him for the night, in hopes of finding it more established in the morning. His stomach retained a little brandy and water, and his spirits were better.

" On Saturday morning I found him much worse in every respect. He had slept, but was wandering and muttering in his sleep; his strength was greatly reduced; he had a general tremulous action of the muscles; his skin was generally suffused with bile. The heat and swelling had entirely left the foot, but the right fore-arm and arm were much swollen and painful, with very slight erythema of the integuments. The constitutional irritation and swelling of the arm increased through the whole of Saturday, and at night the swelling was so great, apparently from effusion into the inter-muscular cellular tissue, that I was much alarmed for his safety, and called on Mr. Travers, who was unwell at the time, but promised to meet me early the following morning. The pulse during this time was not much increased in fre-

quency, and his tongue was loaded, but moist. When we met at seven o'clock on Sunday morning, the report was that he had slept during the night, but had been delirious. The whole arm up to the shoulder was enormously enlarged, and deep-seated sloughing had taken place. His countenance was haggard, and his skin bathed in cold clammy sweat. He was sensible when roused, and answered rationally. It was quite obvious that a few hours would close the scene. He died about eleven o'clock a.m., by which time the whole arm had perished.

"Permission to examine the body was not obtained until the following day, by which time the whole body had so far undergone decomposition as to be quite black and distended with air. I contented myself, therefore, with examining the vessels and nerves of the stump. The veins and arteries were quite healthy, nor was there the slightest appearance of inflammation on that limb. The internal popliteal or tibial nerve was much enlarged, and bulbous at its extremity, and its neurilemma thickened, but exhibited no appearances of recent inflammation."

I shall probably have occasion to refer to this very interesting case under another head; but it is introduced here for the purpose of shewing, like those preceding it, how the slight operation described, calculated by its design to afford relief, and actually doing so by the removal of the first cause of suffering, is converted into an engine of destruction by the excessive universal sympathy which it excites in the peculiar wrought up state of reflected irritation.

The phenomena of reflected, *i. e.* reciprocal, irritation, require to be more carefully studied than they have hitherto been by those who consider the profession of surgery a branch of science, and not a purely mechanical art. It is only of late years that the pathology of surgery has been cultivated, and for this we are mainly indebted to the genius of Mr. Abernethy, who possessed a mind of too philosophical a cast to be satisfied with the bare observation of facts, leaving their analysis and the relation between effects and their causes to more curious enquirers. There is a restlessness about a mind endowed with the power of investigation by induction, to trace the connection between phenomena which are obvious to the senses, and those which, though less apparent, are not less real. The share which the constitution takes in diseases falling strictly within the province of the surgeon is so important, and exercises so vast an influence over the event, that I cannot but feel more surprised at the credit which our predecessors obtained, in neglect of such enquiries, than at the advances which the last twenty years have witnessed in the scientific improvement of surgery. A more perfect physiology is necessary, I admit, to explain much of what we see every day,—but next to the consciousness of this deficiency, I believe that a habit of reflecting carefully upon morbid phenomena to the extent warranted by such data as we possess, will prove the strongest incentive, as well as the most efficient instrument, towards the improvement of physiology. The evils to be apprehended from

applying the faculties of our minds to this object are first, an over-minuteness in our investigations, to the frittering away or oversight of master facts, or, on the other hand, a too rapid adoption of general principles and conclusions from insufficient particulars. The first is an error common to the humbler class of intellect, though not always that of least pretension—the latter is the rock upon which natural quick-sightedness and ambitious enthusiasm, wanting the discipline of patient and laborious and truthful habits, so often make shipwreck of reputation.

Medical Surgery is the offspring of the scientific study of our department of medicine, and I am disposed and desirous to believe that it is the characteristic distinction of the surgery of this country. Wherever the local disease is important from its seat, its character, or its origin; the constitution, its powers and habits, become so intermingled with it, that to regard either exclusively, or to assert that they admit of being so regarded, is the worst because the most dangerous empiricism. Look at the simplest, and seemingly most truly local affections, as ulcers, at the variety of their kind, of their origin, of the states of body and habits of individuals in whom they occur—will it be contended that the regimen or the due action of the great secreting organs is immaterial either to their cure or to the prevention of a relapse? Look at phlegmon and abscess in all its varieties—at lymphatic glandular swellings, and swellings of glandular organs, as the female breast and the male testicle,—at the various

affections of joints and their apparatus, whether from injury or disease—at the multiform diseases of bone —at the class of tumors and their boundless varieties, according to situation, habit, &c., the diseases of arteries and veins, absorbents, and nerves—of the skin and the several classes of membrane. It would be in a comparatively small number of cases that we could undertake the cure of these diseases, without the aid of such general as well as local management, as theory and experience teach us avails so much in tempering the action of vessels, and rendering it obedient to our intention. Pain is a condition often unaccompanied by sensible change of texture, though it has a fixed and defined seat. Its varieties, and those of its origin or cause, might fill a volume. In how few instances do we trust to local applications or local means of any description for its cure.—To bring the case home: what surgeon of any pretension to science, would condescend to practise his profession, restricted to the employment of local remedies?—Or if so shamefully ignorant as thus to degrade himself, with what credit or success would he maintain his practice? The long confinement that many surgical diseases demand, is of itself a cause of complication, and deranges the functions of the machine, independently of the constitutional sympathy with the particular malady. But be it remembered, in all chronic diseases, of whatever character, a gradual and unfavorable change is working in the system, and this is generally proportioned in extent to the duration of the malady as much as its severity.

A large proportion of visceral originate from external diseases; and it is in the imperfect performance of the functions of one or more of the viscera, that the most intractable external maladies take their rise.

CHAPTER IV.

OF LOCAL CHANGES OF STRUCTURE NOT ESSENTIALLY INFLAMMATORY. OF LOCAL INFLAMMATION SUPERVENING ON CONSTITUTIONAL DISEASES. OF LOCAL INFLAMMATION GENERATING CONSTITUTIONAL DISEASE. CACHEXIA. OF SCROFULA, CANCER, SYPHILIS. CACHECTIC ULCERATION AND GANGRENE. CASES.

We are too much accustomed to consider every change of texture a result of inflammation; the thickening or attenuation of membranes is accounted for on no other principle. Every effusion is inflammatory, every deposition is adhesive matter, or at least a secretion of inflamed vessels, and every removal of substance a process of ulcerative inflammation. Thus, to account for very various and distinct phenomena, both of the system and the part affected, very dissimilar qualities in the products of what we denominate inflammation, we have not only acute, sub-acute, and chronic, sthenic and asthenic, true and spurious; but scrofulous, scirrhous, fungoid, rheumatic, gouty, and venereal inflammations, to each of which a peculiar action is assigned.

Inflammation is in itself the same, although its character and products vary according to the influ-

ence exercised by the constitution, and the term specific is used to designate such actions as are characteristic of a certain previously existing state of constitution, and peculiar to it. Admitting this, I contend that many effusions, depositions, and absorptions, both simple and specific, are in no degree inflammatory, and it will be therefore necessary to set this matter clearly before my reader, in order to the right understanding of the subject of this chapter.

The prevailing misconception has arisen partly from the imperfect elucidation of the phenomena which present results similar to those of inflammation, but principally from the circumstance of inflammation being superadded to such changes in the progress of disease: as from growth or distension occasioning a natural effort towards a crisis, or from the loss of passive resistance and support in contiguous parts by a process of wasting, or from incidental injury; or the effects, yet more common, of surgical treatment for relief.

When a lymphatic gland, instead of its proper pulpy texture of a greyish brown color, is found to consist of a firm suety substance, or to contain a white curd-like fluid; or when the proper texture of the testis is so converted, with a very moderate or no increase of bulk, and preserving its uniformity of figure; when there is neither pain, heat, nor redness, nor any sign of increased vascularity, nor any discoverable derangement of health, what reason have we for considering it as inflammatory action? When on laying open a cyst in any part of the surface, a whey-like fluid or a transparent serum or a fluid resem-

bling the albumen ovi, or a gristly substance deposited in concentric layers presents itself, when the general system has not recognised its existence more than the part by any symptom characteristic of inflammation, on what ground do we assume that such productions are results of inflammatory action?

When as a consequence of excessive distension, or of wound, inflammation supervenes, its signs are present and we see the change; we find the healthy or the morbid secretion mixed with or supplanted by the matter of inflammation, and the latter taking its place as the former is discharged or absorbed, and thus we speak of sero-purulent, muco-purulent, and sanio-purulent discharges.

If we incise a bursal swelling of the knee pan, when simply enlarged, the fluid which escapes is the proper albuminous secretion. If we open it, when inflamed by extreme distension or irritated by treatment to inflammation, we shall find the discharge sero-synovial, sero-purulent, or pure and well digested pus, according to the stage of the inflammation.

How are we to reconcile the phenomena of many dropsies, as of the cellular membrane in simple œdema and anasarca, of congestive ascites, of transparent hydrocele, hydrops articuli, of adipose and fatty tumors, and steatoms, and such sebaceous cysts as those common to the face and hairy scalp, with the idea of inflammatory action?

Inflammation doubtless may give origin to these and similar changes, as it produces an opacity of the crystalline lens, although the cataract in the ordinary form of the disease is wholly unconnected with an inflammatory

process; and this in proportion to the former species is more frequent.

The elementary structures of scrofula and cancer are themselves produced independent of inflammatory action, and are strictly speaking incapable of the production of adhesive lymph or pus; it is only when inflammation is superadded to them that secretions at all resembling these are formed.

But in the original formation of a scrofulous or cancerous cyst, or tubercle, we have a deposit *sui generis*, granular, lardaceous, cartilaginous,—neither of them organizable forms of deposit, or presenting any trace or apparatus of organization,—and fluid matters and fungous growths of every variety of color and consistency, all peculiar, and all distinct from the recognised products of inflammation with which eventually they become mixed and blended.

It is therefore only correct to speak of inflammation as ensuing upon or superadded to these morbid actions to complete the course of the disease to its termination, or as set up by artificial stimulation, or the irritation inseparable from the advanced stages of their progress. With inflammation they have only this in common—they are modes of action as widely differing from those of health—parasitical productions deriving their existence and nourishment from the capillaries of contiguous parts.

If the presence of inflammation is determined by certain acknowledged evidences of its existence, it is not necessary to urge the argument, that secretion, morbid as well as natural, is in numberless instances independent of inflammatory action. Slow altera-

tions of structure are therefore improperly denominated "chronic inflammations"; indolent tumors in general, even bulky ones, whether solid or fluid, give no such sign. The origin, there can be no doubt, of these swellings and collections is due to a distinct series of actions, the obstruction or deficient action of absorbents, or the preternatural out-pouring of the excretory and exhalant capillaries from congestion of the venous circulation and other causes; hence many are to be regarded as purely passive in their formation. Mere dilatation resulting from obstruction is so slow and gradual as to lead to the formation of a cell or sac without exciting inflammation, and the vitiated or redundant secretion may be absorbed in part, and in part renewed, under the various states and changes of the capillary circulation, or may remain without change for years, unoffending and almost extraneous to the system.

The thickening of the tunica vaginalis in chronic hydrocele, and in the old irreducible hernial sac, is a process similar to the impaction and condensation of the cellular membrane in the formation of cysts; and the effusion of adhesive matter may doubtless take place under the stimulus of a slow but continued pressure in one instance, and the absorption of original structure in another, by a process quite distinct and often anticipatory of inflammation. What determines that pressure should in one case thicken and in another attenuate, in one case promote the addition of a new, and in another the removal of an original texture, is the mode and degree of the local irritation applied, affecting either the nutrient or the absorbent

action; this is the proximate cause; the remote cause is a final principle established in subservience to the economy, which may not improperly be termed a law.

When adhesive inflammation takes place so as to form an adventitious membrane, this having become an organized and adopted texture, and the inflammatory action being superseded, the secretion from its vessels may be of a nature similar to that of those by which it was formed, or peculiar to the new structure. Thus the cyst may secrete what the follicle secreted, of which it is a mere dilatation, converted into a shut sac by occlusion of its mouth, as we see in the adipose, sebaceous, and meibomian cysts: or it may secrete a substance totally dissimilar to any secretion of health and equally so to serum, adhesive lymph, or pus, as is seen in the ricy, the glairy, the chocolate matter of real cysts in different situations. And it is as familiar on the other hand that it may secrete either serum, coagulable lymph, or pus, the recognized products of inflammation directly, or in successive stages.

But there are an infinite variety of morbid changes or conversions, additions, and losses of substance, in which up to a certain period, no appearance, nor any symptom analogous to the appearances and symptoms of inflammation is presented, until they come under surgical inspection; when it happens, for obvious reasons, that these results are so incorporated and blended that they are regarded as having a common *i. e.* inflammatory origin.

"Although," says Mr. Hunter, "we find collections

of extraneous matter, something like pus, in different parts of the body, yet such extraneous matter is not pus; however towards the last in such collections pus is often formed, but then this is in consequence of inflammation having taken place towards the surface, and when such collections (cysts) are opened, they immediately inflame universally, similar to every breach of the solids, and then the future discharge (secretion) is pus."*

We do not decide that secretions, apparently similar, are in one case inflammatory and in another not, because in one case they serve the purpose of health, and in another of disease; for the adhesive matter which agglutinates the pericardium to the heart, or the intestinal folds to each other, is the same as that which unites the opposed lips of a wound or seals the mouth of a divided artery, namely, the pure result of a definite mode of inflammation. But where the symptoms of inflammation are absent and the morbid secretion differs in its properties and appearances from those of inflammation, we are warranted in speaking of non-inflammatory secretions. The contents of inflammatory and non-inflammatory vesications, of inflamed and non-inflamed cysts, are as different and distinct fluids, as the surfaces which secrete them, and the circumstances under which they are formed. The same may be said of the fluids of the natural cavities, sound and inflamed, as the tunica vaginalis, the pleura, the peritoneum, in the respective accumulations arising from congestive dropsy, (morbid

* Hunter on the Blood, &c. Chapter IV.

excretion,) and the fluid effused under inflammation, (morbid secretion,) whether from injury or disease.

Look at the varieties of the products of ovarian, hydatid, synovial, mucaginous, and sebaceous cysts; at the transparent lymphatic pellicle which coats the surface of the freshly exposed cutis and the tough dense covering of an irritable and indolent ulcer, the one inviting organization, the other resisting it—the one formed by a strictly vital, the other by a semi-vital or half artificial process. Then survey the varieties of solid tumors inflamed and non-inflamed, hard and soft, the lymphatic-glandular, the atheroma, meliceris, &c., &c., as they used to be distinguished by their supposed analogies, the adipose, or mere redundancy of fatty growth, the sarcomatous, the mammary, the pancreatic, the fibro-cartilaginous, osteo-sarcomatous, the horny excrescence, the varieties especially of skin tumors, warts, and condylomata; of tumors proper to the blood-vessels, to the serous and mucous membranes, and the modification of tubercle in particular organs, scrofulous and scirrhous; the varieties of parasitical growths, as the genuine hydatis and the medullary, hematoid, and melanoid fungi. The sections of many, in their elementary form, present such varieties and such an entire absence of every symptom and ordinary product of inflammation, that whether determined by the texture in which they are formed, or peculiar to a newly organized surface, we can only regard them as the results of a morbid irritation, whether to excessive or defective action of the capillaries of the part: which unheeded are capable of depositing and absorbing to an

extent that continually excites the astonishment of the patient, who cannot imagine a tumor to have been formed or dispersed within the space of a few hours, when he suddenly lights upon the discovery.

I am aware that there are varieties of inflammatory as well as of non-inflammatory morbid actions, as of the mucus of the nares, fauces, and bronchi in inflammatory catarrh, the lymphatic and puriform effusions of inflamed membranes, and even the adventitious formations of granulation and of callus, which are as dissimilar in their construction and properties as in their stages, some being as great barriers as others are accessories to healing. But these being attended by the unequivocal signs of inflammation, are but so many additional evidences to shew how varieties of product are depending on the various modifications of vital action.

OF INFLAMMATION SUPERVENING ON CONSTITUTIONAL DISEASES.

From these observations it follows that inflammation is not an antecedent, but a consequent, in a large proportion of cases, in which changes both of increment and decrement are taking place in the solids of the body. Distension creating pain in the one case, and the collapse or falling together of parts from loss of substance and support in the other, being the ordinary exciting causes of inflammation, when such changes are of spontaneous occurrence.

If, then, inflammation be a consequent only, what is the condition antecedent to these changes? Local irritation, the sources of which are more numerous than those of injury. They are likewise in many instances obscure, many are unproductive of permanent consequences, and when the system is in health, the consequences are for the most part simple, unimportant, and of temporary existence. If inflammation supervenes, it runs its course and leaves the part unimpaired. But it is not so if the system is either not in present health, or not a healthy one by temperament or circumstances, as in the scrofulous or cancerous diathesis. And thus the very trifles which are utterly disregarded by some persons, in others form the fuel or kindle the flame of incurable maladies. Irritation purely local may originate a simple, but not a specific inflammation, though the effect of the local irritation will be to excite the inflammation which is according to the constitution.

The symptoms which attend upon these chronic

changes are a sensation of general malaise, languor, and lassitude, wandering pains, unequal distribution of blood and heat, uncertain rest and appetite, gradual decline of muscular tone and power, and perhaps of flesh, variable secretions, both as to quantity and kind, and an uncertain state of the temper and spirits. These are the signs of irritation from chronic change, and are indicative of the state of the system which has given origin to the morbid action, as much as of its effects. I call it, therefore, reflected irritation.

The cases of extensive chronic change, which, unconnected with a specific diathesis, endure for years, causing great inconvenience and great deformity, without producing one constitutional symptom of a truly inflammatory character, form a very large class of surgical diseases. But when the state of inflammation supervenes, and leads on to the institution of the hectic paroxysm, thenceforward the wear and tear becomes destructive; and unless the cause admits of speedy removal, it is not the external malady to which our attention and our fears are directed so much as to the organs which support life, especially the lungs.

The irritation of the constitution is barely perceptible in the early stage of the specific diseases. In scrofula, in all the varieties of cancer, in the numberless tumors and ulcers which have no obvious and direct local cause of origin, the constitution which has given birth to them being predisposed to their formation, discovers little sympathy with them when formed. The seeming exceptions to this observation, are those set up by violence, or whose situation interferes with the structure and function of

vital organs, as tubercles in the lungs, brain, stomach, or liver, for example.

Then the irritation becomes direct, and sets up fever which rapidly proves destructive; for reflected irritation, if left to run its course, is slow in comparison with the direct, which, though originating in some purely local cause, acts, as we have seen, with such intensity as to excite the instant sympathy of the brain and stomach, and thence of the universal nervous system.

In the case of specific disease, the local change marking the accession of inflammation, is attended by an alarming aggravation of constitutional symptoms, by reason of the reflected irritation previously existing, of which the external appearance was perhaps the first clear indication.

The tumors of scrofula are seldom or never painful, unless by pressure on the course of nerves, until they take on inflammation and suppurate.

It is only after a period of uncertain duration that the scirrhous tubercle is a seat of pain, and that seldom considerable. But the period of its accession is important, as it gives notice of the inflammatory character superadded to the specific, that which Professor Scarpa and others consider more urgent for, or prohibitory of the operation, as the case may be, than any other sign.

The venereal is a disease of irritation; its entrance into the system is by means of an inflammatory process, and it is by the inflammation of distant parts modified by the poison, that its presence in most cases is demonstrated; but this is contingent, not

essential to the constitutional action of the poison. This, as it appears free from the action of mercury or of cold, is not characterised by the ordinary signs of inflammation. For example, the skin being lacerated, or excoriated, or inflamed by some acrid substance to the production of a pustule or ulcer, must be subject to the processes which a læsion entails from whatever cause. We are constantly meeting with cases in which unquestionable symptoms of secondary lues are traceable only to a superficial sore which almost escaped notice, and either got well of itself, or on some very slight astringent application, having left no vestige. So a chap, by which the true cutis is exposed, is painful necessarily, and not because it admits a poison. A swelled gland, as a bubo, is painful where from obstruction and distension it inflames, and not painful from the transmission of a poison; for this often passes without inflaming it, and it is often most painful when a poison is out of the question. A venereal eruption is not in any sense painful, but inflammation of the throat or periosteum is always painful, whatever be its origin, and pain is necessarily attendant upon a deposit beneath a fibrous membrane or a loss of substance in a highly organized part, whatever be the occasion of such tumor or ulcer. Inflammation is not the direct and substantive, but the incidental and accessory action of the syphilitic poison received into the circulation, as it is also of the cancerous.

Inflammation, however, when it occurs, is so modified by the presence of the poison, that the appearances of venereal eruptions, of venereal sore throat,

and venereal ophthalmia are for the most part distinguishable from those of common inflammation affecting the same parts, which may equally be said of scrofulous and cancerous tumors and ulcers.

Here, then, is the substantive proof of a morbid state previously existing, an irritation reflected from the system upon the part, and shewing itself in the specific type of its inflammatory changes, whether derived directly from an hereditary or a foreign source, or formed in the individual upon a sore, the fomes of a morbid poison, or independently of any extrinsic agent or circumstance whatever, all which cases are, one or other, exemplified by scrofula, gout, syphilis, cancer, glanders, &c.

A morbid poison, i. e. a poison generated in the individual after the model of a poison inoculated, will sooner or later show itself in an external form, but independently of that it will give notice of its existence by a visible decline in the functions of health. The changes which ensue will be in the action of the capillary vessels, those which absorb, and those which secrete, upon which the due nourishment of the system depends, both as regards the quality of the blood and the action of those vessels. I conceive that a man may die of scrofulous or venereal irritation and atrophy without an external or local sign demonstrating its interference with the vital economy; but it will generally happen that certain morbid sympathies occasioning local embarrassments to circulation,—as congestion, effusion, or absorption,—will have exhibited their local types.

A venereal ulcer of the sacculus laryngis has been

discovered after death where it had not been suspected, in the absence of any visible sore. I have elsewhere mentioned a case where such an ulcer of the os uteri, the case being unsupported by any visible feature of lues, had been treated for cancer. And practitioners seeing much of this disease, can have no difficulty in recalling cases, in which the external symptoms were slight and doubtful, both from their aspect and the length of time which had intervened since the exposure of the patient to infection, and the alleged absence of primary sore, among persons who had no motive for concealment in addition to their being credible on the score of intelligence, and where the history delivered by themselves formed the principal material for judgement. In such cases, the marcor, night pains, fœtid sweats, and general decline of the health have been the prelude to phthisis, if that had not already commenced, and mercury would have been inadmissible under the clearest evidence of the presence of syphilis. The reverse of this case is yet more common, where the loss of parts and every token of the disease in its severest secondary form is witnessed in individuals, who deny the existence of a primary affection of any description whatever, for a long series of years. Either of which cases are conclusive of my argument, that inflammation is an accessory, not a principal action of the poison.

I consider inflammation specific, in being subordinate to the specific irritation, and when this is the case, it is of a chronic character, and circumscribed as in the scrofulous white swelling, in the scirrhous tumor of

the mamma, in a genuine syphilitic ulcer of the glans penis. If the action is rapid and vehement, and threatening extensive disorganization, we may be sure it is the work of some other agent in combination, as to take the last example, a state of high inflammation from neglect, or venereal abuse during the existence of sores; confinement of matter, as in perfect phymosis; intemperance, or the previous employment of mercury in frequent irregular courses during unrestrained exposure to weather. The same remark applies to venereal ulcers of the throat and external skin, to eruptions, nodes, venereal ophthalmia—take away the susceptibility to inflammation from exposure and other incidental causes during the excitement of the system by mercury, and the severe local consequences referred to the action of syphilis would be no more seen.

Inflammation then is the adjunct to specific diseases, as scrofula, cancer, and lues, which determines their activity and their issue when the irritation proper to the disease has so taken possession of the system, that the slightest external causes of excitement will call forth the local changes peculiar to each. Thus in the scrofulous subject, a common strain will produce a diseased joint or a deep seated abscess; in the cancerous, a blow or a glandular enlargement from any cause will become a scirrhus; and in the syphilitic, irregular living, or a blast of damp air chilling the surface will set up the inflamed iris, or the ulcerated throat, or the nodes and blotches of that disease. Dabbling with mercury infinitely aggravates

this risk, and hence has been supposed to constitute the more formidable part of the disease.

We cannot always be observant of the accession of inflammation and its cause, but this we cannot overlook, that the class most exposed to such causes as the above, are the great sufferers. And without the operation of any external agent, the slow change which a morbid state of constitution induces in some or other of the parts most liable to be affected in each disease respectively, shows itself in a way which it was natural to consider, as in the humoral pathology, a critical determination of the vitiated humors, as if by concentration, for the relief of the system. The fact is sufficiently established, and we must be content to know it, that the liability to these diseases falls upon particular textures; and this is one of the strongest distinctions by which specific stands apart from simple inflammation: thus in syphilis, the throat, and the eye, and the thinly covered bones of the head, arm, and leg, are the most susceptible parts of the body, as regards cold and inflammation as a consequence. Another marked distinction is the subserviency of the local to the general irritation, and vice versâ; and consequently, the very gradual change which the local disease undergoes until the health suffers to a certain extent; or the slight disorder of the health until inflammation falls upon the part, or is artificially excited there.

OF LOCAL INFLAMMATION GENERATING CONSTITUTIONAL DISEASE. CACHEXIA.

There is another view in which the specific diseases deserve to be regarded. Though morbid states of constitution, neither local in their origin, nor inflammatory, but the contrary; this order may be reversed, and they may have indirectly a local origin, and that one of simple inflammation. This is a case often seen. Let us take scrofula for an example. The habit most alien from it may be rendered truly scrofulous in three months, by a combination of such causes as will produce that state with a local casualty. An impoverishing system of diet and medical treatment, a vitiated atmosphere with bad nursing and neglect, or mis-treatment of the local malady, will and often does effect this among the poor; who relying on their natural powers, persevere imprudently in labor when the subjects of disease, or being strongly prejudiced against hospitals, suffer their local maladies to lay hold on the constitution. Thus it continually happens that the labourer works upon a strain or a wound, which, with rest and attention, might have been permanently cured, until by extensive local disorganization and loss of health, he is forced to seek parochial or hospital relief. With great attention, the local disease assumes a favorable condition, and is approaching a cure, when the increased emaciation, sloughs of the sacrum, or trochanters, the small cough and flushed cheek, uncountable pulse, frequent diarrhœa, and profuse

sweats, show that his lungs are irrecoverably diseased, and thus the whole career, from full health to the grave, is run within a twelvemonth.

This is not an overcharged picture; and among others was the case of Macdonald, a remarkably fine young man, æt. 22, recently a patient in Henry's Ward, of St. Thomas's Hospital, who was admitted for ulcers and deep-seated sinuses in his left leg, originating in a trifling injury a year before.

A blow, a fall upon the stairs, or a kick from a brutal husband, I have repeatedly seen terminate in cancer mammæ, and cancer uteri, in young and middle aged women of the working class, in a very short space of time.

The venereal inflammation, aggravated by the abuse of mercury, breaks up the finest constitution, and other causes combining, is a most deadly instrument of destruction, by inducing pulmonary disease. These are cases which, a little enquiry will satisfy those who do not see the diseases of the largest class of the community, are not exaggerated. Attention is the more drawn to them by the youth of the subjects, and the indelible though overcast features of personal comeliness.

From the operation of the specific diseases, that state of the constitution results, which has been well denominated "cachexia," and which is in fact the peculiar action engendered by the specific disease, retaining the distinctive character which that possessed. Thus the strumous, the cancerous, the syphilitic cachexia is characterised. Other poisons, as measles, scarlatina, and small pox; as mercury, lead,

and opium, have their cachexies. With the mercurial we have had the opportunity of being best acquainted, that poison having been specially selected to run a race with the venereal.

Of scrofulous action the cachexia is so well known, that it is scarcely necessary to describe it. The principal phenomena are developed in the mesenteric and pulmonary systems—when these are affected up to a certain point, recovery is hopeless, though dissolution is often much protracted. Persons are in a dying state for years. The vicissitudes of the seasons, especially spring and autumn, the supervention of inflammation from any cause, an abrupt arrest of the constitutional changes incidental to the period of life, the accidents of diarrhœa or hemorrhage from progressive disorganization, spasmodic attacks, or any severe and sudden shock of the nervous system inducing syncope, may at any moment extinguish life.

In those who die of cancer, not only the cancerous tubercle is often found affecting the viscera, or their membranes, but the cachexia of the scirrhous cancer is seen in those multifarious cases of inveterate disease, resembling cancer, and yet not cancer, generally occupying years in their progress, as the disease denominated lupus or phagedenic herpes; the malignant polypi; and the irremovable tumors and large intractable ulcers which gradually take on a malignant character, and ultimately destroy. The soot wart, or chimney-sweep's cancer, belongs to this class.

The medullary cancer is particularly the cancer of scrofula—that which intermixes itself most conspicu-

ously with it; and not only selects the scrofulous temperament, and the early period of life, but commonly fastens on those organs peculiarly subject to scrofula, and destroys by those visceral disorganizations and morbid secretions which are truly scrofulous in character and appearance. It might be truly denominated the strumo-cancerous cachexia.

The disease which, some years ago, attracted notice as being the Dromio in aspect, though not in character, of the venereal poison, and therefore called by Mr. Abernethy the mock or pseudo-syphilis, was denied to have the same origin or the same remedy. In another view it was regarded as an impression of the disease, independent of and abstracted from the poison which had given rise to it, a spectrum, as it were, of the original picture. But it had so much of reality about it, as to constitute a very frequent and formidable disease, from the circumstance of its being mistaken for its prototype; a principal distinction being the aggravation of one disease by the remedy which was then considered indispensable for the other.

This observation was the harbinger of an improved practical knowledge and treatment of syphilis, which dates from that period. It was the pure result of careful discrimination between the genuine syphilitic poison and the syphilitic cachexia which it leaves behind it. It was the law of other chronic diseases applied to this, rheumatism and neuralgia especially, inflammation of the joints, the skin, the fauces, the eye, &c. It did not demand the same treatment, or even admit of it, because it was not

that diseased state of the heart and blood-vessels, which, in the aged, is a very frequent forerunner of death; sometimes following the slightest breach of surface, sometimes spontaneous, and seeming to depend entirely on diminished vitality.

There are cases in which the gangrene of an extremity seems depending on the operation of no one cause in particular, and in which no marked change has been detected by accurate post mortem examination in the blood-vessels or elsewhere. This does not occur in healthy subjects, and is referable to a cachexia, the result of a gradual enfeeblement of the vital powers by accumulated causes of deterioration, and which therefore happens at various periods of life. Diseased changes in structure of the heart or of the lungs, indirectly affecting the circulation and quality of the blood, may probably be found in some of these cases, but not such as would be sufficient to explain the phenomenon of gangrene, which is rare in comparison. The case of chronic gangrenous ulcer in old men, gangrena senilis, in which the power of healing is lost, seems to demonstrate that the last or finishing process makes the highest demand on the system, for healthy granulations are produced and maintained for a length of time, but cicatrization, the exclusive action of the capillaries, fails altogether.

The Cachexiæ may be classed as follows:

SIMPLE CACHEXIÆ.

Suppuration.
Ulceration.
Gangrene.

SPECIFIC CACHEXIÆ.

Scrofula.

{ Scirrhous Cancer.
{ Lupus. Sweep's Cancer.

{ Medullary Cancer.
{ Hæmatoid. Melanoid.

Animal Poisons.

{ Syphiloid.
{ Varioloid.

&c. &c.

Mineral Poisons.

{ Mercurial.
{ Arsenical.
{ &c. &c.

CASE. Cachectic suppuration. A gentleman, æt. 60, who had hitherto enjoyed good health and lived freely, had a sluggish boil situated on the metatarsal bone, at the root of the great toe. Having broken and discharged imperfectly, it was freely dilated in the direction of a hollow, which was sub-fascial and of some extent. The exposed surface suppurated, but a livid and painful condition of the surrounding integuments gradually involving the neighboring part of the foot and ankle indicated the progress of the suppuration, which, by slow degrees, extended upwards to the knee. He was, for some weeks before his death,

the same disease. But it required a treatment modified by a retrospect to its origin, and this is the successful and approved treatment of such cases at the present day.

The constitutional changes which more particularly characterise the syphilitic cachexia, are the reduced flesh and tone, the loss of complexion, activity and vigor, the frequent rheumatism in various parts of the body, especially the head and chest, sensibility to cold and damp weather, and small febrile paroxysms in consequence of exposure. The digestive organs are very feeble, and the breath and perspiration have a tainted odor. Mercury, it may be said, has much to do with the production of this cachexia: as an aggravant, I do not deny this to be frequently the case, but not as an element.

The mercurial cachexia is characterised by irritable circulation, extreme pallor and emaciation, an acute and rapid hectic, and an almost invariable termination in phthisis. The utter destruction of the palate, extensive cicatrices, eruptions, or ulcers of an anomalous character in various parts of the body, and large cranial exfoliations are seen in combination with it.

The phagedæna gangrenosa of the pudenda and surrounding parts, which we occasionally see in young persons, of both sexes, in our venereal wards, is the most rapidly destructive symptom of the syphilitic cachexia, exasperated by all the aggravating causes which can well be imagined to operate in conjunction. But neither abuse of spirits nor of

mercury would, in my belief, produce this disease without the foregoing ingredient in the poisoned chalice—yet it is not syphilis.

Suppuration is a mode of cachexia in broken down habits, and is often though not always connected with visceral disorganizations. It is seen in the nates, the loose reticular texture surrounding the anus, bladder, and testicles, in the neck, the axillary and humero-pectoral regions, and in the groins and hams; to which may be added, the sheaths of tendons. The greatest local benefit is obtained by means of well applied rollers, where they are applicable.

Ulceration is a very frequent and familiar example in our hospitals of a cachexia induced by a combination of causes and having no specific character. The effect of poultices and simple dressings, and a horizontal position, under which such ulcers heal, although irritated by almost every other mode of treatment; the effect also of pure air, especially sea air, and a daily allowance of meat, wine, or porter, in this and the suppurative cachexia, demonstrate that the want of power shewn in the part is really the fault of the constitution. The healing of the sores of poverty so rapidly follows upon the newly acquired conditions of rest, cleanliness, and nutriment, that the support of the vessels of the injured part seems to constitute the sum and substance of what is required, in the greater number of these cases, at the hands of the surgeon.

Gangrene is also seen as a sign of cachexia from a combination of depressing causes, independent of

in a state of low fever, unable to take further nourishment or stimulus, which he had previously done in good heart and hope for many weeks. The peculiarity of the case was, the continual recommencement of the suppurative action; for at the moment that the newly exposed surface was beginning to granulate, a new collection was forming higher in the limb, which became so painful as to make him anxious to have it laid open. This was done many times. The gangrenous inflammation invariably ensued upon the ulcerative, as the suppuration proceeded, so that ultimately all the parts affected were destroyed by gangrene.

I have seen several instances of this cachexia in the lower limbs; less frequently in the upper. It is not to be confounded with excessive, and from that cause, wasting suppuration, nor with gangrenous or sloughing ulcer. Its distinguishing character is the uncontrollable tendency to a renewal of the suppurative action in the contiguous parts, and to a decay of the healing action in that which seems prepared for it.

CASE. Cachectic ulceration. Lawford, æt. 58, admitted, May 7th, 1829, exhibited a malignant-looking ulcer of the hand, called by his country surgeon, carcinoma.

The disease made its appearance three years since, on the dorsal surface of the right hand, in the form of a chap or crack. A fetid discharge issued from the part, and a slough separated in the course of six weeks, leaving exposed the ex-

tensor tendon and first phalanx of the fore finger; the tendon sloughed, and this was soon followed by a loss of the third phalanx; the second next yielded, and then the first, as he expressed it, mouldered away, little by little, but not with the same rapidity as the former.

The stump of this finger then healed, and ulceration commenced, at the same time, at the base of the first phalanx of the middle finger; eighteen months having elapsed from the date of the first attack. The ulceration continued extending over the metacarpal bones of the first and second fingers, and the first phalanx of the middle finger, until the present period, three years from the commencement of the disease.

The ulcerated surface varies much in character and appearance, having sometimes a livid, sometimes a greenish hue, and at others florid—the edges are abrupt, irregular, elevated, and ragged; the surface destroyed extends to the carpus posteriorly, forward to the last phalanx of the middle finger; and the stump of the fore-finger is again in a state of ulceration. The palmar surface of the hand remains untouched. The pain, which is considerable, partakes of the darting and aching character; sometimes extending up the arm, to the axilla, where, however, there is not, and never has been, any glandular enlargement. — Sarsaparilla, with an opiate at night were ordered, and a lotion of the chloride of lime beneath a poultice, to the part.

The first report was favorable, the slough

having separated and left an apparently healthy surface. In three weeks, the surface was in a state of uniform granulation; and the application was changed for the zinc dressing.

June 10th. The surface continues to wear a more benignant aspect, and is contracting rapidly; the pain up the arm, however, continues.

The August reports are not so favorable. The edges of the ulcerated surface are again ragged, and pain considerable. The black-wash with opium effected some beneficial change.

In October, the ulceration was again extending rapidly. Ordered Liq. arsenicalis m. iij. ter die. This dose was soon increased to m. v. The ulcerated surface improved slightly at this time, under the application of nitrate of silver.

Subsequent to this he was ordered carbonate of iron and wine; and afterwards calomel and opium, night and morning.

He left the hospital after having been a patient nearly a twelvemonth, the sores but little improved, though his health did not appear to have suffered. At a later period the ulcer retained its original character, though its progress was very slow, sometimes granulating and contracting, at others ulcerating anew.

Case. Cachectic ulceration. Gustaff, æt. 41, admitted March 22, 1827, has been long accustomed to drink freely and chew tobacco; about fourteen months since, during severe weather, the lower lip became chafed at the centre, and shortly afterwards he began to smoke

a pipe. The lip then swelled and inflamed, and ulcers formed in various parts of it; to these he applied different ointments, and during the summer one or two healed, while in other parts of the lip, fresh ulcers formed. The lower lip is now of a dark red color, and somewhat swollen; towards the right side are two small jagged ulcers, near the margin, and penetrating completely through the substance of the lip into the mouth; there is some surrounding thickening, and induration. He complains of occasional shooting pains, not very severe. His general appearance is that of health.—Lot. argent. nitr. gr. v. ad aq. ℥j. ℞ Liq. arsenic. m. vj. Dec. Cinch. ℥ij. ter diê sumend.

April 20th. The lip is much less swollen and indurated. The ulcers having gradually extended upwards, and completely destroyed the fibres of the orbicularis oris, are now rapidly healing. Has not used tobacco in any form since his admission. To continue the remedies.

May 16th. Discharged quite well: scarcely any induration of the lip remaining.

In November following he returned with a fresh attack of the disease, which again yielded to similar treatment.

A case closely resembling the foregoing, in which the upper lip and angle of the mouth was the seat of disease, was admitted on the first of the same month, and healed under similar treatment. The subject of it, Holton, æt. 50, was a drunkard and habitual smoker. He had a coated tongue and

costive bowels, and required free purging with aloes, blue pill, and rhubarb, before commencing the mineral solution.

It is probable that in these cases the pipe aggravated, if it did not excite, the ulcerative action, as happens in most cases of the lip cancer. But the inveterate cancrum oris is often seen in young persons and others who have never smoked. The mere discontinuance of the irritant effects as little as the merely topical applications for these diseases. The arsenical solution, after regulating the action of the bowels, is almost specific.

CASE. Cachectic gangrene. Francis Ward, æt. 18, had come to London in hopes of getting employment, but being disappointed, was soon reduced to a state of destitution. He had been exposed during severe weather, without covering, and was for some days, almost without food.

When admitted, Dec. 14, 1833, he was in a state nearly approaching to coma, his lower extremities cold and insensible to the touch. He took a little broth, and rallied somewhat; he then stated that he was suffering from pains all over, and especially a tingling sensation in the arms; pulse irregular and weak. On the following day, some re-action had taken place, the feet were still cold and of a livid color; he was ordered arrow-root, beef tea, and milk. On the 17th, he was attacked with looseness of bowels; the milk was omitted, and catechu ordered with some opium: the report says he cannot sleep, and complains much of pain in the legs. There were few occur-

rences worth remarking from this period till his death, which occurred on the 2nd January, 1834. The purging was not arrested: he was never able to bear much nourishment; and the gangrene of both feet was progressive. The state of emaciation was extreme, and he appeared to sink from pure exhaustion.

The post mortem examination presented no morbid appearance.

CASE. Cachectic gangrene. Edward Younge, a labourer, of robust make, was admitted, Oct. 12, 1833, with a sloughing ulcer of the nose and upper lip, and another sore of the same description on the left foot. Says he has usually had one good meal a day, but has not had opportunities of obtaining much spirituous liquor. In August last he slept four successive nights in the open air for want of a lodging.

The disease began about a month ago, first by coldness in the part, which gradually turned blue, a burning sensation followed, and the parts then rotted away; the surface being always of a dark color.

The sore on the face is now of a triangular form, nearly the size of the palm of the hand, it extends from the bridge of the nose to the mouth, i. e., including the upper lip, levelling the nostrils with the cheeks, and exposing the alveolar process of the upper jaw; there is a dark furrow surrounding the sore, separating the slough from the edges; no inflammation or tenderness.

The left foot has a similar slough on the toes, and a livid hue extending to the ankles. On the right

foot this appearance is paler; they are cold to the touch, yet to him giving, as the hands also, a sensation of burning; the heat of the body is below the usual standard. Pulse 100 and feeble, tongue dry and brown; he complains of great thirst; his stools pass in a liquid form, and almost involuntarily; urine scanty.

9 p. m. Skin burning hot, and dry, pulse hard and rather full, the diarrhœa somewhat less, thirst still urgent: warm brandy and water ordered for drink.

13th. 7 a. m. Skin getting cold and pulse sinking, no perspiration: brandy every hour.

14th. 12 o'clock; much the same, great restlessness.

15th. 10 p. m. Delirious, and has been so for an hour.

Half past 12 a. m. Delirium was raving, when he suddenly sank and expired.

The post mortem examination presented no morbid change. These cases, of which I have witnessed many proceeding from various causes, are given to exemplify an impoverishment of the habit, so extreme as to arrest or render abortive the functions of nutrition and ultimately of life, although the organic condition of the solids offers no impediment.

Case. Scirrhous cachexia. Patrick Carey, æt. 40, admitted August 1827, was apparently laboring under low fever, with great prostration of muscular strength, pulse rather slow and weak; complained of slight pain in the chest.

He became exceedingly exhausted, passed his stools and urine involuntarily, and his mental faculties were much impaired. Died on the 11th September.

Examination. Head.—Laying bare the calvarium, the surface was found to be here and there covered with tumors, slightly elevated, varying from the size of a shilling, to that of half a crown. The tumors were cartilaginous and white, and when cut into, presented bloody points, with a small quantity of serum oozing from them; the bone from whence the tumors sprung was apparently ulcerated to the depth of a sixth of an inch. The dura mater presented a surface studded with tumors, crystalline in appearance, about a quarter of an inch in size, consisting of minute spicula of bone, mixed with a kind of medullary matter; it was two or three times its natural thickness, and separable into its inner and outer laminæ; the internal surface of the calvarium presented the same appearance as the external, which extended to the basis.

Chest.—Effusion into the left side of about a quart of serum: on the right, the lung was firmly adherent to the ribs. The fore part of the left lung soft and pasty, being strictly œdematous, and on being cut, there oozed out a bloody fluid. The air tubes were nearly imperforate. The right lung was covered by a yellowish transparent lymph, which firmly united it to the costal pleura; it was extensively hepatized.

Abdomen.—The liver was studded with white cartilaginous tubercles, varying from the size of a millet seed to that of a bean. The viscera in the upper part of the abdomen were firmly glued together, and to the

parietes. Fluid was also effused in the abdomen. The stomach throughout was scirrhous. The internal surface of the lesser curvature was hard, white, and puckered up, as if acted on by some powerful acid; the coats were thickened, and the cavity reduced to half its proper capacity; externally this organ was firmly agglutinated to the omentum, pancreas, duodenum, and other intestines, to the liver, diaphragm and abdominal parietes by coagulable lymph.

Case. Syphiloid cachexia. * March 19th, 1833. Mr. ——— applied with a trifling excoriation situated on the frænum of the prepuce. The possibility of its being venereal he positively denied. Sulphate of copper lotion, and gentle aperients.

25th. Sore healing: a painful sensation in the groins, in one of which is a small glandular enlargement. Anodyne embrocation.

27th. Ulcer scarcely perceptible, tumor and tenderness in the groin removed.

April 1st. Ulcer increased in size, and resembling common chancre. The possibility of syphilitic origin still firmly denied. Five grains of mercurial pill night and morning. Lotion continued.

8th. Sore exhibits an irritable unhealthy appearance. Poultices; gentle aperient: rest enjoined.

15th. The appearance of the sore which had recovered since last report, so changed for the worse as to threaten the destruction of the part. The mouth

* Communicated by Mr. Bowie, Surgeon, of Bishopsgate Street, and visited at intervals by myself.

tender, and febrile excitement. Mercurial pill omitted. Carrot poultice. Compound decoction of sarsaparilla half a pint, with diluted nitric acid one drachm daily, and an anodyne at bed time.

27th. Improving, complains this morning of tenderness of the fauces. No speck of ulceration can be discovered, nor any appearance of inflammation. Saline aperients.

30th. Ulcer healthier, pulse 80, tongue clean, bowels regular: skin studded with an eruption, nocturnal pains in the tibiæ, along the spines of which bones, small prominences can be distinguished. Mercurial pill with a grain of opium at bed time, and two drachms of diluted nitric acid in a quart of water daily.

May 2d. Sore in the same state, eruption increasing and assuming a copper color. Medicines continued.

16th. Retrograding, several spots beginning to ulcerate. Mercurial pill continued. Acid omitted, and equal parts of compound decoction of sarsaparilla and dulcamara substituted.

27th. Symptoms more favorable until last night, when the ulcer of the penis suddenly assumed a most unhealthy appearance. The mouth is mercurially tender; irritative fever. Mercurial omitted. Saline medicines and gentle aperients.

June 1st. Febrile symptoms removed, ulcer rapidly healing. Sarsaparilla and acid resumed.

7th. Ulcer almost healed, eruptions disappearing, and every symptom so favorable that the patient will not remain longer in town. The sarsaparilla and acid to be continued.

15th. Returned; ulcer almost cicatrized, but eruption increasing. Left town again the same evening.

19th. Returned again; sore healed, eruption very vivid, and increasing, right eye very vascular, but not painful; vision so much impaired as scarcely to distinguish light from darkness; nocturnal pains very distressing; and the tone of the whole system surprisingly diminished. Compound decoction of sarsaparilla, to the extent of a pint daily, with a quarter of a grain of hydrarg. mur. corrosiv.; and a collyrium.

20th. Is better; the mercurial increased to half a grain daily. Two grains of the ext. conii at bed time.

July 4th. Symptoms steadily improving, but complains of uneasiness in the right nostril. On examination, a small ulcer is perceptible on the septum narium. To continue the medicines. Copper lotion to the nostril.

10th. Still improving, with the exception of the nasal ulcer, which presents a ragged foul appearance.

20th. Nasal ulcer looking more healthy, but so much general irritation prevails, that the patient either with or without opium passes wretched nights, and has been for two days subject to mental aberration; cannot be persuaded that he has not got another person's nose instead of his own, and when for a time he is rallied out of his delusion, he laughs fatuitously, and says, "I know I am talking nonsense, but I cannot help it." The conium to be omitted.

24th. Not altogether free from the delusion, though it is much abated; improving in every respect.

29th. Nasal ulcer completely healed, eye per-

fectly recovered, eruption gone, general health much amended, body more robust, and mental confusion entirely ceased.

August 19th. Returned from the sea-side, where he had been since the 1st instant, with a small superficial sore on the upper and anterior part of the scrotum. Contrary to instructions, he walked about town during the whole of this day, and travelled many miles into the country in the evening.

23d. Returned again; the sore has degenerated into a foul phagedenic tubercular ulcer, the base of which is extensively indurated; pulse quick, small, and wiry; skin hot and dry, tongue rather furred, bowels regular; re-commenced the decoction and sublimate, one pint and half a grain daily. Strict confinement to bed enjoined; carrot poultices.

25th. Has passed a bad night; ulcer is spreading, and the indurated base so much extended as to measure an inch and a half in diameter, and involve a portion of the integuments of the penis. Eye is again suffused, and the eruption re-appearing.

29th. Ulcer had been assuming a more healthy appearance, and was filling in the centre with loose granulations. During the night, however, a very smart attack of fever came on, and this morning the granulations are sloughing; great constitutional irritation; pulse varying from 112 to 120. Poultices composed of carrots, milk, and a watery solution of opium. Saline medicines, and six grains pulv. ipecac. c. at bed time. The decoction and mercurial diminished one half.

31st. Fever abating, ulcer less irritable.

September 1st. Still improving, pulse varies from 90 to 98, and communicates a wiry sensation. Thirty five drops tinct. opii at bed time, in lieu of the pulv. ipecac. c.

7th. Ulcer gradually extending, but granulating in its centre, pulse 90, mouth becoming mercurially affected; aperient draught; medicines continued, with the anodyne at bed time.

12th. A gradual improvement continued until this morning about 3 o'clock, when irritative fever commenced, and the whole ulcer is now foul, fetid, and sloughing. Pulse 115 to 120, tongue very much coated, skin hot and dry; bowels were fully relieved yesterday. Eye perfectly clear. The mercurial to be withdrawn; to take tinct. opii ℥i in a pint of decoction of sarsaparilla during the twenty four hours.

25th. An attack of night fever, terminated by exhausting perspiration. Ulcer does not look quite so healthy as yesterday. To take one grain of sulph. quin. every six hours, decoction and tinct. opii to be continued.

27th. Ulcer foul, and presenting in its serrated cartilaginous edges a most phagedenic appearance. Constitutional irritation excessive, pulse 120, tongue thickly coated, febrile symptoms not abated by the morning perspiration of the last two days. The sulphate of quinine to be omitted, saline medicines and the decoction with tinct. opii continued, and two grains of cicuta at bed time; charcoal poultices.

28th. This morning all the symptoms are relieved, and the ulcer looks much cleaner.

It may not be irrelevant to remark, that the cir-

cumstance of the foul and troublesome nasal ulcer healing, and the eye recovering, and indeed all the symptoms yielding during the exhibition of mercury, renders questionable the relinquishment altogether of that agent, unless without its use any marked improvement could be observed.

The ulcer has been dressed with thin mucilage and opium, the dressings covered by a poultice; diet generous, with a liberal allowance of bottled stout. Pulv. cinchon. given in preference to the quinine, but his stomach cannot retain it even in doses of a few grains. The ulcer is still extending, and its edges are becoming more deeply indented in various places. Eruption becoming more vivid. Eye again vascular.

October 10th. Ulcer extending over one half of the penis, and stretching completely across the scrotum, even to the groins. To prevent the phagedenic process, mercurial fumigations were commenced on the sixth, and as the disease was again making rapid progress, to these was added, the internal exhibition of the muriate, $\frac{3}{4}$ grain daily, in a pint of the compound decoction of sarsaparilla, with ℥i of tinct. opii. As the stout produced cutaneous irritation, it was withdrawn, and three or four glasses of wine daily were substituted.

14th. Ulcer again looking more healthy, the phagedenic process evidently abating; complains, however, of pains in the limbs, which he attributes to cold caught during the fumigation. Medicine continued, fumigations omitted, mercurial unction substituted, ℥ss daily.

18th. Ulcer still looking well, pulse 90, and wiry,

mouth mercurially affected, bowels open; ulcer to be dressed with ung. resinos. on the right side, the other half with the spermaceti and opium. Tincture of opium increased to two drachms daily. Ointment omitted.

19th. Ulcer sloughy. In order to remove the intolerable fetor of the sore, carbonic acid gas was evolved in a retort, by the admixture of chalk and sulphuric acid. The gas, as it was evolved, was conveyed to the ulcer through a flexible tube, fitted at one of its extremities to the neck of the retort, and at the other to an oiled silk bag, enclosing the whole of the diseased parts.

20th. The application of the gas has a most soothing effect, and the fetor is much diminished; the slough is beginning to separate, and the ulcer exhibits some appearance of granulation. Pulse 96 to 104, tongue furred but cleaning, bowels open. Decoct. sarsap. oj; tinct. opii ℥ii, acid nitric d. ℥i daily. Dressings as before.

23d. Still improving, but this morning was attacked by slight hæmorrhage from a small arterial branch, situated in the centre of the scrotal ulcer, and imbedded in the sloughing mass. During the day it occasionally returned, but was stopped by powdered alum, and lint soaked in tinct. kino. On visiting him at ten o'clock p. m. it had entirely ceased.

In addition to the external applications, draughts composed of acid. sulph. dilut., m. x., infus. rosæ. ℥xiss. tinct. digitalis, m. x., were taken every six hours.

24th. About one o'clock this morning the hæmor-

rhage returned so copiously that he had in the space of about an hour lost nearly a quart of blood. The spot, whence the blood was issuing, touched with lunar caustic: this application was attended with success.

Before the application of the caustic, the symptoms were most unfavorable, and he seemed on the very verge of dissolution: being pale, languid, and in a state of great exhaustion, and having a tremulous, feeble, and very rapid pulse. A very small quantity of wine was allowed, and a draught containing tinct. opii. m. xx., tinct. digital. m. v., acid. sulph. dil. m. x., decoct. cinchonæ, ℥xi, taken every four hours.

Evening. Much recovered, ulcer almost without pain, pulse 76, and although small, feels soft. No return of hæmorrhage. Medicines to be continued.

25th. Feels more comfortable than he has done for a long time. Irritability diminished, not only of the scrotal ulcer, but also of all the ulcerated spots on the different parts of the body. Pulse 78, tongue clean, bowels regular.

26th. Still mending, pulse 80, ulcer looking healthy at its edges, and the coagula and eschar beginning to separate: a more liberal allowance of wine, nourishing light broths. Medicines continued.

27th. Still doing well, healthy granulations appearing on the edges of the ulcer. Dressings with the resinous ointment, and the use of the carbonic acid gas recommenced. Saline aperients.

30th. Has been steadily improving since last report, but the ulcer is gradually extending upwards. Dressings and gas continued. Diluted nitric acid ℥i tinct. opii ℥iss daily, in a sufficient quantity of water.

November 2d. Improving. Dressings and medicines continued.

6th. Ulcer still extending in circumference, but filling up in the centre.

16th. Since last report the improvement has been very gradual; the skin of the penis is by slow degrees passing into a state of ulceration, and appears likely to be totally removed before the disease will terminate. The whole of the ulcer is now studded with cicatrizing insular eminences. General health much mended, and he is gaining flesh.

24th. Amendment still progressive. In consequence of the thickening and contraction of the prepuce, it was laid open by the bistoury; glans completely exposed presents a healthy appearance. Poultice applied.

December 4th. Ulcer rapidly filling up, great part of the scrotal portion healed; remains of the prepuce deeply ulcerated, and irritable. The urethra has given way between the scrotum and glans penis, and the urine is voided by the aperture. The whole of the original skin of the penis with the exception of a small piece on the dorsum is destroyed. Cicatrization is advancing quickly from below upwards. Medicines and dressings continued.

31st. With the exception of the ulceration of the urethra he has made great progress towards recovery.

The ulcer on the scrotum is nearly healed, the urethra still remains open. The prepuce is much reduced, but almost sound; a serous discharge of the scrotal cicatrix proceeds from the epididymis of the left testicle, the body of which gland is nearly ab-

sorbed. Large ulcers are situated on the lower and upper extremities, but are all in a state of improvement; numerous cicatrices on various parts of the body, face, and extremities, round the edges of several of which are scattered clusters of small pustules, crusts, or sores, the latter of which invariably commence of a circular, and terminate in an ovoid form. It is evident that the disease is losing its malignity, and is becoming much more manageable; although the eruption sometimes increases, the eye occasionally becomes vascular, and several of the pustules surrounding the cicatrices degenerate into ulcers. Irritative fever also sometimes recurs; still all these symptoms yield much more readily to the remedial agents employed, than they were wont to do a few weeks ago.

January, 1834. During the whole of this month there has been marked improvement. The compound decoction of sarsaparilla with nitric acid and tincture of opium has been constantly taken.

February. There is a very large and foul ulcer upon the head near the centre of the sagittal suture. A large ulcer has appeared upon the leg. The ulcer on the penis is foul and irritable, and portions of the corpora cavernosa are completely exposed.

March. The ulcer has removed a portion of the scrotal cicatrice, and so surrounds the lower part of the penis as to excite considerable apprehension for the fate of that organ. The sores upon the head and leg also remain irritable. The eye too has again become morbidly vascular; his strength seems to be giving way, and he has become subject to frequent fits of despondency. The nitric acid was discontinued

and carbonate of ammonia ℥i daily given in its stead. After the commencement of the ammonia, amendment took place, he regained flesh, and entirely got rid of his mental depression. The ulcers upon the penis and scrotum healed, with the exception of a small speck upon the glans, and the fistulous opening into the testicle; and those upon other parts of the body were cicatrizing. Having continually observed the speedy effects of the mercurial in suspending the phagedenic process, a few grains of mercurial ointment were mixed with the resinous ointment, and used at each dressing. The sores were dressed twice a day for a few days.

March 29. There being much heat and tingling in the few remaining ulcers and eruptions, the ammonia was discontinued, and the nitric acid again added to the decoction and opium.

April. During this month the health has not improved, and several of the ulcers upon the body and extremities have extended considerably. To arrest the phagedenic process going on in the edges of a large crural ulcer, the dressing, with a few grains of mercurial ointment, was employed, for about a fortnight; when it was discontinued, from the mouth becoming slightly affected, and a recurrence of great constitutional irritation.

May. From the close of this month a sudden improvement took place; and much advantage was derived from the use of a vapor bath every other day.

June. The patient now moved into the country, and began to recover rapidly. Five drops of the

solution of hydriodate of potass were given daily, with the sarsaparilla and opium.

July. Although his health continued good, the ulcers on the legs became so troublesome as to prevent his taking exercise.

August. Five drops of Fowler's solution were ordered daily; iodine to be omitted; sarsaparilla and opium as before.

September. During this month remained at the sea-side, where his health continued to amend, but the ulcers upon the leg became very painful, and a new crop of eruptions made its appearance. Advised by a country surgeon to discontinue the arsenic, and take a blue pill night and morning.

After leaving off the arsenic and taking about twenty pills, the irritation began to subside, but a nodular swelling took place upon one of the metacarpal bones, and several glandular tumors in the neck and arm returned, which had disappeared.

October. Returned to town, and is now taking only a wine-glass full of decoct. sarsaparilla, with tinct. opii gr. xxxv. at bed time, his nights having been extremely restless. Is now able to attend to business, and there is little doubt, unless through impatience hurried into some act of imprudence, that he will completely recover.

The following is a description of his state at present: health good; every ulcer healed, with the exception of one, not the breadth of a sixpence, upon the left leg, and it is fast cicatrizing; remains of the eruption faded and almost imperceptible. Enlargement of metacarpal periosteum much dimi-

nished, and free from pain; sleep during the night sound and refreshing, although the anodyne has been withdrawn.

Remarks. The various attacks of the eruption were either preceded by, or accompanied with, febrile disturbance—and it may also be worthy of notice that the eruption was of a mixed character—some portions of it presenting the ordinary shining scaly appearance of syphilitic lepra, while others were tubercular and pustular. The first became ulcers covered with large flattish crusts, the second conical and cornute, before degenerating into open ulcers. Every ulcer which has existed healed from the centre to the circumference.

The ulcers which appeared at various times on different parts of the body, were very intractable, and occasioned great annoyance; and independent of the danger attached to that upon the scrotum and penis, were worthy of exciting no little anxiety.

The application of a weak solution of lunar caustic to the edges, bathing with the solution of sulphate of copper the surfaces of the ulcers, was attended with the most marked benefit. But the application generally found the most useful was the ung. resin. of the Edinburgh Pharmacopœia. The irritative fever was generally subdued by saline and aperient medicines, and abstaining, during its existence, from stimulants.

In conclusion, it may be mentioned that my patient has invariably denied the possibility of having contracted syphilis, and I am of opinion, that he has

told the truth, as from my knowledge of his character, I am satisfied he would have made any disclosure which might have aided the treatment of his disease.

I have to apologize for the length of this case, although abridged as much as appeared consistent with its truth. It was watched and is reported with singular fidelity, and I think its interest will repay the trouble of perusal. Now, setting testimony aside, had not this gentleman absorbed the poison of syphilis? and was not the legitimate course of that disease modified by peculiarity of constitution and by the action of mercury? for modified it was to such a degree as to render that question difficult of solution. I leave the consideration of it to my readers, who have all the materials before them for judgment. I call it syphiloid cachexia, first, because it was not legitimate lues, and secondly, because it bore a resemblance to that disease, as strong as was compatible with non-identity.

CASE. Mercurial cachexia. Mary Pearce, æt. 34, a respectable married woman with a family, admitted June 5th, 1828, had been, for ten months, in a country dispensary. Her mouth and nose have been in a diseased state for a period of fifteen months. She has, upon repeated enquiry, invariably declared that she never had the venereal disease in any form; nevertheless she has been incessantly taking mercury; and her mouth and gums still bear testimony to the truth of this assertion.

A round excavated ulcer appears on the middle of

the soft palate, and another of a similar description on the inner surface of her upper lip. Several small portions of bone have come away, whilst she was under the influence of mercury.

June 6th. Being in a weak state, she was ordered to take two grains of quinine thrice a day. R. argent. nitr. gr. v. aq. distil. ℥i solve. f. lotio.

July 2nd. She has been using the above lotion, and taking the quinine without any material alteration; the ulceration has rather extended in the lip: she complains also of head ache, and great pain in and about the ulcers. Ordered, a blister to the nucha, and to apply the linimentum æruginis twice daily, instead of the caustic lotion.

July 9th. The ulcer on the lip is extending and attended with great pain: she cannot sleep at night. R. Pil. hydr. gr. ij. p. opii gr. ½ M. f. pil. alt. noct. sumend. To leave off the quinine, and take a pint of porter daily.

26th. She seemed, on the first use of the present medicine, to improve slightly, but towards the latter end of July, it was evident that the disease was upon the increase, and assuming a more malignant character.

Aug. 13th. As the ulceration extends, her health is gradually declining. To leave off her former medicine and the porter, and take pil. sapon. c̄. opio gr. v. o. n: vin. rubr. ℥vi. per diem; and to bathe the sores with a watery solution of opium.

Sept. 19. The ulceration of her lip and palate extending up to the date of the present report, she presents a truly wretched appearance. The ulcer

in the palate has formed a frightful excavation; a great portion of the upper lip has been destroyed by the ulcerative process; her power of articulation is in great measure destroyed; and her countenance has that pale and haggard appearance, betraying long suffering, and so characteristic of malignant disease, which this was now generally supposed to be. At this crisis it was determined to try the effect of the alterative and tonic action of mercury.

R. Hydr. oxym. gr. iij. micar. panis ℥j. p. conii ℥j. Aq. dist. q. s. M. et div. in pil. xxx. e quib. sum. j. ter quotidie. Extr. sarsap. ℈ss dec. ejusdem. ℥xvi. M. cap. part. 3 m. c̄ sing. pilul.

She was at the same time ordered to leave off every application in the form of lotions, and apply dry lint to the ulcerated surface on the lip, and over that to make gentle pressure with strips of adhesive plaster, just sufficient to support the edges.

25th. The effect of this trial is decidedly favorable; the ulceration has not only been arrested, but the edges are contracting: the excavated ulcer on the roof of the mouth has put on a healthier appearance, without any local application, showing evidently the beneficial effect of the medicine on the system.

30th. Her health is now making rapid progress; and as it improves, so the progress of the healing is observed to be rapid. She continues to take her wine and porter.

Oct. 4th. The improvement in the ulcers is now daily perceptible; the mode of reparation is two-fold,

the edges are contracting, whilst granulations are being thrown up in the centre; to take two pills only in the day.

8th. The improvement still proceeds rapidly; her health is nearly reinstated; the edges of the ulcer on the lip are approximated by strips of plaster; the excavation in the roof of the mouth is now filled up with granulations: to take only one pill each day.

12th. She still takes one pill daily, and is going on favorably.

15th. Ordered now to leave off every thing, except the sarsaparilla. She merely applies a strip of soap-plaster over the lip, to preserve it from contact with any extraneous body.

24th. She has this morning left the hospital well in health; the lip, as might be expected, does not quite possess its natural appearance; it does not completely meet the under lip, and there is an irregularity in its edge. Before leaving, she again asserted that she had never been tainted, in any form, or in the slightest degree, with the venereal disease.

This was one of those many cases in which mercury had been largely and perseveringly used, under a mistaken idea that the affection was venereal, whereas it was originally a simple inflammation of the membrane lining the roof of the mouth, exasperated to destructive ulceration by the abuse of mercury. The disease however would only yield, as the event which renders it still more interesting, shewed, to the tonic action of mercury and sarsaparilla, which proves nothing as to its syphilitic character.

I have given the above with little selection as abstract specimens of a state of constitution, induced by various natural and artificial circumstances, and unequal to the arrest of a local process of disorganization, which state I denominate Cachexia; for distinction the appellative which belongs to the destroying process, or to the poison which the system has imbibed or generated, is added. Of such a state local inflammation is a progenitor, whenever its nature, extent, or duration are such as to involve the constitution and destroy its powers. Then the failure of the part is but the reflection of the constitutional failure, and the restoratives of the one as certainly ameliorate the condition of the other, as they are indispensable to that effect. Hence the occasional credit of tonic alterative forms and doses of mercury, of sarsaparilla, iodine, quinine, steel, opium, the mineral acids, baths, &c. in such diseases; and hence the infinite importance of the investigation into the modus operandi and actual effects of all available remedial agents with critical exactness, and of the selection of such local modes as preserve the organization and power of the part, and thus relieve the system as far as possible of the dead weight which additionally encumbers and depresses its functions.

CHAPTER V.

OF CONSTITUTIONAL INFLAMMATIONS AS EXAMPLES OF REFLECTED IRRITATION. ERYSIPELAS. CASES. GANGRENOUS INFLAMMATION. CARBUNCLE AND MALIGNANT BUBO. CASES.

Diseases of the constitution taking a local form are not always, as I have shown, of an inflammatory character; but when this local form exhibits inflammation in either of its processes, it is subjected to the influence of the constitution, and must be regarded and designated as a constitutional inflammation. The strumous ophthalmia and strumous sore throat are familiar examples. Where a diathesis prevails, an inflammation due to an obvious occasional cause and having all the character of a simple inflammation in the outset, becomes in course of time adopted by the constitution, and modified by the prevailing diathesis; thus catarrhal inflammation terminates in phthisis, and an excoriated lip in cancerous ulcer.

When we view such an inflammation springing up spontaneously, as an action for which we can assign no external or visible cause, we see in its simplest and most genuine character, the constitution developed in the part, which, for want of a

better term, I have called "reflected irritation," for neither the terms sympathetic nor secondary, would have been sufficient or correct, either as descriptions or as definitions. In either of the cases above proposed the irritation is reflected, for a slight deviation from the ordinary action of the part becomes the irritant in one case, as inflammation aroused by accident is in the other. What it is, that in the absence of external appearances, disposes particular textures to particular modes of inflammation, and disposes the sex, the age, nay, the individual, to the seemingly spontaneous morbid action, is another and distinct question:—but as changes of the part often precede those of the constitution, so those of the constitution often precede those of the part, and the natural susceptibility of one to the other becomes morbid; and thus even the ordinary action of a part may be the irritant of a diseased system, as a plethoric habit aggravates some local diseases. But to justify the term "reflected," it is not necessary either to suppose or to deny the pre-existence of any local affection; it comprehends the local and the constitutional origin equally, requiring only a local action sooner or later, which presents the prevailing morbid type of the constitution. This may be temporary or occasional, as in many cases of erysipelas—or permanent as in carcinoma—it may be hereditary as in some cases of inveterate scrofula, or bred in the individual, as in others—a result of contagion, or epidemy, as in hospital gangrene, or the reverse, as in carbuncle; a poison derived, as in lues, or a poison generated in the system, as in cancer; or an affection

wholly distinct from poison, either natural or morbid, as in tetanus.

The inflammation which is proper to the subject of scrofula, rheumatism, gout, scurvy, the cancerous and the venereal poison, is so marked by the peculiarity of seat, appearance, and pain, that few practitioners fail to detect its existence when present, and none question its specific origin. We have nevertheless been but partially successful, abundant as are our opportunities for the study, in discovering the precise conditions with which each is associated, or upon which it is depending. The practice of the best informed is dark and empirical, and the rationale of the cure, when that is fortunately obtained, is involved in mystery, though in a practical sense the result is not less appreciated than if we were guided by the light of philosophy. One general principle however applies universally; we do not limit our attention to the local change, nor place any considerable reliance on local remedies, therein acknowledging the deeper sources of the malady.

What I now propose to consider is the case in which the constitution sympathizes with injury in a manner peculiar to itself and the injury conjointly, though in different degrees; the constitution taking the occasion to set up an action similar to those which it exhibits in its fitful states of disorder, independent of any visible local irritation. Such is traumatic erysipelas, gangrene, tetanus, in contradistinction to the idiopathic form of these diseases, as when arising from an internal and non-apparent cause. Not that it can be doubted that in reality all

such affections begin alike, and that it is the variety of occasional causes, internal and external, which operate to call them forth, and of the constitutions upon which they fall, and not that of the diseases themselves which leads us so to distinguish them; the state of the habit being much like that of a mine charged with inflammable matter, which only requires a spark for its explosion. And two circumstances especially tend to corroborate this fact of their identical origin, viz. the greater proportion of cases of grave injuries which display no tendency to these affections, and the very slight injuries which often call them forth. Thus a slight abrasion or contused wound of the skin is a more frequent occasion of erysipelas, than a compound fracture; and a puncture or superficial laceration of muscular structure a more frequent cause of trismus, than the more extensive mutilation of a limb. There is a sufficient resemblance in the character of the læsions setting up these constitutional affections respectively, and it is sufficiently obvious that certain textures and particular modes of injury have a propensity to rouse such actions, to prove beyond all doubt, that the local irritation is also peculiar, and has a substantive, though by no means an equal share in their production.

Of all the diseases of the inflammatory class which come under this definition, I select erysipelas, as that of greatest intricacy and importance. I shall first shortly describe its seats and modes of action.

The parts disposed to erysipelas are, first, the

skin, secondly, the skin and sub-cutaneous cellular membrane, thirdly, the mucous and serous membranes.

The skin. This is in general the slightest form of the disease, and may most properly be termed erythematous. It is a slightly elevated patch of irregular figure and abrupt margin, of a bright red hue, with a tinge of yellow as it fades, acutely painful on pressure; sometimes attended by transparent vesicles, seldom by swelling, always by disordered stomach, and generally preceded by fever; it terminates after a few days in exfoliation of the cuticle. It is an exanthema symptomatic of suppressed or deranged secretions; the morbid sensation is that of pricking or burning; it is more frequently unconnected with local injury than otherwise, and in either case a very manageable disease, with one exception to be presently noticed. Purgatives and antimonial salines are its appropriate remedies—it may progressively extend over a considerable portion of the body, spreading in one direction as it desquamates and dies in the part first affected,—spreading therefore by continuity, the character common to erysipelas. Its travelling thus is a source of irritation, keeping up and aggravating the febrile action; still it is generally a lenient disease, except in very aged or infirm, or otherwise diseased subjects, and soon wears itself out, leaving the patient enfeebled and requiring early support and pure air for his recovery.

The erratic form of this disease or its appearance in different regions of the body, or in distinct patches with sound interspaces, at the same time

or in quick succession, is a more serious one, although the skin is the texture to which the inflammation is confined. Spreading by the part is less threatening in its character and consequences than spreading by the constitution, and the difference in the degree of constitutional sympathy bears out this distinction. It is not the extent of surface affected which explains the greater danger of the erratic form, for this is often not equal in the aggregate to the continuous; nor is it the duration of the disease, for duration transfers the danger from the disease to its consequences: it runs its course quicker owing to the deeper sympathy of the constitution; this therefore is the cause to which its danger, as well as its existence, is to be ascribed. Like gout, erysipelas is dangerous in proportion to its diffusion, by this denoting the universality of that state of system which gives origin to it; and its appearing in distinct parts not only shews how completely it is constitutional, but how much the constitution is oppressed and unable to relieve itself.

The tendency to appear at the same time, or in quick succession, in parts remote from the point of injury and from the stomach, is a character of that erythematous erysipelas which arises from the operation of animal poisons, whether admitted by the skin or the stomach, in certain deranged states of the nervous system, following slight wounds: in such cases I have known the patches to turn gangrenous in a few hours after their appearance.

Skin and cellular membrane.

When the superficial appearance described above is attended by swelling from a

serous effusion into the cellular membrane, it is distinguished by the term "œdematous." If, as happens from a variety of causes, this serous effusion is unaccompanied, nay, unpreceded by the inflammation of the surface, it is not erysipelas but œdema. The œdematous is the most common form of the disease, and is always important but seldom dangerous, except when situated about the head, when it is always more or less so. The œdema is a mode of relief to the overcharged vessels which either averts or stands in the place of suppuration, or facilitates it, according to the state of constitutional power. Thus it is a very frequent termination of the disease.

When from the violence of the action, or the loss of tone of the absorbent system, the effusion becomes excessive, the disease terminates by a process of suppuration, and one large diffused collection, or several smaller distinct collections of pus are formed in the cellular texture, which is spoiled and sloughy. The matter is of a thin consistence, secreted by the same vessels which have loaded the cells with serum under a continuance of the inflammatory action, an action incapable of the higher stage of adhesive deposition. The cellular texture dies, and with the effused fluids undergoes that state of decomposition to which the expressive term "pourriture" is applied by the French. The entanglement of the matter by the shreds of dead cellular substance, renders it impossible to discharge such collections but by free incision, and the best practice is to incise them as soon as the suppurative process is manifested, by

which their further extension is prevented and much relief obtained. As such collections are not indicated by what is called "pointing," the presence of pus is not always ascertained so early as is desirable, and it is sometimes not until matter is formed in great quantity, so as to fluctuate, that the surgeon is aware of its existence. This is a sort of delusion conveyed by the œdema under cover of which it forms.

The third termination of erysipelas is in gangrene—in which the skin dies along with the cellular membrane. This is rare, and happens abruptly and from purely constitutional causes; unless a result of excessive distension, as in enormous fascial abscess, or of disorganization from violence, as in bad compound fracture. It is remarkable however to what an extent the destruction of the subjacent membrane, following the inflammation and excessive distension of the skin, will proceed, without affecting the vitality of the latter. Upon the eyelid and prepuce, where its texture is peculiarly delicate, we oftenest see it die.

Gangrenous erysipelas is distinguished from gangrenous inflammation by the prior existence of the erysipelas, and its confinement to the integument, though diffused over a large extent of surface, as the entire or the half of a limb, for example. In gangrenous inflammation there is no such diffused swelling and redness as belongs to erysipelas, prior to the appearance of the phlyctenæ or sphacelated spots. When actual death has taken place in erysipelas of the trunk or limbs, the signs of distinction

become faint and would vanish altogether, but that the extent and circumstances of origin of gangrenous erysipelas seldom permit of the maintenance of life long enough to observe the phenomena peculiar to it.

In the terminations of erysipelas above mentioned the adhesive process is passed over altogether, and this absence of the boundary which, like the hoard erected round a building under repair, precludes interruption to and from its neighbourhood, constitutes the strongest local character of erysipelas. Suppuration, when not so circumvallated, is an action without an object and as purely destructive as gangrene. For not only is the action without local check or confine, but it is also destitute of the material of repair, organisable lymph, the basis of granulation. I say organisable lymph, that which is essential to phlegmon and abscess, because the term phlegmonoid has been adopted to designate a variety of erysipelas, in which the effusion is of firmer consistence than the œdematous and suppurative, yielding less to pressure, and conveying no sensation of fluidity to the fingers of the examiner. The distinction is founded in truth, but the term must not be understood to convey that the matter effused is an organizable medium. In this sense we might as justly call carbuncle, phlegmonoid. A concrete albuminous matter, such as is seen after puncturing and emptying the vesicle of a powerful blister, is seen upon incision of this phlegmonoid erysipelas when the serum has drained away from the cells, which are distended by it to their utmost

capacity—and with this, puriform matter, and in an advanced stage, sloughs are here and there intermixed. The section of the integuments over a deep seated tumor presents the same yellowish white substance plugging the cells of the common membrane, and separating the skin to an unusual distance from the fascia. Surgeons know it familiarly as that firm œdema which extends to some distance above the diseased joint, and gives the preternatural depth and resistance to the incision in amputation. It appears to retard the process of suppuration, or by its bulk and solidity to restrict it within narrow limits. It is peculiar to the extremities in my experience, and absolutely insusceptible of organization.

This variety of erysipelas is well known to hospital surgeons from its often following injuries of the hand and foot, especially the former, in bad habits of body, or under circumstances of aggravation from neglect or treatment. Its termination, if unrelieved, is in gangrene of the entire limb, whereas in the ordinary suppurative form of erysipelas, the skin is preserved at the expense of the subjacent texture.

The reflected membranes.

The conjunctiva, membrane of the fauces, of the air tube, of the rectum, and I believe, of the pulmonary and intestinal surfaces throughout, are occasionally the seat of this species of inflammation. It is rare by comparison with that of the external tegument, and perhaps chiefly occurring in the immediate vicinity of the skin, as where that membrane is reflected or modified by its relation to the function. The subjacent cellular tissue is involved in the in-

flammation, giving it the œdematous character, and it is probable that this tissue, pervading and connecting all the textures of the body, is in all liable to erysipelas, though not hitherto presenting itself to observation in such a form as to be generally so recognised.

The excessive chemosis of the muco-serous membrane of the eye, which ushers in the acute suppurative ophthalmia, indicates, not less than its disposition to gangrene upon the cornea, that it belongs to this species of inflammation. In the pharynx and membrane of the glottis it arises from cold and causes operating constitutionally, in which it sometimes turns gangrenous, as in scarlatina maligna; and from wounds of the throat, or caustic substances applied or swallowed, the obstruction to respiration from excessive swelling is sometimes such as to demand tracheotomy to prevent suffocation. It is also sympathetic, more or less, with acute œdematous erysipelas of the head and face, in which disease the patient is generally from this cause deprived of the use of his natural senses of smell, taste, and hearing. The contagious property belonging to erysipelas is strikingly manifested in some of these cases. I have known it fatal to three of the same family within the space of ten days. In the rectum ligatures of internal piles, and of bleeding vessels, necessarily including a portion of the sub-mucous membrane, give origin to this inflammation; and I have seen it in several cases produced by the division of a fistula, in which erysipelas of the nates, and gangrene of the integuments surround-

ing the anus terminating the erysipelas, terminated also the patient's life. The peritoneum is exposed to this species of inflammation after child birth, and I believe that a large proportion of the puerperal cases are cases of erysipelas. The diffusion of the inflammation over the cavity, the non-production of adhesions, and the presence of flakes of albuminous matter floating in a curdlike serum, the sudden prostration of power, and the strongly marked property of communication, whether by contact or atmosphere, lead me to consider it as of this description. The absence of œdema is explained by the strictness of the sub-serous cellular texture. It is probable that the connecting cellular tissue in the interior of all structures, whether muscular, membranous, nervous, vascular, or bony, is subject to be so affected in those painful diseases which, under the denomination of chronic rheumatism and neuralgia, so frequently defy all our ingenuity of explanation and of treatment.

And yet more certainly we may conclude this to be the case in those deep-seated abscesses, necroses, and tumors hard and soft, which are accompanied with great bulk and consequent extension of all yielding textures, so as to threaten life as well as limb.

The most frequent exciting causes of traumatic erysipelas are,

1. Wounds, superficial and penetrating. There is no description of wound involving the integument which does not sometimes give rise to it.

2. Ligatures, and the employment of adhesive

plaster, sutures, bandages, and splints, in the first instance, with such a degree of strictness as does not allow for after-swelling, or the escape of the necessary discharges from the wound.

3. Inflammation of suppurating surfaces, as chronic ulcers and sinuses leading to dead or diseased bones, &c.

Erysipelas is constantly confounded with inflammations of the integuments, which arise under different circumstances, and are of a distinct character. Thus the inflammatory œdema so commonly following the bites of leeches on the eyelids, prepuce, scrotum, and other cellular textures, parts much disposed to erysipelas; the sympathetic erythema, or even suppurative œdema, which takes possession of the integument of a limb, in inflammation of the fascia, veins, or absorbents, and in sub-fascial collections of matter; and the sympathetic blush of the skin covering a gangrene, as of the tunica vaginalis testis, or a mortified hernia, or a carbuncle, are denominated erysipelatous, by which it is intended to designate an adventitious form of the disease. The state of the integument which results from infiltration of the cellular membrane by an extravasated fluid, from sympathy with inflamed absorbents or veins, and from changes of the subjacent membranes, or accumulations beneath them, is widely differing from erysipelas; and we should greatly reduce the list of cases classed and reported under this head in surgical practice, if we would confine the term to those in which the skin, or skin and cellular membrane, are primarily affected.

If a portion of integument like the prepuce or eyelid swells, reddens, and, instead of simply suppurating and ulcerating, a central portion turns gangrenous and separates, leaving an ulcer penetrating the integument—a very frequent case—it is a misnomer to call it erysipelas. It is inflamed œdema, a disease altogether local.

Serous and purulent effusions in the cellular membrane are frequently met with, independent of any discoloration of the skin, as in many of the cases lately described under the term of "diffuse inflammation of the cellular membrane,"—and in the rapid œdema from substances acting as poisons on the stomach as well as in anasarcous swellings. Commencement in the tegument, external or internal, deficiency of adhesive inflammation, and a peculiar state of the system with which the inflammation is connected, whether spontaneous or the result of injury, are diagnostic characters of erysipelas.

I have now described sufficiently the ordinary local appearances of this disease, to proceed to the consideration of its obscure pathology in more direct reference to my subject.

In what does the local disease consist? Inflammation, indicated by a preternatural fullness, color, sensibility of a portion of the skin derived from the injection of its vessels with red blood, vessels, which are in health transparent, and carrying only the colorless part of the blood; which, although capable of being affected by the permanently increased action of the heart, are nevertheless so far remote from, or independent of its ordinary influence, as

to be unaffected by the state of the heart's action, and to carry on actions and processes without any obvious sympathy of the heart, as evinced by the general circulation. The sympathies of the skin are peculiar in being more direct with the brain than with the heart,—the blush precedes the sensible increase of the heart's action, if any be perceptible, as the pallor precedes the state of syncope. So also, the fever of scarlatina, measles, and small pox precedes the eruption, and the inflammation of erysipelas precedes the fever. Such an interval not peculiar to erysipelas, but applying also to cutaneous inflammation from burns and scalds, as well as the injuries of cutting, tearing, and bruising the surface, tends to shew that the sympathy is slowly evinced between the heart and skin, as compared with that existing between the latter and the nervous centre. Hence I consider erysipelas to be a nervous inflammation, bearing to the actions of the vascular system, that irregular and undefined relation, which tetanus has to the actions of the nervous system. And it is remarkable, by the way, how the injuries are in their nature assimilated which tend to the production of one or the other of these diseases. The independence which subsists between the capillaries and the heart does not exist between the sentient surface and the brain—the two are in contrast, and it is therefore through the medium of the brain, i. e. the nervous centre, that the irritation which acts directly upon the one is transmitted to the other, it may be slowly, or not at all. Thus all the phenomena of local inflammation of the skin may be present and the

heart unroused, as we see continually—the inflammation which has a deeper seat or whatever be its seat is of a more vigorous character, and, as in direct adhesive, or suppurative action, involves the arterial circulation, is quickly enough participated by the heart, as in sympathetic inflammatory fever—that, on the other hand, which is continued under the superintendence of the nervous system by the vascular action of the part, is carried on without rousing the heart's sympathy. The seat of such weak and ineffectual action is the capillary system, and its action is of the nature of erysipelas. Vesication and œdema are purely local actions, never indicative of power—but modes of relief under an obstructed or overcharged state, the result of atony of the system of vessels to which they belong, or the forerunners of a dissolution of texture. The preternatural pulsation of the arterial branches, and the sensation of throbbing, felt in the contiguity of phlegmon, are not observed in erysipelas. It is to the venous side of the circulation that the capillary system inclines, when the balance which it holds between the two is disturbed. In fine, the expansion of the sentient extremities rendering the skin an organ of most direct and intimate alliance with the brain, and its being, at the same time, the seat of a vascular system peculiar, not less for its subservience to the brain, than for its remoteness and partial independence of the heart, appear to me to explain phenomena of its pathology, not otherwise intelligible, and first and chiefly, the character of erysipelas.

Of idiopathic erysipelas the causes are referred to

sudden changes of temperature, a humid soil and atmosphere—of which, particular conditions at certain periods of the year, render the disease more frequent. Especially also, an unchanged, and therefore, as well as from other causes, a polluted atmosphere; such as the ill ventilated apartments of the poor, and even of many old parochial and eleemosynary institutions, manufactories in crowded cities, narrow alleys, and underground chambers, where running sores and other uncleanlinesses additionally contaminate the stagnant air.

Indigestible food, exciting or depressing passions of the mind, excessive fatigue, or habitual indolence, coupled with a torpid and vitiated state of the great secreting organs; luxurious living, and the habitual use of fermented liquors to excess, are among the causes which predispose to it.

What is the effect of simple injury upon a habit predisposed by age, infirmity, an irregular state of the secretions, bad atmosphere and diet, debauchery, &c., or upon one previously the subject of slow disease? What is the species of inflammation which we apprehend when a wound falls upon the extremities in such an individual? Are not all the causes above enumerated alike in kind depressing, and such as would contribute to the production of typhoid fever? Is it not upon the brain and nervous system that they act directly and with especial force? And what is the direct operation of severe and complicated injuries upon the same system? It is to trouble and depress the tranquil and tonic condition of that system, and the preserving and restoring ac-

tions which depend upon it; hence the inflammation is not sanatory, but destructive. Again, I enquire what is the effect of injuries which have passed into a chronic stage, so considerable as to threaten life from the long continued irritation and waste of power attendant upon the natural processes toward repair; as for example the removal of dead bone, the discharge, filling up, and obliteration of large abscesses, sinuses, ulcers; or of such new structures and alterations of original structure, as by their position, extent, and increase, sap the powers of resistance and support? In such cases, of all the most anxious, we reason prospectively: we see the constitution struggling gallantly in the conflict for a long period of time, but we tremble for the event, when we reflect how much is yet to be done before the disease can be arrested, or the mischief repaired at whatever compromise, so as to cease to vex and harass the constitution. Now these are the circumstances in which erysipelas continually makes its attack with greatest severity, for it is never a primary disease, whether acute or chronic, whether set up by an invisible or an obvious cause, whether removed by the aid of medicine, or resisting its operation altogether. It is a disease of irritation and of reflected irritation, and there are doubtless circumstances vindicating its appearance and determining its site, in the absence of external injury, as clear and cogent as in the visible presence of injury, could we penetrate the veil which shrouds the nervous agency. Why this mode of inflammation should appear in lieu of the adhesive or phlegmonous species, as a symptom of irritation, is answered by the

fact that it is an irritation due to a morbid condition previously existing, and in the absence of which it can no more appear than an effect can precede its cause. A part being of feeble power owing to its remoteness from the centre, or by having been the subject of previous inflammation or læsion, or possessing some extraordinary sympathy existing in most individuals with the nervous centre, an idiosyncrasy,—as various ingesta produce an erythema or an urticaria,—may determine situation. I may notice, however, that there appears to be a principle of preference or exclusion possessed by different regions of the surface for different modes of erysipelas, as for other morbid affections and actions. The œdematous is common to all parts, but less frequent on the trunk than the erythematous. I have seen the erythema suppurate and gangrene upon the chest and abdomen. The suppurative and gangrenous terminations are seldom seen in the œdema so commonly affecting the scalp, but about the eyelids and angles of the jaw, and the neck, suppuration is common. The most lax cellular texture, as that of the palpebræ, prepuce, and scrotum is most liable to the gangrenous supervening upon the œdematous, as well as the suppurative erysipelas; the phlegmonoid variety is confined to the extremities.

Not only is a certain morbid condition of the system an essential ingredient in the production of erysipelas arising under a variety of circumstances, such as would at first sight appear very dissimilar to each other, but it is in itself wholly destitute of a healthy character—it forms no stage of a process, necessary or intermediate to recovery.

Without adhesive inflammation, the suppurative, ulcerative, and sloughing processes are undefined and uncontrolled, and it must be by supporting and rectifying the constitution, that we oppose any effectual check to them, and superinduce that healing action, when the work of destruction is at an end. It may be asked, how is the appearance of erysipelas in a person previously healthy, after a lapse of forty-eight hours or sooner from the infliction of an injury, to be reconciled with this statement of its constitutional origin? Simply thus—the elements of the disease have been the immediate workings and results of the injury, or, if they have pre-existed, they have been stirred into activity by its direct effects. Do we not see nausea, retching, obstructed or paralysed bowels, skin, and kidneys; head ache, loins ache, anxiety, stupor, delirium, full and bounding, contracted and wiry pulse, all following upon an injury within the same short period? And can it be questioned that here is combustible material for the change upon the part injured, whether erysipelas or gangrene? would it not be more wonderful if with such commotion of the citadel, the tranquillity of the outposts was undisturbed, even without the provocation of assault? That a certain morbid condition is an essential preliminary to its appearance, as to that of gangrene and tetanus, is the strongest proof that can be had of its constitutional origin. The liver and the stomach have been generally regarded as chiefly in fault, and certainly they are always more or less disordered. But even in gastric erysipelas no organ suffers more remarkably than the brain.

I have formerly shewn that the actions of the vascular system are under the control and superintendence of the nervous, and on no other hypothesis can I comprehend the physiological or pathological phenomena of the human body. If there was an oversight in the comprehensive views of Mr. Hunter, it was his not sufficiently appreciating this all-presiding influence in the economy, and especially on inflammation and its consequences. The specific character of this and other irritations which act through the nervous system, and which I call diseases of reflected irritation, is derived from the important influence exercised by the brain. Over these diseases a mystery has hung to this day, which has rendered them a sort of enigma. Some have called erysipelas a salutary effort of the constitution to eliminate morbid matter, or depurate the blood of vitiated secretions, which it has absorbed: others have regarded it as peculiar to broken down habits, and its fever depending upon a putrescent state of the fluids: others again have imagined that its seat explained its peculiarity, and have thought little of remote or constitutional influences, external or internal, and treated it accordingly on the same general principles as other local inflammations: and by one, who had seen much of it, it was gravely pronounced to be no inflammation at all, but an erethysm sui generis. If variety of doctrine were not sufficient evidence of its obscurity, I would simply appeal to the experience of the profession for the fact of its capricious, shifting, and difficultly intelligible character, its danger, the vagueness of opinion generally prevailing as to its cause, and the diversity of practice adopted for its cure.

My own opinion is, from careful reflection on its history and phenomena, that erysipelas derives its local peculiarities from those of its seat, viz., the membranous capillary circulation; and from the intermediate influence of the nervous system between this and the heart, and all the other organs of the body, its peculiar pathology. That it partakes therefore in the strongest form, the character of a nervous inflammation. To the healthy and vigorous action of inflammation, the tone and tranquillity of the nervous system are indispensable, and its sympathies are subservient—the enfeeblement and derangement of that system constitute interruptions and drawbacks to such an action of inflammation, even when secondarily aroused, in all situations and circumstances; but in erysipelas, the sinister influence is primary, because its seat and causes concur to subject it to the more direct influence and control of the nervous system. The organ most exposed to the operation of external agents is that which puts us in relation with them, presents the largest surface to attack, is organized so as to fit it for the expansion of a sense, and at the same time the principal emunctory of the body, and which maintains an ever watchful sympathy with every organ and function of the system. Its sympathies are universal, but the brain is the organ of sympathy, and it were as idle to look for any other medium of communication between the skin and the heart, the lungs, the stomach, or the kidney, as to renew the search for a duct extraneous to the circulation between the two last named organs, to explain the rapid transition of fluids. The skin is the

organ consequently upon which a large proportion of the diseases to which the body is liable, make their attack—not so much by actual ingress as by disordering or arresting its function. Such is the commonest origin of fever, of visceral inflammation, of glandular, and many other diseases. It is remarkable in how many of its own diseases it suffers secondarily, or by sympathy with its fellow organ, the interior skin, or lining membrane of the visceral cavities and alimentary canal. With the pulmonary surface the skin sympathizes in the noxious effects of atmosphere and temperature in all their qualities and vicissitudes, with the heart in the varieties of its circulation from a thousand causes, with the stomach in the quality and quantity of its ingesta, and remarkably with the kidney, so as indeed, in some instances, almost to reciprocate its functions. But with none is its sympathy so active and so instant as with the brain, of which, in a certain sense, it may be regarded as a production.

If proof of this were required, I would mention only the extraordinary effects of burns and scalds, and of erysipelas in its severe form, produced by slight injuries; the operation of heat, and friction of the surface in suspended animation—and in a minor sense, of affusion, of baths, and of vesicatories.

I need scarcely mention that the temperature and nutrition of a limb, of which the nerves of sense and motion are paralysed, are defective in a degree to be apparent to superficial observation; that both the preserving and restoring powers fail, so that the ordinary external agents of heat and cold, and pressure, pro-

duce læsion of the skin, which, by whatever cause induced, being unequal to inflammation, dies at once. Hence, if the nervous power is greatly enfeebled, or only partially withdrawn, similar effects follow, in a corresponding proportion, and hence the reason why a person in health may lie for years upon his back, without inflammation of the skin covering the base of the sacrum, which in an individual enervated by sickness, sloughs in a few weeks to the bone. Hence, also, the reason why gangrene of the extremities is frequently the result of an extremely depressed state of the nervous system, independent of any perceptible change in the texture of the heart or arteries, or any mechanical impediment to the circulation of the blood. Nervous collapse, or prostration without reaction, is an extreme instance in exemplification of the same state.

But it is unnecessary to multiply facts to shew the dependence of the vascular on the nervous system, or the contrary; what I wish to convey is, that the nervous fibre is so integral a constituent of the surface of the body, that the system to which it belongs exercises a special influence over its condition, both in health and disease, and is roused by its injuries in an extraordinary degree. That the vascular action proper to the surface, is directly modified by its agency, in consequence of this quick sympathy between them, and the more circuitous and remote connection and sympathy with the general circulation. Hence the precedence of the nervous to the vascular phenomena, as is implied by the term "throwing out" in all the exanthemata—the

nervous indisposition preceding fever, the fever preceding the eruption; and where, as often in erysipelas, idiopathic and traumatic, no fever pre-exists, the invariable indisposition evinced by heaviness, lassitude, pains, anorexia, and numberless other signs of nervous irritation. All the predisposing causes of erysipelas are, in their nature, debilitating, whether unwholesome atmosphere, or diet, chronic disease, confinement, anxiety, the long continued action of alcohol, mercury, antimony, and repeated bleedings,—(a person may be as easily blooded into an erysipelas or a carbuncle, as a dropsy; I have seen both fatal to apoplectics who were freely cupped, at short intervals, as a precaution)—and last of all, not least, its own atmosphere, for it is a highly contagious disease. Its exciting causes are such as irritate enough to produce inflammation, whether by local congestion or external stimulation, or wound of any description; but if in some shape or other, both causes were not indispensably instrumental to its production, how could we explain the history of a single case, or of the thousand cases of its non-appearance in the same and graver injuries, for one of traumatic erysipelas?

What, then, are its circumstances? Does it ever appear either as a spontaneous affection, or as a result of injury in a sound condition of the system? I should say, never. Of course I am not now speaking of a rash, as a roseola or an erythema may be termed, or of that chronic state of skin in the legs of old people, covered with scales of the diseased cuticle, or coupled with varicose veins and

old ulcers, and many more of such disorders as pass under the name of St. Anthony's Fire.

Erysipelas, properly so called, is habitual, in a mild and chronic form, to infirm and elderly people who are laboring under a morbid diathesis, especially to women, the subjects of scirrhus. In children it is very rare, and is of the gastric species; in sedentary and corpulent women, at and after the cessation of the catamenia, very common. Mr. Hunter thought it was not always constitutional, because it affected young children and women of temperate lives and faultless constitution, and because it was the common course of the disease, to get well on one side as it spread on the other. With respect to temperance, I should say, under living was, in my experience, more directly predisposing to the disease than the contrary, and the constitution is in the main what the health is; the other argument is double edged, the inflammation having run its course, terminated by the death and exfoliation of the cuticle, is not what the term "getting well" conveys, except in relation to the individual case; and its spreading in the opposite direction, so continually seen in cancerous and venereal ulcers, is not a happy illustration of the pure locality of the disease. In truth, I should have reversed the inference. However, it is evident that the remark applies to the lighter form of erythematous erysipelas from disordered stomach, not to those which I am considering.

In both sexes, the young, fair skinned, and delicate are liable to traumatic erysipelas, when debauched

in their habits and mode of life. The frequent substitution of ardent spirits for food, among the lower classes, is a powerful predisponent to the inflammation of erysipelas and gangrene, when they become the subjects of local injury. The gastric erysipelas which Desault seems to have erroneously regarded as the universal form, is met with in persons of sedentary lives, and what is called atrabilious temperament, and among hard drinkers. It is common to find erysipelas, like jaundice and dropsy, in company with diseased changes of structure of the liver.

The symptoms, as well as the causes, are such as characterise deficient power. In addition to those of passive congestion in the vessels of the brain,—as pain and a sense of weight extending throughout the body and limbs, confusion, lethargy, deafness, or wandering delirium,—frequent retching, which it is often difficult to appease, and a degree of prostration resembling that of typhus, which incapacitates the patient from moving in his bed, are symptoms of erysipelas, though confined to the extremities. A surcharged state of the veins and sinuses of the brain, and a quantity of fluid beneath the arachnoid tunic are the principal, if not the only, recent changes observed in post mortem examinations.

The apoplectic character is still more strongly marked when the disease affects the head. The patient is scarcely to be roused from his stupor, and the breathing is stertorous. I have seen maniacal delirium present, but it is rare compared with that of dreaming and muttering. All accidents accompanied with shock or concussion of the brain, or inducing an

undue determination of blood to that organ, and especially wounds of the face and hairy scalp, are particularly prone to erysipelas. Indeed, it is a consequence of scalp wounds almost invariably, when closely bound up by strips of resin plaster, to promote union. The practice is highly objectionable. On the other hand their edges should not, if clean incised wounds, be permitted to gape, as this promotes a diffused suppuration of the cellular membrane. The agglutinative should be unirritating, and the daily dressings light, with interspaces for the discharge. Sutures should never be employed.

Leeches and blisters, after injuries of the head, often give rise to erysipelas, which in another case would be simple œdema. The vicinity of the brain and its membranes has been supposed to explain the peculiar danger of erysipelas affecting the head. The great disfiguration of the countenance, and total loss of expression, perhaps aggravates the idea of danger. I believe the sympathy to be independent of contiguity, as the same general symptoms and appearances prevail, with this exception, when the disease is seated on the trunk or limbs—but it is reasonable, and in conformity to experience, to conclude, that the sympathy is quickened by contiguity.

The state of the pulse in erysipelas is variable in an extreme degree; now large and bounding, now attenuated and feeble. The secretions are scanty and highly morbid, and their improvement in these respects, especially of the bile and urine, is said to be sometimes critical of the disease. This, as regards the latter, is the opinion of Richter.

All the eminent ancient authorities have regarded

erysipelas as a disease of debility, making its attack with a vehemence disproportioned to its power, and therefore prohibiting the use of the lancet, or the continuance of depressing remedies of any description. Theories may have unduly biassed observation in some instances, but the general jealousy of the full antiphlogistic treatment has doubtless been inculcated by experience of its ineligibility and its danger. The truth is that an hypercatharsis of very short duration, or the loss of a few ounces of blood has often proved fatal in an erysipelas, and the disease is not unfrequently terminated on a sudden, or the patient narrowly saved from sinking by such volatiles and cordials as could be got down. At this moment there are hospital physicians, and others of equal repute, who treat the disease with ammonia, camphor, bark, and even alcohol at its outset; others who treat it upon a purely antiphlogistic plan, but of these, few who venture upon bleeding, or more than a single and early bleeding, and they have speedy recourse to alimentary support to preserve the patient's powers. The truth, probably, in this as in most instances, lies in medio, for it is a curious fact that the success of the two parties is as nearly as possible balanced, so that the principle of treatment approximates more nearly than the details would lead us to suppose. This must arise from such modification in obedience to the same general principle as the circumstances of individual cases dictate, an explanation equally creditable to the discernment of the physician and his freedom from prejudice. A proof, too, that the disease presents great variety, or rather, perhaps, the

constitutions in which it appears, and that the empirical (not to speak it profanely) is in truth the rational practice.

The custom of Dr. Fordyce and Dr. Wells of St. Thomas's Hospital, no mean authorities in the profession, was to adopt the tonic system in the commencement, acting gently on the bowels. The typhoid character of the fever, and the early, sudden, and extreme prostration were with such men doubtless the inducements to the practice. The humoral pathologists who referred the disease to a putrescent state of the fluids, drew their notions from observations of the same phenomena, and prescribed accordingly. And I am bound to say that, with the exception of calomel and the tartar emetic, in the onset of the disease, especially when attended by gastric irritation, I have seen the greatest benefit derived from the early administration of ammonia and the different forms of bark now in use. As regards the local treatment of erysipelas, I cannot say that I consider any external applications beyond a cool and gently astringent lotion, or a light and equally consistent poultice, productive of any advantage. Many are decidedly hurtful, and by irritating the overloaded and weakened vessels, induce the speedy disorganization of the part. The mercurial ointment, blisters, and the application of caustic to the circumjacent sound part, and compression, as well as a variety of herb fomentations and farinaceous powders, have each had their advocates. But I have no confidence in the efficacy of either after trying all these plans ineffectually. There is, however, a mode of

treating the severe œdematous erysipelas, and especially the variety termed phlegmonoid of modern introduction, and which, not less for its value as a remedy in this disease, than the still more important benefit to be derived from its establishing a principle of general application in surgery, deserves to be mentioned in terms of high approbation. Indeed I should be at a loss to name a more valuable accession to the art, of modern date, than that for which the profession stands indebted to Mr. Copland Hutchinson. Formerly, the incision, nay, the scarification of an inflamed and swollen integument, not affording any sign of suppuration, but rather threatening gangrene from its color and extreme tension, was neither practised nor proposed, and except a deep seated abscess was to be relieved by the thrust of a scalpel, the wounding of the inflamed and livid integument by a lancet or a leech bite was shrunk from in apprehension of the consequences*. Now, we not only fearlessly smother the inflamed surface with leeches, but in inflamed œdema, œdematous erysipelas, diffused inflammation of the skin from whatever cause, provided it be attended with swelling and tension,—whether soft and pitting, or firm and brawny; without any reference to the effused fluid, whether pus or serum; whether a circum-

* "What," exclaims my learned friend Professor Cooper in his most valuable Dictionary, edit. 1825, "are all the principles of surgery now so changed, and is the nature of the human body and constitution so altered," that inflamed parts are to be soothed by maiming and wounding them, or to use the Author's words, by making "from six to eighteen incisions" in them?

scribed infiltration, or a diffused and heterogeneous collection—a free and penetrating division of the integument is ascertained to be the most effectual mode of relieving constitutional irritation and saving texture. The relief is equally marked, even although no pus follows the incision, from the removal of stricture, and the escape of blood from the divided veins.

Much mutilation and many lives have already been spared by this admirable practice. The incisions may be proportioned to the mischief to the extent of three inches, but seldom need or should exceed that space. They should penetrate the entire cellular structure, and if arteries of a size requiring more than the pressure of the finger for two minutes be divided, they should be secured by ligature. The venous bleeding is beneficial; arterial is neither advantageous nor safe, as has been sufficiently proved *. Two, three, or more such incisions may be made, if an entire limb is affected. Of the puncturing practice I have no favorable opinion. It irritates, without effectually unbinding or unloading, and is a cruel prolongation of suffering, especially when the disease is situated on the face and head. The relief of the system is evinced in the practice of division in two ways. First, by disembarrassing the circulation of the part

* If such patients are left but for a few minutes to bleed, they are left to die, and the object and end of this invaluable practice are misunderstood. A needless extent of incision not only increases this danger, but is open to other obvious objections.

and relieving the increasing congestion of the vascular system; thus raising instead of depressing its powers. Secondly, by the division of a stricture otherwise unrelievable, and establishing a free suppurative action at one or more points of the surface.

The proofs of the contagious character of erysipelas are more decisive, and unfortunately more abundant, than of almost any disease with which I am acquainted. When it prevails in a particular ward of a hospital, cases of accidents, and even trifling operations, should, if possible, be excluded from it. A patient, the subject of wound of any sort, should not lie contiguous to one affected with erysipelas. The idiopathic arises from the traumatic, as this from the former, and each from the same, as I have repeatedly seen. The practice of scouring the floors of wards and ships' decks has been supposed to contribute to its production, and the substitution of dry-rubbing the floors and decks, to relieve the ward and ship of the contagion. This practice, Sir Benjamin Brodie informs me, has been successfully employed at St. George's Hospital in wards so affected.

It is not to my purpose here to enter into this subject in detail, or attempt to analyze the character of the contagion, but I may observe, that it is an additional corroboration of the argument, that the disease holds that peculiar association which I have described with the nervous system; this being the organ by which the deleterious agency of the matter of contagion is first manifested, whether admitted by the cutaneous or the pulmonary surface. And the history of all the local contagious diseases agrees in shewing the nervous

system to be primarily engaged in them to a degree over-proportioned to the vascular, whether plague or small-pox, scarlatina or puerperal inflammation, or, lastly, as being the medium by which they prove destructive.

That this early implication of the nervous system in inflammatory disease occasionally serves as a mask to the real powers of the system, and thus conduces to a belief of greater weakness than in fact exists, must be admitted. This opinion has received strength from the fortunate result of some cases treated upon a bolder plan of reduction than the symptoms appeared to warrant, as well as from persons of athletic and robust temperament being occasionally attacked with erysipelas.

I have never intended to convey that the disease was confined to any one class of temperament or life, or, in defining the character of the disease, to set bounds to its varieties of form and degree, or the influence of complications with other morbid states. And thus we see the lancet may be useful in one case and injurious in another; that one patient will bear calomel and antimony and not another; that in one case support will keep down the pulse when a lowering regimen fails; and opium correct the function and support the tone of the nerves, while in another it adds to the disturbance, and is in fact an irritant. As medicine can never be reduced to a simple science subject to invariable rules, the apology for the interference of the physician is furnished by the occurrence of varieties.

CASE. Erratic erysipelas from incision of a sympathetic bubo.

Cook, a girl æt. 17, was admitted into St. Thomas's Hospital in December, 1817, for gonorrhea, with a suppurating sympathetic bubo in each groin. These were opened by the lancet, a week intervening between the operations. Four days after the second operation, patches of erysipelatous inflammation appeared upon the lower part of the abdomen, assuming something of the character of shingles. In a day or two afterwards, similar patches appeared upon the nates, loins, and hips, with some few and small vesications.

The girl had a strumous complexion, and the appearance of delicate health, but had never taken mercury. The inflamed parts were extremely painful; her rest and appetite forsook her, and her stomach became so irritable that she could retain nothing. Upon the appearance of these symptoms, she was removed from the mercurial atmosphere of the venereal into a clean ward. Her bowels were freely but gently cleared, and she was put on the decoction and tincture of bark, with a small addition of the tincture of opium. The inflammation spread rapidly, presenting a continuous surface over the loins, nates, hips, abdomen below the umbilicus, and thighs, with vesications here and there but sparingly interspersed. Soon afterwards, the left mamma presented an extensive but defined patch of erysipelas. The pulse was 120, small and feeble; the tongue slightly furred, bowels moderately moved, skin open. She complained of great pain, and a total want of rest and appetite, with considerable

thirst. Some sulphuric acid was added to the bark, and a pint of porter allowed daily.

For the two following days, the irritability and pain were diminished, the stomach had become tranquil, the inflammation less florid, and stationary; the pulse still very quick and small; no appetite, and constant watchfulness. The tonic was continued, and eight ounces of wine directed to be given daily.

Next day the countenance and manner of the patient became altered; the former livid and hollow, with much heaviness of the eyes, and a general expression of languor: her answers were slow, and somewhat indistinct. The inflammation was spreading on the breast, and a patch now appeared upon the right cheek. The tongue was morbidly red and dry in the centre, and brown at the sides: other symptoms the same. From this period, the patient sunk rapidly, the languor approaching to stupor, so as to make it difficult to obtain her answers. Both cheeks and the neck were now affected. On the lower part of the trunk the efflorescence had faded. Aphthæ appeared on the edges of the tongue, which had still a morbid redness on the surface. She objected to the wine, and took an additional quantity of porter.

On the tenth day from the attack, she was in a state of low delirium: her countenance extremely pallid and sunken, pulse as quick and small as possible, and tongue now covered with aphthæ.

Next day she was insensible, occasionally convulsed in respiration; and in this state expired.

The body was attentively examined; but no morbid appearances were discovered, to throw any light upon the disease.

CASE. Erratic erysipelas from dilatation of a sinus in the groin.

Taylor, æt. 24, a girl of delicate habit and health, was admitted, in February, 1818, into St. Thomas's Hospital, with two sinuses between the integuments and abdominal muscles, a little above the crural arch of the left side. After taking the house aperient, and poulticing for some days, one of the sinuses was dilated with the bistoury, and lint laid between the edges of the wound, which was covered with a poultice. Two days afterwards she was attacked with fever, accompanied by headache, and flushed countenance.

On the fifth day an erysipelatous inflammation made its appearance, extending upon the belly to some distance from the wound, and nearly the whole length of the left thigh. A weak, spirituous lotion was applied to the inflamed part. Considerable constitutional irritation was present, the pulse 120, and countenance still flushed. Her bowels were freely opened, and she took the fever mixture.

On the seventh day the symptoms were not alleviated, the inflammation was extending slowly upwards, she complained of much pain in the part, and got no rest. Tongue moist, but morbidly red: pulse the same, countenance less flushed. She was ordered a pill of calomel, antimony and opium nightly, the effervescing mixture, with a dram of the tincture of Gentian every four hours, and four ounces of red wine daily.

Next day the inflammation was observed to spread at the under part of the thigh, but was less vivid on the abdomen: the tongue was becoming parched. She was deprived of rest by the pain, and her looks were altered for the worse. Pulse 136, and small. Bowels purged.

On the tenth day the constitutional debility was much increased. The inflammation had spread extensively upward and downward, and the left mamma was now affected. She was ordered bark, in substance and decoction, with ammonia, and the wine increased to half a pint daily. The night pill was discontinued.

On the twelfth day she appeared to be sinking fast; the inflammation on the under part of the thighs and nates, going on to gangrene. Pulse very quick and small, tongue covered with a brown crust, her eyes vacant, countenance pallid and sunk; and she was unable to reply to questions.

She died the following day.

No vesication had appeared in any part of the inflamed surface. The friends refused an examination.

Case. Erysipelas following contusion of the knee.

Bromley, æt. 20, was admitted into St. Thomas's Hospital in July, 1820, for a swelling in the knee joint and the leg, the consequence of a blow received a fortnight before. An abscess, which had formed just below the knee, broke the day after his admission. A poultice was applied, and he took the decoction and tincture of bark.

Six days after his admission, sinuses, extending from this abscess, were freely dilated.

On the following day, erysipelatous inflammation was observed, spreading from the knee to the groin. He took a full purge of calomel and colocynth, and was ordered fever mixture every four hours.

On the ninth day from admission the inflammation had not extended, but febrile symptoms were increased, viz., quick pulse, foul tongue, hot and dry skin, and thirst. He was again freely purged with the same cathartic, and the bark ordered in substance and decoction, with a small addition of tincture of opium. A poultice was still applied to the knee, and linen, wet with spirituous lotion, to the thigh.

On the following day he was attacked with vomiting and purging.

On the eleventh day these symptoms had ceased by the use of a cardiac mixture with opium. He had a dry brown fur upon his tongue, quick pulse, and excessive thirst.

In the night ensuing, he was attacked with delirium.

On the thirteenth day he was restless, and occasionally delirious, and the other symptoms were aggravated. Pulse 140, small and weak. He now sunk rapidly, and on the fifteenth day from his admission he died.

CASE. Erysipelas following bruised and lacerated scalp.

Brown, æt. 48, in March, 1818, fell down in a fit of intoxication, and received a severe bruised wound of the scalp, detaching it from the parietal bone on the right side of the cranium. The bone, though denuded to some

extent, was not fractured: a quantity of blood was extravasated upon the forehead, as low down as the eye-brows. The wound was dressed with strips of adhesive plaster, and the forehead bathed with evaporating lotion. He was ordered to be freely purged.

On the fifth day after his admission, it was found necessary to dilate the wound in the scalp, owing to the accumulation of fluid beneath it. A poultice was afterwards applied.

On the third day after this operation, the entire integument of the face and head was swollen, to the utmost degree of disfigurement, by erysipelas. The febrile excitement was extreme: pulse too quick to be counted. Delirium ensued, and to this succeeded the apoplectic coma, in which state he died, on the tenth day from the injury, and the fifth from the dilatation of the wound.

Examination. Much blood was found in the vessels, both of the scalp and membranes of the brain, and some fluid effused between the dura and pia mater, but there was no organic læsion within the cranium.

Case. Erysipelas following operation for a temporal aneurism. A man had a temporal aneurism, for the cure of which the artery was tied at each extremity of the sac; the pulsation continuing, it was laid open, and four vesssels terminating therein secured by ligature, when the bleeding ceased.

On the fourth following day the patient was attacked with acute erysipelas of the scalp, which rapidly spread over the head and face on the same

side. The violence of the inflammation was partly subdued by copious venesection and free purging, but the fever continued, the swelling increased, he became delirious, and died comatose with stertorous respiration, on the twelfth day from the operation.

A case similar to the above in its progress and sequel occurred a few months since, in which a tumor occupying the outer side of the orbit and adhering to it, was extirpated by careful dissection. The patient was a strong healthy man, and not much advanced in years.

Case. Gangrenous erysipelas of the upper extremity.

Williams, æt. 60, was brought into the hospital on the 23rd March, 1816, in a state of imminent danger from an extensive erysipelatous inflammation occupying the whole of the right arm. The people who brought him, mentioned his having a day or two before poisoned a wound in his hand by some liquid in which it had been immersed, but being disposed of in the hospital he appeared to be friendless, and as he was almost comatose, no distinct history of its origin could be obtained from him. Pulse 40, feeble and irregular, countenance sunk, and intellects unsettled. The swelling was equal from the tips of the fingers to the shoulder, where there was great heat. The skin covering the biceps much discolored, threatening gangrene. The arm was enveloped in beer grounds poultice, and he was ordered bark, wine, and opium. During the night following his admission, he was seized with raving delirium, and from this state passed into the opposite, which was succeeded by stupor,

total insensibility, and death on the third day from his admission.

CASE. Traumatic erysipelas followed by tetanus.

John Bott, æt. 22, a stout healthy man, working on the 11th of May, 1831, with a chaff machine, the knife entered his leg posteriorly, at the lower part of the middle third, and inflicted a wound in the upward direction of about six inches in length and three inches deep. Mr. Keal* was immediately called, and with great gentleness drew the lips of the wound together with adhesive plaster, placed the leg in a semiflexed position upon the outer side, and ordered a rag dipped in cold lotion to be thrown over the leg; and a dose of aperient medicine.

Evening: constitutional irritation very great, leg excessively swollen and painful. The plaster was removed and a poultice applied; and he took a narcotic draught.

12th. Leg very much swollen and painful, and the inflammation is decidedly erysipelatous; countenance flushed, eye anxious, violent head ache, skin hot and parched, tongue foul, pulse 104, hard, and wiry; an enema was administered, and a second before the bowels acted.

Evening: symptoms remaining unabated he was bled to sixteen ounces; this relieved him considerably, the blood was cupped and buffed.

13th. Slept a few hours, and upon the whole he seems better; leg very painful and swelled; erysi-

* Surgeon of Oakham, Rutland, to whom I am indebted for this valuable case.

pelas spreads above the knee; no fluctuation can anywhere be detected.

14th. Erysipelas increased, no fluctuation can be discovered: several free longitudinal incisions were made, which was followed by the escape of a large quantity of unhealthy pus, dark, grumous, and very fetid: this afforded him great relief; the bowels are well open; fermenting poultice, wine, and beef tea ordered.

15th. Erysipelas increased, having extended half way up the thigh; free incisions were made there also, followed by the exit of a large quantity of discharge of the same character as the former. Countenance anxious, eye sharp, pulse small and quick; skin hot and dry.

Evening. Wounds very sloughy, does not feel the slightest pain or smarting; chlorate of soda lotion to be applied. Sumat statim liq. opii sedat. ℥ xx.

16th. Has passed a very restless night; the leg has become very painful, though the discharge is more healthy, and the wounds are much cleaner. Mutton chop and beer were now ordered; the countenance is depressed.

Evening. Complains of soreness and stiffness about the throat, and difficulty in deglutition, increased on the approach of a draught of air; there is also slight rigidity of the masseters; the opium draught to be repeated every two hours.

17th. Leg very painful, though looking quite healthy and granulations springing up; the erysipelas has extended to the groin. Tetanic symptoms

very much increased; the jaw is quite fixed, and there is great rigidity of the whole muscular system, occurring in an aggravated degree every six or eight minutes.

Evening. Complete opisthotonos; leg looking better. Enema terebinth.

18th. Gradually sinking. Tetanus the same.

At 12 o'clock, p. m., died.

Examination not allowed.

CASE. Erysipelas of the mucous membrane of the throat.

In the year 1819, a poor woman called to consult me under great distress of mind, having lost her husband a very few days before from a sore throat. Except a general redness of the fauces and slight tumefaction, there was nothing to create alarm, but her husband having died of the same disease after a very acute illness*, over which the remedies prescribed had no control, I entered into her apprehensions, and directed a copious venesection, blistered the throat, and ordered calomel and antimony at short intervals. At present she had no dyspnœa, but a difficulty in swallowing. I desired her to get away from her home, which she did for two days, but having a family at home, and finding the difficulty of swallowing increase, she returned, took to her bed and in two or three days died, under symptoms exactly similar to those of her husband. There was high fever and excitement to convulsion in the attempt to swallow, great tumefaction and irritability of

* The husband died suffocated, and I had been called to perform bronchotomy, but arrived too late; he had expired.

the fauces, and lastly suffocation from impeded respiration, which took place only a short time before death. In consequence of my being absent, Mr. —— was called to her assistance and performed the operation of bronchotomy, but without relief. On examination after death, I found the cricoid cartilage had been only divided, and that the edges had fallen together again, so that no permanent aperture existed. The inflammation was confined to the fauces, pharynx, and rima glottidis, the membrane being so tumified by infiltration, as to prevent the passage of food, and lastly of air. A child was threatened with the disease, but by immediate removal to the hospital the inflammation was cut short before it assumed a fatal character.

I ought to add, that I had not the charge of the poor woman's case above related, but saw her at the instance of a respectable practitioner in her neighbourhood, who had attended her husband, and assiduously employed all the known means of arresting inflammation.

Among the various affections of the throat requiring the operation of bronchotomy, upon which so many able papers have been given to the profession, is this erysipelas of the common mucous membrane, by some termed cynanche or angina pharyngea, and by others laryngea, although respiration is not primarily affected, acute in its attack and rapidly fatal, owing to the intumescence or œdema of the inflamed membrane closing the glottis and causing suffocation. It is quite distinct from the croup or angina trachealis. Serum is effused into the sub-mucous tissue, but there

is no organizable adhesive matter. No real relief follows any medical treatment, and beyond a first full bleeding, the further loss of blood is probably injurious. Neither emetics or mercury are of any avail. Bronchotomy, early and efficiently performed, is the patient's only chance *.

GANGRENOUS INFLAMMATION.

Much confusion has arisen from not duly distinguishing the causes, and the processes incidental to the state of mortification, and a consequently vague use of the terms employed. Gangrene and sphacelus are commonly used to express the partial and entire death of a part, from whatever cause proceeding; but the inflammation which terminates in gangrene, and that which stops and throws off a sphacelus, although forming essential parts of the history of mortification, are things so utterly opposed, that we cannot use the same terms to express them, whether in a general or specific sense. The gangrene cannot depend on inflammation which is not preceded by it: that inflammation, on the contrary, of which it is the crisis, is gangrenous inflammation. This last term therefore does not apply, as a primary condition, to the instances of gangrene which depend upon strangulation or arrested circulation from a change in the structure and adaptation of

* See the interesting memoir by Dr. Baillie, in the third volume of the "Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge," and the papers of Dr. Farre, in the third volume of the Medico-Chirurg. Transactions.

parts ; nor to the instances of decomposition from the operation of heat or cold, or chemical agents.

Gangrenous inflammation may undergo resolution and pass away without inducing gangrene, or may ensue upon any species of disorganization. I have seen it set up by the prick of a pin, the bite of an insect, and a leech. A slight abrasion of the integument of the leg has often been a first step to a fatal mortification ; in which case it may be properly regarded as gangrenous inflammation induced by injury, taking the place of adhesive, suppurative, or ulcerative inflammation ; or it may be superadded to any of these previously established, and especially to the peculiar inflammation last described, the erysipelas, which then takes the name of gangrenous erysipelas ; but to this condition, from whatever cause proceeding, as when proceeding from no visible cause, the term gangrene, strictly speaking, is inapplicable.

When gangrene or the death of a part is the effect of arrested circulation from causes mechanical or chemical, the inflammation of surrounding parts is a consequence, not a cause of the destruction ; and if the origin and nature of this inflammation be conservative, its tendency being to circumscribe and throw off the gangrene, the case of mechanical or chemical origin deserves to be regarded in the very opposite light to that of gangrenous inflammation. Pathologists have nevertheless mixed these opposite cases, some maintaining that inflammation is a preliminary in all cases, indispensable to the mortification, while others have considered mortification the cessation of all action, and therefore

never a result of inflammation; thus confounding the disorganization critical of an excessive action with that of a stagnated circulation, or in other words the physiological with the physical phenomenon.

It is only necessary to compare the state of parts and of constitution, to be assured of the utter dissimilitude of the two cases. Thus in the dry gangrene proceeding from frost-bite of the feet, a case continually seen in hospitals, as in sloughs produced by caustic substances, or by strangulation, the line of demarcation is announced by the deposition of adhesive matter; then the ulcerative action beginning upon several points and proceeding along this line gradually accomplishes the separation, while at the same time the construction of granulations out of the adhesive matter, constituting the third process, advances the final stage of repair, viz. the fabrication of the new surface. In the mean time the health is very little interrupted, the system being able to take and apply the support which the case calls for.

The appearance of the parts affected with thorough gangrene in this case as in all others of arrested circulation from whatever cause, whether chemical, mechanical, or vital as in defective nutrition, is dry, shrunk, or mummied, whether opake or semi-transparent, as if the horny cutis were stretched over the bones without any intermediate substance. The consecutive inflammation may be altogether stagnant, as in the dry gangrene described by Mr. Pott, though the dying process is scarcely extending, for days and weeks together; in other cases this inflammation, instead of being adhesive, and ulcerative at the line of

boundary, is, by the operation of the same cause as gave origin to the disease, gangrenous; and swelling, livor, and acutely agonizing pain of the parts above are present with the constitutional signs of mortification. The gangrene is said to be spreading, for the line of boundary is either not formed, or is ineffectual, and destroyed by the progress of the mortification, and from day to day the advance of the inflammation is such as speedily to involve the limb.

Now, this is the case of gangrenous inflammation ensuing upon gangrene, and is a common one in aged, exhausted, and diseased persons; the contrasted appearances show the difference of the two affections, viz. the gangrene (of the foot or hand, we shall suppose) dry, cold, pallid, shrunk, and insensible, and the gangrenous inflammation of the leg or arm, swollen, moist, livid, vesicated, acutely painful, and undefined in extent. In this case, the adhesive inflammation fails, and the gangrenous inflammation succeeds, and our ancestors very sagely prohibited amputation until the barrier was established, and amputated without delay when it was, rightly appreciating the nature of the case, and knowing that the system, which had not power to stop a destroying inflammation, à fortiori had not power to initiate a healing one, and consequently, that the same mischief would fall upon the stump. We have not advanced, and cannot improve upon this sound and practical pathological axiom.

Gangrenous inflammation is characterised by the moist state of the part, owing to the atony of the exhalant vessels; a peculiar dusky livor, and emphysematous swelling, with sanious vesicles here and

there appearing; the pain, often excruciating; and an undefined and irregular margin from the deficiency or tardy formation of the lymph barrier. To these, as disorganization advances, may be added the cadaveric fetor and the loss of temperature, compared with that of the neighbouring sound parts.

The fever is either the mild inflammatory, or the typhoid in its commencement; the first speedily lapses into the second, marked by frequent sinking and call for support; livid and cadaverous complexion, deficient alvine and urinary secretions, thirst, brown or black furred tongue, hiccup, cold clammy skin, anxiety, and propensity to rambling, or muttering delirium. The pulse, yielding to the stimulus applied, is an artificial one, until the vital powers are so far sunk as to be no longer responsive to it; but even with the swell communicated by ammonia, wine, and opium, it has no real resistance, being easily compressible; and naturally quick, thready, and powerless.

I know of no process subjected to frequent observation, the pathology of which is so imperfectly elucidated as this of the de-vitalisation of parts from various causes. It has, perhaps, in part arisen from the confusion of ideas betwixt the effects of life and death, and their relations and boundaries, and the share belonging to each respectively in the process of disorganization. But the real reason I take to be, that the difference has been in a measure overlooked between the external and internal, direct and indirect cases of mortification, and that the first appearance of a gangrene being almost always referred, though often erroneously, to some morbid condition of the part, the

constitutional state therewith connected has become generally identified with it, and regarded as a secondary or sympathetic state, and seldom, or ever, as the primary or leading condition. The association of acute and moist, chronic and dry gangrene, employed to denote the different rate or stage of progress, but arising from a confusion of two things essentially distinct, viz., gangrene and gangrenous inflammation, has conveyed erroneous ideas, and additionally bewildered the subject. The confusion has been increased by the circumstance of gangrenous inflammation occasionally ensuing not only upon gangrene, but upon every variety of local state, for no accident is exempt from the chance of such a consequence; and on the other hand, from the gangrenous inflammation of purely constitutional origin, as well as that which is a result of local injury, being sometimes, though not often, arrested, and the mischief repaired by the same sanatory process as follows the death of a part from cold or the cautery.

But what has perplexed the entire subject more than any local contingency is the remarkable variety of results, quoad constitution; how it happens, for example, that mortification, once established, is in one case equivalent to death, and in another a state comparatively devoid of danger, and this difference not determined by cause, nor by place, nor by extent of surface, nor by extent of mischief;—how it happens that one man parts with both his feet from frost-bite with scarce any illness, and another dies in three days after the appearance of sanious vesications upon his instep, with all the symptoms, local and con-

stitutional, of rapid mortification;—how it happens that gangrenous inflammation of the hand and forearm is sometimes as quickly fatal as a mortified hernia, and in other cases that not only the loss of organs and enormous masses of integument, but of many inches of the intestinal tube is sustained, and the health restored.

Now this apparent discrepancy of result, which is not exaggerated, is only to be reconciled by a reference to the constitution, and the share which it takes in every case of gangrenous inflammation. If the constitution be sound, the effect of the mechanical or chemical death of a part is to rouse it to a preserving action, viz. the adhesive, which stops and repairs the mischief; if it be infirm, or from any cause adverse, the gangrene produced spreads, by the continuance of a similar action, beyond the part destroyed. If the part be previously inflamed, especially if the inflammation be erysipelas, the continued excitement, either of the part or the system, will determine the gangrenous inflammation; but if the disorganization be recent and not very extensive, —even although the gangrenous inflammation is seemingly spontaneous and much more so when a result of injury—the progress of the mortification may be arrested, and the ulcer healed by supporting the patient's powers. If disorganization be complete, although sudden, the constitution is less disturbed and the sanatory action sooner set up, than when disorganization is an inevitable result of the changes which must ensue, by reason of the injury. In proportion as the local circumstances and changes

arouse and impress the constitution, the liability to gangrenous inflammation is increased: thus, if the trunk of the body be the seat of the gangrene, the sympathy is greater and the danger greater than if seated in the limbs—if a spot only be affected with gangrene, though penetrating, the sympathy is less than if the gangrene involves a large surface, though it be confined to it. But the great difference is whether or not the gangrene interferes with a vital function, as when, for example, it falls upon the contents of the abdomen, and whether the patient be sound or diseased, strong or weak, young or aged—the subject of present or recent fever or other constitutional ailment—or the contrary. Thus, the sympathy is according to the cause, and according to the part, but most according to the constitution; and in all there are considerable varieties.

A caustic issue is a common remedy and fearlessly employed. I have seen one, the size of a shilling, placed upon the summit of a large glandular tumor on the neck of a scrofulous boy, followed by gangrenous inflammation of the entire swelling, and death on the third day.

The application of leeches is resorted to without reserve, even on inflamed parts. I have seen the application of half a dozen leeches to a small and painful but uninflamed tumor, in a young woman's breast followed by gangrenous inflammation of the entire mamma in twenty-four hours and death on the succeeding day.

The slough of the foot, from cold, is often unattended by any serious disturbance of the constitution;

but if the frost-bite falls on an old and starved subject, it is fatal: and if the gangrene be spontaneous, the result of a worn out system, or a diseased state of the heart or blood-vessels, it is almost invariably fatal.

The slough of the penis is very rarely fatal—of the nates, cæteris paribus, very generally. This depends on the obvious difference of trunk and extremity, as regards constitutional sympathy, as well as the difference of structure of the parts.

Mortification of the bowels is not always a cause of death, as we have seen in cases of intus-susceptio and mortified hernia; and even where the sphacelus of the hernia is complete, the post mortem examination more frequently presents the adhesive peritonitis than any extension of the sphacelus to the cavity. The patient dies, however, under all the genuine symptoms of mortification, and that the inflammation has passed into the gangrenous stage, may be seen from the altered aspect and texture of the fold of bowel adjoining the sac. But the cause of death in hernia is complicated; the obstruction being unrelieved or relieved too late, (though I have seen it absolute in a chronic stricture of the rectum for several weeks, and proving fatal without an approach to inflammation:) the irritation produced by the symptoms of stricture and of inflammation combined, so sinks the vital powers, that the inflammation becomes gangrenous, and is not bounded by the stricture. When therefore the state of complete strangulation has existed only for a few hours, the patient does well upon a return of the bowel, but

where several days have elapsed, the chances are against him.

The relative importance of the function to life, and thence the sympathy of the system, is what makes the difference between the strangulated intestine and the strangulated penis.

Although, in all cases of mechanical and local origin, it would happen, were the functions of life not interfered with, that the dead part would be separated by "the natural surgeon," yet a previous feebleness of system, or defective circulation, or advanced age, favor and precipitate the extension of gangrenous inflammation—if it stops on one side, it extends on another, and even overshoots the boundary line, the newly organized lymph being incapable of maintaining its vitality; the newly formed granulations ulcerate, and are included in the death. In this state erysipelas suddenly involves the limb, and speedily puts an end to the uncertainty, taking directly the gangrenous termination.

Gangrenous inflammation then is distinguished from gangrene, in being, whether primary or secondary, a constitutional and not a simply local action; not that any local process can be conducted without more or less involving and depending upon the constitution for its event. Like erysipelas, it sometimes appears without any obvious cause, and at others is superadded to a læsion, or an inflammation already existing, and not previously affecting a character of destruction. Gangrenous inflammation is rare, whereas gangrene is very common. They are seen asunder when the inflammation stops short of actual

disorganization and loss of substance; as we say "threatening, or on the very verge of gangrene," or when the powers of life fail during the first stage of the action, as is not very unusual.

In some most acute cases of gangrenous inflammation, no further change than deep and extensive discoloration of the part affected, with a sensible loss of temperature occurs; in fact a stagnation of its circulation. I have seen large surfaces, as the arm and corresponding part of the trunk, and one of the lower extremities, and in fact one half of the body thus attacked. In these cases, the highest degree of delirious excitement passes rapidly into the state of dissolution, as described by Mr. Hunter.

Acute gangrenous inflammation is commonly more dangerous from the typhoid fever which attends it, and the rapid, even sudden, prostration of strength, than from the existence or extent of the destructive action upon the part. It is always accompanied with much excitement of the nervous, and an habitual loading of the pulmonary and venous system. The loss of balance on the venous side of the circulation is apparent in the undue change of the blood in the capillaries, and the early effusion of their contents upon all the exhalant surfaces.

The cases of gangrenous inflammation more commonly met with, are those in which phlyctenæ and discolored patches precede the actual death of a portion of the soft parts; these are more hopeful in proportion as the previous state is apparent, and admits, as in the case of over-repletion or starvation, of a gradual correction of the errors of the system.

If the march of the gangrene be arrested, and a good suppurative process established with the aid of the local stimulants which are applicable, such cases generally do well, if they appear upon a previously sound surface; but not so in cases of ulcer, or previously diseased surface. The accession of erysipelas taking on the gangrenous character is then a most serious impediment to their well-doing. Another is the continually recurring death of the newly-formed granulation by alternate sloughing. It is in one of these ways that we see entire limbs affected from a seemingly insignificant beginning, in the impoverished systems of free livers and hard drinkers.

The pain attending the dry gangrenous spot upon a toe or finger, and extending to the remainder, is sometimes of the most unrelenting description, and scarcely appeased by any form or dose of opium. This I have several times observed, when the health was otherwise unaffected, the system apparently well nourished, and the person robust; and the disorganization, proceeding very slowly, was for a long time limited to one or two toes or fingers. I believe this disease, although apparently local, to be coupled with and depending upon an imperfect sanguification or circulation, owing to physical causes. It destroys by continued irritation and exhaustion of the system.

The carbuncle, malignant bubo, and phagedæna, are all constitutional cachexiæ, from various causes operating upon the system; in the former, enfeeble-

ment from age, infirmity and disease, habitual repletion and irregularity of circulation, and any and every species of excess; in the latter, from the action of an animal or mineral poison: these formidable local maladies are sometimes consecutive upon the slightest local irritation. Thus a furuncle of a young and healthy individual is a carbuncle in one of an opposite character. The bubo of plague, and that produced by the flesh of diseased animals, is symptomatic of the poison which pervades the system; and the frightful cases of phagedæna which we sometimes witness in hospitals, are in most cases not to be explained by reference to the character or amount of the injury, mechanically considered, and result therefore from the operation of some powerfully depressing cause upon the vis vitæ of the individual. Of the same description, doubtless, in this respect, is the horrible disease termed hospital gangrene, and malignant ulcer, of which, however, we know little or nothing from personal observation in civil service *.

I do not mean by this observation to underrate the value of local treatment in such cases; it is most essential to facilitate Nature's operations: but I mean to convey that the local malady is symptomatic, whether commencing spontaneously, or in consequence of læsion; and that calming and supporting the constitutional action is the efficient method of treating such diseases, whether that be done by local or general treatment, or both. And there can be no

* See Dr. Thomson's Lectures on Inflammation, for a very interesting collection of these cases, and Dr. Hennan's Military Surgery, for a full account of hospital gangrene.

occasion to illustrate the fact, that surgical local treatment, as the division of stricture, the renewal of the surface, &c., is in many cases most influential in accomplishing this great purpose.

The practical objects to be effected, if possible, in carbuncle and phagedæna, is the arrest of the gangrenous inflammation, and the establishment of a free suppuration from the line of separation betwixt life and death. Whenever this can be attained, there is reason to anticipate a favorable issue, and when it fails, and dryness is the condition of the sore, the contrary. A dry carbuncle is fatal in my experience, invariably.

The cases which follow exhibit gangrenous inflammation arising from various causes.

CASE. Gangrenous inflammation following a puncture from a thorn *.

Mrs. ———, æt. 77, while plucking a rose, on the 13th of July, 1833, pricked the inner side of her thumb with a thorn.

She was of a full habit, and had always been a free liver. Her disposition was irritable, and she possessed what is called "bad flesh to heal": the slightest injury often produced a festering sore. On a former occasion the application of a blister on the chest was followed by a deep slough, which was long in separating, and left a troublesome sore.

Previously to the present accident, she had been much harassed by family trials of various kinds; the effect of which was to make her feel unwell. She had no definite complaint, but felt generally heated

* Communicated by Mr. Evans, of Hampstead, with whom I visited the patient.

and uncomfortable, was more than usually irritable, and thought that she needed a course of medicine. The appetite continued good, and the bowels regular, but she was depressed in spirits, and her sleep was not so good as usual.

The injury was hardly perceptible, but the thumb soon swelled, became painful, and throbbed; and these symptoms increased so rapidly, that before the evening her suffering was severe. The patient made no change in her diet, however, but took the customary quantity of animal food, strong malt liquor, and wine.

No remedial measures were taken until the third day, when the pain and throbbing were so urgent that she was compelled to consult a surgeon. The injured part presented a slight elevation, much inflamed; the thumb and wrist were somewhat swollen. The pulse was frequent and full, and there were feelings of restlessness, general discomfort, and irritability of temper. There was constant thirst, though the appetite was good; the secretions from the bowels were unhealthy, and there was a frequent desire to pass urine.

The part was opened by a lancet: a very small quantity of pus escaped, and with it the point of a thorn, so minute as almost to escape observation. A poultice was applied, some active aperient medicines prescribed, and the necessity of rest and abstinence enjoined: these injunctions, however, were but little, if at all, obeyed. The pain and swelling increased daily, the latter almost precluding sleep, and the febrile action became more decided. In about a

week from the time of the accident, the cuticle began to separate in the neighbourhood of the injury, and the cutis beneath poured out a large quantity of lymph, which coagulated into a thick gelatinous crust. The vesication soon extended over the thumb, palm, and back of the hand, and now the cutis, which looked like buff leather, presented at two or three points, ulcerated openings, through which the cellular tissue might be seen, in a sloughy condition. A free division of the cutis was made in several directions: from the openings a little pus oozed out. Although the whole cellular substance was one mass of slough, yet the cutis remained sound, was sensitive, and bled rather profusely when divided.

The pain now diminished, but the health became more affected: the sleep was scanty, and disturbed by delirium, and slight wandering of mind was observed by day; the strength and spirits were depressed, the appetite failed, and the thirst became extreme. Each day brought an extension of the vesication and subcutaneous sloughing, which now involved the whole thumb and hand, part of the fingers, and the wrist: and the forearm was greatly swelled and inflamed. The extension of the sloughing was followed up by fresh incisions through the cutis. The most vigorous means were adopted to improve the patient's health, support her strength, and arrest the progress of the local mischief; and for a day or two some success seemed to attend these efforts. The sloughs separated from the parts near the original injury, leaving a dissection of the mus-

cles and vessels of the thumb; in the rest of the wound there was a more healthy suppurative process, and the sloughing made no progress up the forearm. On the morning of the 9th of August, however, the twenty-seventh day after the injury, there was a sudden failure of the patient's powers, and about noon she expired.

CASE. Gangrenous inflammation of the arm, from a wound of the basilic vein.

William Painter, æt. 35, from the country, a stout muscular man, of dark complexion and intemperate habits, was admitted, 28 June, 1827, with swelling and inflammation of the left upper extremity. Three weeks back he received a wound about the middle of the inner part of the upper arm, with a sharp-pointed knife; it penetrated about two inches; it was not followed by immediate loss of blood, but the following morning, on moving the arm, profuse hæmorrhage ensued; the bleeding ceased spontaneously. In the course of the day he was seen by a surgeon, when a compress of lint was applied, and a lotion directed to be kept constantly to the arm. The next day, finding little inconvenience from using the arm, he went to work, and took his usual quantity of beer and spirits. The arm is now double its natural size, excessively tense and tender to the touch, from the axilla to the elbow. On its inner side it is of a dark red color, fading to the outer and back part, where it has a yellow appearance; there is much heat of the surface. The hand and fore-arm are also much swollen, cold, of a livid color, and without sensation; around the wound, which is closed by a coagulum, the integument is

slightly raised. He complains of great pain in the upper arm; the pulse is full and hard, tongue foul, skin hot and dry, much thirst; pulse at this wrist scarcely perceptible. Leeches and opening medicine.

29th. Sensation returned in the hand and fore-arm last night, when the temperature was restored and the pulse distinct at the wrist, but very small.

He complains much of shooting pain in the axilla, and down the arm; the redness is not so diffused. Several small vesicles have formed along the radial side of the fore-arm, containing a dark yellow turbid fluid; leeches and medicine repeated. On placing the hand on the inner part of the arm, a diffused pulsatory motion is communicated to some extent.

30. Several vesicles have formed on the inner part of the arm and hand; sensation is very imperfect; pulse at the wrist not perceptible; pain at intervals very severe. The appearance of the upper part of the arm the same.

July 2d. Redness and tension towards the point of the shoulder decreased, but the discoloration along the inner part has extended, and is now of a chocolate color. The fore-arm and hand are cold and livid, without the slightest sensation or motion, and covered with large dark vesicles; pulse quick and small, tongue coated, countenance anxious, skin hot. As a last resource, it was thought advisable to amputate the arm, which was done with the patient's consent, close to the joint, the bone being divided immediately below the tubercles.

3d. Obtained some sleep during the night; pulse

quick and sharp, tongue white, bowels confined, slight discharge from the wound.

5th. Somewhat better; the stump was partially dressed yesterday, very little adhesion had taken place; suppuration free; passed a good night, countenance improved, pulse small and weak.

6th. Not so well; more heat of skin; much pain about the shoulder; complains of thirst. He has had several evacuations during the night and this morning.

8th. Very little febrile excitement; sleeps well; pulse quick; tongue foul. The dressings were removed yesterday; adhesion had taken place to some extent; profuse sanious discharge; does not complain of pain.

10th. Great alteration has taken place in his appearance since yesterday. During the night he has complained of excessive pain over the shoulder and down the side, and was very restless. He is now evidently sinking. Pulse irregular, and hardly perceptible; tongue furred and dry; countenance anxious, skin cold and clammy, bowels disordered, senses unimpaired. Died in the evening.

Examination. The lower part of the wound had a dark sloughy appearance, and effusion of serum into the cellular tissue had taken place to some extent around the shoulder; the ligature was firm upon the artery; there was no appearance of visceral disease. The brachial artery, having been injected, and a large quantity of coagulated blood removed, proved to be uninjured; but the basilic vein, lying on its inner side,

was wounded, and from this the blood had been effused; the gangrene of the hand was superficial.

CASE. Gangrenous inflammation following abscess of the knee-joint from laceration of the integument, and recurring in the stump after amputation.

Henry Cauldfield, æt. 52, an actor, of unhealthy appearance and intemperate habits, was admitted 23 Dec. 1827. On the preceding evening, while in a state of intoxication, he fell and injured his knee, but it did not prevent his walking home. Upon examination, it was found that a portion of integument about the size of a crown-piece was removed over the right patella; the bone at its upper part being denuded to the extent of about half an inch. The edges of the wound were irregular and slightly inflamed; the skin on the inner side of the knee was much grazed and soiled. The wound was ascertained to be superficial; having been well cleansed, simple dressing and a poultice were applied, the limb being laid straight.

26th. There is a dark-colored slough partially adhering to the patella at its apex; the edges are clean, and granulating; slight discharge of pus. Does not complain of pain in the joint, but slight stiffness; no constitutional disturbance.

30th. Since the date of the last report to the present time, he has been going on well; the wound looking healthy, and attended with moderate secretion. When admitted, the movements of the joint were not painful or in any way impeded: he now complains of severe pain in the joint, which appears inflamed, the slightest motion causing great pain, and on pressure being applied to the sides, pus of a

very fetid kind issues. The slough has separated from the patella, leaving it bare to some extent at the upper part, as also its tendinous attachment. He has pain in the head, thirst, and restlessness.

Feb. 2d. An opening has formed into the joint, from which an abundant secretion of fetid dark-colored pus is constantly discharged. Pulse quick and small, with some degree of sharpness; tongue foul, bowels open.

4th. Nausea, with loss of appetite; rests badly; suppuration more copious; a probe passes readily into the joint on the outer side. He takes some wine, but has no appetite for food.

5th. The foot and leg, to the knee, are œdematous, pitting on pressure; the integuments inflamed and hot; pain urgent; profuse discharge from the joint. High constitutional irritation; great restlessness; pulse very small, but quick. As it was evident that the profuse discharge from the joint was exhausting his vital power, amputation was now advised, but postponed by him for the purpose of consulting his friends.

6th. Slept better, and says he is fully prepared for the operation, which was performed about the middle of the thigh; great want of tone and contractility in the muscles; very little blood lost. The leg and foot of the amputated limb were double their natural size; a large gangrenous patch occupied the greater part of the calf, surrounded by a livid redness to some extent, and vesicles containing turbid serum, mixed with pus. The gangrene had extended deeply into the cellular tissue of the limb.

On opening the joint, the synovial membrane was found highly inflamed, the cartilages generally softened, and that of the inner condyle had already undergone ulceration; the patella was softened throughout, and partly detached; the joint contained a large quantity of fetid pus.

7th. Has passed a good night; stump not painful; no discharge; tongue moist, pulse small and weak.

8th. Has been very restless all night, talking continually, though he says he has slept well. There is a profuse and very fetid discharge from the stump, attended with great pain. Stump in a state of gangrene; lower third of a dirty ash color, insensible when touched.

9th. Is delirious at intervals; bowels abundantly relieved; no pain.

10th. Remains in the same state.

11th. Died this morning.

CASE. Gangrenous inflammation following extensive abscess.

William Creane, labourer, æt. 24, of an unhealthy and sallow aspect, was admitted, 15th August, 1834, with an extensive sub-fascial abscess of the left thigh.

States that he has long labored under partial incontinence of urine, and during the last few years has lived irregularly, sometimes, as of late, getting very spare nourishment. Five weeks ago, in consequence of the frequent dribbling of the urine, an excoriation took place upon the left thigh, which gradually increased, causing him much pain and inconvenience; he took some doses of aperient salts,

and applied a poultice to the part. About a week previous to his admission, he lost all pain, and was, as he therefore supposed, much better; when a medical man, who chanced to see him, immediately sent him to the hospital.

The abscess is situated on the posterior aspect of the left thigh, extending from the tuber ischii to the middle of the popliteal space; there is palpable fluctuation, with a livid or dusky-red color and general crepitation of the swollen integument, but neither heat nor pain; a central spot of sphacelus appears below the tuber ischii. His countenance is depressed and eyes sunk. He has dyspnœa with cough, but neither pain nor expectoration; bad appetite and occasional nausea, but no vomiting; bowels constipated, urine alkaline; evening chills and night sweats; pulse 96, small and feeble; tongue red and parched.

An incision was made through the whole length of the abscess, which gave exit to a large quantity of ill-conditioned and very fetid pus, and grumous blood, with many large flakes of sloughy fascia and cellular membrane—Lot. sodæ chlor. cum catapl. fermenti. R. ammon. carbon. gr. viij., tinct. hyosc. ℥ss. ex mist. camphor. 6tis horis—Wine four ounces, daily.

16th. Slept well, and says he is better; appetite improved; wound looking sloughy and unhealthy; bowels have been opened by castor oil; motions very dark and fetid.—R. Quinæ gr. v. 6tis h. ex infus. rosæ:—strong beef tea; and sago or arrow-root with brandy, four ounces daily.

18th. Very little change; a large portion of slough was removed to-day by the forceps.

19th. Slept well; has had a rigor this morning, and vomiting; pulse 102, small and feeble; tongue parched; great thirst.

20th. Much the same; discharge from the wound excessive.

21st. Inflammation of gangrene extending upwards; constitutional symptoms the same.

22d. Frequent rigors, vomiting, and hiccup; pulse about 100, small and intermittent; secretions very unhealthy; chest symptoms increased.

23d. Countenance sunk and moribund.

24th. Died.

Examination. Chest: old and firm adhesions between the pleural membranes; tubercles of various stages thinly scattered throughout the substance of each lung.

Abdomen: liver large and granulated, *i. e.* the gin-drinker's liver in an early stage. Kidneys large, and the ureters enlarged and thickened; other viscera healthy.

Thigh: from mortification of the septa of intermuscular fascia and cellular membrane, the integuments and muscles were detached and hollow. A morbid softening with partial sloughing of the muscles was also evident.

Case. Gangrenous inflammation following a compound fracture of the tibia.

William Ridge, labourer, æt. 65, of pallid complexion and not robust habit, was admitted Nov. 15th, 1827. A butt had fallen on his leg, and when raised he was unable

to stand. On examination, an oblique fracture of the tibia was ascertained, about two inches above the malleolus; the fibula was fractured in the same direction, but rather higher up. Through a very small aperture at the inner angle of the fracture a portion of the tibia was projecting about half an inch, so that the integuments surrounding it were much on the stretch and bound under it; an attempt was made to reduce this, but it could not be effected; the wound was therefore enlarged, and the fractured portions brought into apposition. The leg was laid on a pillow on its outer side until the evening, when it was carefully placed in Mr. Amesbury's apparatus, with the knee straight.

16th, 9 A.M. He has been restless during the night, but felt inclined to sleep in the morning; skin hot, pulse quick, with some degree of sharpness; tongue slightly furred; the integuments of the leg somewhat inflamed. He does not make much complaint of pain, and there is no bleeding from the wound.

10 P.M. The integuments of the leg up to the knee are very red, tense, and hot; there are one or two vesicles on the dorsum of the foot, and there is some bleeding from the wound, with more pain; he feels inclined to sleep.

17th. 9 A.M. Leeches have been applied, and bled freely; he is easier, having slept pretty well, and on the whole feels better. The skin is less hot, the pulse small and thready, the tongue white and moist. The appearance of the leg is very unfavorable; the

heat is diminished, the toes are cold, and the integuments of the leg, from the ancle much above the knee, are of a dark purple color, and mottled.

He sank rapidly, and died in the night. The body was not examined.

CASE. Gangrene of the foot, and gangrenous inflammation of the leg following the ligature of the femoral artery for popliteal aneurism.

William Cannon, æt. 45, a labourer from the country, and, apparently, a strong, healthy man, was admitted 28th August, 1834, for a popliteal aneurism of moderate size.

Sept. 5th. The operation of tying the femoral artery was performed to day. On opening the sheath profuse hæmorrhage occurred, and as the bleeding proceeded from the upper part of the incision, the opening of the sheath was extended, and the ligature placed higher upon the artery, when the bleeding and the pulsation of the tumor ceased. A second ligature was placed below the first, and the artery divided between the two: the external wound was then closed, and the patient replaced in bed. The foot shortly became cold; hot bottles were immediately applied to the limb.

7 P.M. Foot still cold; complains of a numbing, cramping pain in the leg and foot; is exceedingly restless; pulse full and soft, but rather quick; tongue moist. Tinct. opii m. xxx. ex mist. camph.

6th. 1 A.M. Pain and restlessness continue; the leg and foot still cold, and marked about the inner malleolus, with a dark blue streak. Rept. haust. anod.

10 A.M. Pain considerably abated, and is more

comfortable, limb cold; blueness increased; pulse 72; tongue moist; has slept since the last report.

2 P.M. Quite free from pain; the foot and leg are warmer; has been dozing all this morning.

8 P.M. The foot and leg very cold when the hot bottles are removed; the blueness is increasing in all directions; and sensation is lost in many parts, as on the dorsum of the foot, above the internal malleolus, in the toes, and over the tendo achillis. The limb has been constantly rubbed, since the last report, with hot flannels.

7th. 8 A.M. The blueness increases, and is mixed with yellow; hard, bright, semi-transparent surface of the foot; all beneath the skin seems adherent to it; complete loss of sensation of the foot, and lower part of the leg. Friction has been continued all night, which has kept him awake; feels faint and tired; pulse 75; excessive pain about the calf of the leg, excited by the lightest touch. R. Amm. carb. gr. v. tinct. hyosc. m. xv. ex. mist. camph. 4 hor.—beef tea.

8 P.M. He complains of more pain in the leg, of a pricking, shooting character; the discoloration extends to within three inches of the head of the fibula, and bounded by an indistinct white line, which is acutely sensible on the inner side of the leg; pulse 84; slight thirst; rubbing discontinued in order that he may sleep; flannels applied.

8th. 6 A.M. Slept some hours; temperature natural above the line; no pain except when touched, then it is acute; much swelling and tension of the calf of the leg, which when touched is acutely painful; the foot and ancle and some space below the middle

of the leg, is brown, hard, dry, glazed, cold, and insensible.

6 P.M. The white line is more distinct; all below this is darker than before; this line, and the swollen leg even to the knee are acutely sensible and painful to the touch. Opium to be continued at night; bowels not open since the operation. Extr. coloc. co. gr. XV.

9th. 10 A.M. Has passed a good night; pulse 90; limb as yesterday.

10th. 10 A.M. Has suffered a great deal of pain in the leg and foot, which he described as seated close to the bone; the cuticle upon the leg raised in a few places into small vesicles: two evacuations; pulse rather quick.

11th. Passed a good night, having less pain; pulse 90.

15th. Continues much the same, sometimes in much pain, at others quite easy. The leg is black, with several vesications, and very much swollen and tender; bowels regular; pulse 90; very irritable.

16th and 17th. Much the same.—T. opii. m. XV. 6. horis. The discoloration has spread considerably upwards since yesterday.

18th. Amputation by the circular incision was performed above the knee; much venous hæmorrhage, and four arteries of large size secured.—T. opii. m. XXV. and a little wine were ordered.

6 P.M. Quite comfortable: a slight discharge from the wound has already taken place; pulse 100, and small; skin moist.

9 P.M. Opium repeated; wine and water to be given during the night.

From this time the patient did as well as possible in every respect, and the stump soon healed.

CASE. Gangrenous inflammation of the whole arm, terminating in gangrene and separation of the hand and forearm.

Sarah Ward, æt. 56; mother of a large family, long accustomed to drink freely of spirits and porter, with deficient animal, and indeed nutritious food of any kind, admitted 5th April 1833. Three weeks ago, the summits of the fingers of the left hand became painful, and swelled, with a sensation of pricking. The extremity, from the tips of the fingers to the shoulder joint, is now swelled, and variously colored, from a bright crimson to a dark blue; the disease bounded superiorly by a florid and exquisitely painful circle; the limb colder to the touch than natural, and exceedingly painful; the power of moving the fingers is lost, but they are not deprived of sensation. There is constant delirium, with high constitutional excitement; the pain confined to the limb. Half a pint of proof spirit with a pint of the decoction of poppy heads to be applied warm every four hours, and a mild calomel and antimony pill to be taken night and morning.

10th. The same: to omit the pill and take an opiate draught nightly.—Liq. ammon. acet. c̄. vin. antim. 6 hor.

14th. Pain continues; delirium the same.—Ammon. carbon. c̄ trâ hyoscy. ex infus. serpentariæ.

These symptoms continued for about two months after her admission, the pain gradually diminishing

and then leaving her slowly, from above downwards; the appearance of the red circle above mentioned descended, and the part above it resumed its natural and healthy character. The loss of sensation, in the hand and lower half of the fore-arm, has been complete from a fortnight after her admission.

May. There is a circle of inflammation about four inches below the elbow, and immediately below this is a line of ulceration, i. e. separation; the hand and arm below are dry, black, hard, and shrivelled.

July. In this state she remained, with occasionally a sense of darting pain at the organized extremity; the denuded tendons were divided from time to time at the ulcerated part, and nitric acid lotion applied.

October. The bone was sawn through, and a portion remains to be thrown off, around which the integument is adherent, so as to form a puckered stump. The brachial artery is quite natural in its pulsation and volume, as is the arm in its general aspect.

CASE. Gangrene of the hand and arm, from ossification of the arteries and valves of the heart.

Richard Salter, a very infirm and debilitated old man, was admitted, 6 Sept. 1827, with the left arm in a state of complete gangrene. He stated that it commenced about a fortnight since, with heat and tingling in the extremities of the fingers, which very soon extended to the back of the hand and up the fore-arm, attended with constant burning pain. No attention has been paid to him at the workhouse, from whence he came. The arm, which hangs motionless by his side, is, within a hand's breadth of the shoulder, of a

dark purple color, cold and insensible, and emits a very disagreeable fetor; in one or two places on the inner side the cuticle has peeled off. His face has a cadaverous appearance; skin cold and clammy, respiration short and hurried, pulse very small and feeble, tongue brown and dry, bowels much relaxed. There is no distinct line between the dead and living parts, and the artery may be felt pulsating very feebly in the axilla. He was immediately put to bed, and warmth applied to the surface of the body.

7th. The gangrene has extended further upon the inner side, and is now within an inch of the axilla, in other respects the same. Pulse a little increased in volume, skin warmer; slept a short time during the night, but is inclined to be restless.

8th. There is an indistinct line on the outer and upper part, about an inch below the acromion process, extending about half way round the limb; but the gangrene continues to spread; the axilla is now affected. Pulse 130, small and weak; bowels still much relaxed; takes wine and sago freely.

The disorganization gradually extended until the entire limb became involved and also the pectoral region of the chest; he did not complain much of pain, slept at intervals, and on the 16th expired.

Examination. General ossification of the arteries and valves of the heart, and particularly of the left subclavian artery; the blood was coagulated in all the vessels of the gangrened part, and to some extent beyond.

CASE. Dry Gangrene. Mr. Ollard, surgeon, of Upwell, Norfolk, favoured me with the following note of a genuine case of dry gangrene under his care, for which I was consulted among others, in the beginning of the year 1828. The patient, a well-looking gentleman of about 60 years, suffered the most agonizing pain, as have other subjects of the disease whom I have seen; a pain upon which anodyne applications have not the smallest influence, and opium by the mouth acts ineffectually.

"The first appearance of Mr. B.'s disease shewed itself, 20th Nov. 1827, in coldness, numbness and discoloration of the great toe, extending its whole length. This state continued about three weeks; a shining erysipelatous appearance of the toes then took place, with acute pain in the toe affected with the sore, which made its appearance a few days after this change in so slight a manner as not to excite any particular anxiety, nor did it increase in size until a fortnight previous to our journey to town; indeed, a few days before that, granulations began to form, and I was led to imagine it was healing, and it was only on my arrival in town, and seeing it after an interval of two days, that the true nature of this dreadful disease became impressed upon my mind.

The constant recurrence of pain, upon his return, produced a sensible effect upon his constitution, and as every dressing, but of the most simple kind, appeared to increase his misery, I contented myself with the application of the cerat. cetacei. A fortnight probably might elapse before any further spreading upon that toe took place, and the disease then went

on progressively, giving the appearance of a dry, shrivelled, black skin, and no discharge, until three weeks previous to his decease, at which time he was constantly under the influence of opiates. The disease had now reached the last joint of the toe, when a most offensive discharge took place, and nature appeared to set up an opposing inflammation to check the disease, as in this direction it spread no further, although the toe had not completely separated at the time of his death.

11th March, 1828. The integuments of the great toe had not separated, although sphacelus to a small extent had taken place. A week or ten days previous to his death, the cutis of the under part of the foot became gangrenous, rapidly suppurated, and the inflammation reached to his heel, accompanied with a very offensive discharge*. As he frequently complained of his other foot, examinations were repeatedly made. I do not recollect how many days before his death I last saw it; certainly not many; at which time there was great deficiency of heat, and it was afterwards found ulceration had already taken place on more than one toe.

Mr. B. has been attended occasionally by me since the year 1824, and until the summer of last year his health was in general good. He was then attacked with remittent fever, and has never since enjoyed his former state of health, suffering much from indigestion. He mentioned to you when in town his in-

* A case resembling this, was that of the Rev. Mr. H., a well known and much respected clergyman of Battersea, whom I attended with Mr. Howell, of Wandsworth.

ability for years past to walk, from the violent cramp produced, and it is also singular, that the same discoloration and coldness attacked the great toe in the Christmas of 1826, although it did not continue more than a week."

Case. Gangrene of the fauces.

The brief particulars of this case, of which an active and intelligent medical practitioner was the subject, are contained in the following note, with which I was favored by Dr. Paris. The patient was a stout man, aged about 50.

"On meeting Mr. P. professionally, as far as I recollect about two months or more before his death, he asked me to look at his throat, which he said felt stiff and uncomfortable whenever he swallowed his saliva, and yet did not feel like an ordinary sore throat. Upon examination, I could not discover any thing very remarkable, except that the tonsils and palate presented a darker hue than usual. He complained, however, of general prostration, and his pulse was feeble. I advised him to use a stimulating gargle, and after having opened his bowels, to take the sulphate of quinine. I do not, however, believe that he followed the advice with regularity; but he said he was better, and went to Ramsgate, from which place he returned and sent for me. I do not know the exact interval that had passed, but I should think about a fortnight. On my visit I found him still complaining of his throat, which had so much annoyed him, that he had, at his own suggestion, twelve leeches applied. I reprobated this practice, for I

could see nothing more than a discoloration of the fauces, which had greatly increased since my last inspection. My plan was to support the powers of life, for which purpose quinine and a moderate quantity of wine were prescribed; the throat became more painful, and he could not put any of the muscles of the neck into action without much distress. As the disease advanced, he was unable to lower the jaw, so that all inspection was out of our power; the tongue became covered with dark matter; deafness came on; his memory failed him; the powers of life were evidently failing, and petechiæ appeared on the breast and legs; the respiration was laborious, and his constant exertion to expectorate from the throat was highly distressing. On introducing the end of a tea-spoon between the teeth, we could perceive a very large and loose slough, which Mr. ——— repeatedly attempted to remove by the forceps, but without success. On the night of his death, he brought up by coughing, a considerable quantity of offensive dark colored matter, evidently portions of slough; his respiration became more difficult; a cold clammy sweat covered the body, the pulse failed, and he died.

As far as I can recollect, I should say that, from the commencement of his indisposition to his death, an interval of two months occurred, one half of which he spent as a decided invalid, never quitting the house.

I believe I have mentioned all the leading features of this curious case; prostration of body and mind may be said to have constituted its most prominent peculiarity, without, in the first instance, any cor-

responding local affection in the throat; that is to say, any local source of irritation in any way commensurate with the constitutional disturbance."

CASE. Carbuncle following an apoplectic seizure.

Mr. W., æt. 60, a robust man of temperate and regular habits, subject to occasional slight chest affections, had an attack of apoplectic paralysis on the 12th of July last, and lost the power of the left side, for which he was bled, purged, and otherwise depleted for a month; during this period he took mercury, but ptyalism was not produced; he was gradually though slowly improving through the month, and so far recovered as to be able to stand, and to sit up for an hour or two daily, when he was attacked with headache and giddiness, also wheezing and cough, in consequence of which a blister was applied between the scapulæ, which relieved him considerably.

Aug. 10th. He was now weak and low-spirited; tongue deep red, and moist; pulse full, slow, and very soft; slight headache and restlessness; loss of appetite, and hiccup; bowels inclined to be costive.

A tumor, clearly carbuncular, appeared on the back of the neck, which ultimately extended to within an inch of each ear, being about five inches wide. Previous, however, to its reaching this size, a free crucial incision was made; fermenting poultice applied, and a small allowance of wine, quina, and beef-tea prescribed. There was a great discharge of ill-conditioned pus, dark, and containing a quantity of sloughy cellular membrane and fascia.

Aug. 16th. The surrounding inflammation and hardness increasing, the incision was enlarged to about four inches; he was weaker, but his appetite had improved, and the headache was completely relieved.

Aug. 18th. The inflammation has not increased; the surrounding integuments are purple-colored; the discharge is copious and flaky, the wound looking glassy and morbidly red; skin hot; pulse rather quick and weak; countenance blue and depressed. Chlorate of soda lotion to the wound, quina increased; diet to be improved as much as possible.

Aug. 30th. The carbuncle is much the same; discharges largely, no disposition to granulate: in health he seems very much weaker. A second carbuncle has appeared on the lumbar fascia, and several pustules over the hands and arms: the lumbar carbuncle was incised, and plaster and pressure were applied to that in the neck.

Sept. 7th. Health seems to be generally failing; not the slightest change in the carbuncles; appetite not so good; retention of urine.

Sept. 10th. Died.

Examination. Head.—On the left side the dura mater was very much thickened, and firmly adherent to the calvarium; great effusion beneath the tunica arachnoides; the brain was very firm, and its vessels were much enlarged and distended. The left internal carotid, as it entered the cranium, was dilated and ossified. A small cavity, apparently the remains of

an apoplectic cell, was discovered in the back part of the right optic thalamus, and another of smaller size in the corpus striatum of the same hemisphere.

Chest.—Bronchial membrane congested. In the substance of the lungs there were marks of former inflammation, but nothing recent; many old pleuritic adhesions; heart somewhat hypertrophied.

Abdomen.—Kidneys enlarged; a large calculus was found at the upper part of the pelvis of the left kidney; the mucous membrane of the bladder, which held a small quantity of gravel, exhibited an appearance of congestion.

The case of carbuncle is common. I have given this case to show more strikingly than most do, how its appearance, even though immediately set up by a local irritation, is really a result of dilapidated constitution. I have seen two other cases of its consequence upon apoplectic attacks. The subjects, a male and female, both under sixty, recovered slowly under the ordinary treatment, and not long afterwards died of a return of apoplexy. The subject of this case was a remarkable person, a portly man of robust habit, who had been twice relieved of a calculus in the bladder, during adult life, by the late Mr. Cline, and had subsequently enjoyed many years of health and activity in the responsible duty of butler to St. Thomas's Hospital.

A few words on the treatment of gangrenous inflammation shall conclude this chapter.

I beg it may be borne in mind that I have been

guided in my selection of cases, more by the view of illustrating the pathological history and condition, than any therapeutic principle—indeed, in several of those related, I had no share in the treatment.

A mistake often committed by practitioners is an immediate recourse to stimulants: great additional mischief sometimes results from it. I have often seen patients restored under a gentle course of carminative aperients, with occasional salines, and a diaphoretic opiate at night, where severe sloughing had already taken place; the inflammation of the surrounding part has abated and the progress of the destruction has been arrested, and then tonics and wine have been administered with the happiest effect. Sometimes the tonic has been premature, and the patient has suffered a fresh access of inflammation, and been compelled to fall back upon the antiphlogistic for a longer time. On the contrary, after a dose or two of castor oil, I have in other cases resorted to the tonic and wine with equal advantage. As regards diet, good nutritious broths and jellies, or even a moderate allowance of solids may be given as soon as there is appetite for them, and I need not add that, in such circumstances, diet should take precedence of medicine.

In the presence of acute pain or in full habits with flushed countenance, I have bled once, and in the onset of gangrenous inflammation generally with advantage. I have also bled where the inflammation has been established and extending, and where the immediate margin of the gangrene (not arising from cold or chemical disorganization) has been of an intense red color; but seldom, I must admit, with any obvious

benefit or encouragement to a repetition. The fever present in most of these cases leaves little choice of treatment; the camphor mixture with liq. acet. ammon., keeping the bowels gently cleared, and a full opiate at night, with or without antimony as the symptoms may require, agrees best in my experience with the fever of gangrenous inflammation. The state of the secretions deserves particular attention, and determines the propriety of giving or withholding blue pill or calomel with opium; by which, when so indicated, I have often seen great advantage obtained. Mr. Abernethy was accustomed to purge with calomel and jalap repeated at short intervals, in the case of gangrenous inflammation, a practice quite erroneous in my experience, to say nothing of the danger of diarrhœa, and which I deprecate without reserve. There is a period, often an early one, at which ammonia may be exhibited, from five to ten grains for a dose, with the best effect. Of camphor and musk I have not the opinion which some practitioners have entertained. Quinine is recommended by its conveniently small bulk and lightness rather than the cinchona in powder; with a few drops of acid the decoction of bark is an excellent vehicle for it, and this given with as much of the extract as it will dissolve and the tincture of Huxham, forms an excellent medicine in these cases. The diluted nitric and sulphuric acids, in an open state of the skin, are serviceable as well as agreeable. If however, I were to restrict my pharmacopœia for gangrene to a single drug, I should choose opium without hesitation, as being that alone

for which I could find no substitute, and of most general efficacy in allaying the irritation and upholding the powers of the constitution. Its dose may be increased beneficially. I have known it carried to six grains in twenty-four hours, without inconvenience. The morphines, acetate and muriate, seem to do remarkably well with some patients; as for any other narcotics, save opium, they are not worth mention. If the constitutional state is that of irritation rather than fever, calomel and opium at night, and the lighter forms of tonics and stimulants, with proper allowance of well chosen food and cordials, will be our best resource; if the skin and tongue and head are so disordered as to render the tonic plan inadmissible, the treatment must of course be anti-febrile, always leaning to the side of support in the article of sustenance, and guarding against over-depression, as by loose stools, and a too free and long-continued use of antimonials; but the condition of the part will generally improve pari passû with the restoration of the secretions to health.

If by any treatment fever is set up or is aggravated, we may be assured the local disease relapses; to steal a march on the constitution, if possible to supersede fever, as may now and then be done,—and when present, to allay it as speedily as possible,—is the only line of treatment that can rationally be pursued.

For the local treatment the first question is local bleeding. Leeches in large numbers are of great utility, when venesection is out of the question, indeed, gangrenous inflammation following severe contusion is a case in which topical bleeding is almost indis-

pensable; the danger of inducing sloughing in erysipelas or gangrenous inflammation by the bites of leeches, is less than that of setting up erysipelas in a previously inflamed part.

The linseed, and especially the yeast or charcoal poultice, with poppy and chamomile fomentations, or opium suspended in mucilage and water; the chlorates of lime or soda, half an ounce or more of the solution to half a pint of water; the diluted nitric acid; the lunar caustic lotion; the black wash, with or without opium, are the best applications in my experience; these may be at first covered by the poultice, and afterwards by cerate. In cases of inaction, turpentine and olive oil, the benzoic tincture, the peruvian balsam, and the compound elemi ointment are useful dressings; but the strong nitric acid most quickly and beneficially changes the surface. A lotion composed of three drachms of the chloride of lime, one drachm of caustic potass, and twelve ounces of distilled water, very speedily removes those dense crusts of ash-colored slough which adhere so tenaciously to the bed of gangrenous ulcers.

But the washes before mentioned, and the resinous, mercurial, and other ointments in common use, properly diluted, are generally sufficient, if good is to be derived from topical applications.

CHAPTER VI.

SUPPLEMENT TO THE FOREGOING CHAPTERS.

ABUNDANT cases were related in the first volume of this work, for the purpose of showing that the state of the system sometimes supervening upon injuries, operations, and inflammations, is a state of direct irritation characterised by symptoms threatening if not fatal to life. In the cases which have formed so large a portion of the preceding pages, I have endeavored to show that an extension of the same principle applies to many morbid actions indirectly consequent upon injuries and inflammations. It includes instances of the sinister influence of previous organic disease, and of secondary inflammations contiguous and remote; and is further exemplified by certain modes of action, in their nature strictly indicative of the state of the constitution, and by inflammations, morbid in their origin and progress, as truly emanating from that state when grafted upon lesion as in the total absence of injury.

I have said that sympathy, healthy and morbid, comprises the whole mystery of irritation, by which I intend to convey that in a constitutional sense irritation cannot exist without it. But I by no means admit that they are synonymous or convertible terms, or that irritation and sympathy are not distinct

phenomena, unless the carrier is necessarily confounded with the thing conveyed.

With all deference, therefore, to the author of a work entitled "Observations on the General Principles of Inflammation," to the value of which I beg to offer my testimony, in addition to that expressed generally by the profession, I do not consider that sympathy does include or render intelligible the alterations of the system induced by local derangement, and still less the alteration in parts induced by constitutional disease. I do not hold it to be a question of terms. Irritation is a substantive condition, whether primary or secondary; sympathy, as the word implies, is always a secondary or mediate action. But I will take Mr. James's own use of the term, and ask, if sympathy be a substitute for it. "There must be some cause for inflammation; in many instances this is cognizable: it is more immediately produced by some known agent, which in technical language is termed an irritant, and its action irritation. This state of irritation may subside or be prolonged; if prolonged, a state of inflammation occurs: the exact point where irritation becomes inflammation is hard to determine."*

Sympathy is an effect of irritation, and a very common one; but severe local irritation may exist in one individual without exciting constitutional sympathy, whereas in another a very slight irritation may excite it, which is both a proof of their distinctness, and an apt exemplification of the meaning I affix to the term.

* Observations on the General Principles of Inflammation, &c., &c. By J. H. James, Surgeon to the Devon and Exeter Hospital, &c., &c. 1832.

Again, irritation is an effect produced through the medium of sympathy, as when worms in the alimentary canal produce a pruritus or a sore at its extremities. The term sympathetic fever I freely admit may be applied to the greater number of those alterations in the constitution induced either by injury or disease: my object has been to point out certain cases, undoubtedly not the greater number, in which it cannot be so applied. "Can we say with truth," says Mr. James, "that a violent contusion or a mortified part are irritants? If a depression of power and action are the results, irritation can hardly be said to arise from their influence." Why not? Did Mr. James ever see a case in which a dead part did not either procure itself to be separated by ulceration, or set up and keep up ulceration or gangrenous inflammation in its neighbourhood? He takes a very narrow and inadequate view of the subject, if he supposes that a depression of power and action, either local or constitutional, may not be symptomatic of or identified with irritation, a proof that the term excitement is no better substitute for irritation than that of sympathy. Gangrene is an example of local irritation constantly occurring; a state most nearly resembling typhus fever is an example of constitutional irritation resulting from a crushed limb; the dead and the disorganized parts are equally irritants or causes of irritation, and the prostration which terminates in death, the legitimate result. But that the transfer of the irritation from the part to the constitution, and vice versâ, is by the medium of that attribute of the nervous system which we term sympathy, there can be no doubt. Mr. James

observes, there will hardly be a case of inflammation which, as I use the term, is not included under the denomination of irritation. In reply to this I observe, that although many are the cases entirely differing from inflammation, which have been the occasion of its separate investigation and form the type of its separate existence, yet that few cases of inflammation can occur in which it does not play a distinguished part, either as cause or effect.

The term irritation, in a pathological sense, is by some protested against as of hypothetical existence, like the Archæus of old; let practical men substitute another term equally significant and intelligible, for the derangement of the presiding nervous agency of a part or the system, and the symptoms thereto belonging. They are not less marked than those of inflammation and fever, neither of which approach to substitutes, for in numberless instances neither are present. Nor will contractility, sensibility, erythism, do one whit better in point of accuracy, nor excess, or defect, or perversion of nutrition, or innervation, which last comes nearest to the definition, be more eligible. It is a monstrous evil in science to multiply even synonymous terms: the term irritation was not of my choice, but in constant, though I grant imprecise, use; yet I know of none equally unexceptionable to convey the sense which custom has rendered almost universal, and in my judgment reason and experience confirm.

But the signs of irritation, it is said, are but morbid sympathies, and the expression of them those of inflammation and fever. If local irritation be ever so

strictly local, it is still the derangement of that local sympathy which puts the nerves and vessels and other constituents of the affected texture in consent, although the derangement may not be such as to excite inflammation, or in the remotest degree to affect the constitution; such a sympathy is nevertheless indispensable to the phenomenon of local irritation; and to that of constitutional irritation à fortiori it is directly instrumental. In the first case it may be so inconsiderable as not to be recognised as an object for medical interference, in the second it is always palpable to observation; so that sympathy is bound up with its existence. But sympathy is a healthy phenomenon, and disturbed or morbid sympathy could not be an admissible synonyme for irritation, because it is, as I have before said, not a primary condition. It must have material to act upon; an irritant is essential to constitute irritation. The irritant in relation to the part or system is morbid; the sympathy only becomes morbid when it appears as an instrument or sign of irritation.

If irritation and inflammation are co-relative terms for the same state, how happens it that the former is so often present without the latter? and if the symptoms of constitutional irritation are those of idiopathic fever, how is it that they vary in so many cases, one from the other? If they are capable of being confounded, not I alone err, but better informed and abler men than myself are in error. The fact is undeniable that the one often merges in the other, and that different febrile conditions supervene upon that of irritation; that the sympathetic fevers of inflammation

and mortification are synochus and typhus fevers, and fairly warrant the inference, that similar conditions of body to those present in injuries and external inflammations are present in idiopathic fever; that perhaps sympathetic cannot always be distinguished from idiopathic; some have thought never: but unless it be fair to say that because the pulse of an hysterical girl or of a nervous dyspeptic beats a hundred and twenty in a minute on the visit of the physician, ergo, they are the subjects of fever, I maintain the distinctness of the constitutional state which I have described as a result of local injury, from fever under any modification. They mistake me who suppose, that the symptoms which I have had occasion to exhibit in the progress of many cases have been other than symptoms of fever, in my view more than in theirs; but that in many the symptoms have been either for a time or altogether unallied to fever, and therefore improperly designated by the term 'irritative fever,' and that a considerable proportion of cases falling under the observation of surgeons is of this description, I re-assert, without fear of contradiction from those who exercise discrimination and are without prejudice. Inflammation and fever in acute cases come to the relief of irritation, local and constitutional, which may be said to terminate in them: on the other hand, irritation may predominate to the exclusion, or at least in the absence, of fever, for months together, and ultimately destroy, (unless healthy secretions, rest, and appetite, are legitimate symptoms of fever,) as it may destroy before inflammation and fever have had time to form.

The nervous principle, whatever that may be, I hold to be indispensably necessary to every vital action. Its disturbance, whether in quality or proportion, constitutes irritation, and according as it interferes with the properties and actions of other parts, the symptoms of such interference are manifested. By sympathetic connexion all parts are liable to be consensually affected; thus local and constitutional affections are reciprocated. The causes of disturbance of the nervous principle are various, both external and internal; the effects are confined to its own proper phenomena, or are extended to those of the blood, the blood and lymphatic vessels, &c.

An irregular, excessive, or deficient supply, or an imperfect quality of the circulating blood, from whatever cause, and under variously combined circumstances, proximate and remote, may be the source of irritation, or it may arise from causes not operating on the blood or vascular system, and in which that system is nowise concerned, but being prolonged it partakes of the irritation, and its actions are modified accordingly. Thus irritation may be primary or secondary, cause or effect. If we trace the different causes by which the balance of the vital powers is disturbed, we necessarily reason in a circle, for while the circulation continues, the nervous supply is preserved in a degree sufficient to maintain life, and vice versâ; and when either absolutely fails, the other is incapable of longer supporting the vital functions. By artificial contrivances we can exalt or diminish both the nervous and the vascular supply, but we cannot permanently arrest either and preserve life on

any terms. The hypotheses of fluidists and solidists are therefore necessarily erroneous; no element of the animal body having an independent existence, their error consists in their exclusiveness.

In my fourth chapter I have advanced that many of the changes which take place in the structure of the body, and pass under the general denomination of inflammation, are not due to that action, being destitute of the characters and symptoms of inflammation; in so saying however, I am desirous to guard myself from the imputation of being in the slightest degree tainted by the heresy of the French school, that there is no such reality as inflammation—that it is an old-fashioned coin, of which the impression is effaced, and that ought now to be withdrawn from circulation*. A better or more convincing proof that the doctrines of Hunter are not understood, for if understood they must have been appreciated, could not be given, even in a school which has only yesterday begun to practise the mode of healing wounds by adhesive inflammation.

It is familiar to observation, that the greatest benefits to science as to knowledge in general, admit of being converted into positive evils by exclusive study and abstract speculation. To illustrate my meaning—if the study of diseased actions had gone hand in hand with that of diseased structures, and the wards had contributed their fair proportion with the museum, it is impossible that such a doctrine could ever have

* See the Treatise on Pathological Anatomy of M. Andral.

been advanced. Out of the débris of the dead subject, however accurately inspected, examined, and arranged, to attempt a solution of the great problem of living actions, and to build upon such a foundation an edifice of pathology capable of self-support, is as injurious a fallacy, and scarcely less arrogant or absurd than that of the Cartesian philosophers, who undertook, out of the depths of their anatomical sagacity—to make a man.

The effect of morbid anatomy holding the first and almost the only place in the mind of the medical enquirer, is to substitute effect for cause, the laws of physics for the laws of life, to confound the cause of death with the cause of disease, and in short to obscure by attempts at simplification. I venerate that study for its power of confirming or correcting the opinions of the cautious and intelligent student of living nature; of shedding light where darkness reigned supreme; developing and enabling us to connect and compare the characters of morbid changes with the phenomena of disease during life, and thus to establish inferences, and gradually to arrive at a knowledge of the principles and laws which regulate morbid actions. And there can be no doubt that science is indebted to pathological anatomy for great advances in our time, subjected to the correction of minds well tutored and long disciplined at the bed-side: but this must be both the initiative and the moderator of our post mortem researches, or the museum becomes a thing apart, a mere collection of curiosities, quite as capable of perverting, as of guiding aright the mind of the beholder.

When I entered the profession at the commencement of the present century, this department of pathology was comparatively barren, and beginning only to be cultivated : the example of Baillie was held in high esteem, but the education of physicians had not, with almost this exception, embraced the details of structure, and was very deficient in morbid anatomy. The reaction about that period commencing, as in the example of Farre, has since that time become general, and so increasing, as already in some branches to have reached a high point of cultivation,—witness the labours of Abercrombie and Bright. In France and Germany, these labours have been prosecuted with great zeal and success. Of what they will effect for the extension of scientific pathology and the improvement of practical medicine, we may take as earnest what has been already done by Laennec and others. In surgery, which has necessarily held a closer alliance with anatomy from an earlier date, the advance has been most unequivocally illustrated, within the period of which I have spoken, by the history of ophthalmology, the diseases of blood-vessels, of joints, &c.

But we begin at the wrong end if we lose sight of the principle which should guide these researches,—if, unlike the illustrious Morgagni and his school, we overlook or do not specially cherish the connexion between the symptoms and the seats and causes of disease ; and a very doubtful service would be rendered to science, if the analysis and classification of the various changes met with in dead bodies were to be employed as instruments for the synthetical arrangement and elucidation of the vital phenomena,—in fact,

for the natural history of disease. I have been led into these reflections by observing that morbid anatomy is assuming a too exclusive and undue importance, and being ingeniously strained and tortured to supply new conceits, to the utter subversion of the plainest and best established principles in pathology; to be, in short, the phœnix of a new system. The substitution of new terms for those established by long usage, is an additional evil of considerable magnitude, but of no account compared with that of doctrines militating against the results of long and profound experience. Thus the attempt to substitute the loss of balance of natural actions for those of disease, the excess or defect of nutrition, of nervous supply, of secretion, or the perversion of either,—a term too vague and relative to admit of any precise signification,—appears to me, with all the machinery of congestions, transformations of texture, &c., utterly incompetent and unsatisfactory. The determination of blood to a part neither constitutes excess of nutriment nor the act of inflammation; nor is the wasting of substance or the absorption which belongs to inflammation, and is indicated by breach of texture, a necessary consequence of the opposite condition. The quantity of blood circulating in a part has in fact only an indirect reference to the healthy function, and to the morbid function a relation as subject to variety as the changes of which the part is susceptible. Phenomena have been regarded in the light of causes which are contingent only or adventitious features, and which alone we are permitted to observe, being wholly ignorant of those which stand in a nearer

relation to life. Too much, or too little, or perverted action, may, it is true, apply to the circulation, innervation, to borrow a not inexpressive term, secretion, absorption, exhalation, &c., but they are all capable of existing and do exist in the absence of inflammation, and when they attend upon it, are as probably effects as causes. Inflammation is not a mechanical or a chemical phenomenon, because the animal mechanism and animal chemistry of the part are altered and disordered by its presence. It is a vital process of which we obtain some characteristic signs during life, and observe certain effects both in life and death with so much uniformity, that we are warranted in classing and denominating them; and in their absence we are justified in denying the existence of inflammation, and in recognising the disturbance and alteration of the healthy actions by another denomination, as we impute them to another series of phenomena. These I refer to irritation, and as inflammation is of various kind and degree, so also is irritation, as à priori we might suppose. Of both, some are of the part, others also of the constitution, and others again, proceeding from and depending upon the constitution, are by its influence developed and maintained in the part. But these are complicated, not simple phenomena; they involve not one or two but all the issues of vitality in the part or the system, according to the character of local or constitutional, simple or specific; and until we know more of the springs and sources of action, the mutual relation especially of the nervous principle and the blood, the cause of either will not be determined by inspecting the state and action of

the different orders of vessels in irritated and inflamed parts, or by classifying the various changes of structure after death; the former the symbols of the morbid action, the latter its effects. That these nevertheless should be the objects of our careful study, no one will doubt; but let them not be made of undue importance, lest they mislead us, and we commit the anachronism of a theory explaining the actions of disease before we know those of health.

A local determination is a sign of inflammation, of congestion, of irritation. Either of the two last-named states may be present without inflammation, and without any permanent consequence as regards structure.

An organ may become enlarged or diminished, as the heart or the muscles of a limb; indurated or softened, as the liver or the brain; the seat of granular depositions, of tubercles, of dropsy, of a variety of morbid growths, interstitial or superficial, neither proceeding from inflammation nor exciting it. On the other hand, nobody questions that inflammation may produce all these consequences: we witness them daily: the post mortem observations confirming the clinical history. It appears then, though irritation and congestion are invariable attendants upon inflammation, that the converse does not hold; that the former are competent to the production of extensive and various primary changes, upon which the latter may or may not ensue, according to circumstances.

But let it not be supposed that the constitution is unaffected by such non-inflammatory actions where their existence is purely local; on the contrary, they

are a thorn in its side, disturbers of its peace, deranging the consent and harmonies of action between its several organs, exposing the system to the more easy access and triumph of disease by undermining its power of resistance. Neither are such changes in their origin local, in a vast number of cases, an observation which applies to both inflammatory and non-inflammatory actions. The blood is not what it should be; it is of bad materials or badly elaborated *;

* The original and very valuable researches of Dr. William Stevens on the physiology and pathology of the blood, supported as they are by experiments and practical results, will constitute an era in the history of medicine. The almost forgotten experiments and observations of Boerhaave, Huxham, and Haller, have thus been incidentally revived, and clothed with a new and important interest by the aid of modern chemistry*. The great advances made in the department of Animal Chemistry by the philosophical investigations of Dr. Prout and others, hold out the promise of solid acquirements to physiology and the practice of medicine, and ensure a due appreciation of the novel and ingenious theories of Dr. Stevens, touching the changes of the blood in circulation and respiration, and the source and distribution of the animal temperature.

A spirit of liberalism is the offspring of enlightened science, and weighs the value of discoveries by their intrinsic worth, from whatever quarter emanating—allows for the errors of persons unversed in the technicalities of the schools, and honestly and carefully separates valuable facts from trivial inaccuracies. Such a spirit, while it conduces to the progress, regulates the march of truth, and preserves us from the danger of relapsing into the solidism or humoralism of our predecessors. With every appreciation of the claims of Dr. Stevens, it is impossible to overlook the fact, that his views of the importance of the blood in the economy, lay him open to the danger, if not the charge, of exclusivism, which he so much deprecates.

* See Dr. Burrows's Gulstonian Lectures for 1834.

the nervous secretion and supply are of consequence deteriorated, the circulating machinery is ill supported, the uniformity of its tone is impaired, the balance between the arterial and the capillary system and consequently that of the arterial and venous, is unduly maintained, or is lost; this is reflected upon the exhalant and absorbent systems: the compound organs suffer, the sympathies by which their actions are regulated are deranged, their muscular actions are imperfectly and irregularly performed, their secretions become morbidly altered in quantity and quality, permanent congestions ensue, and thus a morbific train is established, by which it is easy to perceive that irregular and anomalous changes, as well as the phenomena proper to inflammation, may be produced, and the whole economy of the system be deranged and ultimately overwhelmed.

It is universally admitted, that it is in the small circulation that structural changes commence, whatever be their character. It is obvious, that when obstructions to those natural processes of which the capillaries are the efficient agents occur, if the secretion, exhalation, and absorption, by which not only the functions but the very forms and capacities of organs are maintained, are either of them out of proportion active or indolent, the effect must be a preponderance of the remainder, which must more or less affect the part and the circulation. In some circumstances, the part undergoes a change to the relief of the circulation, and in others the circulation is unrelieved, or so partially that the effect of its interruption is propagated to the arterial branches, and thence to the trunks, and

so onwards to the heart. A priori, we might suppose, that the obstruction being on the venal or absorbent side, the arterial capillaries would be less disposed to take on the act of inflammation than if they were themselves the seat of the obstruction, and that non-inflammatory changes of deposition would therefore be determined by an imperfect return of the circulating blood, or an imperfect action of the absorbents, whether veins or lymphatics. These are circumstances in which we do see enormous accumulations of fluid and enormous growths and losses of substance, without any increased arterial action, or other sign of inflammation. But though a mere change in the balance of action may serve to explain irregular accumulations or deposits, or the contrary, it is far too simple and too mechanical a view, though perhaps just as far as it goes, to explain the act of inflammation; nor does the microscope bring us a step nearer to the solution of the vital problem*.

"It is assuredly neither rational nor philosophic to apply to the varied morbid phenomena of the inflammatory process but the one hypothesis of either increased or diminished action."†

"Inflammation," says a learned and very sound author, "like every other phenomenon occurring in

* The term "vital affinities" is introduced by the chemical physiologists, to explain such phenomena as are peculiar to the living organized body and at variance with the laws which regulate the chemistry of other substances and subjects of their examination: "obscurum per obscurius."

† Article, "Inflammation," in the Cyclopædia of Practical Medicine.

animated bodies, is to be regarded not as a simple event, but as one uniformly arising from the combined and complicated operation of powers, some of which are known, others at present completely unknown to us. Simple views, whether of health or disease, however ingenious, can seldom be just. They have their origin in the spirit of system, not in the careful study and faithful enumeration of the complicated circumstances which concur in the production of all vital phenomena."*

I anticipate practical benefit from the careful distinction of inflammatory and non-inflammatory organic changes, a view which I have long entertained. As to what have been called latent inflammations, I consider them to belong to the latter class, or if not admitting to be so disposed of, they are cases in which some sudden metastasis or unusual complication of diseased actions has masked or merged the symptoms from the view of the physician. But the delusion has probably arisen from want of sagacity or patience in the analysis of the symptoms. The term sub-acute, as applied to inflammation, and the division of congestion into active and passive as distinct from inflammation, appear to me to be superfluous refinements, and therefore objectionable. The subject of congestion is astonishingly drawn out of late years, and the cases of its supposed existence so multiplied, as to leave the field for inflammation of comparatively small dimensions. Congestion and inflammation are essentially distinct; and where the former state denotes activity,

* Thomson's Lectures on Inflammation, page 174.

it is from the supervention of inflammation. Congestion is a frequent symptom of irritation, but does not constitute it, as Broussais and his followers think; for they not only often exist apart, but a state the very opposite to sanguineous congestion is not an unusual state of irritation, which, I repeat, belongs first and chiefly to the nerve, not the blood-vessel.

In the rapid progress of all subjects of scientific enquiry during the last twenty years, that of physiology seems to have fully participated. The renewed intercourse between the nations of Europe stimulating, by the quick circulation of knowledge, a spirit of national emulation, has rendered the present age prurient of discovery, and it is not without some apprehension for their stability and value, that I observe the credulous reception and ready adoption, by the physiologists of this country, of the results of experimental enquiry on the continent. It is enough that a name of some celebrity stands connected with them, to obtain currency for many statements startling by their novelty, and reasonings irreconcileable with our own previous observations and opinions.

Some physicians, confessedly men of great learning and talent, little accustomed to the details of healthy anatomy, and unacquainted with the visible changes of living structure forced upon the surgeon's observation, have innocently contributed to the encouragement of crude theories and fanciful distinctions; add to this, a tendency to hypothesis is begotten by the obscurity in which the medical department of pathology is necessarily involved. The microscope, the means of discovery most commonly resorted to, is a most pro-

lific source of delusion, judging from the strange and discordant appearances which it presents to the eyes of its different employers. I read that the globules of the blood are gaseous vesicles, whether of carbonic acid or atmospheric air, and imbued with the property of moulding their own vessels in a layer of coagulum; of the *exudation* of lymph and of pus; of the separation of the coloring matter from the globule of blood actually taking place in the vessel and thus constituting one of pus; the organization of a clot of blood; the formation of an entire organism —blood-vessels, absorbents, and nerves—in a floating layer of fibrine wholly detached from all surrounding parts; the branching forth of new canals through the cellular texture from the continuous sides of inflamed vessels; the transportations of pus by the veins from remote lesions, abscess or ulcer, to parts free from any other sign of diseased action, as the parenchyma of the lungs or the parietes of the heart, &c.,—these things, and a thousand others not less extraordinary, may be; yet if knowledge has no bounds for our senses, its advancement must keep some measure with our understandings, or it ceases to be useful. It is impossible to contemplate the present travelling rate of physiology, and the mass of unsatisfactory experiment and undigested speculation continually throwing up, without a feeling of sympathy with the hopeless perplexity of the student in such an 'embarras de richesses,' and what is vastly more serious, some alarm at the possible consequences that may result to the usefulness and credit of the profession of medicine, and the health of the community.

The following are the principal phenomena which distinguish the inflammations that may be termed constitutional: the disposition to appear independent of injury, to relapse or reappear in the same organ, to spread by continuity, to appear in various parts or organs at the same time, or consecutively in different textures, preserving the same character, as tubercular deposit, or suppurative inflammation, or erysipelas; to pass rapidly from the state of phlegmonous inflammation into erysipelas, or gangrenous inflammation.

What are called secondary inflammations, i. e. inflammations partaking of the same character in distinct parts of the body, show more than any the influence of the constitution over the local action. They have been already spoken of in the second chapter of this volume. I cannot attribute these to absorption, or the introduction of pus into the blood, nor to any partial or local sympathy, but to the principle of morbid irritation extending to the system at large which was at first confined to the part, and now re-acting upon other parts; the character and stage of the action being preserved.

Although some inflammations are allied to health, or at least the preserving power, others to the destructive, it does not follow that either may not be deflected from its primitive course, as we see adhesive matter perish at the mouth of an artery, and gangrenous inflammation terminated by a healthy suppuration and cicatrization, with scarce any loss of substance.

I have endeavored to show that the influence of

the constitution on inflammation, is as marked as over the effects of injury or operation; that peculiar irritability, or reduced health, or previous organic change, are conditions equally unfavorable in both instances; and further, that the effect of local inflammation, whether the result of injury or not, if either very acute, extensive, or much prolonged, is to set up sympathetic morbid actions in distant as well as contiguous, and sometimes in vital parts of the body.

From all which it follows, that the pathology of surgery especially embraces, or rather is based upon the connection between, the part and the system and their mutual influences,—and that many of the diseases which lie strictly within the province of surgery are so much more belonging to the constitution than the part, that a very principal share of our attention is necessarily directed to the former, to arrest the morbid and induce the healing process. This forms the department of high surgery. Its cultivation is not only necessary to the success of our operations, but in many cases it is competent to the supercession of them altogether, and to overrule and prohibit such as inexperience and a sanguine disposition (I will not suppose other and less excusable motives) not unfrequently lead men to perform.

PART THE SECOND.

PART THE SECOND.

CHAPTER I.

OF THE NERVOUS SYSTEM AND ITS PATHOLOGY. SENSATION AND VOLITION. SYMPATHY. MORBID SENSATION. MORBID ACTION.

GREAT advances have been made in our time towards a better knowledge of the anatomy of the nervous system, and a more accurate arrangement and fuller development of its properties and phenomena. My readers must not expect from me more than such a summary account of this subject as is necessary to the pathological purpose of this work. The physiology of the nervous system is at this moment in a state the most unsettled, and perplexed by conflicts both of anatomical detail, experimental result, and theoretical opinion. The mere record of these differences would fill a volume *. The value of patho-

* A neat and concise Report of the present state of our knowledge respecting the physiology of the nervous system, was presented by Dr. Henry, of Manchester, to the British Association assembled at Cambridge, in June, 1833.

logical observation as a guide, is in no department more obvious for its correcting and confirming as well as directly instructive tendency.

The ultimate control of the nervous system over the functions of the animal economy in general, I considered in my former volume, and endeavoured to explain how all the results of observation and experiment tend to the confirmation of this fact. Something corresponding to a nervous centre is met with in the lowest scale of animal organization; and the phenomena of monsters only corroborate the conclusions deducible from the experiments of physiologists, by whose researches the present century has been distinguished. The very gradual and remote approaches made to the knowledge which we now possess, of the arrangement and properties of the nervous system, show how obscure and difficult was the path, additionally bewildered by the false lights of experiment and conjecture. Under the correction of a philosophical method of investigation, that is, by the guidance of anatomy and observation of the living functions conjointly, many delusions have been dissipated, and much clear and strong light thrown upon what seemed till now shrouded in impenetrable darkness. And this, with all respect to the genius and labors of his distinguished collaborateurs, we owe chiefly to the intelligence and perseverance of our countryman, Sir Charles Bell. The greatest anatomico-physiological discovery of modern times is that of the double origin and distinct properties of the symmetrical system of nerves. The public adjudication, if not appreciation, of great dis-

coveries, is often, by a singular fatality, posthumous; —a consideration which offers no discouragement, however, to one who seeks and loves truth in sincerity.

The first, and to my mind the most distinct and satisfactory account of the 5th and 7th pair of nerves, we owe to Bellingeri * of Turin, whose labors have been directed to the illustration of the entire system with a zeal and talent which entitle him to a very high rank among physiologists, whether his inferences be wholly, or only in part, confirmed by future research and observation. A remarkable candor towards his predecessors and contemporaries distinguish him not less than his patience of labor, and the comprehensiveness and originality of his views.

Much as has been done, however, we have but obtained an entrance within the porch of the temple, and planted a foot or two securely in advance of our former station.

The properties of those nerves issuing from the brain and spinal cord which are not, like the nerve of smell, and sight, and hearing, exclusively devoted to a sense, have been ascertained with more precision. Instead of being common vehicles of sensation and motion, there is reason to believe some to be purely motive, as the 3d, 4th, 6th, portio dura of the 7th and 9th: others in part sensitive and in part motive, as the 5th, 8th and 10th, and all the spinal nerves; the origin of the motor and sensitive nerves having been found to exhibit a cor-

* Dissert. Inauguralis. Ex anatome; de Nervis Faciei. Ex Physiologia; Quinti et Septimi Paris Functiones. Turin, 1818.

responding relation, on the two sides of the brain and spine, to tracts and columns respectively continuous, and the origin of the nerves possessing the double faculty to be by double roots from these tracts and columns. The 5th pair has been demonstrated thus to arise, and to resemble the spinal nerves in its double function : the first and second divisions being chiefly if not purely sensitive, the third partly sensitive, viz., the organ of taste, and in part motive. Ganglia, instead of being stops to volition, have been found on the sensitive portion only, and the motive portion observed to pass the ganglia without entering them.

The tract from which the nerves arise that supply the muscles performing the functions of respiration *

* The assailable part of my learned and able friend's theory is his respiratory system, that which exclusively assigns, under this denomination, to the 4th, 7th, and 8th nerves, the function of respiration. As respects the 4th pair, the assumption is clearly hypothetical: the portio dura has enough to do quite independent of respiration, and the glosso-pharyngeal and par vagum are fully as much otherwise engaged as in respiration. As regards the muscles, all those which he names doubtless assist in respiration, but this is only one of their many functions, and the sterno-mastoid and trapezius far less than the intercostal and abdominal muscles, which get their nerves from the anterior or motor tract of the spinal cord, and are, like the others, mixed muscles. The error has been in defining that to be the function of one set of muscles, to which all the muscles of the trunk of the body more or less directly contribute; and that the office and proper function of one set of nerves, which contribute to the performance of numberless other actions besides respiration. This division perplexes his system and hampers his progress, which none more sincerely desire should have his mature and unbiassed reconsideration than they who appreciate his labors and their result as highly as I do.

and deglutition, and in fact, the heart, is intermediate to the motory and sensorial tracts, and stops short of the brain, so as to explain why their motive powers are independent of volition; while the remainder of the spinal cord is the continuation of the crura cerebri and cerebelli; and thus its nerves are those of voluntary motion and sensation. These are the primordia of grand discoveries, the foundation of which, being laid in anatomy, is solid; and so far as experiment could be applied, it has in most instances proved an additional pillar of support. But experiment is extremely difficult of application, pregnant with fallacy; and closer examination convinces us that we are not yet in a condition to explain with accuracy the functions of the brain, as regards its several parts, more than the actual nature of those functions.

A host of experimenters, from Rolando downwards, have undertaken to determine the function of the several parts of the brain, but their results have agreed only in some particulars. The superior lobes of the cerebrum are generally admitted to be the organs of intellectual perception, thought and judgement; the parts of the cerebrum proper, below the mesolobe or corpus callosum, the seat of animal sensation, the external senses, and the voluntary motions; the cerebellum, the combiner and regulator of these motions. The spinal chord consists of two anterior or cerebral strands, two posterior or cerebellic. Between these lie the lateral or restiform strands, terminating in the pons or nodus cerebri. From these last arise the trifacial, pneumo-gastric, glosso-pharyngeal, and accessory nerves, this being

the organic sensible or involuntary tract. The anterior spinal nerves are regarded as purely motive; the posterior as purely sensitive by Bell, Majendie, and others; the posterior as sensitive and motive by Bellingeri and others. What is called the grey matter of the brain and chord is considered to give origin to the sensitive roots or filaments; the white matter to the motor roots. A partial origin from the grey matter of the chord is stated by Bellingeri to be the source of the sensitive faculty in the posterior spinal roots. It is with the posterior roots alone that the intercostal or great sympathetic nerve is conjoined, by the medium of ganglia, upon their exit from the canal.

The difficulty of distinguishing the sensitive and motory branches with perfect accuracy, seems to me insuperable, by reason of the complicated anastomotic communication of distinct primitive branches of the same nerve, and of distinct nerves with each other. Look at the anastomosis of the 5th with itself, with the 3d, 4th, 6th, 7th, 8th, the first and second spinal and the sympathetic; with the olfactory by the nasal, with the optic by the ciliary, with the auditory by the chorda tympani, and with the facial by the vidian. Communicating, therefore, with all the organs of the senses, and by the sympathetic with the whole frame, distributing itself to muscular parts as well as parts devoid of motion, as glands and membranes, and to sensitive surfaces, so intimately conjoined with the 7th pair as to render their unity of action indispensable to its purposes — when we see one portion of this nerve so much voluntary as

the acts of manducation and deglutition ; so much involuntary as the sensation and circulation, the play of the iris, the secretion of tears, of the mucus of the nostrils, of the cerumen of the ear; so much sensitive as the use of the senses of vision, smell, hearing and taste imply, and so much expressive as to be the guide, if not the agent of physiognomy, general and particular, of articulation, of harmony!—how shall we venture to assign to its capacities such definite limits as may give it a place in any exclusive system of nerves sensitive and motive, of nerves animal and organic ? We cannot explain its variety of powers and uses but by supposing that if itself purely sensitive, its seemingly motive powers are derived from its intimate and complex communications with motive nerves, that if purely organic, its seeming obedience to the will is from similar inter-communications with nerves of animal life ; unless we suppose that it combines all the properties in itself to which it ministers as the several and proper endowments of others, and is the organic or great sympathetic system of the head, the minister and moderator of the vital functions in their first stage. And its anatomical character and origin, as compared with the other organic nerves, its early development and subservience to animal life confirm this inference.

Of the actual functions of that important division of the nervous system comprehended under the term of the great sympathetic, the most extensively diffused and connected of all the nerves, having no direct connexion with the brain and spinal chord, abounding with ganglia and with plexuses, a superadded system

and yet a system of itself, we have no positive knowledge. Plexuses upon the locomotive nerves seem to preside over the functions of their muscles, combining and classifying their movements. They are found both in their trunks and branches, at their origins and extremities. The viscera are supplied by plexuses; and if this theory of their use be the true one, the sympathetic must be a motive nerve, as its abounding in ganglia proves it to be a sensitive one, and its properties, both of sensation and motion, are unreferred to and independent of the brain, for they are active when the perception, and volition, and all the other faculties of the brain are locked in sleep. It follows that there is a sensation and motion independent of consciousness; for it is not more clear that this motion exists, than that it must have a motive stimulus, and that stimulus be equivalent to some modification of the sensitive principle.

Will any one question that the sensibility of the larynx or the air cells to their stimulus, or that of the heart, or the stomach, or any other organ to its stimulus, is the immediate and necessary provocative of the actions thence arising?—and yet how but through the medium of impeded or disordered action, that is, but by its consequences, do we know anything of the sensation of the lungs, heart, stomach, &c.

I am utterly unable to comprehend the force of the objection raised to this argument; but in truth it seems rather directed against the term 'sensation,' than the faculty to which it is assigned. The vis insita, vis nervea, irritability, contractility, what are they all but endowments of the system of nerves? evidences of the

principle derived to the muscular fibre from its connexion with the nervous, and exhibited even after death, while the warmth of the part is retained by the presence of the blood in its tissue, exhausting as this diminishes, and soon ceasing altogether. If involuntary motion, why not unreported sensation? Why suppose two distinct principles, when a modification of the same principle suffices for every purpose of explanation? So long as the blood is not intercepted, although every fibre of solid texture be divided, and the divided vessels artificially connected, as by quills, we are assured that the properties ascribed to the nerves are propagated more or less imperfectly to those parts which it visits. I admit this for argument sake. Yet it is by no means sufficient to establish the non-agency of the nervous principle; for the circulating blood cannot be rendered destitute of that principle but by such destruction of the entire nervous mass as is incompatible even with artificial circulation. But the truth is, that the sympathetic system is so constituted and arranged, as to be beyond the reach of experiment: if that could be effectually cut off, the question would soon be set at rest, and we should hear no more of independent vitalities, and of irritability and contractility as innate or ultimate principles of the economy, whether in muscular or other tissues.

The sympathetic has been spoken of as a purely sensitive nerve, as a nerve of combination and sympathy, by which, if it is implied either that it is not motive, or merely a combiner of the motive powers of the spinal and other nerves, I beg to enquire, how the actions of the abdominal viscera are maintained after the com-

plete annihilation of sensation and motion by destruction of the spine above the first dorsal vertebra ?—the brain and spine being as incapable of supplying the vital sensation and motion of these viscera, as is the sympathetic of performing the cerebro-spinal sensitive or motive functions.

The system of the sympathetic, superadded to that of the brain and spine, constitutes the involuntary or vital system. It holds in communication, direct or indirect, all the nerves of the body.

The loss of all the senses would not be immediately followed by the loss of life, though it would render the animal dependent; the sense of feeling, alone, would amount to a more severe loss than that of all the remaining senses collectively; but while the vital sensation remained, (and we have reason to believe such a condition possible,) the vital actions would survive.

The action of all the muscles subservient to the will, may, in addition to the sense of feeling, be suspended, without destruction ensuing as a direct consequence. If by supplying air to the lungs and assisting its escape we imitate the act of respiration, we can prolong life; and if the circumstances admit of it, as in suspended animation from submersion, &c., we can finally restore it with all its phenomena. Even where the system is palsied by the action of a deleterious poison, the continuance of this artificial process has restored life. Nay, we can decapitate and remove the spinal chord of the animal, and preserve the circulation of the remainder by this proceeding, showing that the organs supplied by the

sympathetic system retain their faculties of vital sensation and motion, when what is called animal life is destroyed. The division of the spinal chord is, however, directly fatal, if performed above the origin of the nerves which support respiration; but this operation is not directly fatal, if performed below that part *.

From these statements it appears, that although the lungs and heart, the blood-vessels and muscles, are capable of being re-excited after a separation of the spine and brain, they are incapable of maintaining their properties of vital sensation and motion, and their functions cease. For it is not contended that the artificial respiration could, if prolonged indefinitely, maintain the contractions of the heart and arteries, even though the temperature were accurately preserved: what then is it which prevents? It is the loss of the nervous principle, no longer supplied to the solid or the fluid by the ablation of its only spontaneous and primordial source of supply. The integrity of the brain and spine is therefore in reality necessary to the success of the experiment of artificial respiration as a means of preserving life; and this is doubtless one reason why, in numberless

* If the spinal chord be not simply divided, but crushed and broken down in its texture, the motions of the parts supplied by the nerves emanating from that portion of the chord, are incapable of being excited by stimuli, which, in the simple division, is not the case. The experimenters also confirm the result established by Legallois, that a point of the medulla oblongata corresponding to the origin of the 8th pair, constitutes a nervous centre, the section or destruction of which annihilates the inspiratory movements, and is therefore instantly fatal.

cases of asphyxia, its use has been persevered in without the smallest advantage, while in others equally prolonged it has restored animation, and why it would be labor thrown away in sudden death from injuries of the head and top of the spine, and in apoplexy. And the same observation applies to any insulated portion of the spine, and the parts supplied by the nerves emanating therefrom. This shows clearly that the independence enjoyed by the sympathetic system is one limited to the condition of integrity as regards the continuity of the brain and spinal chord, to the extent of the supply of those organs, the functions of which are essential to life. Pathology confirms this in the cases of instant death from disorganizing injuries to the top of the spinal chord, and of slow death from dissolved continuity of the dorsal spine, the organic functions of the neighbouring parts failing, and the organs themselves losing the preserving power and becoming diseased. Thus the partial independence demonstrated by experiment and disease, proves no more than the perfect consent which obtains in natural circumstances, and is essential to life.

SENSATION AND VOLITION.

The sensation excited by the presence of blood in the fibres of the heart is not reported to the brain, although its failure is, as may be said of air and food in reference to the lungs and stomach. Muscles which are not subject to the control of the will are capable of being influenced by it. Thus a man may

breathe quicker or slower, or fetch a sigh, or whistle at his own pleasure, or hold his breath as in diving, but he cannot by an effort of the will cease to breathe. So by exertion he may quicken the pulsations of the heart, but he has no power to arrest them.

By this quality of certain muscles life is preserved; that is, the actions of those parts are maintained which carry on the respiration, circulation, absorption, secretion, &c. But what excites and keeps alive these motions? The lungs require the presence of respirable air, and the heart of blood duly prepared, to be set and kept in motion; there must therefore be an unconscious or vital sensation, as well as an involuntary or vital motion for the maintenance of life.

Volition originates where perceptive sensation* terminates, viz. in the brain; in states of insensibility therefore both are suspended; in ordinary paralysis one is lost, most frequently motion, while sensation is only partially affected; in other cases sensation is lost, while motion only is impaired. If the sciatic nerve be compressed, as in an oblique sitting posture long continued, the extremity is insensible, incapable of supporting the weight of the body and of motion. In broken spine, both sensation and motion are equally lost to the parts below the fracture.

We have said that sensation is the initiative of

* Henceforward I shall use the single term, sensation, according to its common acceptation, for perception, i. e. cerebral sensation, and prefix the term *vital* to that which is not transmitted to the brain, the associate faculty of the involuntary motions, as the former is of the voluntary.

volition; it is also occasionally the initiative of involuntary action in parts subject to the will. If the limb of a person be pricked in sleep, it is withdrawn, not by an effort of volition which implies consciousness, but by an involuntary motive power, excited by the stimulus of sensation. Such a power is exerted over the muscles subject to the will, in the same partial sense as we have stated the will to exercise over the involuntary muscles. It is predominant in morbid sensations and states of the brain and spine, as we shall show hereafter. In dreams, an ideal or delusive sensation sometimes rouses the will into action sufficiently to command the ordinary action of the locomotive muscles, as in somnambulism. How far delusive perception from memory and the force of habit aid in this phenomenon, belongs to another branch of philosophical enquiry.

A nerve of the arm or leg may be obstructed in its course, or intercepted at its origin from the spine. In the first case, the faculty of sensation or volition, as regards that nerve, is only not called into action, i. e. dormant from non-excitement. This is proved by the restoration of the faculty on the removal of the obstruction.

If sensation and volition were conveyed by the same nerves, the paralysis would be complete to the extent of its supply, in the defect or obstruction of a single nerve. But this not being the case, we have the frequent phenomenon of partial paralysis, as loss of sensation affecting a particular region, or loss of motion affecting a particular class of muscles. If the obstruction include all the nerves of the limb, the

paralysis is complete, i. e. extends both to sensation and volition.

In the second case, we are led by recent observations to believe, that if the nerve issuing from the anterior pillar of the spine be intercepted, the motive power is lost; if that from the posterior, which enters the sympathetic ganglion, the sensitive. Still, though this is the origin of the nerve, anatomically speaking, as sensation and volition are exclusive properties of the brain, it is obvious that the column of the chord to its connexion with the brain and the brain itself is equally a part of the tract, the integrity of which is essential to the corresponding function of sense or motion. Therefore, in affections of the brain or spine, which leave the nerves of the limb perfect as passive instruments, volition or sensation is impaired or annihilated, one or the other, or both, as the anterior or posterior column of the medulla spinalis, and their continuity with the brain, and the brain itself, are severally or conjointly affected. Profound apoplexy, as well as broken spine, arrests both.

In ordinary paralysis of the arm or leg, referred, and with reason, to the brain, the volition fails altogether and leaves the sensation only generally and slightly impaired. The opposite case, loss of sensation, occurs, but is comparatively rare. The loss of one invariably injures the other faculty more or less, but sensation suffers less when motion fails than the contrary. If the plexuses formed by trunks at the spinal, and by branches at the digital extremities of the limbs explain the reciprocity, it is difficult to comprehend how it happens that with so much inter-

communication the distinctness of properties derived from the twofold origin of each spinal nerve is so far preserved. But the muscles are systematized and classed in their actions conformably to their position and use, as flexors, abductors, and supinators; extensors, adductors, and pronators, &c., and the variety and complication of the movements required; and for this it seems necessary that the nerves should be also classed, in obedience to the dictate of instinct or experience, to balance or adjust the moving power. Such provision is probably furnished by the plexuses. The properties of sensation and motion owe their distinctness to their origin and transmission by distinct chords and in opposite courses.

There are cases in which we see the respective properties of the nerves of sense and motion most oppositely affected, and changed from their ordinary and healthy state, as connected with their spinal and cerebral origin. A limb partially deprived of sense and entirely of motion, is often excruciatingly painful, and the varieties of delusive sensation as regards the properties of surrounding objects, and the excessive severity of pain in hysteric and neuralgic complaints, are well known to pathologists. As regards the motor muscles acting habitually at the command of the will, they are rendered altogether involuntary in different morbid conditions, and exhibit a preternatural vigor; sometimes a paroxysm of jactitation continues for days and nights without cessation, jerking the limb to the same extent in the same direction. Sometimes an occasional paroxysm exhibits every possible variety and capricious combination of actions,

and at other times the muscles assume a state of spastic rigidity, giving a fixed and statue-like position to a limb for hours together, which, if attempted to be maintained by the will, they would be utterly incapable of preserving for as many minutes. These things show that if the nerves of sensation and volition are not convertible to each other's purposes, both are capable of being excited by stimuli, the very converse of those which are natural to them, and to contradictory results, and that they are instruments subservient to the condition of the spinal and cerebral masses from which they are derived. Thus it appears that the motive stimulus is not invariably furnished by the will in the muscles called voluntary, but that the will is sometimes overpowered and annihilated, being incapable of commanding the simply tonic state, which preserves them in tranquillity independent of definite motions. Nor is the sensation always faithful or consistent with itself, for it presents to the perception contrarieties, as heat for cold and the reverse, and objects which are not, as a foot after amputation, and images, lights, sounds, and numberless indescribable objects, as visionary as the mere creatures of the fancy.

SYMPATHY.

THE principle of consent, the peculiar and exclusive property of the nervous system, is identified with animal existence;—look at its operation in the function of any individual organ, as for example, the alimentary tube, the regular alternation of relaxation and contraction

of the muscular cylinder throughout its course, the state of diastole and systole of the heart, arteries, and veins, the rising and falling of the chest and corresponding state of the lungs, the alternate influx and efflux of the blood to the brain, the uterus, and all the glandular and muscular structures of the body. In organs which are subject to the control of the will, the alternate states are required of action and repose, though the interval is irregular in duration. The tonicity of organs, by which they are capable of maintaining a condition in the intervals of action, suited to the necessity or exigency of the part and the system, without the consciousness of the individual, as the sphincters of the mouth, anus, and bladder: the occasional actions dictated by a sense of uneasiness or interrupted function, as sighing, coughing, sneezing, yawning, hiccuping, vomiting, &c.: the actions called into existence by the passions, as those belonging to the entire generative orgasm, the expressions characteristic of the emotions of anger, terror, despair, are all regulated by the same principle of consent. Now on what does this most important principle depend, which links together all the functions necessary to the protection and maintenance of the individual and the continuance of the species, which being interrupted, partially affects his existence in proportion to the importance of the function affected, and being wholly suspended, is fatal? Of what use would be sense and motion under the command of the will, without this link of involuntary association, which renders the actions of parts harmonious, and preserves the balance of the nervous and circulating

systems, the secreting and excreting functions; which determines the growth and decay, the development periods and decline of the generative system—which in fact ministers to the well being of the whole by the adjustment of the parts? This I consider to be the office of the sympathetic system of ganglions and nerves, which more or less directly communicates with all the nerves of the body; which supplies not only the vital organs, but all the viscera of the chest and abdomen in a manner peculiar to itself, by plexuses emanating from its ganglia, and is distributed even upon the sheaths of the blood-vessels. The lingering vitality of parts separated from their connexions, as evinced by some faint remnant of vital sensation and motion, is depending on the peculiar arrangement of the sympathetic, which being a connecting chain as regards other nerves, and originating (if we must use this artificial term) in its ganglia, as so many centres of its own system, being supernumerary to the cerebral and spinal nerves, not one of them; I say that this arrangement it is, which to the last, and after life has ceased, presents the transient phenomenon of surviving action.

I have said that the sympathetic is so situated as not to admit of being made the subject of fair experiment, but it is also so constructed as to be beyond its reach. It is a multitude of small concatenated systems, and each ganglion, (as the semilunar ganglion displays itself to be,) a nervous focus. Its inaccessibleness to injury from its position, its intricate arrangement and universal diffusion, contribute, with

the complex character of its functions, to the support of organic life.

The phenomena described under the denomination of nervous antagonism, and, as it seems to me, carried by Bellingeri much beyond the evidence, though indisputable to a certain extent,—the nervous circle of Sir C. Bell,—the reflex function of Dr. Marshall Hall,—are all modifications of nervous action, depending upon and regulated by this principle, as indeed are all the functions of organic life.

It is not yet distinctly ascertained what relation the nerves, arising from the same tract intermediate to those of the cerebral and cerebellic crura, bear to the sympathetic; whether they are to be considered as originally endowed with the involuntary principle, or mediately, by their dependence upon and connexion with the system of the sympathetic; for the 5th, 8th, and accessory nerves, so arising, may all derive their partial properties of organic life, which minister to the vital functions of deglutition and respiration and the exercise of the senses, through the medium of the sympathetic, as well as the carotid artery and its subdivisions which nourish them. They at least are mixed nerves, which cannot be said of the sympathetic, some of their branches being subservient to the will and others independent of it, and some partially but not absolutely under its dominion. The sympathetic is, in my belief, that which maintains the involuntary or consensual principle, and consequently the functions which are termed vital.

A condition of the brain and spine totally suspending sensation and voluntary motion, leaves the

organs of life in possession of those properties which enable them to carry it on, however imperfectly, for days and weeks together; and although an injury to a certain amount of the medulla oblongata is instantly fatal, from the stop put to respiration, it does not, there is reason to believe, deprive the heart and other organs of these properties, but of the excitement of the circulation which is necessary to their actions, as may be proved by the reproduction of their actions if the respiration be artificially renewed. If the entire origin of the nerves be destroyed, then the faculties of all parts are destroyed, and the sympathetic or involuntary movements are of course and consequence annihilated, as happens, if the spinal chord of any particular region be crushed, throughout the parts which that region includes. This is the explanation of the stop put to respiration on the destruction of the upper portion of the cervical spine.

Although there is not a vital function to the performance of which the sympathetic, or as it might better be called, the vital nerve, is not directly subservient, yet it is so far dependent that if the first link of the vital chain be broken, viz. respiration, all its apparatus, being contingent and superadded, lies useless and incapable as the machinery of a watch when the main-spring is motionless. The surviving actions of parts in artificial circumstances, as after the removal and injury of various portions of the brain and spine, are in fine to be referred to the same principle as in natural circumstances constitutes the ultimum moriens: viz. the partial independence of the in-

voluntary system by the medium of the sympathetic nerve. This, possessing vital sensation and motive power in the highest degree, preserves life, during the suspension of the animal functions by injury or disease, to its latest ebb in the fibres of the heart, the purest, if not the only pure involuntary muscle.

Let us now enquire how the nervous system is affected in disease, and how far the phenomena of injuries are traceable to its lesion or altered actions.

It is with the properties and functions of the nervous system that we have principally to deal in treating of irritation, because in these it has its origin and existence.

If we would render a person insusceptible of constitutional irritation, we must contrive to deaden that universal consent and combination which pervades the system by the chain of nerves; but in proportion as we succeeded in deadening it, we should undermine and impair the preserving and the restorative principle. We could not by artificial means induce such a state of inirritability as we see some individuals naturally possess in comparison with others, without prejudice to their vitality.

MORBID SENSATION.

SEEING, hearing, smell, taste, and touch are the subjects of extensive deviations from the healthy standard, as well as of all degrees and forms of over action and atony. These deviations are arising as frequently in the absence of any organic cause as the contrary. Light and sound are painful to the eye and ear, the

rose revolting to the smell, and a favourite food disgusting to the palate. They are all liable to be distressed by the impressions left upon them after the stimulus itself is withdrawn, and by the artificial combinations which an over-excited condition of the nerve or the brain presents in the absence of the natural stimulus.

The sensation appertaining to all organs, and distinct from the specific endowment of the organs of sense, is that, the consciousness of which in health constitutes physical pleasure, as food and drink to the stomach, pure air to the lungs, grateful objects to the organs of sense, &c. Natural and healthy circumstances elevate the character of these sensations and diffuse them by the medium of sympathy over the whole frame, as is seen in their exhilarating effect upon the circulation, and in the increased elasticity of body and mind. And they are transmuted by the opposite conditions into sources of pain.

The origin of pain is either negative, that which results from the negation or deficiency of the natural stimuli to sensation,—or positive, that in the sentient extremities which renders the natural stimuli hurtful, or which results from an alteration in the nature of the stimuli from the state of health. These include a vast variety. Insufficient air or food, or insufficient blood or vigor of circulation, may be taken as examples of negative pain. Of the first kind of positive pain, the case of aggravated dyspepsia, which renders every morsel that passes the cardia painful, is as good as a thousand others; of the second, the secretion after

a debauch, of bile or urine so acrid, as to create scalding of the sound and healthy surface of the rectum or urethra.

Pain has no fixed standard; the susceptibility to it varies in different individuals and at different times in the same individual. When the powers of life are sunk to a certain point, and the person seems least able to bear it, it is positively less, so far as can be judged, than when the physical power is greater. The fulness generally increases the severity of pain more than the frequency of circulation, and the degree of arterial reaction more than the fulness. We must not, however, forget, that the circulation is as much influenced by the sensation as this by the circulation. The pulse may therefore be more safely taken as an index of the effect than the cause. That pain is essentially distinct from inflammation, though one of its symptoms, is proved by the continual occurrence of the most excruciating pain in the total absence of inflammation, —that it has also in many cases of great severity no sensible influence on the pulse is obvious,—but I by no means conclude that the distribution of blood through a pained organ is not nevertheless accessory either to the existence or the removal of pain, for every day's experience teaches how the abstraction of blood and the diminution of the arterial impulse by derivation from the capillaries lessens inflammatory pain, and how the administration of such medicines and applications as invigorate and brisken the small circulation, relieves neuralgic pain. So that as regards circulation, pain in its intensest forms may consist with

opposite states;—and the character of such pains is scarcely less contrasted.

Whether the brain and nerves exemplify in their proper injuries and diseases a sensibility greater than that which belongs to the other textures of the body, has been long a question; it does not follow, because they are the instruments of healthy sensation, that they are more than the instruments of morbid.

The nerves of the external senses are not the instruments of pain, as when sight becomes painful to the eye, more than the nerves of volition, when the slightest movements of a maimed limb are painful. The sensation to which the sensitive nerves are subservient, which are the medium of communication between the organ and the source of sensation, when they are extraordinarily or morbidly excited, is the source of pain. Thus, if inflammation of one organ be more painful than that of another, it is to be explained on a similar principle to that which explains why one organ is more or less acutely sensible to external impressions and injuries, or insusceptible altogether of pain on the infliction of a wound, viz. that it is more highly endowed with sensitive nerves, or that none are traceable into its substance. Pain, therefore, is a sympathetic rather than a direct effect of injury, inflammation, or whatever other condition gives rise to it. This accounts in great measure for its variety of kind and its variety of seat, as regards concentration or diffusedness, and proximity to the injured organ or remoteness from it. The differences in kind are depending on the organization and healthy function of the part affected, and the nature of the injury or

disease which excites it. Take the mucous membrane, looking at its endowment and its office, in an attack of acute bronchitis or enteritis, and the acute inflammation of the synovial membrane of the knee joint, as examples of the influence of organization. Take the case of a subcutaneous phlegmon or abscess, and a suppuration within a flexor theca or of the bulb of the eye, as shewing the influence of seat.

The erratic, the concentrated, the diffused, the remote, are varieties of pain familiarly known to pathologists, as exemplified in fever, rheumatism, and gout; in obstruction of the passages, as the bowels, gall duct, ureter, and urethra; in inflammation of the liver, kidney, hip joint, &c., especially also in neuralgia. Pain is metastatic also, i. e. suddenly shifts from one part to another. It is continued, remittent, or intermittent, the intermission sometimes regular and periodical, and at other times irregular and uncertain; and this is frequently the case where inflammation is the obvious cause of pain, and undergoes no alleviation during these changes.

It varies in its character with the nature of the existing action, as in the several stages of inflammation, as well as in the modes and forms of it. All these circumstances tend to confirm the statement, that pain is the common indication of disorder in the structure or function of all parts of the body, through the medium of the nerves destined to convey sensitive impressions to the brain, and that it is modified by the temperament and state of the individual, the degree of sensibility and the function of the organ, and the character of the exciting cause. There is also another most

important modification, which is that produced by the deviations from health of the instrument of sensation, viz. the brain and sensitive nerves; this affects not only the nerves concerned in transmitting sensitive impressions, but excites other nerves through the medium of the brain, as those of volition and even of involition, of the senses, and the brain itself, influencing its actions of perception, reflection, judgement, &c. Thus we see the convulsive affections, the inordinate actions of the heart, the delusive sights and sounds, the delirium and delusions of patients afflicted with cephalalgia and neuralgia, from whatever cause, of great intenseness or long duration.

MORBID ACTION.

THE class of motor nerves, which in a state of health are subject to the will, are variously affected by disease; deprived of their tonic power, the muscles become tremulous and incapable of executing their ordinary actions steadily, both of resistance and of motion, passive and active. This, which amounts to a partial paralysis, may arise from causes operating through the brain or from the brain, i. e. from the defect or disorder of the stimulus conveyed by the sensitive nerves, or from the disorder or disease of the nerves of voluntary motion, singly or in association, or of the part of the brain in which they have their origin. They may cease to be influenced by volition, and the muscles be in consequence motionless from the defect of the stimulus of volition, or an obstruction to its course; or other causes acting as a more power-

ful motive stimulus, they may be taken from under the control of the will and rendered altogether involuntary. Thus spasm and convulsion is accounted for by an action over which the will has no control. This may emanate directly from the brain, as we see in injuries of the head, or from some new, extraordinary, and powerful motive stimulus acting upon it. Such an one is injury or irritation of the nerves of the cerebral, spinal, or sympathetic division. It may be partial and transient, as in cramp of the gastrocnemius; or with intermissions and diffused, as in epilepsy, infantile convulsions, and tetanus; or it may be continued and partial, as in chorea; or continued and diffused, as in the paroxysm of frenzy.

This is an extraordinary motive impulse, both as to origin and course and kind, operating upon the voluntary muscular system. But the involuntary, though less exposed and less frequently excited, is not beyond its reach; hence spasm of the heart, of the diaphragm, of the stomach, and the intestines. The nerves of these organs are those which belong to both systems, the cerebro-spinal, and the sympathetic; for we are perhaps more accessible to pain from derangement of the vital functions than of any; and though we are not conscious sufficiently to identify the sensation which the blood produces on the lining membrane of the heart, or of food on the stomach, or of air on the cells of the lungs, we are quickly sensitive to the defect of these necessary stimuli to the motive power, by the distress which it occasions throughout the system, and this must be conveyed by the same nerves which render their

morbid affections painful. Independently of the pneumogastric, the sympathetic ganglion upon the sensitive nerves of the posterior column, establishes the communication of the cerebro-spinal and sympathetic sensitive systems; and as the muscles under the guidance and control of volition, which in the ordinary state of health are excited by the cerebro-spinal system of sensitive nerves, in disease obey the sensitive nerves without its superintendence,—so the sympathetic system, which in health maintains a partial independence of the cerebro-spinal, and is the centre of its own sensitive impressions and motive impulses, in disordered or diseased states of these organs propagates its impression and involves the cerebro-spinal system in an active participation and sympathy with its distress.

Yet, as we have observed, the nerves which are proper to the special function of any organ, are not those which convey the general sensitive impression which is the source of pain, as the optic nerve is not susceptible of conveying any sensation but that of light, or the olfactory but that of smell; so the morbid impressions are conveyed by the sensitive nerves in communication with the organ—whether the eye, or the heart, or the stomach—to the brain; and thence arise the morbid actions, the involuntary motors being excited to action by the extraordinary and powerful stimulus of morbid sensation. And it is this partial substitution of the involuntary for the voluntary, and the voluntary for the involuntary stimulus, or, more accurately speaking, of the sympathetic for the cerebro-spinal, and this for the sympathetic stimulus,—which constitute the derange-

ments of consent and of action, which we see in extreme cases of constitutional irritation. We see the muscles of voluntary and involuntary motion, as of the limbs and the heart, the muscles of respiration and of locomotion obeying other than their natural and accustomed stimuli. It is true that the heart in spasm does not act at the command of the will, as the voluntary muscles in spasm defy the will, but its actions are so violent or so feeble, so unequal and inconsequent, as to excite universal agitation, and the utmost efforts of the whole muscular system in support of respiration and circulation, so as in some instances to render their continuance almost an act of volition; in short, to render the exertions of the cerebral system, while its powers remain, so far predominant as only establishes the partial independence of organic life, which we witness in the phenomena of sleep and of death. The influence of the emotions and passions of the mind over the organic actions are sufficient to show the cerebral power of interference with them under extraordinary excitement.

Vital sensation is not however transmitted to the brain, but its deviations are reported by the sensitive nerves, the instruments of perceptive sensation; thus we are not sensible of the action of the stomach and duodenum, but keenly so of a spasm of the pylorus or a stone in the gall duct; the same applies to the action of the heart, &c., in health and in inflammation. The disturbed organic excites animal sensation, as, vice versâ, the disturbed animal excites organic, when the state of fever is set up by mental or bodily pain. This is not that the organic sensations pass further,

i. e. beyond the ganglia, or that the involuntary motions arise from any other than their ganglionic and proper source, but that the sympathetic system being disturbed, the cerebral is excited in consequence, and they act and re-act upon each other. Thus a mental alarm excites palpitation, and, e converso, palpitation from dyspepsia produces mental alarm.

In regarding the multiform effects of nervous derangement, there is evidence to demonstrate that extraordinary stimuli are called into action, and that the accustomed stimuli either cease to act at all, or are so overpowered as to be comparatively ineffective; hence the diseases of function as contradistinguished from those of altered organization. Every organ of the body is liable to these diseases; some, for obvious reasons, more frequently than others. If the affection be extended to several organs, or if, being primarily limited, the sympathies and uses of the organ in the economy are such as to spread the disorder, hence arises the disturbance of consent, the grand conservative principle of life and health, and the characteristic endowment of the nervous system. Its gradual impairment is a frequent source of organic disease; its continued suspension or sudden destruction is fatal.

The great political axiom of division of labour and combination of purpose derives its highest authority from the phenomena of the human body. Nothing can be more strictly true or apposite than the fable of Menenius to the infraction of this principle and its consequences, applied to the physical microcosm of man as an individual.

To conclude:—the brain and ganglia are organs furnishing a material impalpable to our observation, of which the fibrous structures we call nerves are conductors; of these, some are destined to one, some to another office. Sensation and volition travel in opposite currents. The sensation of which the mind is conscious has its source in the brain, and is the stimulus of volition and voluntary motion;—that which orders the involuntary functions, and of which the mind is unconscious, is seated probably in the ganglia. These form an intervening link between the brain and all the organs of life. They are so numerous that if they were collected into one they would amount to a considerable volume, and so placed as to make the intervals short between them, and their communications by means of nerves, innumerable. They are also peculiarly protected by their situation from injury, and present fewer examples of organic change than any of the structures of the body. They were of old regarded as so many sources or depositaries of the nervous element, and there is reason to believe not incorrectly.

The plexuses are another important feature of the nervous structure: they are subtle and complicated networks, formed by combinations of nerves, both in their trunks and their extreme branches; hence they have been supposed to combine and regulate the actions of muscles, so as to preserve their harmony, as we see it in alternation in the systole and diastole, in the peristaltic motion, in the distribution and moderation of motion throughout the parts even of the same muscle, also in the ...

tagonism of muscles, as in the sphincters, in the flexors and extensors, supinators and pronators, &c. This however is altogether conjectural. As regards the cerebro-spinal system, ganglia appear, as before said, upon sensitive nerves exclusively, the plexuses are met with in both. But the sympathetic system is throughout both ganglionic and plexiform.

The actions of the respiratory, circulatory, secretory, and excretory organs, the temperature, the tone of the mind and of the muscles, are immediately depending on the condition of the nervous system. If that is enfeebled and languid, so are they. If any part is the subject of injury or disease, beginning ab externo, it is reported or not, beyond its immediate neighbourhood, according to the importance of the organ and the injury or disease. If it interrupts no important function, its effect is local, and the remedy is local also; and the amount and extent of disturbance, if it be more than this, is according to its infringement upon the general regularity. It may act in two ways—directly or reflectedly:—in the first case it excites the sympathetic shock, irritation, or fever, with all its consequences, which is recognized, immediate and remote, as the obvious result of the disturbance. This is direct irritation. In the second, it is followed by little or no immediate result, but it silently lays the foundation of a train of disordered actions, nervous or vascular, which emanate from the altered relations of sensation and action, i. e., the disturbance of consent in the nervous system. This is what I denominate reflected irritation.

If the brain is a secreting organ, its subservience to the circulation must be that of all such organs; its working or failing, the healthy or vitiated condition of its product must depend on the sufficiency and regularity of its nourishment by the blood, as much as that of the liver; and the action of the heart as a muscle can only be maintained by a supply of that nervous element which contributes its sensitive and motive power, derived directly or indirectly from the same source.

I know that the doctrine here stated is out of fashion; and certainly we cannot demonstrate a nervous aura as we may gather the chyle from the lacteal vessels, although the accumulation and suspension and exhaustion, the equal and the irregular distribution of some such element, appear to me as abundantly manifested by the vital phenomena, and almost as palpably as the corresponding irregularities in the distribution of the blood. However this may be, I have no respect for the modern dogma, so hardily and repeatedly put forth, that there is no evidence for the transmission or existence of any material proper to the nervous structure, and that the whole and sole office of the system of nerves is to regulate the irritability of muscles! And so entirely do I subscribe to a materia vitæ diffusa, that the said irritability of muscles and tonicity of other tissues and organs, and the preservation of the fluidity of the blood, and its endowment with the properties of stimulus and nutrition for the maintenance of vitality, are, in my humble judgment, derived from no other source,—that even the air we breathe, and the food

we consume, fail to support life, if this materia vitæ be not adequately supplied.

Of what importance, then, is the curious question which has so much occupied physiologists,—which is the source and dispensatory of vital power, since each is to each indispensable, and neither can survive the other? For the passing life of an acephalous monster only shows that the whole nervous mass is not essential to the functions of organic sense and motion. It would be as reasonable to say that the intellectual faculties were not necessary, since a born idiot vegetates, or that because the lungs of one side have been found condensed or absorbed in some individuals, these organs were not necessary to the mechanism of respiration.

Diseases are organic and functional. This applies to all organs. The first shews a palpable alteration of structure, the latter none, or if any, such as has evidently been consecutive on the suspended exercise of the organ, for no organ long maintains its healthy structure after its action has ceased. As the nervous endowment is in the first degree necessary to the action of organs, it is especially involved in all functional diseases, and the nervous element being impalpable to our senses, and the nervous structure yet but imperfectly understood, we may often be in error in supposing that organic changes do not exist because they elude our observation.

It is, however, certain that in a large proportion of nervous diseases, no such deviations from their healthy structure are to be found in the brain and nerves as are explanatory of the symptoms of disease,

and as are met with in the diseases of blood-vessel, membrane, joint, bone, muscle; and in the compound organs, as the stomach, liver, kidney, testicle: and in the diseases of these organs the symptoms of nervous affection, as pain, spasm, &c., combined with those which are peculiar to them, are not elucidated by corresponding alteration in the structure of their nerves.

Further, it is certain, not only that the most minute examination continually fails to discover any organic change in this system in diseases so destructive as to be almost invariably fatal, but that the most serious and alarming morbid actions of this system, such as threatened instant dissolution, often pass away, and leave the patient to the enjoyment of a long life of uninterrupted health. It is not less worthy of remark, that in many cases of extensive organic disease of the brain, the symptoms have been wanting by which, à priori, we should have expected them to have been characterised; for proof of which we have only to refer to the many histories of cases on record, accompanied by the reports of their autopsies.

Some of the severest cases of nervous disease are those produced by temporary causes, and by causes acting remotely from the seat of complaint, whether temporary or permanent, as organic change. From reflection upon these facts we must infer that many nervous diseases are those of action rather than of structure, of association and sympathy rather than original; and this corresponds to what we know of the properties, the office, the universality, and the versa-

tility of the system in health. The system which associates and reports the various functions of the body in health, performs similar offices in disease; its associations and reports are now morbid instead of natural, and often fallacious instead of true. The system which regulates the nourishment and the temperature, originates the sensibilities and the movements of every organ in the body, combines and adjusts all in their due proportion, and participates by sympathy in all their disturbances, so as to constitute, in fact, the register and index of the diseases by which they are severally assailed.

Nervous diseases are, therefore, comprehended in the exaltation, diminution, or suspension, or the unnatural varieties, combinations, and vitiations of sensation, perception, and motion, voluntary and involuntary.

The organic changes of the nervous structure destroy by reflected irritation, i. e., their effects are evinced in the imperfect or disordered actions of other parts. It is often passive in its own organic diseases inversely as it is active in indicating and even simulating the diseases of other organs.

CHAPTER II.

OF NERVOUS AFFECTIONS CONSEQUENT UPON LOCAL INJURY OR IRRITATION, AS EXAMPLES OF REFLECTED IRRITATION. MORBID AFFECTIONS OF THE SENSITIVE NERVES. HYSTERIA. NEURALGIA. MORBID AFFECTIONS OF THE MOTIVE NERVES. SPASM. TETANUS. CASES.

The depravation, suspension, and even total loss of sight, hearing, smell and taste, are not unfrequently indirect results of injury or inflammation. They may ensue as the direct consequences of organic læsion, the mechanical effects occasionally witnessed of violent concussions of the brain and nerves; but it is not of these that I propose to speak in this chapter. I refer to cases in which the morbid affection is resulting from a change in the tonic condition of the organ, or of the nerve itself, in which no structural change is perceptible that can explain the defect, until after long disuse of the function the organ falls into decay. Such cases are to be considered as functional, in contradistinction to those which, bearing palpable mark of altered organization from whatever cause, we term organic. A blow on the head or back, or a fall on the breech or the feet, producing a temporary stun, which having passed away is thought of no more; extraordinary mental excitement, or a deep and lasting affliction, or suc-

cession of troubles; an inflammation, or a slow organic disease of any part of the body, or of wasting remedies for its cure; penetrating cold from long exposure; sudden changes of temperature; a metastasis, or the sudden disappearance of cutaneous eruptions or inflammations of the surface, or of habitual discharges, but especially the imperfect or vitiated action of the secreting organs, which is more or less connected with all,—are the ordinary precursors of these functional disorders.

Such as are not consequent upon injury, gout, and cold, are more the diseases of women than of men, and they are more frequent in the early and later stages of their sexual life, than in the middle interval, or after its termination: they are entirely distinct from inflammation, and are in no degree painful.

They are sometimes sudden, instantaneous even in their accession, especially when traceable to a metastasis, or depending upon irritation of the stomach or alimentary canal. In this case vomiting and purging sometimes remove them; but bleeding and counter-irritation are of little or no benefit. Mercury, judiciously administered, more frequently succeeds, though slowly and not without the aid of tonics. In general they are slow, and commence with perverted and delusive, or partially defective sensation; the latter increases until the sense is lost. These affections are modified by the peculiar construction of the several organs, and their proper functions. The eye and ear are most commonly so affected, as from the complicateness and delicacy of their organism, might be expected. The organs of taste and smell

are affected less frequently, being subject to the influence of fever and simpler causes of irritation, indeed almost confined to those resulting from the deranged state of the alimentary canal, when independent of organic change; and the diffused sense of feeling and touch is susceptible of few functional variations which are unconnected with cerebral pressure or læsion, except those which are obviously sympathetic with the derangements of the stomach. What is vulgarly denominated 'the hay fever', is a relaxed and atonic condition of the mucous membrane lining the chambers of the head, eyes, and fauces; a very curious disease in its phenomena, periodical, evidently atmospheric and influenced by temperature, especially as regards its exciting cause, and hence its name: the smell and taste are nearly suspended during its continuance, though unimpaired in the intervals of its absence or by its frequent recurrence.

The delusive sensations of the surface, as those of heat or cold, or circumscribed stricture, creeping or prickling, or the partial or multiplied sense of contact, or imperfect sensation from dullness to actual loss of feeling in a part, as well as the loss of muscular power, are often temporary and sympathetic, as is proved by the immediate beneficial effect of emetic or brisk purgative medicine, and the injurious effects of large depletion.

The condition of system termed in females 'hysteria', exists, under certain modifications, in the male sex. It is a morbid condition of the nervous system, most frequently induced by the artificial restrictions

which society and custom impose on the generative functions, but at all events, by the predominant influence which these exercise over the general system. Sympathetic in its nature and origin with the derangement of this important organism, it is witnessed principally at the period which marks its evolution and early development, but may exist at any point of the interval from thence to its decay.

The superaddition of this complex and mysterious mechanism to the simpler one upon which the preservation of individual life depends, is, under the negation of natural instinct, the prolific source of malady in the female, vague, various, and anomalous beyond the compass of description. It is in the nervous system that its effects are displayed. Hence the digestive powers, the circulation and all its subordinate functions, are troubled or interrupted; and the external senses, the temper, and moral character of the individual, even the faculties of the mind, are subject to be suspended, perverted, and impaired. The sensations especially are preternatural and morbid; and acute pain is referred to parts which may or may not have been the seat of injury, but which discover no vestige of inflammation or altered structure. In other cases, inflammation has run its course and left some slight traces of its existence, but none sufficient to furnish any satisfactory explanation of the suffering complained of. One very striking characteristic is the remittent and intermittent form of such pain, and the prevailing tendency to spasm; and with more or less caprice of appetite, irregularity of the secreting organs, and

the habitual lassitude and exhaustion of the system, the absence of fever, and the maintenance of what is termed condition. Sleep too, though uncertain and of short continuance, is generally obtained in sufficient proportion. Imagination is troublesomely alive and active, and hence the exaggerated descriptions, the reveries, phantoms, noises, dreams, bizarre similitudes, and odd conceptions of patients so affected.

How often have we known patients treated for supposed diseases of the lungs, heart, liver, who persisted in referring acute pain to one or other of these regions, aggravated on pressure, in whom evidence of generally impaired functions was apparently confirmed by the coincidence of certain symptoms commonly present in organic affections, and confronted at the same time by the palpable signs of the hysteric aspect and temperament, the habitual leucorrhea, the suspended, scanty, or redundant menstruation, globus, pale urine, &c., &c., and especially the long duration of the disease without wasting.

The breast of the female, and the testis of the male, are particularly liable to be affected with preternatural irritability in young persons. It is not necessary that there should have existed any previous injury or inflammation, but something of this kind is generally mentioned. The pain is described to be so acute as scarcely to bear the contact of the dress, and to be aggravated by handling the organ however tenderly. It has been properly called the irritable breast, and the irritable testicle, because it admits of no explanation but that which preternatural irritability suggests.

In other examples, a blow or other injury has actually induced an inflammation, of which the symptoms are manifest in its chronic stage, as deposition or thickening of parts, amounting to circumscribed tumor or partial induration. Yet the pain is of a severity quite peculiar, and far exceeding that which the acute stage of the same inflammation presented, and as much unlike that of parts in chronic inflammation: it is in fact, a pain which we can only refer to a preternatural irritability of the organ left by the inflammation, or in other words, a diseased state, organic or functional, of the nerves of the organ arising from the same cause; for it is not confined to one particular spot, if there be one which is altered in its texture, but diffused over the entire organ.

A remarkable absence of constitutional indisposition observable in these cases, remissions more or less marked, but especially such as admit of sleep in sufficient proportion, and the non-impairment of the nutritive functions distinguish them at once; and these circumstances coupled with the age, temperament, situation and habits, the successful employment of remedies of the diffusible stimulant and tonic character, and their perfect though often slow recovery, show clearly that the disease is of the neuralgic class modified by the sexual organization.

It is quite erroneous to suppose that such complaints are hypochondriacal or in any degree simulated, there are none in which the patient is more willing to submit to severe and even deforming modes of counter-irritation, and none in which these more completely fail of giving relief. I have seen the organ

waste permanently at the close of the disease by interstitial absorption, both the breast and testis, but this is rare.

There is an hypochondriac as well as an hysteric pain, but it is vague and shifting, or if localized, so contradicted by accompanying facts, and the description is so picturesque and overcharged by the imagination, while the aspect, air, and tone of the patient are eloquent of its delusive origin, that no medical man of experience hesitates as to its nosological character: the pains which are sometimes simulated are as distinct from these however; for the hypochondriac's is a case of exaggeration only, and though referred to a part in which they have no fixed seat, they are not unreal, but are now here, now there, belonging to the whole nervous system.

The simulated pain is obstinately localized and combined often with simulated lameness and deformity, and even self-inflicted mutilation. Of these I have known some very extraordinary instances, but they belong to moral more than physical pathology; and I shall therefore only observe, that the most gross are those of lechery in females, and the desire of exemption from irksome service of some kind in men, and that for many it is scarcely possible to conceive a motive.

From the cases of pain existing in or ensuing upon the hysteric paroxysm, and those frequently prevailing in the hysteric temperament, in the absence of any inflammation or organic change in the part, we infer that pain is a symptom of various states and conditions, and that it is its character, and relation to

the organization and function of the part, and the changes which it is undergoing, that mark its alliance with inflammation. This less exclusive view of its nature is essential as a guide to practice.

The attendance of pain upon spasm is, I believe, invariable, and I might add that it is of the most acute description when so excited, especially when spasm is set up, as is the case in muscular organs, by inflammation, as in enteritis and inflammation of the bladder. But in inflamed and sound organs there is this difference more or less in the spasm, that pain is remittent only in the former, and intermittent, if not resolved altogether, in the latter, a very important distinction, as it enables us to detect and treat the case with success.

For the sudden and copious loss of blood to which, if unable to decide whether the pain is spasmodic or inflammatory, we have recourse as a precaution, is no remedy for pure spasm, or even for that which depends on a local irritant, as the impaction of a calculus in the gall duct or ureter; and on the contrary, the employment of alcohol and the diffusible stimuli and full doses of opium is probably a fatal error, if the spasm has its origin in inflammation. Some remedies applicable to both conditions, as the hot bath and local fomentations, and the promotion of the excretory functions universally by gentle but sufficient means, and topical blood-letting to relieve the vascular congestion which is always present, are perfectly compatible with the administration of antispasmodics and opiates; and such combinations as qualify the administration of these, as calomel and antimony and ipe-

cacuanha, are equally effective in either condition, by anticipating the inflammation which unallayed spasm might induce, or arresting the inflammation of which the spasm may be symptomatic. This therefore is the safest ground on which we can take our stand, in equivocal cases.

The pain which affects the joints in those slow and obscure changes to which young females are especially liable, and which is at variance both with the local indications and the ordinary amount of complaint, even where these are manifestly advanced, must be regarded as of the same class as those before mentioned, i. e. referable to the state of the nervous system of the individual. But whether in these exceptions there be not some peculiar implication of nervous structure, whether the nerves of the part have not at some time sustained an injury or an inflammation, the effect of which has been to alter their excitability and sentient tone, is and must be doubtful. Some cases have led me to this conclusion which have originated in a punctured wound, in a particular over exertion, or a long continued strained position of the limb, and in which, after a long interval, the thickened and distorted and immoveable condition of the joint has supervened, showing plainly that effusion of lymph has taken place to the extent of partial anchylosis. In many of these cases the repeated application of blisters, tartar emetic ointment, moxas, and issues is quietly and cheerfully submitted to in the absence of any very obvious affection of the general health, for the removal of pain and immobility, without any loss of shape or any enlargement beyond a general puffi-

ness, such as the continual irritation of the surface will sufficiently account for. Such cases go on for years, and the patients are cured by perseverance in bandaging or a residence at the sea coast, or in some cases of humble life, it is to be feared, by a sacrifice of the limb at their own earnest request, to enable them to procure the means of subsistence. But the commonest cure is effected by time, i. e. a confidence in its innocence acquired from the duration of the complaint, and a settling down of the mind to bear with it tranquilly and to treat it with less tenderness, which favors the efficacy of general remedies. The solution is that the hysteric period wanes, and the restlessness of the temperament undergoes a slow but salutary change. The term chronic inflammation has been far too generally applied to these cases, and of this no better proof can be offered than the frequent success of the practice of bandaging parts, which, although painful in the state of immobility, are gradually relieved by equal compression; if inflammation be really present it is aggravated by compression, which cannot be borne, at least without increase of mischief; but the undue sensibility which follows upon inflammation is relieved by it, and the constant re-excitement of pain by any degree of inter-articular motion is prevented.

The origin, history, and surrounding circumstances of these cases distinguish them as strongly, in the mind of a careful inquirer, from the inflammation of the synovial membrane, and ulceration of the cartilages and the scrofulous disease of the joints, as the local symptoms. Sir Benjamin Brodie's remarks, the

result of acute and extensive observation, are, in my experience, so just and pertinent to my purpose, that I shall quote them.

" There is a class of cases of no unfrequent occurrence, in which the patient suffers considerable distress in consequence of pain referred to some of the larger articulations, and which often occasion no small degree of anxiety and alarm among the patient's friends, although there never arise any ultimate bad consequences. The cases to which I allude occur chiefly among hysterical females. The disease appears to depend on a morbid condition of the nerves, and may be regarded as a local hysterical affection. At first there is pain referred to the hip or knee, or some other joint, without any evident tumefaction ; the pain soon becomes very severe, and by degrees a puffy swelling takes place in consequence of some degree of serous effusion into the cells of the cellular texture. The swelling is diffused, and in most instances trifling, but it varies in degree, and I have known, where the pain has been referred to the hip, the whole of the limb to be visibly enlarged from the crista of the ilium to the knee. There is always exceeding tenderness, connected with which we may observe this remarkable circumstance, that gently touching or pinching the integument in such a way as that the pressure cannot affect the deep seated parts, will only be productive of much more pain than the handling of the limb in a rude and careless manner.

" In general, it is not difficult to distinguish the cases which I have just described from those of more

serious disease. I do not hesitate to say that a large proportion of young ladies who have been supposed to labour under disease of the hip-joint, and the great majority of those who have been treated as suffering from caries of the spine, have in reality been affected by these local hysterical symptoms and nothing more."

In addition to these, there are cases in which the actual scrofulous changes going on in the small as well as large joints, in patients of the same age and temperament, are attended by an amount of pain greatly exceeding that which is commonly experienced, and having the neuralgic more than the inflammatory character. This may be contrasted with the rheumatic, which is a large source of the diseases affecting the joints, even to their destruction, and with other inflammations in which the pain confined to the joint and great tenderness on pressure exists at all points, not to mention other symptoms—the pain in the neuralgic cases being excited by motion, or by pressure on one or more particular spots, and coursing along the limb to the shoulder or the hip, and so much seated at a distance from the affected joint as to make it for a time questionable whether any organic change exists and where it is going on. The spasmodic action generally present in these cases is frequent and severe, and contractions and distortions, such as render the limb useless, are sometimes the result.

What is the precise signification affixed to the term neuralgia in the minds of those who so constantly employ it? It is characterized by no out-

ward sign, general or particular. The disease is made up of pain of a peculiar character, subject to remissions or distinct intermissions, and the paroxysm is sometimes accompanied by spasmodic twitches and involuntary muscular action at or near the seat of pain. This is a symptom only, and by no means always present. It is therefore a disease of sensation. The nerves are the instruments by which sensation is transmitted, but they are not the seat of sensations in any other sense than as the parts are which are endowed with them. The diseased sensation may be excited by the state of the instrument, or by that of the organ which is the source of sensation. It is to be inferred that in the majority of cases, the instrument and not the organ is the seat of the disease, because the neuralgia is a rare symptom of diseases obviously situated or ascertained to have existed in the brain; because local affections are continually followed by neuralgia, and the greater number are curable, or after a short time cease spontaneously; because where incurable and they terminate fatally, it is by the exhaustion of body and mind which continued suffering and continued attempts to mitigate it by medicine induce, and not by destructive changes in the organ; and lastly, because the only remedies for the disease are the discovery and removal of a local irritant, or a class of remedies which in diseased changes of the organ it would be contrary to all experience to employ with safety, much less with advantage.

There are cases however in which it is probable that the disease is seated in the organ, and that the seat of the pain is not the seat of the disease, and

many in which it is more than doubtful whether any permanent change whatever could be detected either in the instrument or the organ, which compels the belief that it is less a disease of structure than of action or function; an inference strongly supported if not confirmed by the fact, that its most frequent origin is sudden change of temperature or long exposure to cold, that it is often preceded by mental harass and anxiety, most frequent in the advanced and declining periods of life, and as before observed, cured by medicines whose effect is to invigorate the capillary circulation and augment the nervous power.

It is not upon present inflammation that the disease depends, if it have an organic origin, for neither is there any local sign of it nor any fever of the system. It is distinguished by both these circumstances from acute rheumatism; from chronic rheumatism by the reference of the pain and swelling of this disease chiefly to the joints and the muscles in their vicinity; whereas the neuralgia invariably follows the course and marks the communications of the nerves. As regards muscular action, the disease termed sciatica, when very acute, renders the person equally incapable of motion without great aggravation of pain, and leaves a partial paralysis and shrunken state of muscles; and the business of mastication, or the act of laughing, often commences the paroxysm of tic douloureux in the portio dura. It must be remembered too, that quinine and steel and arsenic and the volatile tincture of guaiacum and the cold bath are among the best remedies for chronic rheumatism; whence the notion of a sub-inflammatory condition of the textures

affected, has prevailed in the pathology of both diseases. If the atonic congestion consequent upon inflammation in the one case, and upon an irregular supply of nervous power and consequently an imperfect action of the small circulation in the other, be compared, I think the analogy as far as it extends may be explained; and upon the principle that this congestive state depending upon want of tone is relieved and removed by such applications, and especially by such medicines as by aiding the actions of the arterial branches restores the balance of the circulation, we may comprehend also the success of analogous modes of treatment. Though the train of causes be dissimilar, the result is in some characteristic points so far similar as to admit of the same remedies proving efficient. The nerve of sensation supplied to skin, muscle, and periosteum, being subject to the same derangement from a cause acting directly upon it or intermediately, as through the circulation, will, as it is distributed to these different textures, give out pain modified in character and degree according to its distribution.

And though the large portion of nerve distributed to muscle, and entering into the texture of its fibres, is probably that which serves its special office of motion, yet that such a proportion and such a connection exists between these nerves and those destined to sensation as makes the smallest motion a source of exquisite suffering, is proved by our every day's experience of fractures and contusions prior to the access of inflammation, as well as by the anguish manifested in acute rheumatism. That parts to our

consciousness insensible or nearly so in a healthy state, and hence fitted for the performance of their function, become exquisitely painful when inflamed, is a striking proof of the influence of circulation, both as to its volume, and its freedom or detention, in the production of pain. But as irregular circulation may depend upon many causes besides inflammation, and as there can be no doubt from the continual proofs which are exhibited to us, that the capillary circulation is especially influenced by the nervous fibre, and since as often before observed, irritation and inflammation are essentially distinct, it is not too much to infer that it is on the side of the nerves that the balance of action is suspended primarily, in cases presenting no symptom of inflammation throughout their course, if we except pain; and secondarily, in a certain proportion of bygone cases of actual inflammation, in which pain alone remains after all other signs of inflammation have disappeared. It is on this principle that I explain the sudden attacks of tic doloureux after exposure to the cold produced by evaporation—of sciatica after sitting on damp ground —of irritated nerve by an old unsound tooth, or a portion of dead bone, or any foreign body acting upon a nerve of sensation, as the ligature including a twig after amputation and its confinement by cicatrization, whence the pain of stumps long healed;—and thus that I reconcile the points of analogy between the phenomena of chronic rheumatism and neuralgia in its largest sense, concluding that the morbid sensation, like the natural, varies according to the texture in which the nerve is dis-

tributed, and that the neuralgia may be and often is a secondary as well as an idiopathic or primary affection; and lastly, thus that I explain the efficacy and the success of similar remedies and modes of treatment in these different diseases.

MORBID AFFECTIONS OF THE MOTIVE NERVES.

THE inequalities of action in the several systems of voluntary muscles, as they arise from different causes, are differently displayed and characterized. Partial paralysis of the motive nerves gives the predominance to the opposed or antagonist power, and this distorts the passive or only the active expression, as of the countenance for example, according to the extent of the paralysis. So the flexors of the limb being unopposed contract the fingers, and bend the arms and legs. In paraplegia, the sphincters being palsied, the fluid contents of the bowel or bladder escape; but if the extruding forces are paralysed, they accumulate to over distension. It is not my purpose to speak of such disfigurements and inequalities of action as depend upon the defective libration of the body during growth, and incurvations of the spinal column, or of the wry neck, or of the contractions of the fingers and toes from adhesive inflammation between the muscles and fasciæ, or the tendons and their sheaths; these are cases of a class totally distinct.

A modification of paralysis, sometimes congenital, sometimes occurring in infancy from dentition and

other causes, is a deficiency of control, and consequently a want of consent in the actions of muscles. These are the cases in which the child totters and is in danger of falling if capable of supporting himself, and the grown person with difficulty maintains his equilibrium, and in order to do so enlarges his base, performing all the motions of progression circuitously or by jerks. In these cases, which are depending upon an originally checked or imperfect development, the entire voluntary muscular system is affected, so that stammering interrupts the speech as much as sudden halts the gait. In extreme age the loss of command approaches almost to the same state, but in this, permanent tremor or shaking palsy is more frequent; another modification of impaired nervous tone. That a condition somewhat similar may depend on the state of the cerebral circulation, is seen in the delirium tremens or tremulous excitation of drunkards and debauchees; it is also from the same cause an occasional and temporary consequence of severe nervous ailments and brain fevers. Overstrained and painful extension of the arm or leg will induce the same loss of command as regards their muscles, and to a certain extent, the undue interference of the mind with the effort. All these cases are arising from a deficient or impaired innervation, and are to be regarded as of a passive character.

But there are others in which neither the failure of one set of muscles, producing contraction, nor the simple privation or impairment of command and consent in the steadiness of voluntary muscles or of the direction of motion, constitutes the disease,—but a con-

vulsive action or twitching of certain muscles, wholly uncontrollable and unsystematized, so as to present the most awkward, imbecile, and ludicrous expressions and postures of the features and limbs, and in some rare cases of the entire person: such is St. Vitus's dance. This is sometimes contracted in the tricks or diseases of infancy, and continued in a partial and subdued form during life; it sometimes follows blows on the head or spine, panic terror, or debilitating disease; it is a malady of youth, and chiefly of females, and oftenest appears somewhat before or at the commencement of menstruation. Its worst forms are intermittent; it is attended by torpid and disordered visceral secretions or worms in the intestinal canal; it yields to purging and tonics; or terminates in epilepsy, idiotcy, hydrocephalus, and effusion into the spinal sheath.

Again, the muscles are subject to be thrown into irregular and involuntary action by causes not obvious, and which must be supposed to depend on some mechanical irritation of their motive nerves, probably an unequal compression from the encroachment of some bony growth upon the spinal theca, or the orifices by which they make their exit, or from contiguous bone in some part of their course, or a deposition in or upon their sheaths; it is generally but not always a painful disease. In this case, the sensitive being affected as well as the motive fasciculus, renders the first suggested hypothesis the most probable. The affection is more or less extensive, peculiar to a limb, or affecting a part of the body, or even the whole trunk. It is sometimes incessant,

rendering artificial support necessary to maintain even a precarious and deformed position or accomplish progression in any sort; sometimes it occurs only in paroxysms at uncertain intervals, or in such efforts as require and cannot be performed without the action of the affected muscles.

This chronic convulsion is little if at all remediable. I attended a lady with the late Dr. Babington, who had been afflicted thus for years in the muscles of the nucha and left side of the cervical spine, for which we could detect no organic cause. It was not in any degree benefited by various modes of treatment, nor was the distressing pain alleviated by any external application or narcotic drug.

There is a form of the maniacal paroxysm in which the hapless lunatic will sing the same tune, utter the same cry, or repeat the same words, and perform precisely the same evolution or contortion of the muscles for days and nights together and suffer no interruption, with such accuracy and regularity that the living machine seems converted into an automaton. Without any affection of the mind one sometimes sees cases of involuntary motions of the muscles of the limbs or trunk, equally symmetrical in their order and extent, continued and resistless. Most extraordinary but well authenticated cases of this kind are on record. We must refer these attacks to some temporary morbid condition of the brain and spine, without which they could neither be set agoing nor maintained. If superadded to organic change they are not simply enduring but permanent; not intermittent, but subject to frequent paroxysm, and soon

destructive from exhaustion and interruption of important functions.

Epilepsy presents the most violent form of convulsion, especially the hysteric epilepsy; it may exist without permanent organic change in its severest form, since the latter is almost always cured. But when on the other hand injuries of the head are immediately followed by the diffused convulsion of epilepsy, they are almost always fatal, and speedily. Convulsion on one side and paralysis on the other, as well as total paralysis, I have often seen recover after injuries of the head, but not so the violent diffused convulsion where it followed as an immediate consequence. As a symptom of apoplectic effusion in the brain it is also generally a fatal one in my observation.

Epilepsy which is depending upon irritation of the stomach or the uterus, is cured by such purgatives and glysters as are appropriate to the cases respectively; where idiopathic or periodical, by appropriate diet and regimen and such a course of tonics, external and internal, as the cerebral circulation will bear. It induces if it is not originally combined with fatuity, when it resists treatment. It often runs its course and is outgrown, never recurring after childhood; and on the other hand, sometimes relapses after an interval of years. There has been reason to suppose that persons who have been at one period epileptic and at another imbecile, and who have nevertheless attained to longevity, have been the subjects through the whole period of serous cysts discovered after death in the brain.

A remarkable case of symptomatic epilepsy occurred many years ago, at St. Thomas's Hospital, under the care of Mr. Birch. A boy who was admitted for these fits was discovered to have a pit or depression of the skull, upon which pressure created uneasiness. Upon that spot the trephine was applied and the concave piece removed; at the instant of turning it up he had a sharp epileptic fit, and this was the last. From the internal table a spiculum, a quarter of an inch long, projected, pressing upon the dura mater. The operation threw as much light as the morbid growth upon the cause of the fits, the occasional state of the circulation rendering the membrane liable to the same offence as it received from the slight pressure or irritation occasioned in turning up the loosened piece.

The tonic spasm or cramp of particular muscles is a frequent symptomatic affection in persons labouring under irritation of the primæ viæ and indigestion from all causes. It is most familiarly known as gathering up into a ball the great muscle of the calf of the leg, rendering it literally as hard as a board, and is intensely painful while it endures. When it partially affects the diaphragm from oppressed stomach, it is accompanied with a peculiar noise and jerk in expiration, hiccup; when the spasm is complete and strong, it arrests respiration, and when it affects the heart, awfully suspends the circulation.

The degrees of this affection in all their variety are seen in infants during dentition, and after the loss of more blood than they can bear to part with; from the slight flickering and momentary distortion of the facial

or orbitar muscles, viz., the clonic spasm which relaxes alternately with the contraction, to the universal tonic spasm, which being unrelieved by relaxation and affecting the respiratory muscles and the heart, extinguishes life in a few seconds.

A plethoric and an exsangueous state, strange as it may appear, are both really conducive to the state of convulsion, and indicate that the loss of balance between the circulation and the nervous mass, however occasioned, whether from over injection causing pressure or deficient support inducing enervation, is sufficient for its production; and that the nervous and vascular actions are not only reciprocally necessary, but necessary in certain definite proportions, for the due entertainment of the vital phenomena. The convulsion of inanition, though in itself less violent, is not so in relation to the exhausted state of the system. It is not uncommon for persons to be affected with partial paralysis after great loss of blood for convulsive affections symptomatic of disordered stomach. A dyspeptic gentleman who complained of pain in the head with a slight degree of stupor, or rather slowness of intellect, and lost blood immediately by the advice of his physician, found that one side of his face was paralyzed after the operation, from which state it has slowly and imperfectly recovered, though it happened two years ago. The injected and overgorged condition of the brain is palpable in some forms of spasm, and the permanent relief and cessation of the spasm takes place under the actual flow of blood. The volume of the blood may be either absolutely or relatively increased in the brain

or other part; the former happens in fevers under an increase of its temperature; the latter, in what are called determinations to an organ in the absence of fever: we know how the secretions of glands are increased by such determinations from familiar examples. The determination to an organ depends either on an altered state of the organ, or an altered state of the blood, or its force of propulsion; but the one soon induces the other change.

The effect of certain poisons is to produce the tetanic spasm, and of others to induce paralysis. In certain districts the disposition to nervous as well as febrile diseases is greater than in others, as if from the qualities of the soil and the atmosphere. This must be due to some deleterious agency like that of a poison upon the blood, rendering it less fit for the maintenance of animal life. Hence the nervous phenomena developed in the African and Asiatic, and indeed all malignant fevers, and in the spasmodic cholera; in all of which Dr. Stevens has proved a change in the qualities and properties of the blood amounting to devitalization.

The more stimulating quality of the blood upon the fibres of the heart will occasion, as we see in the different stages of fever, the opposite states of determination and defective impulse, or congestion and inanition. In the course of the same disease we have the violent and mild delirium, the tonic and the clonic spasm. The quality has probably more to do in determining the degree of activity and propelling power of the heart, than the quantity of the blood in fever; this power is diffused, be it more or less,

throughout the body; in the absence or decline of fever it is partial, i. e. thrown upon the organ which is the seat of irritation.

The unyielding cavity within which the brain is contained, the substance and texture, and I may add functions, of the organ, are circumstances peculiarly conducive to render it the seat of irritation, and thus to occasion congestion both arterial and venous, both of excessive and deficient injection, and to display the effects of such states in all the morbid varieties and degrees of altered and impaired sense and motion which are presented to our notice.

Thus the spasm of the involuntary or organic class of muscles is happily rare, in comparison with the muscles of support and motion which are obedient to the will. The former as we have seen derive their nerves from other sources, and are placed beyond the reach of many causes of disturbed action.

When the muscular structure becomes inflamed, as in acute rheumatism of the heart, or the venous side being over loaded it is incapable of relieving the pulmonary circulation, it becomes subject to spasm which terminates life suddenly. When the supply of its nutrient blood fails from the constriction of the mouths or ossification of the walls of the coronary arteries, it is also subject to fatal spasm under any excitement which induces its increased action. The spasm of the pylorus, and of the gall-duct, and of the intestine in its course, are predisposed to by irritation of the villous surface, and is also a symptom of obstruction and inflammation. The pain attending these affections recurring at short intervals, is most

acute, especially the spasm of the ureter, of the sphincter ani, and of the neck of the bladder in dysuria, whether from irritation or inflammation.

Spasm of the cremaster muscle is rare, but I have seen it so severe as to make the patient scream with the agony, the testes being perfectly sound, as well as when inflamed.

In all the cases we have referred to, irritation is a competent and frequent cause of spasm, which is a temporary, irregular, and involuntary action of muscles, attended with pain and followed by exhaustion, and often preceded by a notable or discoverable cause of irritation of the nerves supplying the part affected, either at their origin, in their course, or at their termination. The contractions produced in a fresh killed animal by galvanism convey the best idea of the connexion subsisting between the nerve and muscle, and the effect of irritation acting directly upon the muscle, or upon the muscle through the nerve.

We have seen that nerves of sensation and motion are subject to varieties of paralysis from checked or impaired development and extreme age, as well as from disease incident to all periods of life. It may affect exclusively sense or motion, or include both. It may be partial, limited to one side, one limb, one district, and set of muscles, a single muscle, the point of a finger, or affecting the whole system. It may be a direct or an indirect result of injury or irritation, and the injury or irritation may be adjacent or remote. But as sensation and voluntary motion are principles, resident not in the

parts but in the brain and spinal chord, the deficiency must in either case depend on some interruption to the transmission or some deviation in the supply of these faculties. Whether the cause of irritation exists in the organ of external sense or the brain, the stomach or the limb, the morbid alteration of sensation and motion is only to be explained by an alteration, organic or functional, in the brain supplying or nerve conveying the principles of sensation and motion. Hence if we amputate a limb, the man is troubled with the delusive sensation and motion of that hand or foot of which he is bereft from irritation of the remaining nerves, the instruments which conveyed sensation and motion, and the brain, the organ by which they were supplied. What determines the various modes and seats of paralysis of sensation or motion in cases of organic change, we have sometimes opportunities of seeing either during life or at its close; but in a large proportion of cases we see the symptom only, the cause is hidden from us. Still more is this the case with the affections of irregular muscular action, since a yet larger number of these are sympathetic, i. e. due to temporary circumstances, such as disordered circulation or innervation, and leave no trace behind.

TETANUS.

I offer no systematic description of the phenomena of tetanus*; it is to examine and explain their pa-

* For this, as well as for some new and important views of the treatment of the disease, I refer my reader to an admirable 'Lecture on Tetanus,' by Mr. Morgan, Surgeon to Guy's Hospital.

thological character and relation to other affections of the nervous system, symptomatic of what I have called reflected irritation, that I advert to them.

Idiopathic tetanus, as it is called when not preceded by manifest injury, is a disease more frequent in warm latitudes, and appears after exposure to sudden extremes of temperature. Cold and damp, combined with fatigue and anxiety, are the more frequent occasional causes. Traumatic tetanus is also most frequent in warm climates, the predisposition being supposed to consist in a greater mobility and laxity of the muscular fibre; this is false pathology, the disease being seated not in the muscular but the nervous system, and these terms must be applied, if used at all, to the brain and nerves. All the diseases of this class are in reality symptomatic, and since sensation and motion have their exclusive origin in the brain and its appendages, these stand between the local and constitutional irritation, and the disease as demonstrated by its symptoms is reflected through this medium. Whether the morbid contents of the intestinal canal, or the effects of a sudden chill of the surface, or an exhaustion of nervous power, or the irritation of an external injury prove exciting causes of the tetanic spasm, the disease must be equally regarded as symptomatic, and the predisposition as the circumstance which explains the varieties of susceptibility. This is either peculiar or adventitious, i. e. in the individual or in the circumstances in which he is placed; and it is certain that the natives of warm climates have a more relaxed fibre and a greater susceptibility of impression, both external and internal,

or in other words, that less resistance is opposed to morbid action, and that in them disease runs its course with greater vehemence and rapidity than in those of temperate regions. The natives are more disposed to the spasmodic diseases of such climates than Europeans.

The traumatic is a more severe disease than the idiopathic tetanus. It has a mild and slow and a severe and rapid form: the former gradual in approach, often partial or partially diffused, unattended by fever or even quickened circulation in the intervals of the paroxysms, losing much of its danger after four days' duration, and disposed to become chronic and curable by support: the latter universal, with shorter intervals of spasm, attended with greatly accelerated circulation, in almost all cases resisting remedy, and speedily even suddenly destructive.

The period of accession after injury varies from an hour to ten days or a fortnight. In some rare instances it is almost immediate. The case of a negro is recorded by Dr. Robison, in which the spasms commenced in a quarter of an hour after the infliction of a puncture with a fragment of china-ware: and some years ago a man was brought into St. Thomas's Hospital for a recent fracture, in a state of universal tetanus of tremendous violence, which proved fatal in a few hours. The fracture was an oblique one of the thigh-bone, which penetrating the rectus muscle, was continually playing through its belly in a see-saw. I have seen the disease set up by the same circumstances with

probably less aggravation on the fourth day; the fractured portion had impaled the vastus internus muscle. This case was in Guy's Hospital, and proved fatal on the seventh day. The interval preceding the attack does not determine the form of the disease, i. e. the disease is sometimes of the severest and most rapid description where an interval of ten days has elapsed. The late unfortunate Earl of D—— was seized on the fifth day, from the accidental amputation of two of his toes by an axe. The disease was of the severest form and proved fatal on the seventh. On the other hand, where the disease follows close upon the injury, it is for the most part uncontrollably rapid and fatal.

The form of injury is subject to every variety,—punctured and small-mouthed and large open wounds, superficial abrasions and ulcers, lacerations of tendinous and of fleshy fibres at the extremities and in the middle of the limbs, moist and dry wounds, sloughs, contusions from gunshot, and the explosion of gun-barrels, flasks, squibs, &c., compound fractures and mutilations, and simple contusions without any breach of surface, abscesses beneath the plantar and palmar aponeuroses, and in the sheaths of muscles, as the rectus abdominis and tendons of the hand and foot, ligatures of nerves, and foreign bodies penetrating their neurilem or substance. Baron Larrey saw the disease produced by a fish bone lodged in the throat, and two cases are mentioned by Mr. Morgan, following the blows inflicted by a schoolmaster with his cane, and both fatal. Even the injection of a hydrocele has been followed in the West

Indies by locked jaw; and a chronic trismus after the extraction of a tooth with injury to the jaw is at this time under my observation. One remarkable exception may be mentioned. I never knew or heard of a clean incised wound inflicted without concussion, as by a surgeon's knife in operation, producing tetanus, whatever was the structure divided. The seat of the injury presents also great variety,—it is more frequently in the hands and feet, or at least in the extremities, for the obvious reason that they are more prone to such injury than the trunk of the body.

As we have said the period of access varies, so must the stage at which the local injury has arrived; but in flesh wounds the period of commencing cicatrization, after the mundifying process is completed, seems to be most liable to the attack of spasm; not unfrequently the punctured wound, as from a nail, wears the aspect of being healed, and is almost forgotten when the spasms set in. These facts are now so established by repeated observation, that it is difficult to disconnect the phenomenon of the incipient spasm with the altered condition of nervous and muscular structure in the healing or newly cicatrized part. Ligature of the funis umbilicalis, of the entire spermatic cord, and the anterior crural nerve, are among the known causes of tetanus. The former is common in hot climates; the two latter I have myself seen. Now cicatrization is adhesion and fastening of parts before free and movable on each other, and approaches much to the nature of a ligature. In adverting to a mechanical condition, we of course admit all such varieties as may tend to the production

of a similar effect, and we should expect that fastening a naturally free part would be equivalent to its strangulation or confinement by pressure of any kind, the interruption to its function being the same. Destruction of the part by caustics and its removal by amputation have been resorted to ineffectually when the symptoms have commenced, and I have twice known the disease ensue after amputation. But if, when the circumstances admit of it, wounds likely to produce tetanus, were treated while recent like those inflicted by a strange dog, so as to destroy, or at least alter the sympathies and mode of healing, it would probably be of more rare occurrence.

The susceptibility to the tetanic spasm varies exceedingly. It is often seen that a wound or injury, so likely to produce the disease that we are daily on the watch for it, passes uninterruptedly through its stages; it is also seen by those who have the opportunity, that a menace or premonition of the attack is often decidedly exhibited and yields to continued and active purging, or a free incision. Now and then, but not often, it takes the most experienced surgeon by surprise. But we are utterly unable to account for its comparative infrequency with the local circumstances and occasions that seem to give rise to it upon the hypothesis that some peculiar mischief, of which we are not cognizant, is in all cases productive of the disease, as for example, the injury of a motor fibril or filament; for it is opposed to this, that slight wounds have completely healed before the symptoms appeared, and that careful dissection in numerous instances has discovered no such injured fibril;

that lacerations of nerves are seldom followed by tetanus; that the injury is sometimes so situated as not directly to include parts destined to motion, as the tunica vaginalis testis, the mucous membrane of the bowels, the alveolar fossa, &c; that similar and worse injuries in the proportion of a thousand to one are followed by no such symptoms; that the natives of warm climates are vastly more liable to the disease; and that the self-same disease is seemingly at least spontaneous, i. e. preceded by no injury whatever.

It appears from the cases of idiopathic tetanus that neither a wound nor any manifest local irritation is necessary to the production of the disease, while the influence of an obvious local irritation is evidently acting as an exciting cause in traumatic tetanus; the same may be said of tic douloureux, in which the irritation is sometimes apparent and sometimes undiscoverable. Are we to infer from this that in the one class the local irritation is not existing, according to the axiom 'de non apparentibus et non existentibus eadem est ratio,' and that the disease is to be referred to a general morbid condition of the nervous system,—or shall we not rather conclude that a local cause of irritation with or without læsion, such as from situation and circumstances escapes detection, does always exist.

In erysipelas we have an idiopathic and traumatic form, and so in most other constitutional diseases. But since in post mortem examinations we find tubercles of the lungs and diseased changes in other organs, which were not suspected during life by the most sagacious physicians, is it not more pro-

bable that the condition is overlooked, or perhaps of a nature temporary and occasional, and not to be ascertained before death, than that it has been wanting. In tetanus not only the most obstinate costiveness prevails, but when by powerful medicines the bowels are relieved, matters the most unhealthy and unnatural, as Mr. Abernethy observes, "quite unlike fæces," are voided. We suppose the scybalous condition to be an effect as probably it is of the disease, but how do we know that the morbid quality, quantity, consistence, &c., of the contents of the canal were not existing previously to the attack of spasm, and operating with all the force of a powerful local irritant upon the highly irritable nervous tissue of the canal. Abrasions and small ulcers of the villous coat and mucous glands of the alimentary tube are seen continually in slitting open the canal, where they were wholly unsuspected; and I know no reason why, when we find idiopathic tetanus and dysentery springing up under the same external conditions of the body*, the local condition which is competent to the production of tetanus from the analogy of the traumatic form, should not be so considered in that of which the local cause is hidden during life, and therefore supposed to be simply a morbid condition of the general system. Drs. Macarthur and Dickson have given dissections showing inflammatory conditions of the bowels, in four cases of acute tetanus. We want more precise and extended information on this subject. Certainly the trau-

* See Sir J. Macgrigor's Report of the Diseases in the Peninsular War. Med. Chir. Transactions, Vol. vi.

matic tetanus of this country does not bear out the opinion of visceral inflammation.

Instances of indigestible substances, and of tape and round worms found on inspection of the canal in tetanic cases, are on record; and a case of trismus, under Mr. Earle, recovered after the expulsion of a tape-worm from the bowel.

Indeed an idiopathic, if strictly taken to mean a spontaneous and exclusive disease independent of the natural sympathy between part and part, is an absurdity not to be tolerated; it is only in a relative sense that it can be employed; and in by far the greater number of cases it means only a disease of which the derivative is occult and imperceptible.

In a considerable number of cases anomalous appearances of ossific deposition have been met with upon the arachnoid coat of the spinal chord, or upon the processes of the dura mater, and some unusual saliency of the ridges or processes of the cranium has been noticed in examinations post mortem. That such appearances, whether of early or recent date, have no necessary connexion with these diseases, must be admitted from their being as commonly absent as present, and their being as frequent in the bodies of persons who have died of other and different diseases; but it by no means follows that they have no influence in predisposing to undue irritability of the nervous system, and it must be admitted that vascular turgescence of the cerebral and spinal membranes is usually attendant on convulsions.

That various forms and modes of injury are irritants of the motor nervous system, direct or indirect,

and excite this and other forms of spasm we have indisputable proof, and that in this system, originating in the brain and spine and expanded over the entire frame, one seat and mode of irritation determine one mode of spasm, and another, another mode. Thus irritation of the brain and its membranes, and particular conditions of the cerebral circulation proper to it or sympathetic with remote irritation, as of the gums in dentition, the stomach, intestines, &c., give origin to infantile, hysteric, epileptic, apoplectic convulsions; others to cramp, chorea, and subsultus; others to the tic doloureux; others to the tetanic spasm; which, though otherwise so complicated as materially to alter its aspect in læsions and morbid states of the brain, is occasionally witnessed in these in its severest and most hopeless form.

I should say that the evidence before the public to establish that tetanus has its origin in inflammation of nervous structure has failed, and that few if any practical surgeons of experience entertain such a notion. The spine, the ganglia, the nerves of the wounded part have been repeatedly and minutely inspected in the worst cases of tetanus and other spasmodic diseases, and no such appearance discovered. Even the common statement of increased vascularity and effusion beneath the investing membranes are as common in other acute diseases as in this, and these are by no means universal in tetanus. Very rare instances have occurred of a nerve being included in the injury, and palpably altered in consequence in common with other textures by inflammation; but even in such cases, I should, from reference to the whole pheno-

mena, be inclined to question its operation as a cause, for wounds of nerves happen continually without betraying any tendency to the disease.

Where convulsions have once shown themselves, they are most apt to be re-excited, and the same may be said of spasm in general and of all morbid nervous phenomena. The spasmodic condition I take to be of all others most invariably a sympathetic one in its origin; when established, it gets beyond the reach of the natural sympathies and we cannot control it by their medium, i. e. the removal of the exciting cause.

Medicines and all external agents which, according to our experience, operate promptly and powerfully in composing disturbed natural sympathies and occasional and ordinary morbid sympathies, are comparatively inert when the morbid action is established and universal;—it is now a disease unconditional and independent, and of the most destructive as well as uncontrollable kind from the tremendous exhaustion of power which attends it.

Thus injury and inflammation are the two sources of irritation in tetanus as in other constitutional affections; the former may be simple contusion or any possible variety of wound, and in any situation, since nervous texture abounds in all parts modified according to their need—the latter may be in any stage of its progress. If in one case spasm has been known to subside upon the mortification of the limb, the attack has in others followed upon gangrene. The former I imagine was not a consequence but a coincidence, the vital powers of the part and the system

failing simultaneously; for it is remarkable that the presence of tetanus does not arrest or interfere with the healing action, and the amputation of the limb offers no check to the disease once established *. So also the destruction of the surface of the wound by caustic is of no avail. In fact, neither the vascular nor the absorbent system are directly implicated in the disease; but it has happened that inflammation of the bronchia and lungs has suddenly supervened upon the subsidence of the spasm, and in the form of effusion proved fatal in a few hours. So in a case I have already given, tetanus supervened upon erysipelas, and in another yet to be mentioned, the same thing occurred. The danger of metastasis is greatest in all those diseases which are essentially nervous, or being inflammatory, are under the special influence of the nervous system, as e. g., aggravated hysteria, chlorosis, and convulsion of all kinds; erysipelas, gout, rheumatism, &c. From the plunge of the cold bath I have seen the tetanic patient brought up a corpse †, and have known an hydrophobic patient expire in the spasm induced by the act of excising the wound. In neither case was there any premonitory sign of impending dissolution: the symptoms were but of a few hours. A gentleman under the care of Mr. Key,

* An exception is furnished in 'A case of Traumatic Tetanus successfully treated by Amputation.' By John Wayte, Esq., Surgeon, Calne. Ed. Med. and Surg. Journal, Vol. xvii. p. 394.

† A similar event is recorded by Dr. Morrison of the cold affusion, in Demerara, being the third case of its unsuccessful use. A Treatise on Tetanus, by John Morrison, M.D., Newry, 1816. On the other hand, there are several cases of its successful employment on record.

who had just recovered from a severe attack of tetanus, was thrown into a fit of passion by some ill-timed communication relating to his property, and died on the spot, probably from spasm of the heart. In a chlorotic girl I have known the shock of a shower-bath fatal; and chorea sometimes terminates suddenly in hydrocephalus. The tendency of erysipelas to seize the head, and rheumatism the heart, and gout the stomach is well known.

The practical inferences are twofold which we may draw from these facts; the imperative necessity of procuring and preserving free and healthy secretions from the visceral glands, and of caution to avoid sudden shocks or surprises of the greatly debilitated system.

The nervous pathology is to be viewed first, as regards its proper system; secondly, as regards its associations with the vascular. In such affections of nerves as are peculiar and exclusive, we may conform our treatment to the first view; in those which are resulting from or mixed with the arterial and venous system, we must modify it in obedience to that connexion. Pain, depending on a morbid condition of nerve, is aggravated by such measures as allay pain proceeding from inflammation. The same may be said of spasm not depending on inflammation or mechanical obstruction, inducing or threatening inflammation. In the acute stage of inflammation we do not give tonics; but in the chronic stage, where the consequences which it has left constitute the disease, we administer them most beneficially. In the paroxysm of intermittents, we carefully withhold such

tonic remedies as exhibited in the intervals of the paroxysm break the train, and prevent its accession by fortifying the nervous system. Functional disorders and irregularities are counteracted and cured by such agents as operate upon function, i. e. upon the brain and nerves; whether acting directly upon the trunk or the extremities of the arterial tree, upon the pulmonary or the aortic side, or not upon either directly, but intermediately.

Now the treatment of tetanus admits of the employment of two classes of remedies—relaxants and tonics. They are in no degree incompatible, but common sense would lead us to endeavour first to calm a wrong action, and having succeeded in calming it, then to apply our tonic for the restitution and preservation of the right one. Perhaps the tonic may be the calming power we ought to employ, in a case so rapidly destructive to life as the really acute tetanus, but our limited experience does not warrant the conclusion. The spasmodic action is of itself destructive, and our first indication therefore is to allay it. The rapid march and urgency of symptoms in acute nervous diseases, as that which we are considering, points out the quick entering and extensively acting remedies, and their administration in bold and frequent doses, as our only resource. We must impress the entire system sensibly.

First we should clear the stagnant, perhaps loaded bowels; the preternatural rigidity of the abdominal muscles and their interrupted action is of itself sufficient to induce torpor, but it is probable that the muscular action of the canal partakes of it, since the first

evacuations obtained generally consist of indurated scybala. Two or three doses of calomel and scammony may be given in pills or as they can be got down, and if castor oil admits of being swallowed in the intervals, it should be given. But unhappily, the muscles of deglutition are often affected in the onset of the disease. Stimulating purgative clysters should in any case be efficiently injected, until the canal is well cleared.

Entirely appreciating the valuable observations of Dr. Hamilton, of Edinburgh, I deprecate the notion of trusting to purgatives for the cure of tetanus. But I am as well convinced that our hopes are vain, unless the full action of the bowels is obtained and steadily preserved throughout the disease. The signs of improvement bear a constant reference to the fulfilment of this leading indication.

To allay the excessive spasmodic action, opium is inefficient, I should add objectionable. It formed so prominent an article for exhibition with this view, that it has had ample trial, both in small and almost incredibly large and often repeated doses. An old surgeon, of high provincial reputation, used to call for a wine-glass when he came across a patient in tetanus, and increase the dose by drachms until he filled it *. There may be some figure of speech in this; but it is well ascertained that the sedative effect of narcotics in general and opium in particular is comparatively small in this class of diseases. What is the narcotic

* Dr. Morrison saw half an ounce of tincture of opium given for a first dose, in four ounces of rum, in a case which terminated favorably in Demerara.

which we select for the purpose of most quickly relaxing muscular fibre?—assuredly not opium, which raises and swells the pulse, and for a time at least augments the muscular energy, and in truth does not cease to do so until it induces a state resembling drunkenness or congestive apoplexy. Antimony induces nausea and vomiting, purging, and perspiration, and thus relaxes muscular power; but its effect is too indirect and uncertain both as to its time and extent of operation upon the nervous system, and too little controllable within the limits desired, to recommend itself to our selection in these cases *. The infusion of tobacco injected per anum, beginning with half a drachm of the dried leaf to a pint, and increasing the strength to double, if indicated, may be employed with signal effect in calming the spasm of tetanus. It may be used twice or thrice daily with perfect safety in the onset of the disease. It produces nausea, perspiration, and sleep often of hours' continuance; but above all, it diminishes its force and frequency if it does not arrest the morbid action, and gradually restores the pliancy of the fixed and board-like muscles. To counteract its depressing effect, and indeed to support the patient under the disease, independent of all medicinal remedies, I give strong animal broths or jellies, and alcohol in the form of brandy or wine every hour or two: and this I hold to be a not less important indication of

* A case has lately been mentioned to me, in which the acute form of the disease was arrested by a hot bath containing a solution of two ounces of emetic tartar. Its effect in allaying the spasm was most remarkable.

treatment. Patients have been lost in tetanus from want of proper nourishment and cordials, oftener than from want of proper medicine.

The sulphate of zinc or of iron, or the muriated tincture of iron*, or the quinine every second hour, are the medicinal agents which I administer by the mouth. Cold affusion, the hot bath, opium, belladonna, digitalis, stramonium; camphor, musk, ammonia bark; lead, arsenic, mercury, I have seen or found to fail of procuring any decided advantage. On the other hand, every article named and several others have the credit of one or more cures; and I have myself witnessed the recovery of some cases under the use of opium, mercury, and musk, as well as the preparations of iron and zinc. The most inconvenient form of carbonate of iron in large doses has been exhibited successfully at St. Thomas's, and a case recently occurred in Guy's Hospital, where the cure was ascribed to musk.

It is with me extremely doubtful if medicine has any real efficacy in this disease in its acutest form; when less severe in character or protracted in its course, there can be no question of its benefit, if it promote the recovery of nervous tone. Venesection has been palpably mischievous in my observation; indeed the proposition seems opposed to all rational theory.

I have said we must endeavour to impress the

* I remember an obstinate case in Guy's Hospital thirty years ago, over which this remedy triumphed, having so excoriated the mouth from its persevering exhibition, that the patient refused to continue it.

entire system; but for this purpose we must be careful to select such remedies as may act diffusedly, rapidly, and powerfully, yet not permanently or by accumulation, and we must be specially careful to counteract by support and stimulus the depression which they induce, to supply the demand which the remedy as well as the disease makes upon the vital powers. It must be recollected that our field of operations is limited; we cannot calculate on more than the surface of the large bowel and of the skin. It may be doubted, even if deglutition remains, whether in acute tetanus the stomach and digestive organs are in a condition to perform their functions. The nervous and absorbing surfaces of the skin and rectum direct us to medicated baths, inoculations, and injections, and if we ever obtain a command over this dreadful disease in its acute form, it will be by the prompt operation of some medicinal agent, perhaps untried or even unknown, introduced by these surfaces.

The effect of the Java poison, chetik, announced by Mr. Morgan, is shared in a less powerful degree by the strychnine employed in medicine; a small portion of which sprinkled upon an issue as big as a shilling upon the dorsal or lumbar spine will produce rigidity and spasms of the lower limbs resembling the tetanic a short time subsequent to its application, and of several hours' continuance. The same effect is produced by this medicine taken internally, and it has been exhibited in cases of paralysis with this view. The American poison, wourali, on the contrary, paralyses not the voluntary system only, but the heart

itself. Its effects are capable of being regulated by quantity and by the intervention of a ligature, according to Mr. Morgan's statement, and having inserted enough of the one poison to produce the disease, he has counteracted its effects with enough of the other to prove antidotal and restore the animal. This is a highly curious and important fact, and approaches nearly to the establishment of a principle of successful treatment applicable to the human subject. Mr. Sewell in two cases removed the symptoms of tetanus by the wourali and restored natural respiration and circulation. The after treatment alone was wanting to the perfect success of the experiment*. But if we except hydrophobia, a disease, to say nothing of its horrors, from which no single instance of recovery is on creditable record, I am of opinion that recourse to such agents could not be justified. But why, when we know that the effect of tobacco is capable of being carried to the point of syncope, and has too often proved fatal from such effect, should we not by adjusting the proportion and frequency of its exhibition endeavour to regulate the operation of that familiar and less dangerous, because comparatively less specific and rapid, agent? I do not re-

* The following is a Note with which I was favoured by Mr. Sewell, Assistant Professor at the Veterinary College, relative to the disease as it appears in the horse.

"The most common and most fatal form is the traumatic. The average of recovery I think may be fairly rated at three cases in five. The head and neck are not in general more affected than other parts. The muscular contraction and rigidity, under perfect quietude, considerably subsides, unless in the rapid progress of some cases and the last stages of the protracted

cognise from experience the fact that its administration is resistible if thus managed and persevered in. Certainly the means of resuscitation should be at hand, if it be required to use it in an extraordinary quantity before obtaining its ordinary effects. When we know that a pinch of snuff, speaking literally, dropped upon the back of a frog, will in two minutes put a stop to the action of the heart, and recollect the powers of its essential oil in Mr. Brodie's experiment; nay, when we witness the effect of the drug upon a novice, and call to mind the many fatal examples of its imprudent or accidental over dose, it is impossible to doubt its power if properly introduced, allowing for long previous habits

ones; some being fatal in three days, while others continue from a week to ten days or a fortnight.

"Active purgatives are generally indicated, and given if possible immediately:—setons over the medulla oblongata and on each side the cervical and dorsal vertebræ,—warmth and perfect freedom from annoyance by *repeated visits* and examinations. We bleed when the pulse is frequent, full, and respiration embarrassed.

"If supposed to arise from exposure to rain or cold air, after being heated by exertion, it is good practice to induce perspiration by applying a fresh warm sheep skin to the back and loins.

"The spinal chord is sometimes inflamed, and the nerves in and adjacent to the injured parts; the *stomach* often considerably inflamed, the lungs also; and the heart ecchymosed in the ventricles, as in violent deaths.

"To effect restoration from suspended animation by woorara requires about four hours of artificial respiration, to be kept up with great regularity.

"Neither of the animals on which I tried it died from the experiment, or the return of the tetanus; but one from inanition, and the other from repletion."

of use, and the general inaccessibleness or resistance of the nervous system in this disease. Nevertheless there may be other and better agents than any yet known in store for future observers; but though that which I have ventured to recommend will meet with its failures, I adopt it, on my own experience, as an available remedy, of rapid and indisputable power, for the tranquillization of the morbid action, which is the destructive symptom of the disease: and therefore, as furnishing the means of procuring time, and the use of other aids for this end *.

I am in possession of many valuable original cases, and shall select and abridge a few as appropriate illustrations.

Symptomatic Trismus.

A young female had recently but perfectly recovered from a severe hysteric neuralgia, affecting the region of the heart and left side of the chest, accompanied with most rapid circulation, and an incessant preternatural palpitation of the heart and principal muscles of the trunk of the body, being the subject, at the same time, of profuse leucorrhea,—chiefly by the aid of the galbanum and steel pill. Having occasion to lose a molar tooth of the lower jaw on the right side, the extraction was unfortu-

* See a case of Traumatic Tetanus cured by injections of Tobacco Smoke. By Thomas Duncan, Surgeon, Grenada. Ed. Med. and Surg. Journal, Vol. xi. p. 193. In a very acute case, a bath impregnated with tobacco might perhaps be allowable.

nately attended with a pretty extensive splintering of the alveolar process. From the day following the extraction, now three months ago, she has had trismus so obstinate as to render the employment of a lever, or speculum oris, necessary to separate the teeth, the temporal and masseter muscles on the same side being rigidly contracted, and painful when pressed. Neither medicine nor local applications have produced any material change. She is fed by an elastic tube, inserted in the place of a tooth, and is not constitutionally ill. Since this note was written, the additional symptom of chorea has appeared in the hands and arms, illustrating the relationship and hysteric origin of the two affections.

A stable man was admitted into the hospital, with a tense circumscribed hypogastric swelling, corresponding to the sheath of the right rectus abdominis muscle. It had followed the kick of a horse in the right groin, while dressing him a few days before. His health was not disturbed, fluctuation could not be detected, and some doubts were entertained of its being a ventral rupture, when he was suddenly seized with trismus. I immediately punctured and then freely incised the swelling, which was emptied of half a tea-cupful of pus; and the spasm subsided and left him entirely, after a day or two. The wound healed, and he was discharged.

A stout man, æt. 27, received a lacerated wound of the hand, 3d May, 1819. He was seized with

trismus on the 16th of June following, which was removed by the discharge of a deep sub-fascial abscess of the fore-arm.

Symptomatic Tetanus.

A man, æt. 28, received a gun-shot wound of the hand, with fracture and luxation of the wrist and metacarpal bones, Jan. 18th, 1820, and became tetanic on the fourth day. Complete relief of the symptoms was obtained by incision of an abscess of the fore-arm, Feb. 5th.

A farming servant was attacked with tetanus threatening suffocation from spasm of the diaphragm, in consequence of a wound, four inches long, of the integuments of the right buttock, received June 27th; accession of symptoms, July 9th. The disease yielded to extensive and repeated divisions of the common integument, beneath which matter had collected*.

Idiopathic Tetanus.

A grave-digger, whilst at work, Oct. 14, 1830, fell down in a fit: on recovering, the lower limbs were paralysed, and abdominal muscles rigid from spasm. The jaws were closed; there was much pain in

* This case was under the care of Mr. Howell, of Wandsworth, and treated with much decision and ability.

the loins, groins, and back of the neck, and frequent tetanic paroxysms of the abdominal muscles.

17th. Use of the hot bath commenced: repeated daily at as high a temperature as he could bear.

Dec. 1st. Recovery complete.

Acute Tetanus.

An infant, æt. 22 months; admitted, Aug. 7th, 1816, with fracture of the extremity of the tibia and tarsus, and laceration of the extensor tendons. Amputation overruled by the friends. The child went on well for the first week; the wound presenting a good appearance. On the 14th, the internal and middle cuneiform bones detached with the forceps. In the night of the 15th, the child was attacked with convulsions; and in the morning the jaw was locked, and acute tetanus was present. No relaxation of the spasms was obtained by the various means employed, and the child died on the afternoon of the next day, being the tenth from the accident.

A lad, æt. 18, admitted Sept. 1807, had the two middle fingers amputated for a gun-shot wound of the left hand. Up to the tenth day going on well, when he was seized with trismus, and soreness of the epigastric region, followed by universal tetanus, and died in three days. He was freely purged with calomel, aided by cathartic clysters, and much indurated fecal matter expelled on the commencement of the attack. He took the extract of belladonna, from one to three grains for a dose, every fourth hour, without any sensible effect. Pulse 150, wiry.

A stout lad was admitted, May 13th, 1808, with a compound fracture of both bones of the fore-arm. Until that day week he was in every respect well: on the evening of that day attacked with trismus: general spasm succeeded on the tenth day. On the eleventh, the diaphragm was affected. The spine was arched backward, and his legs were often drawn up. Pulse quick and hard. Six drams of strong mercurial ointment were rubbed in every eight hours. He died on the twelfth day, when, for the first time since the seizure, several dark and fetid stools were procured, though powerful purgatives had been repeatedly administered.

Dec. 1820, a porter fractured the third phalanx of his middle finger: it was removed at the joint on the seventeenth day after the injury. On the same day he complained of pain and stiffness in the nucha and between the shoulders, also stiffness of the jaw, difficulty in swallowing, pain at the pit of the stomach, and oppression of breathing. Pulse 112. v.s. ad ℥xx: blood not inflamed. Pil. calomel cum opio, tertiâ quâque horâ. Symptoms increased rapidly, in spite of full purging, belladonna, and colchicum wine freely administered, and he died on the evening of the fourth day, opisthotonos chiefly prevailing. On examination, half an ounce of reddish serum issued from the spinal canal, and the medulla spinalis was pulpy. Membranes healthy.

During the summer of 1804, a man admitted for simple fracture of the thigh, and who appeared to be

doing well for four days, was seized on a sudden with locked jaw, and died in three days of acute universal tetanus. On examination, it was ascertained that the fracture was oblique. The upper fragment of the bone had perforated, and left a detached spiculum of considerable size transfixing, the vastus internus muscle.

A mail-coach guard, æt. 38, admitted the night of 19 Nov. 1815; fractured the tibia and fibula of the left leg, in the lower third. Fracture of the tibia was oblique: upper fragment protruding. Limb was placed in splints, and in the semiflexed position. On the sixth day, up to which time he continued well, an erysipelatous blush appeared round the ancle joint, with small straw-coloured vesicles. Pulse 90.

8th day. Dressings all removed: edges of the wound gaping and ulcerated. Erysipelas extends to the knee. Fever inconsiderable.

18th day. Wound dressed daily since last report: is much enlarged; discharge abundant. Portion of bone exposed and denuded, but still attached. Fever inconsiderable; takes animal food and porter.

21st day. Exposed portion of bone removed with the forceps without violence. Pulse 112, thready. Has had a shivering fit of half an hour; occasional spasm of the diaphragm; vomiting. Complains of stiffness in his jaw.

22d day. No return of rigor. Slept better last night than the preceding.

23d day. Severe rigors, succeeded by protracted and profuse sweating. Pulse 120. Uneasiness along

the course of the spine: anxiety; increased pain and stiffness of jaw. Answers slow and indistinct. In the evening of this day had a violent shivering, which lasted above an hour, and the jaw became fixed.

24th day. Delirious during the night: rigors and perspirations. Attempts to protrude the tongue are followed by violent spasms of the face and neck. Much difficulty in swallowing. Pulse 140: perspiration colliquative: discharge from the wound diminished.

25th day. Low delirium during the night: drowsiness; dejections involuntary; tongue and teeth covered with sordes; countenance sunk. Pulse 140, and very feeble.

26th day. Continued muttering delirium. Skin sodden. Pulse indistinct, and very rapid.

27th day. Inarticulate; and died.

A lunatic woman, æt. 37, admitted Oct. 5th, 1822, for a compound fracture of the right leg, from a fall in attempting her escape over a lofty wall. Tibia fractured obliquely in the middle third, projected through a wound about an inch long, transverse to the limb. Leg laid in splints on the outer side.

2d day. Very restless and incoherent. Pulse 120.

3d day. Sympathetic fever. Limb swollen and inflamed to the foot; strong spasmodic action of the muscles; extensors drawing back the lower portion to an angle with the upper. Mr. Amesbury's apparatus without the side splints; position nearly straight upon the heel, with foot and knee much raised. Wound as before covered with lint.

3d and 4th days. Fever and restlessness. Limb keeps its position, though the spasm is strong and frequent.

5th day. Copious evacuations from medicine have induced quiet. Pulse soft, skin moist, tongue clean.

6th day. Wound sanious and sloughy; a poultice. Health improving.

8th day. Discharge purulent; sloughy edges separating.

12th day. In all respects improved. Wound dressed with cerate, uniting bandage and side splints applied; limb laid on the outer side, with the foot raised above the level of the bed.

18th day. Going on well, except occasional spasm in the limb; but has been observed to take her food with difficulty the last few days.

19th day. Complete trismus; opisthotonos and general spasm commencing. The spasms bend and extend the fractured bones violently, especially the upper portion. Spasms much quieted by frequent full doses of opium and ether, and the excessive pain in the back removed. The soft extract of opium is applied to the wound. Pulse 150.

20th day. Is under the influence of opium, which evidently allays the spasm.

21st day. Dozes much. Lips livid; skin covered with cold perspiration. Pulse imperceptible at the wrist: no sign of delirium. Called rationally for cold water, drank it eagerly and died, an hour after noon.

Examination. Adhesive matter was thrown out between the bone and the contiguous periosteum, but the fractured ends of the tibia overlapped laterally an

inch, and the upper portion was denuded for two inches, the lower portion for one inch, of its entire circumference. A spiculum of bone, half an inch in diameter, attached by one edge to the upper portion, projected backward transversely to the limb, and opposed its sharp and rugged points to the contiguous muscles. It could not be ascertained that the posterior tibial nerve had been injured by the spiculum of bone. Some bloody serum was found in each cavity of the pleura, the vessels of the brain were turgid, and a considerable effusion of serum was found between the opake arachnoid and the pia mater. The membranes of the chord presented unusual vascularity. With these exceptions the viscera were all healthy.

A man, æt. 48, was admitted July 8th, 1820, at ten o'clock, A.M., in a state of confirmed and universal tetanus; the trismus having attacked him the day before. He had run a rusty nail into the sole of his foot about a week before, and had taken a dose of eight grains of calomel since the symptoms commenced, which had taken effect twice. The wound was dilated to the extent of two inches, dividing the plantar aponeurosis, and the foot was covered with a poultice. A blister was placed upon the occiput, and another along the spine. Took ten grains of calomel, and being unable to pass water, the bladder was relieved by the catheter. Pulse accelerated from 100 to 130 during the spasms; great anxiety; contracted pupils. Deglutition brought on spasms of the whole trunk; much complaint of pain in the course of the spine. The extract of belladonna, taken to the extent

of a scruple in twenty-four hours, has not affected his pupils.

9th day. Getting weaker: worn out by the spasms; respiration very difficult. The bowels have been freely relieved by a turpentine injection. At two o'clock he was taken from bed, and plunged into a bath at his bed-side, the temperature of 63°, and withdrawn immediately. The pulse fell instantly, and he expired.

The only morbid appearance was a preternatural vascularity of the arachnoid tunic of the spinal chord and the villous coat of the stomach.

A brewer's servant, æt. 40, had fractured his little finger through the last joint, which was bound up with adhesive plaster, splints, and roller, and he continued his work. On the ninth day following he was seized with tetanus in the most acute form, and blooded to the extent of two pounds without the smallest relief. He died in forty-eight hours. Inspection of the body, and particularly of the brain and spinal chord, presented no unhealthy appearance.

A boy in St. Thomas's Hospital died in two days after amputation of the arm for a complicated injury.

A puncture with a rusty nail penetrating the plantar aponeurosis of a young and healthy man, proved fatal on the tenth day. Accession of symptoms on the seventh.

A school-boy died of trismus—accession the seventh, death the eleventh day—after explosion of a powder-flask, which stripped off the skin of the ring and little finger, and fractured the metacarpal bone.

A gun-shot wound of the inside of the thigh, where the shot had not spread from the proximity of the muzzle, produced a slough as large as the bottom of a saucer, in a stout young man. The slough loaded with the shot separated on the tenth day, leaving the exposed muscles a florid granulating surface. Same evening he was seized with tetanus, of which he died on the seventh day following, the spasms having almost ceased under the administration of opium and muriated tincture of iron.

A crushed foot, which had gone into gangrene, set up fatal tetanus after the sphacelus was complete.

A lad, æt. 15, March 1828, had his thumbs lacerated by explosion of a canister of gunpowder, which he was holding in his hands. Trismus on the seventh day, followed by general and violent spasms the ensuing morning, and death in twelve hours from the first paroxysm. Some effusion under the arachnoid, and general increased vascularity of the cerebral and spinal membranes.

A lad, æt. 16, had a blow on the cervical spine on the 23rd of March. 25th, admitted at St. Bartholomew's Hospital. 26th, violent spasms, and fixed retraction of the head; was blooded, and took croton oil and opium. Death at midnight. Softening of cervical portion of spinal chord, to the extent of an inch; its membranes inflamed and thickened.

In my note-book I find the subjoined minute. A man, advanced in years, had a scirrhous testis removed about the end of October, 1807. The whole spermatic chord was included in the ligature, as was then a common practice. Within ten days the man

died of locked jaw. This was supposed to have ensued from continuous irritation propagated by the ligature along the spermatic nerve. A little before this occurrence, a man who had suffered amputation of the leg above the knee, was attacked with violent tetanic spasms. These increased until it was deemed expedient to open the stump and examine the ligatures, when it was discovered that the anterior crural nerve had been included in one of them: it was removed, when the spasms gradually subsided, and the man did well.

It is worthy of notice that in another case, in which the preparation exhibits the nerve held by the ligature, there was no symptom of tetanus.

In a case of tetanus which I examined many years ago at Guy's Hospital, the arachnoid coat of the brain was raised into pouches by an unusual quantity of serous fluid; the ventricles were also fuller than natural. In other respects the brain presented no morbid appearance; the veins of the pia mater, choroid plexus, and vena galeni, were comparatively empty, and the arterial vessels somewhat distended. The disease had supervened upon a slight incised wound of the skin upon the back of the neck. After this case occurred, it became the custom to inspect the spine in every case of death from tetanus; and in five out of eight, some morbid deposition was discovered in the substance of the arachnoid tunic covering the medulla. With one exception, they presented the appearance of distinct osseous patches, chiefly on the lower part of the cord, or cauda equina; brittle, so as to crackle on pressure, and of

the thinness of silver paper. In the exception referred to the deposit had a cartilaginous appearance. The same appearance has been noticed in a case of amputation after injury, where the highest degree of constitutional irritation prevailed, and proved fatal, but in this case there was no tetanic spasm. Universally and without exception the vessels of this tunic have been loaded.

The Transactions of societies and periodical journals are rich in histories of the disease arising under great variety of circumstances; and it would be difficult to name a remedial agent which cannot boast of one or more cures. In one case the disease appears during salivation; in another it distinctly yields to ptyalism; in a third, mercury only aggravates the disease and exhausts the remnant of life more rapidly. So in other cases, mortification and amputation of the part have been said to remove the disease; in others again it appears without any premonition, after sphacelus and after amputation. One case is cured by the cold affusion, another aggravated; a third patient killed by the cold bath. And the same in substance may be said of the efficacy and unprofitableness of the various medicinal articles employed.

A recurrence to remedies of which the inefficacy has been repeatedly demonstrated, or perseverance in such as are unproductive of relief, are mere waste of opportunity; and the neutral practice resulting from indecision and frequent changes of remedy, or the employment of several at one and the same time, is equally to be reprobated. But because the disease is in some cases utterly intractable, and in others so

mild as to get well of itself, to conclude that the treatment employed in cases which have had a successful issue had not contributed to that result, would be to suppose that medicine acted injuriously, and would render practitioners either indifferent or reckless. The following are two cases of recent occurrence in which I employed the tobacco. A very severe case which occurred several years ago was cured by this remedy, under my direction, and coupled with extensive opportunities of witnessing its effects when administered in strangulated hernia, first impressed me with a practical sense of its value.

Case, treated by Tobacco. Mary Ann Elliott, æt. 14, admitted Dec. 18th, 1833, with an extensive lacerated wound of the wrist and palm of the hand, which had been caught in a carding machine. The superficial flexor tendons were concealed from view by a flack of lacerated integument. There had been considerable hemorrhage, and she was suffering much pain, for which she was ordered an opiate draught, and the hand was enveloped in a poultice.

19th. Careful attention was given to the patient's bowels, and no untoward symptom manifested itself.

On the 29th the slough had separated, exposing a surface of healthy granulations.

30th. A little tendency to spasm was observed in the muscles of the fore-arm, to which a roller was applied.

1st Jan. Complaining of soreness of the throat and difficulty of deglutition, and inability to sepa-

rate the teeth. Headache, pulse unaffected, bowels constipated. Mist. sennæ comp. Wound exhibiting a healthy appearance with an exuberance of granulation.

3d. Increased pain, and difficulty of swallowing: bowels constipated. Rigidity of the muscles of the jaw continues. R. Pilul. hydrarg. ext. coloc. co. pulv. scammon. sapon. dur. sing. ℈ss. M. div. in pilul. xx. et capiat duas sextis horis.

4th. Trismus not increased. Has had three evacuations, containing a large quantity of scybala, exceedingly fetid. Tongue white but moist; thirst moderate. Contin. pilul. aper. ut antea. Wound going on well.

6th. Rigidity and tenderness of the muscles of the neck, especially the sterno-mastoid. Pulse 100. Bowels have been once opened. Complains of thirst. Habeat olei. ricini ℥ss. statim et contin. pilul. Pulse 104. Bowels have been but scantily moved.

7th. Bowels still confined. R. Ol. terebinthinæ ℥jss. tinct. assafœtidæ ℥ss. m. f. enema cum decoct. hordei q. s. statim injic. R. Tinct. opii ℈ii. decoct. hordei lbss f. enema (alvo solutâ) injic.—Ol. ricini ℥ss. cras mane sumend. Pulse 120.

8th, 9 A.M. Has been very restless, suffering great pain in the hand; bowels not open. Repet. inject. cum ol. terebinth. ℥iss. Tension of the muscles of the back. Pulse 128. Tongue coated. 8 P.M. Increased difficulty of opening the jaws. Has had no stool from the injection, though twice administered. Pulse 130. Stomach much disturbed. R. Pilul. cum

ol. croton ♏j statim sum. et repet. summo mane, si opus sit. Cataplasm. sinapis scrob. cord. vomit. urgent.

9th, 9 A.M. Has slept five hours; bowels have been freely moved twice, which has much relieved her; free from pain in the hand, jaw still fixed; pulse 110, with little power; countenance flushed; wound looking healthy. Rep. pilul. cum ol. croton. ℞ Aq. vitæ cochl. larg. j. ex aquæ cochl. ij. alternis horis. ℞ Zinci sulphat gr. ij. quinin. sulph. gr. ij. ♏. f. pilul. 2^dis horis s. Rigidity of the muscles of the back. 8 P.M. Tranquil and disposed to sleep.

10th, 1 P.M. Opisthotonos has supervened, though in no great degree. Nicot. tabaci ℥ss. aq. ℔. j. f. enema statim adhibend. Beef tea. 9 P.M. Spasm evidently quieted by the tobacco; perspired and slept; pulse 100.

11th, 10 A.M. Opisthotonos occurring about every hour, though not severe; still able to separate the teeth sufficient to protrude the tongue, and now and then to a further extent; bowels open; pulse 130. 1 P.M. Rep. enema tabaci. ℞ Zinci sulph. quinæ sulph. sing. gr. iij. in pilul. 2^dis hor. sum. Spasms continuing, the intervals varying from half an hour to two hours. Rep. clysma tabaci.

12th, 10 A.M. Has had an hour or two of sleep during the night; pulse 128. Rep. enema tabaci. 5 P.M. Bowels constipated. Spasms less severe. Ol: ricini ℥vj. stat. sumend. ℞ Solut. morphiæ, ♏. xx. aq. menth. pip. ℥ss. h. s. s. Bibat vini rubri oss. per diem, vice aq. vitæ.

13th. Better. Has slept well; bowels open;

spasms much less frequent. Cont. pilul., quinin. et zinci sulph. Rep. haust. morphiæ h. s. Ol. ricini ʒvj. cras mane. Rep. enem. nicot.

14th. Has slept several hours undisturbed by spasm; bowels not open; considerable uneasiness of the hand. Ol: ricini: et injiciatur enema purgans. Tinct. ferri muriat. m. x. secundis horis vice pilul: capiend. Rep. haust. anodyn. h. s. Solut. opii manui applic.

15th. Improved. Pulse 104; free from spasm; bowels open; had slept for six hours uninterruptedly. 12 P.M. Tumbled out of bed, whether from spasm or not could not be ascertained; after which she fell into a disturbed slumber, in which she remained about two hours; frequent spasm. 3 P. M. Opisthotonos again violent; pulse 108; increased pain in the hand; bowels costive. Ol. ricini ut antea. Rep. enem. tabac. ʒj. ad oj.

16th. Has slept well; bowels open; sickness returned; complains of pain in the chest. Cataplasm. sinapis nuchæ et scrob. cord. applic. Spasms recurring occasionally. Rep. enem. tabaci.

17th. Countenance rather indicative of exhaustion; bowels as usual inert without the aid of medicine; spasms much less frequent; hand still painful. Pulv. scammon. cum cal. gr. xv. statim sumend.

21st. Better. Pulse 100; hand less painful; wound healing; no opisthotonos;—ordered a mutton chop daily.

24th. Sat up for a few hours; complains of the hand, which is occasionally affected with spasm.

27th. Better; and from this date continued progressively improving without any recurrence of general spasm; bowels still remaining torpid unless assisted by the castor oil; contraction of fingers gradually lessening from the application of splints, though at present she has no motion in the fingers.

March. General health perfectly re-established.

April 3d. Hand perfectly straight, though not quite healed, some fungoid granulations preventing cicatrization.

Case, treated by Tobacco. Susannah Phillips, æt. 43, admitted May 8th, 1834, a married woman, has had a family, and generally enjoyed good health. Six weeks ago her knee became very painful and swollen; applied a poultice; a pustule formed and ulcerated. A week since was attacked with difficult deglutition, spasms of the neck, back, and extremities, which have been increasing both in frequency and severity since that period. Paroxysms recur every ten or twelve minutes; visage pale and contracted; the angles of the mouth drawn down; difficult deglutition; is unable to separate the teeth; constant cutting pain extending from the sternum to the spine; opisthotonos; legs drawn up; pulse 108; profuse perspiration; bowels constipated. Two superficial ulcers appear below and to the outer side of the right patella.

6 P.M. Pulv. scamm. cum hydr. ℈j statim. ℞ Extr. coloc. co. assafœtidæ g. ā ℈j. infus. sennæ. decoct. avenæ ā ℥vj. m. f. enema. A table-spoonful of brandy in water every second hour. Beef tea and arrow root.

10 P.M. Injection was retained about half an hour, then produced a small black pitchy stool; catheter used. Habeat nicot. tabaci ℥ss. decoct. avenæ oj. pro enemate. This was not retained and caused no depressing effect; one scanty motion followed, black and lumpy.

May 9th, 2 A.M. Spasms remain the same; repeat the tobacco enema (℥j. ad oj.); this shortly produced a full evacuation, which was lumpy and black. She felt very faint afterwards and perspired; also slept a little.

7 A.M. Paroxysms as frequent, though much less severe; repeat the injection.

2 P.M. Muscles very rigid, frequent paroxysms, pulse 112, sharp and contracted, skin dry and hot; is able to evacuate the bladder. Repet. enema tabac. Zinci sulph. gr. ij. cum pil. terebinth. gr. v. 2^{dis}. horis. s.

10 P.M. Injection retained two hours, caused nausea and vomiting, approach to syncope, and profuse perspiration; pulse fallen to 92; no stool.

10th, 9 A.M. Countenance improved, slept an hour or two, deglutition the same; no opisthotonos; to omit the brandy for the present. Repet. enema.

Evening. Considerably better, pain from the sternum to the spine quite gone; paroxysms not so long; no stool. Repet. enema ℥ss. ad oj. statim.

11th, morning. The last enema caused great collapse; has passed a restless night; perspiration copious; rigidity not so great; pulse 84.

2 P.M. Continues to have less spasm; counte-

nance improved; pulse 116, great sweating, bowels open once; motion thin and of a dark green colour; omit the pills. Tinct. ferri muriat. ♏. xx. 2^{dis} horis. Wine oj. daily. Repet. enema tabaci vesperi.

Evening. No change. The ulcers appear to be increasing, and are very painful. Lotio opii.

12th, morning. Has passed a much better night; countenance improved; says she is quite free from pain between the paroxysms; pulse 120, feeble; has had one motion this morning.

Evening. Has had little pain during the day; spasms recurring more frequently this evening, thirst, slight headache. Omit the wine; repeat the enema.

13th, morning. Considerably better: deglutition less difficult, and is able to separate the teeth. Enema retained ten minutes, caused great collapse and nausea; pulse 100, small and feeble; slept at intervals.

Evening. Slept during the day; spasm now confined to the right leg and thigh; nausea and headache gone; no evacuation; some cough and wheezing; pulse, 120, rather sharp. Pil. coloc. co.

14th, morning. Passed a tolerable night. Spasms still violent at times, though chiefly in the legs. Ol. ricin. statim.

Evening. One copious motion, containing solid matter; no particular change. Injic. enema tabaci statim, gr. xv. ad oss. This produced complete syncope.

15th, morning. Has had no spasm whatever, can separate the teeth considerably, and expresses herself as very much better. There is still some

slight rigidity, but though the tetanus is subdued, the cough is increased, with dyspnœa; pulse 116, small and sharp; thirst; one motion.

2 P.M. Chest symptoms increased, otherwise better. Empl. canth. sterno: ol. ric. statim.

10 P.M. Less cough, but more dyspnœa; pulse the same; bowels open.

11 P.M. Died suddenly, apparently of suffocation. Autopsy refused.

A definite proportion of power and action exists in natural circumstances between the animal and organic nervous systems; the latter maintains the actions of life, and is therefore unintermittingly active, the former provides for and ministers to the preservation and purposes of life, but requires by its construction intervals of repose and refreshment, and admits of absolute suspension without destruction to life.

The governing organ of animal life is the brain, of organic life the sympathetic system; the intermediate organ of connexion between them, indispensable to their co-operation, is the cerebro-spinal system. The theory of spasmodic and convulsive diseases seems to be a disturbance of the balance of power and action existing between the motive nerves proper to the animal and organic lives.

The disturbance, from whatever cause prevailing in either system, is liable to be communicated to the other. Thus the organic functions are disturbed by the animal, and e converso, the animal by the or-

ganic, in various degrees. The gradual extension of irritation, whether of excitement or depression, from one to the other system, does not interrupt the actions of either, when not exceeding ordinary limits; but when the irritation is sudden or excessive, the mode and degree of disturbed action are also sudden or excessive, and may interrupt the actions of either. Thus an irritation of the brain may produce unappeasable vomiting, or may arrest the respiration and circulation; and an irritation of the stomach may suspend sensation and consciousness, as well as arrest the functions of respiration and circulation.

While the irritation is such as leaves the organs in possession of their functions, though altered by excess or defect, it is the direct irritation or disturbance of that natural sympathy of the two systems which is necessary to the permanent security of the system at large; when so inordinate as to embarrass or suspend the action of organs, as to overthrow the mind, to render the voluntary muscles involuntary, or the reverse, the irritation is not a simple extension, but a transfer or metastasis of the disorder prevailing in one system to the other.

Irritation may commence in the animal or the organic system, and be productive of the same phenomena: idiopathic and traumatic tetanus. The cerebral, or spinal, or sympathetic system, may be severally the seat of the irritation which gives origin to the disease; but the seat of the disease is the cerebro-spinal system. The functions of the brain and viscera are never primarily, and often never sensibly affected. The branches of the fifth pair,

the cerebro-spinal nerve, first and sometimes exclusively exhibit the signs of the disease, i. e. it stops there. This is peculiarly the nerve in which the animal and organic, the sensitive and the motive actions, meet. It is that small portion of the nerve which passes the ganglion, the manducatory, which is first affected, a voluntary nerve. The voluntary tract is progressively affected, i. e. the motor columns of the spinal chord. The stimulus is preternatural, a stimulus probably wholly distinct from sensation, and one over which sensation has very little if any control. It resembles in its effects nothing so much as those produced by the galvanic pile, when brought to operate strongly upon the nervous and muscular systems. We are warranted, in the absence of cerebral symptoms and the inefficiency of cerebral power —volition,—in saying that the brain is not the medium by which the stimulus is propagated. We are also warranted in the absence of fever and visceral affection in saying that the sympathetic system is not that medium. The ultimate tendency of the disease, it is true, is to travel into the region of organic life, and affect the heart and other viscera with its spasm; but the fever of acute tetanus is symptomatic of the violent nervous and muscular excitement: it is in no degree inflammatory, it is an effect, not a cause. In the absence of the spasm the pulse falls many degrees, and when blood is drawn, as I have known it to the extent of two pounds and upwards, it exhibits no buff or other sign of inflammation. In proportion as the tetanus is acute, the sympathetic affection of the organic system is rapid and violent; hence the

explanation of those cases which run their course in a few hours. The prognosis of the disease turns mainly upon the length of the interval between the paroxysms, as in ague. If they are distinct, and can be lengthened, the patient is safe; if they are wanting altogether, or indistinct, or become contracted instead of being drawn out, the vital power is quickly exhausted, and liable to be suddenly extinguished. The rapidity of progress will also depend on the previous strength, though with the accession or liability to the disease this seems to have no connexion; and it is probable that if the disease is set up by or supervenes upon visceral injury, the fatality will generally be more rapid as well as more certain. I would not underrate the influence, in this respect, of the læsions or inflammatory changes of nervous texture, which however are far more frequently coincidences than causes of the tetanus. For not only are the cases very rare in which any real change has been discovered, but all the morbid changes, compression, laceration, stricture, ulceration, thickening, induration, and softening are commonly without a symptom approximating to the disease. It is essentially a disease of function and destroys by exhaustion, if not by sudden translation of the spasm to the heart. We are ignorant whether the disease is propagated by continuity from the sole of the foot to the jaw, or reflected from the seat of injury to the centre of the cerebro-spinal system. I have noticed subsultus in suspicious wounds, and have heard pain complained of in the immediate region of the injury a day or two before the attack, but it is vastly more

common to have no such premonitions, and to find the patient suddenly complaining of a stiffness of the jaw, and some difficulty of swallowing, and pain of the nucha; to observe some rigidity of the platysma, sterno-mastoid and trapezius muscles, and this succeeded by pain in the epigastrium, and hear him attribute all to cold, his previous state having been to feeling as well as appearance convalescent. If the irritation has advanced 'a calce ad caput', it has crept silently like a thief in the night; and I am more disposed to believe that it is conveyed by reflection or remote sympathy, like that which, to compare small things with great, makes the nose itch in irritation of the lower bowels. Amputation not only does not arrest, but it does not prevent the disease, as I have adduced proof; which makes it probable that the irritation is sooner communicated than expressed by outward signs, or that the disposition is engendered before the symptoms appear. Wound is not necessary to the worst forms of the disease, and it appears when wounds are advanced in healing or even actually healed; and injuries which do not implicate parts destined to motion are equally capable of inducing it. For one injury of any description that gives rise to it, one thousand, at the lowest computation, fail to do so.

What the intimate connexion is subsisting between nervous and muscular structure, is not made out; that they are incorporated is obvious from the phenomena characteristic of their connexion, and especially by the existence of that nervous property in muscles which has been considered an attribute of

their structure, and termed irritability, of which the living muscle cannot be dispossessed unless its texture be disorganized, and which the muscles supplied by nerves independent of the will possess in the highest degree, and retain the longest; and next to them, those which are of a mixed character, i. e. in part involuntary and yet partly subject to volition.

It is one among the pathological illustrations adduced by Dr. Bellingeri of his doctrine of antagonism, that the tetanic spasm of the body forwards or backwards, or to one side, is determined by the situation of the injury or irritant in the cerebrum or cerebellum, the anterior or posterior strand of the spinal chord, considering the posterior as well as anterior spinal nerves to be motive as well as sensitive nerves.

Although many experiments and cases are adduced in support of this hypothesis, which is not new, it is one which, independent of its irreconcileableness with the generally received opinion of Bell that the posterior spinal are purely sensitive nerves, is exceedingly difficult of proof, for the obvious reason that morbid affections of the brain and chord can rarely be so insulated in their operation even if they were so in their site; and general observation shows that the opisthotonos and emprosthotonos are exhibited at intervals in the same individual. I have certainly seen cases in which the flexion or extension of the trunk and limbs has been predominant and obstinately maintained, and the experiments of Flourens, Magendie, Bouillaud and others establish the determination of motions according to the wound and the removal of

given parts of the brain, as lateral motion, gyration, retrogression, &c., as they do the impairments of sensation, volition, and association.

The following interesting case, which occurred lately under the care of my friend and colleague, Mr. Tyrrell, shows the partial affection of the muscular system which has led or given countenance to the theory of Bellingeri.

A boy, æt. 11, July 29, 1834, received an incised and contused wound of the inner portion of the right eye-brow. Erysipelas supervened and was met by venesection and purging, which removed all unfavorable symptoms. Aug. 11, the thirteenth day from the injury, inflammation had subsided and the wound was granulating kindly, when the following symptoms appeared. Trismus nearly complete, difficult deglutition, spasm of the muscles of the face on the right side, pain in the neck and belly, all recurring in aggravated paroxysms at intervals of ten minutes during the day. Then came on rigidity of all the voluntary muscles and great difficulty of breathing, the jaw remaining fixed,—sense of soreness referred principally to the flexors, surface cool, pulse 92 and soft. Pain on the right side of the head and temple. R Hydr. c̄. cretâ gr. v. pulv. antimon. gr. ij. 4^{tis} hor. s.—Sp. terebinth. ℥j., ex. decoct. avenæ q. s. pro enemate—emp. lyttæ nuchæ.

On the second day the free operation of the injection produced marked relief; disposition to sleep, inclination of the head forward, dilated pupils, paroxysms at longer intervals and more violent towards night. Rep. enema.

13th. Diaphragm much affected, spasm most on the right side, induced immediately by a current of air, even by another breathing in his face, and by the effort of swallowing. He will occasionally spring up in bed, remain erect for a minute, then as suddenly fall down exhausted. On these occasions he always displays an inclination approaching to curvature of the body forwards during the paroxysms, and clings to any object or person to assist him whose position favors that posture. Pulse 120, small. Pulv. scam. c̄ calomel. ℈ss. statim. Wound irritable, much pain on pressure in the zygomatic region.

14th and 15th. Bowels well opened; system affected by mercury; features distorted, inability to close the right eyelid, right pupil dilated and motionless, vision not affected. Paroxysms less frequent and milder. Pulse 130.

19th. Has had but one bad spasm to-day. Pulse 90.

By the end of the month the trismus, which symptom lasted longest, had left him and he was walking about the ward; he had no sensation in the right forehead and right temple. This he had partly regained, together with the power of the orbicularis and iris, towards the middle of September, when he was presented well; his mouth having remained sore until within three weeks of his discharge.

Extensive morbid changes however take place in the brain and spine without any spasmodic action or active obliquities of movement, other than such as are the necessary consequence of partial paralysis; it can be therefore only certain modes as well as seats of

irritation that exhibit these phenomena, and they must be so far circumscribed in tetanus as not to injure sensation. I am of opinion that the combination of a partial motory paralysis with the tetanus, as was observed in the muscles of the face and pupil in the case above related, is the real explanation of the phenomenon.

It is against the theory of Bellingeri that sensation is in no degree implicated in tetanus, whatever be the direction in which the spasms prevail, and especially that the acting power, whatever it be, is altogether preternatural which is employed to produce the involuntary contraction of muscles, in health obedient only to the will. If it were an excess or failure of natural action, we might expect a conformity in the natural structure, but it is an absolute perversion of healthy action, and therefore not illustrative of healthy conformation and function. —" Un état parfaitement normal de ce systême est indispensable pour la production normale de ces phénomènes."*

* Manuel de l'Anatomie. Par I. T. Meckel. Traduction par Jourdan et Breschet. Vol. I. p. 262.

CHAPTER III.

OF NERVOUS AFFECTIONS CONSEQUENT UPON LÆSION OR ALTERATION OF TEXTURE OF THE NERVOUS ORGAN.

THE nervous organ stands alone in its pathology, in being the system of expression, and of communication of all that is passing within the machine; not limited to its own proper disturbances or diseases, but either notifying, symptomatizing, or taking part in those of other organs and systems. We have seen, in the last chapter, how large and important a class of diseases its disordered actions constitute, when destitute of foundation in any perceptible change of its own organization; and to the consideration of this class of diseases my subject properly limits itself. But in a pathological view I should not be justified were I to leave unnoticed the cases of actual morbid change, both as further illustrating the subject of Irritation, and as enabling us to compare the functional with the organic affections, and thence to derive some practical principles applicable to their respective treatment.

If the peculiar influence of the nervous system over the functions of other organs, as the lungs, heart, stomach, renders it often difficult to distinguish at an early period their functional embarrassments from those which depend on organic change, yet more is this the case with the nervous organ. The brain

plays so large a part in the diseases of other structures, that the symptoms of its proper diseases are difficult of recognition; and it is a more frequent problem, whether any organic change exists, or the disease is functional only, in the brain than in any other viscus. A principal source of the variety and obscurity of its pathological phenomena is doubtless the peculiarity of its circulation, which, notwithstanding the admirable provision of the venous sinuses, renders the balance more delicate and susceptible, and the effect of its disturbance of more importance than in any other organ, if we except the heart. In truth, there are instances of daily occurrence, in which the most attentive and sagacious observers are unable to decide whether the disease or injury is organic; and if so, what it is must be altogether conjectural*. It may be very gratifying to the pride of science to suppose that the presence or absence of this or that symptom has instructed us beyond all doubt as to what the mischief is or is not; but Nature is not so uniform and tractable as to be thus easily read,—and the truth is, that all we can do in a large proportion of cases, is to wait upon the indications and developments that time affords, having carefully removed all obvious impediments in the way.

Cases are not unfrequent in which the fatal apo-

* I have before adverted to such a case. Let the reader refer to the interesting case, No. 1, in Dr. Paris's Treatise on Diet, in which several physicians of the largest experience referred the disease to the brain and found it sound but bloodless, and the cavities of the heart so morbidly dilated as to constitute what has been termed passive aneurysm.

plectic seizure exhibits no permanent appearance on examination that can be accounted morbid, and falls and blows upon the head have been followed by profound apoplexy, yet no læsion of parts, nor extravasation of blood has been discoverable on the minutest inspection.

CASE. An elderly man fractured his right arm and two ribs of the right side by a fall, on the 5th October. Having previously cough and dyspnœa, he was blooded freely and kept on spare diet. On the 14th November, it was discovered that the fractured arm had not united, and his feet and ankles were anasarcous. On the 23d the cough and dyspnœa had increased, and the anasarca was becoming general. On the 26th he was seized with complete apoplexy during a paroxysm of coughing. V. S. ad ℥xxviij. Relieved so as to recover partial sensibility, but in a few hours the pulse again filled and became hard, the coma returned, the breathing was again stertorous, and the mouth drawn to the left side. Rep. v. s. ad ℥xvj.

The pulse now became intermittent. On the morning of the 27th, insensibility complete, breathing stertorous, pupils permanently contracted, mouth drawn to the left side, pulse 92 and compressible, much throbbing of the carotids, and incontinence of urine and fæces.

28th. Slight returning consciousness, can neither articulate nor project the tongue.

29th. Another seizure, coma profound, but vio-

lent cough at intervals. Pulse rapid and very feeble.

Dec. 1st. Died.

Examination. The only morbid appearance within the cranium, at twenty hours after death, was a very small serous effusion beneath the arachnoid tunic.

Chest. Heart enlarged and uniformly adhering to the pericardium. Three pints of turbid serum in the left pleura, which was coated with a false membrane. Left lung hepatized below and much gorged above. Right lung healthy, but uniformly adherent to costal pleura.

Abdomen. Liver enlarged and granular on section. The fractured ribs had united. The apposition of the fractured portions of the humerus was good, but the ossific union was completed only on the thoracic side.

Cases. One night in January, a lad was heard to fall from the mast-head of a vessel in the river, and was found lying upon the deck, with his head under a cask, perfectly insensible. He remained in that state, his pupils dilated, his fæces and urine passing involuntarily, breathing about eleven times in the minute, pulse 168. He was twice blooded, the pulse sinking each time under the operation; on the afternoon of the third day he died without a struggle.

Not the least vestige of injury in the brain or spinal chord was discovered on inspection. The viscera of the thorax and abdomen were more

turgid with blood than natural, but also perfectly sound.

A prize-fighter was taken off the ground insensible, and apparently apoplectic, and died in eight hours.

No læsion or extravasation could be discovered on careful inspection of the brain.

It would be impossible to mention a single symptom of the whole range, from head-ache, or morbid vigilance, to absolute insensibility; from the most partial to the most complete paralysis; from the slightest to the most thorough derangement of the senses and intellectual faculties; from the least to the greatest degree of irregular and involuntary muscular action, which has not attended recoverable concussion and recoverable forms of idiopathic disease.

But if very slight and seemingly inadequate appearances have sometimes presented themselves on enquiry after death, whether from disease or injury, accidents attended simply with contusion, and temporary derangements of the general health have often been the forerunners of fatal disorganizations. As regards injury, which is most to my present purpose, without fracture we have extravasation en masse, or in a thin membranous layer coating one or both hemispheres; suppuration of the dura mater; lacerations of the cerebral substance speckled with coagula of blood, abscesses on the surface and in the substance of the brain, and tumors encysted and solid; effusions of serum or of blood between the membranes, or occupying the chambers and fossulæ of the brain, and blood effused in the substance of the cerebrum, cerebellum, crura, pons va-

rolii, medulla oblongata, or upon the general basis of the brain; and while some of these are from their nature, situation, or extent instantly mortal, others are equally so after a lapse of days, weeks, or even months. Ossific growths upon the dura mater or its processes, ossifications of the arteries, opaque and adhering portions of the arachnoid, circumscribed indurations and softenings of the cerebral substance, apoplectic cells, or rather the vestiges of such effusions, aqueous cysts in the ventricles or their walls, or beneath the brain, and a variety of chronic morbid appearances are occasionally met with in dissecting rooms, stumbled upon by accident, as well as discovered by an especial inquiry into the cause of death, and the rationale of the symptoms which preceded it.

A wasted appearance of the optic nerve, its pulp absorbed, so that only a discolored and shrunken neurilemma is presented, is seen in cases of organic amaurosis, and has been witnessed in paralysis of other nerves, as those of the extremities. Cartilaginous patches, or even osseous scales on the arachnoid tunic of the spine, as before mentioned, are common. A dry and wasted spinal chord (atrophy) is sometimes seen in perfect paraplegia; effusions of serous fluid, and collections of pus and lymph are found external to the dura matral sheath, and in the arachnoid sac and beneath it, and in the marrow itself; extravasations of blood, fluid and coagulated, in and upon the chord in all parts of its course; scrofulous, aneurismal, bony, medullary, and hydatid tumors encroaching upon and compressing it; and lastly, a broken down and dissolved medulla is seen, not only after fracture,

both of the cranium and the vertebræ, but in the absence of external injury, and may be due to a process of ulcerative absorption, or of gangrene.

In fact the morbid affections are the same in kind, variety, and extent, in the brain and chord, and observations require only to be multiplied to enable us to connect the symptoms and morbid appearances with equal accuracy in the one as in the other *.

Now if there be no detectible difference between the convulsion of the epileptic, and that produced by a spiculum of bone irritating the dura mater; between the coma of an apoplectic, and that consequent upon compression from fracture or extravasation: if a large proportion of cases of injury of the head recover from a degree of suspension or disturbance threatening the worst result, when the surgeon's experience and discretion restrain him from officious interference, it is evident that functional disturbance, separately considered, is not a criterion by which to judge either of the presence or nature of organic mischief. Much of it may really be indicative of a power of reaction, promising in such circumstances, as the natural consequence and expression of irritation of an organ sufficiently retaining its integrity to admit of recovery, which mechanical injury of any amount would have prevented. Continued insensibility furnishes the worst prognosis, and next to that, those temporary and partial illuminations which fade almost as soon as they appear. If the signs of commotion subside, we may infer that læsion is seldom if ever present.

* See article "Diseases of the Spinal Marrow", by R. B. Todd, M.D., in the Cyclopædia of Practical Medicine.

The recovery of the mind, however gradual, if it be but progressive, is a most auspicious sign. On the other hand, the increasing failure of the mind, and the giving way of the organic and vital functions, as e. g. the loss of power of the alimentary canal; the frequent pauses and increasing labor of respiration; the small running indistinct pulse, and the oozing of the exhalant capillaries, are the fatal prognostics.

I should say, therefore, that organic change is distinguished by the assemblage and combination of the symptoms, by their permanency or frequent recurrence, and in place of the signs of restorative power, by the progressive failure, whether rapid or gradual, of the system of nutrition, and consequent increasing embarrassment of the vital functions, as the circulation and changes of the blood, the secretions, temperature, &c.

The organic læsion of the brain is never perfectly recovered, whether resulting from injury or disease. The senses or the mental faculties, the sensitive or motive power, or all, are more or less affected. The continual disposition to over-excitement or depression, the relaxed tone of mind, the altered expression of countenance and manner, the enfeebled gait, the measured articulation, the irksomeness of bodily or mental labour, even if no touch of palsy be perceptible, characterise such mischiefs more or less to the end of life. The appetite is hearty, the sleep overabundant, the bowels costive, the temper uncertain and irritable, the judgment wavering and indecisive, the muscles flaccid and slowly obedient if not tremulous, and the memory, speech, sight, hearing,

smell, and taste more or less impaired. Yet these signs, so finely are they outlined, may all pass unnoticed by an ordinary observer, to whom the person is a stranger;—a medical man traces the disease in its effects on his first introduction.

It is not the actual amount of the injury, and its direct interference with the functions of the brain that occasions or maintains this state, but the effect of a shock which has so powerfully and permanently impressed the organ as entirely to have modified its susceptibilities and habits of action, and "turned the walking-stick into a crutch."

All that has been described as the consequence of injury to the structure of the brain applies to cases of morbid change in progress, with the addition of such symptoms as are set up by the seat, extent, and nature of such change, as partial paralysis, spasm, &c., and all may exist independent of any organic change in the brain, the gradual effect of the injury or disease of another organ of which the functions are important to the economy of the system, or simply of the deterioration effected by time or injurious usage.

Structural changes in the nervous system, which do not directly affect life, derive their symptoms from the nature and degree of their interference with the proper functions of that system, and with those of the parts which it supplies; in one case spasm, in another paralysis, either of sensation or motion, in a third, neuralgia is set up,—and these affections may be variously combined,—of which either the cerebral, the

cerebro-spinal, or the sympathetic system may be the seat.

It would carry me into a research wide of my present subject to enter into further detail on this head, or I could present my reader with cases abundantly illustrative of this position.

As the consequences of disorganization of nervous structure, we see blindness, deafness, loss of smell and taste and voice, and anasthæsia, or loss of tact, general as well as proper; loss of command and antagonism in the muscles of the features, attended by deformity of expression, and interruption of articulation and deglutition; in the trunk and limbs loss of figure and motion, deformity and lameness, partial or complete; and finally, total destruction of sensation and motion.

Independent of any permanent organic change, as may be fairly presumed from the fact of recovery, we see these same powers and faculties suspended only, or impaired in various degrees and proportions. The history, the association, the situation and extent, the permanency—the health, the temperament, the age, are our clues to the diagnosis.

As results of injury, and as originating from causes less obvious or unconnected with violence, we recognise in the nervous organ the processes of inflammation, effusion, tumor, abscess, ulceration, induration, softening, enlargement, wasting, and gangrene. We also see changes corresponding in character to the malignant actions of carcinoma, scirrhous and medullary.

The labors of some distinguished pathologists of the present day have been directed with encouraging success to the development and elucidation of this subject, which is one of great delicacy and difficulty, and requires all the industry and sagacity which can be enlisted in its service. As the white substance of the brain may be reddened by successful size and vermilion injections in certain cases, as for example in subjects who have fallen victims to acute typhus, presenting an appearance totally unlike extravasation or that which is supposed to be the state of congestion—and this again is widely different, when in excess, from the appearance of a healthy brain—we have evidence of an organization which may explain all the processes capable of resulting from inflammation, from its mildest to its most acute form, as well as of those various and extensive vascular changes which may explain the extraordinary phenomena of irritation. The states of excessive and defective injection of the medullary substance present a contrast quite as remarkable as the inflamed and uninflamed condition of the white of the eye, as it is called.

In nerves I believe that the neurilemma alone admits of being injected, and that the appearances of vascularity, as recognised by color, both in the healthy and diseased nerve, are to be referred to the vessels of the sheath and interstitial cellular web connecting it with the fibrils, and supporting and connecting them. These vessels are very numerous, and take a direction parallel to the fibres. Such an arrangement seems most reconcileable with any hy-

pothesis which assumes the fibres to be instruments for the rapid, uniform, and uninterrupted conveyance of sensation and motion in all their intensity, and might explain why they are in themselves so rarely the subjects and present so few appearances of organic disease.

Vascularity, thickening and induration, softening, deposit of lymph between the fibres, or between the sheath and the nerve, so as to separate or to displace the fibres centrally or laterally, severally or in one or more packets; tumors and cysts of various character, so situated, the neurilemma forming the investment; the fibres terminating abruptly in a tumor above and below; the fibres passing direct through the centre of a solid tumor without displacement or separation, and in both cases the neurilemma continuous and enclosing the tumor; the ganglion or nervous knot, in its varieties of size and consistence, ulceration from pressure, or wound, or contiguous inflammation, and the absorption of the medulla (wasting), comprehend all the diseased appearances with which I am acquainted.

The tumors above named are homogeneous, firm, or pulpy; or cavities of abscesses, or cysts of solid contents in a state of disorganization. In the Hunterian collection is one specimen of a firm tumor embracing a nerve, and throwing off fibres on either side at right angles to the nerve. It presents an exact analogy to the osseous tumor which is formed in the cellular tissue connecting the periosteum with the bone, and I should think has a similar origin in the sub-cellular tissue of the neurilem.

That a large proportion of the cases of neuralgia, even when acute, are unaccompanied with any permanent change and are unallied to inflammation, I have already said, and have offered an explanation more consistent in my view with the phenomena of the origin, intermission, and frequent cure of that disease; but there is reason to conclude that the most severe and enduring cases are to be referred either to a change in the nerve or the brain, in its course or at its origin, or an external irritant acting upon either, from the occasional combination and character of symptoms during life, and from post mortem inspections.

Tic douloureux of the branches of the fifth pair, and impairment or loss of power of the retina, are effects induced by diseased teeth upon the same side of the head. That very severe symptoms of cerebral disorder, and not unfrequently of sudden and fatal termination, are depending on anormal dentition, is proved by the relief obtained through the timely assistance of art. I have seen permanent and complete amaurosis, preceded by intense suffering in and around the orbit, from a deep seated abscess between the pterygoid muscles. The inflammation of the eye was superficial, and subsided on the discharge of the abscess.

The following is the authenticated report on examination of the body of a much-esteemed physician, a martyr to the facial neuralgia or acute tic douloureux, made about eighteen hours after death. The left infra-orbital nerve was the seat of pain, and the subject of operation.

Head. 1st. An unusual thickness of the os frontis, which was full 3-8ths of an inch when it had been sawn through, above the frontal sinuses, and more than 2-8ths at its juncture with the parietal bones.

2d. In the falciform process of the dura mater, at a little distance from the crista galli, a small osseous substance was found, measuring about 3-8ths of an inch in length, rather less in breadth, and about a line in thickness.

3d. Slight adhesion of the tunica arachnoides to the dura mater at the vertex. The vessels of the pia mater, on the right hemisphere of the brain, full and turgid. Where the tunica arachnoides and dura mater had adhered there was a milky appearance of the pia mater, with effusion of coagulable lymph on the surface. The turgid state of the blood vessels of the pia mater was observed throughout its whole extent on the right side, but not at all on the left.

4th. The right lateral sinus distended with blood, especially just before its termination in the jugular vein.

5th. The substance of the brain seemed to be softer than natural.

6th. The quantity of fluid collected from the ventricles amounted to $7\frac{1}{2}$ drachms.

Chest. Some adhesions between the pleura costalis and pleura pulmonalis.

Abdomen. A biliary calculus weighing 348 grains nearly filled the fundus of the gall bladder.

No morbid appearance of the nerves of the brain could be detected, nor was there, (as Dr. —— had been heard to say, he suspected might be the

case,) any disease at the bottom of the orbit of the affected eye.

I have to express my obligations to my friends Sir Astley Cooper and Dr. Bright, for permission to publish the following interesting communication, drawn up by the latter gentleman.

CASE. "Dec. 26th. I was requested to see Mr.——, who was at that time the subject of epileptic fits of the most severe kind, and attended with much pain in the parts affected, succeeding each other almost without intermission, and affecting the left side chiefly with violent convulsions, though all parts of the body were implicated. This state of things had existed for nearly a fortnight. Between the attacks, and even during the greater part of the attacks, his mind was nearly unaffected.

"On the 28th, the same symptoms still continuing, he fell into a state of exhaustion from which it was supposed impossible that he could rally. Yet he did rally, and survived till the second of January, when he died. During the whole of my attendance, I believe the longest interval between the attacks was less than two hours, but the usual interval was from two or three minutes to twenty minutes."

EXAMINATION. "The skull was thicker than natural, and more solid in its structure, having scarcely any diploe.

"The dura mater at the anterior part of the right hemisphere adhered firmly to the bone, and there was a slight depression in the bone corresponding

with the basis of a bony deposit, situated in the anterior part of the falx of the dura mater. This bony deposit was of an irregular form, its surface scabrous, and its ends pointed.

" The dura mater was attached by firm adhesions over the extent of one-third of the anterior lobe of the right hemisphere. The dura mater was thickened very greatly, and the arachnoid, to which it was firmly attached over a space of three or four square inches, was quite changed in its appearance, being thickened, opake, and firmly glued to the brain. On attempting to raise the membrane, the substance of the brain tore away, being changed into a gelatinous-looking and shreddy substance, forming imperfect cells, which contained a serous fluid. This degeneration of the brain occupied a space nearly the size of a large walnut, and probably extended into the anterior portion of the lateral ventricle; but this was not perfectly ascertained, on account of the softened condition of the cerebral matter. Certain portions of the brain, immediately surrounding the softened part, were much firmer than the rest of the brain, and were even hard under the scalpel.

" The vessels at the basis of the brain, and all other parts of it, might be considered healthy."

For some further particulars of this gentleman's case I am indebted to Sir Astley Cooper, to whom he was well known. Up to the age of 38 he was robust and active, when he became habitually dyspeptic. At 41 he was the subject of hæmoptoe, which was cured by digitalis, and ever afterwards he had a slow and irregular circulation, with imperfect

digestion. At 45 he married, and four children were the issue of his marriage. At 48 he was first seized with a fit while on horseback, which was brought on by sudden mental excitement. He was blooded, but complained still of pain in his head, and had another, ten days afterwards, like the first; in nine months afterwards a third, which was followed by numbness in his left leg. At 50 he had another attack in his carriage; and at 51 a very severe return preceding his last illness, as above related.

Sir B. Brodie favored me with the subjoined notes of a case and dissection which came under his observation in 1829.

Case. "Mr. —— had laboured for many years under severe pain of the face, which had been regarded as the effect of tic douloureux. He had also suffered from epileptic fits. Latterly the former symptom had subsided, while the fits became more frequent and more severe. After one of these attacks he expired with symptoms of apoplexy. There had been, for some time previous to his death, ptosis of the left upper eyelid, which made me suspect that the brain was affected at the part from which the third pair of nerves derives its origin.

Examination. "The internal surface of the cranium exhibited marks of increased vascularity. The impressions of the vessels were larger and more numerous than usual, and the foramina of the vessels more distinct—in some places also there were reddish discolorations, and the projections of the basis

cranii were unusually prominent. The membranes of the brain were preternaturally vascular. The vessels of the dura mater large and numerous, the tunica arachnoides thickened, and at the upper and back part of the left hemisphere of the cerebrum, an adhesion had been formed between the tunica arachnoides and the dura mater of about an inch or $1\frac{1}{4}$ inch in diameter. The veins of the pia mater were unusually turgid.

" The cut surfaces of the cerebrum exhibited numerous bloody specks indicating increased vascularity, and also a red mottled appearance in many places. The texture of the brain was remarkably soft, especially in the crura cerebri, fornix, and adjacent parts. The fibrous appearance of the brain was particularly distinct. The nerves of the 5th pair in the cavernous sinuses were carefully examined and seemed free from disease. No excess of fluid in the ventricles. The membranes of the spinal chord exhibited marks of increased vascularity, but the chord had the usual appearance.

" The viscera of the thorax and abdomen were free from disease, except a partial adhesion of the pleura and a small brown interstitial deposit in the liver."

I should think that there was sufficient deviation from healthy appearances in these cases to explain the symptoms, and sufficient localization of the appearances in the first and second case, to connect them with the bony growth. I do not say that such changes in the brain and its membranes were not

fully sufficient of themselves to have provoked the symptoms, or that they might not have existed independent of the bony deposit, as indeed the third case and others upon record might be adduced to prove, but here was an obvious cause of local irritation and permanent interference with the cerebral circulation, which operated by reflection to produce in the first case neuralgia, and in the second epileptic convulsion. To illustrate the effect of an organic irritant thus to produce neuralgia in a remote part, I may mention the first accession of facial tic of the most severe and obstinate description after an amputation of the leg; and the removal of a leg for excruciating pain of the knee joint, in which scarce any appearance of inflammation was discovered, but the lumbar spine was found loaded with cartilaginous flakes. Such a case occurred some time since in one of our great hospitals.

The degree of pressure to which nerves are subjected, appears to determine the events of pain and palsy, as regards sensitive branches, and involuntary and spasmodic action and palsy in those destined to motion. With the other modes of irritation we are less acquainted, but with the tingling and burning pain produced by concussion, and the numbness and insensibility following pressure of the ulnar and sciatic nerves, every body is familiar. The approach of paralysis is often announced by morbid and painful sensation, and the return or recovery of sensation from a state of paralysis is in general extremely painful. In injuries of the spine, I have seen one limb palsied to sense and motion, another deprived of motion only

and intensely painful. The recovery of sensation has in some instances been attended by a sense of coldness in the part affected, which was not relieved by artificial heat and not indicated by the temperature of the surface. A burning sensation is that more commonly experienced after temporary numbness.

The following is a striking example of the effects of severe concussion of the medulla spinalis.

Case. Aug. 4th., John Twedie, æt. 33, a plumber, fell from a height of thirty feet from the ground, and lighting upon his feet fell backwards with great force, his sacrum coming in contact with a large stone. He was unable to rise, though he could move his legs, and he was immediately brought to the hospital.

4 P.M. Excessive pain in the loins and legs, with total loss of motion; no crepitus, irregularity, or swelling could be detected in the course of the lumbar spine. Great depression; cold skin and slow pulse; warm brandy and water was given.

6 P.M. Reaction somewhat violent, exquisite morbid sensibility of the legs and feet; when touched slightly, pain of the most acute and lancinating character is produced. Pulse 120, hard and wiry, skin hot, great pain of head; C. C. lumb. reg. ad. ℥xvj.

10 P.M. The cupping relieved him for a short time, but now the local and general symptoms are more severe than before: the slightest motion, even that caused by walking up to the bed-side, brings

on the most agonizing pain of the whole of the lower extremities, particularly on the posterior surface, and upon the bed-clothes being touched, he exclaims most piteously: head-ache violent: v.s. ad ℥xvj. Liq. opii sed. ♏. xxx. Calomel gr. iij. 4^{tis} horis. His water was drawn by the catheter.

5th. 6 A.M. Has had no sleep; pain not quite so violent, and confined more particularly to the back of the thighs, calves of the legs, and top of the feet; head-ache; pulse 120, sharp. Aperient draught. 12 o'clock. Bladder and sphincter ani paralysed; pain the same. Evening. Complains of pain in the lumbar region; pain in the legs again increased to the most excruciating degree; (to use his own words, when any one walks by his bed, it is just as if a number of razors were cutting him down to the bone;) pain more severe in the left than the right limb, which is colder to the touch; head-ache violent, skin hot, pulse irritable.

6th. Slept a little during the night, pain somewhat abated; countenance anxious, skin moist, pulse 112, full and soft. No aggravation of symptoms in the evening, as before; to increase the opiate to-night, and continue the calomel.

7th. Has passed a tolerable night; has much less pain, more on touching the skin of the legs lightly than firmly grasping them; bowels relaxed, paralysis the same, spirits low. Evening. Continues better; pain almost confined to the nates, back of the thighs, calves of the legs and toes; is able to move the toes a very little; both limbs seem now to

be equally affected, skin moist, pulse 104 and soft; diarrhœa, mouth sore: omit the mercury.

8th. Vomiting and pain of the stomach came on in the night, which was immediately relieved by the hydrocyanic acid, and which also alleviated the pain in the limbs. Evening. Remarkably improved, having scarcely any pain except when touched, and then it is merely a pricking pain, as of pins. Diarrhœa has ceased. G. camphor. extr. conii ā gr. v. 6^{tis} horis.

9th. Is able to pass his urine, has but slight pain upon pressure of the legs, and can bend the ankles.

10th. Merely complains of a stinging sensation of the feet.

12th. Sleeps well, and suffers very little pain; is able to move his feet; constitutional symptoms quite gone. Ordered a mutton chop daily, and to discontinue the night draught.

15th. Going on well; can bend his knees, has some command of the sphincter ani, though not perfect.

19th. Daily gaining more power, both local and general.

25th. To omit the camphor and conium, and take quinine and wine.

30th. Rapidly improving; is able to sit up for two hours daily, and can flex the thighs.

Sept. 8th. Walks with the assistance of crutches, and his health is recovered.

Some weeks after leaving the hospital he walked three miles with the assistance of a stick, his only inconvenience being a trembling of the legs, when fatigued.

As regards the organic affections of the spinal chord and its membranes, including inflammation and all its notable appearances within the cranium, very interesting histories are on record, associating the symptoms of tetanus with spinal meningitis—pain of one region, and insensibility of another from the pressure of aneurismal and other tumors on the chord—convulsion, coma, spasm of the heart, and diaphragm with spinal effusions—convulsion, trismus, paralysis, diminution or exaltation of sensibility, with spinal apoplectic coagula and purulent matter; and epilepsy as well as impaired sensibility and paralysis with changes of consistence in the marrow itself, as the ramollissement, or opposite condition of induration. If the cervical region is affected, difficult deglutition and dyspnœa; if the dorsal, the disturbed action of the heart; if the lumbar, paralysis of the bladder and rectum, and paraplegia are the symptoms associated. A state of spinal atrophy is met with in some cases of paraplegia, and in the new formations in and adjacent to the chord, the symptoms are intricately combined or isolated, according to the position and extent of interference with the organ. Messrs. Ollivier, Serres, Hart, Abercrombie, Velpeau, Magendie, Gendrin, Leveillé, and others, are authorities for these interesting observations*.

The following case occurred in St. Thomas's Hospital, in the practice of my friend and colleague Dr. Roots.

CASE. Peacock, was admitted in August, 1834, with

* See Todd, loco citato.

total loss of motion, and partial loss of sensation of the lower extremities, and lived about a month. There was pain on pressure or percussion on one spot, viz. the 5th and 6th dorsal vertebræ, and on no other part of the spinal column. "This," says Dr. Roots, "I speak confidently, because I was astonished to find, at the post mortem examination, most extensive caries of nearly the whole of the bodies of the vertebræ below the 5th, where the disease commenced. Just opposite the 5th and 6th dorsal vertebræ, the whole of the spinal chord was softened to the consistence of thick cream *to the extent of five-eighths of an inch*, but not exceeding that;—the membranes were not appreciably thickened. I addressed my pupils on more than one occasion on the subject of the absence of pain on percussion, where there was such extensive disease of the bones."

The facts developed by pathology, I need scarcely observe, are infinitely more worthy of confidence than any results of experiment.

Some highly respectable practitioners have laid before the profession instances of what they consider to be functional affections of the spinal chord and system of ganglionic nerves, and have treated the combinations of hysteria, with neuralgia, spasm, paralysis, and other morbid states in which spinal tenderness is present, with reference to the connection between the spine and visceral, and especially the generative organs, under the denomination of spinal and central irritation*.

* Messrs. Griffin, Tate, Teale, Brown, Darwall, &c.

If we receive, to their full extent, the doctrines advanced by one or other of the gentlemen who have treated the subject, almost every variety of nervous affection and in every situation, appears to be capable of originating from this source. Great caution should undoubtedly be exercised in adopting conclusions insusceptible of actual demonstration; but these, it must be recollected, are essentially the terms of the hypothesis, and I think it is sufficiently established, as regards the diseases of the entire nervous system, that the symptoms, in numberless instances, are not explained by any permanent change of structure. If an imperfect injection of the arteria centralis retinæ is as sufficient a cause of amaurosis as its over-repletion, and if both are forms of disease recoverable under favorable circumstances, if the various and contrasted conditions of the vascular system are capable of producing all the symptoms pathognomonic of cerebral derangement, and even death itself; if pain, paralysis, convulsion, and tetanus may exist as temporary conditions, and where continuing or destructive, leave no trace behind; surely we cannot reject the evidences furnished by careful observation of functional diseases, their analogies, associations, and similar modes of relief and favorable termination:—or if we do, and abide by a like rigid method of reasoning, what becomes of the therapeia? Shall we reject all remedies, the modus operandi of which we are unable to explain?

The painful arm after bleeding has been attributed to the puncture of a cutaneous nerve by the lancet, but the conclusion is gratuitous, fascial or

venous inflammation, of which one or other is present, being fully sufficient to explain the symptoms.

A foreign body, as a portion of glass or a spiculum of carious bone, in contact with a nerve, is productive of most distressing pain, and its removal is followed by immediate relief.

CASE. A young man applied at St. Thomas's Hospital, complaining of acute and constant pain in the ball of the left thumb, shooting along the track of its nerves to the apex. His general health was sensibly affected, rest and appetite much impaired, having suffered severely for a period of three months. At times the pain was described as too severe to be long endured. Leeches and free purging, followed by large opiates at night, produced no lasting effect. One day he exhibited the scar of a wound occasioned some time before by breaking a pain of glass upon the ball of the affected thumb. This was now deeply incised in a direction transverse to the cicatrix, and during the night a poultice was applied; on being removed in the morning, two minute spicula of glass lay on its surface, and the man was instantaneously and completely relieved.

The handling, pricking, division, separation by dissection, and tying of nerves, are accompanied by instant manifestations of more acute pain than is evinced by similar treatment of other textures *.

* The simple division of a nerve is not followed by enlargement of the cut extremities, provided the inflammation be no

That no such permanent consequences follow the puncture or division, partial or entire, of nerves, as many persons seem to imagine, is proved by the very small proportion of cases, as compared with operations, in which any local symptoms of this class are exhibited; and it is further demonstrated by the fact that wounds of nerves inflicted by accident, and operations on tumors with which nerves are implicated, present a train of very remarkable symptoms in other textures.

Two cases related in my former work on this subject*, that communicated to me by Mr. Earle†, another likewise mentioned in this volume ‡; and an example of the ligature of a vascular tumor of the forehead, of recent occurrence, followed by gangrene

more than is necessary to its reunion; nor if a portion be removed sufficient to prevent union; but if it is irritated and inflames, the truncated end becomes ganglionic.

After the operation of nerving in the horse, which Mr. Sewell has performed in upwards of a thousand instances, and by which many condemned horses have been perfectly restored, the terminations of the nerve above and below undergo slight enlargement, acquiring the size of the bulb of a small onion, and a bed of lymph is deposited between the divided ends, which, although apparently connecting them, is destitute of sensation. The lower portion of the nerve undergoes a process of shrinking or shrivelling. If the nerve be simply divided, the disease returns in two months, and no permanent benefit results from the operation. Mr. S. removes a full inch of the nerve, which runs on the outside and inside of the great pastern. This operation is an instance of the total loss of sensation without any impairment of motion.

* See pages 193 and 198 of that work. 2d edition.

† See page 58 of this volume.

‡ See page 56.

of the arm and death on the seventh day, are not the only instances which I have known of inflammation of the integument of a rapid and diffused character, and fatal from constitutional disorder consequent upon the surgical treatment, by whatever process, of painful tumors. The application of leeches in one, and of an open blister in another, the simple incision of the periosteum of a painful stump in a third, the removal of one tumor by the knife and of another by the ligature, constituted the several distinct sources of irritation in these cases. The inflammation is diffuse, and more or less remote from the injury, suppurative or gangrenous, but in four out of five cases the latter. I believe that the irritation of the treatment, superadded to the irritation of the disease, acts upon the whole nervous system, with such severity as to prostrate its powers, and that the local effect is concentrated upon the nervous tissue of the integument, and hence has a character of erysipelas.

I may add that the operations for the removal of nervous tumors are always followed by symptoms of high constitutional irritation, and appear to have been in many instances fatal.

The case of ligature above referred to is so illustrative of my opinions, as well as valuable in itself, that I consider myself fortunate in being enabled to present it to my readers in the words of Sir Benjamin Brodie, in whose practice it occurred.

CASE. "In the fifteenth volume of the Medico-Chirurgical Transactions, I have given an account of the case of a lady who had long suffered from an aneu-

rism by anastomosis in the forehead, and in whom the disease was successfully treated by the application of ligatures to the basis of the tumor. She continued well for six years. In November 1834, however, she experienced a recurrence of some of her former symptoms, and a small pulsating tumor, similar to what the original tumor had been in its origin, began to show itself. In the end of February 1835, she consulted me respecting it. At this time there was a pulsating tumor in the centre of the cicatrix on the forehead, of the size of a hazel-nut, but of a more flattened figure. It was *most exquisitely painful* when touched, and gave her much pain at other times. The patient objected to any attempts being made to relieve her except by an operation, as every other method of treatment had failed formerly: and I did not advise her to go through an operation at this time, as it appeared that the disease was trifling and making but little progress.

"About a fortnight afterwards I received a message from her to this effect; that her sufferings under the disease were greater than I supposed them to be; that she would soon leave London, and would then be at the distance of 200 miles, and that recollecting what she had suffered from the disease formerly, she was anxious that an operation for her relief should be performed without further delay.

"On this I requested that Mr. Keate, who had attended her with me in 1828, should be again consulted; and on considering all the circumstances of her case, he agreed with me in thinking that there was no good reason for our not acceding to her wishes.

" Accordingly, on Monday the 9th of March, with Mr. Keate's assistance, I proceeded to the performance of the following operation. A circular incision was made in the skin of the cicatrix left after the former operation, so as to expose the base of the pulsating tumor, without penetrating into its substance. A long, straight needle was then introduced under the tumor, by means of which it was elevated from the parts beneath. After this another straight needle was introduced underneath the first, and at right angles to it, drawing after it a strong ligature. One portion of the double ligature was then tied on one side, and the other on the other side, and drawn as tight as possible; and the remaining needle was withdrawn. The operation seemed to be attended with excessive pain, and a very severe pain remained afterwards, which never entirely subsided. There was some oozing of blood from the wound, which continued for the first forty-eight hours, but in inconsiderable quantity.

" At first there were no remarkable symptoms: the pulse was about 90 in a minute, and no sleep was obtained without the aid of opium. On the 11th of March there was a diffuse redness of the skin of the forehead, with some degree of œdema. This gradually subsided, but as it left the forehead it extended to the eyelids, which in the course of the next three days became a good deal swollen. On Friday the 13th of March, an attack of diarrhœa supervened, on account of which it became necessary to administer the misturæ cretæ, &c. On the 14th, the swelling of the palpebræ began to subside, and the marks

of inflammation on the forehead and face had nearly disappeared. But now the pulse became more rapid, being seldom below 120 in a minute; and at the same time it became manifestly smaller and weaker. The tongue was furred but moist. There was but little heat of skin. The mind was at times much disturbed, mistaking objects and persons. Hitherto the patient had refused all sustenance, but now she swallowed readily, and apparently with appetite, sago with wine, jelly, and whatever else was offered to her. In the evening she complained of pain in the right forearm, which her attendants attributed to a tight sleeve, and of which I was not at the time informed.

"During the following night she was in a very disturbed state of mind: never sleeping: she insisted on being dressed, and had her boots laced on that she might set out on a journey. At 8 A.M., on the 15th of March, her pulse was very rapid, small, and feeble: the skin not unusually hot; and her tongue was moist. She took an abundant quantity of food similar to what she had taken on the preceding day, swallowing it almost voraciously, and always saying that *it was so good.* I now learned that she had complained on the preceding day of a pain in her forearm, and on examining it I found it much swollen from the elbow to the wrist. The swollen part was tender, but there was little redness of the skin. There was neither inflammation nor swelling of the neck or arm, so that it was evident that there had been no extension of the inflammation to the extremity from the head and face. During the day the symptoms continued nearly the same, except that the

pulse became still more rapid, smaller, and weaker. At 5 P.M. the swelling of the forearm had, in a great degree, subsided; but in six hours more, on examining it, I found the whole forearm in a state approaching to that of gangrene. From this time she continued to sink, and on the following morning, March 16th, she expired.

"Unfortunately, no examination was made of the body. I have since been informed that for two or three years before her death, the patient had labored under occasional attacks of palpitation of the heart, attended with severe suffering, and that she was at those times accustomed to say that she thought that she had some disease there, like that in her forehead.

"The ligatures were divided in the evening of the 14th, and a small quantity of matter which had formed in the cellular membrane underneath was set at liberty, but this occasioned no evident alteration in the symptoms."

The following case seems to show the direct tendency of injuries of nerves to produce that species of inflammation termed erysipelas, which if not especially under the nervous influence, is at least remarkable for its nervous affinities.

CASE. In 1833 a man struck his leg violently against the points of a pair of scissors used for cutting tin. The wound was on the posterior and outer side of the leg, in its upper third, and passed round the fibula to the interosseous ligament in front. In a few days he was attacked with erysipelas of the limb and extensive sloughing of the cellular membrane in

the vicinity of the wound, under which, in spite of treatment, he quickly sunk. On examination, the anterior tibial nerve was found three parts divided. There had not been the slightest symptom of spasmodic action or other nervous derangement. The preparation is preserved in the museum of St. Thomas's Hospital.

To observe the effect of isolating and inflaming a nerve without læsion, I directed the following experiments *.

The sciatic nerve of a young healthy dog was exposed between the tuber ischii and trochanter femoris, and a piece of linen rag, an inch long and half an inch wide, was wrapped round it, and secured without pressure. Placing the substance on the nerve and touching it with the aneurysm needle appeared to cause great pain. In afterwards closing the wound by two sutures, he did not appear to feel the needle.

Two hours afterwards he appeared to suffer much pain and moved the leg with difficulty.

2d day. The leg is evidently very painful, he will not eat and is irritable; moves his leg better than yesterday evening; it feels flaccid.

3d day. The leg is very much swollen and œdematous, considerably colder than the opposite limb;

* These experiments were conducted for me by a young gentleman of great zeal, intelligence, and industry, who was also, my dresser and clinical clerk, Mr. Henry Bullock, of Pickwell near Melton Mowbray. I have great pleasure in thus acknowledging a part of my obligations to him.

does not wince at the insertion of a pin deeply in any part of the limb, except high up on the inside of the thigh; moves the limb better, though still very lame. Countenance and manner irritable.

4th day. Bears the introduction of a pin as before; refuses food.

5th day. Symptoms increased; the linen rag was gently removed.

6th day. Easier and more tranquil.

7th day. The leg less swelled and is warmer; will not suffer it to be touched, but moves it very much better.

8th day. Swelling subsided, lameness less, takes his food cheerfully, seems to suffer no pain, and the leg is as warm as the opposite.

9th day. Got away.

The last experiment was varied by substituting a piece of kid leather an inch wide, passing it under the nerve and not fastening it, without violence or displacement. The integument was closed by one suture.

2d day. The animal seemed quite well, rather lame, but would allow the limb to be handled—was by no means irritable.

3d day. No constitutional change observable; the leg is swollen and œdematous, and he is unable to put his foot to the ground.

4th day. Appears dull and eats but little, the swelling of the limb excessive, heat and sensation unaffected.

5th day. Looks dull, loathes his food, the leg is

much swollen and becoming morbidly sensitive, will not attempt to move it.

6th day. Moves his leg a little but will not allow it to be touched; is constantly howling.

7th day. Moves the leg more, which remains swollen; looks depressed, eats but little, and howls incessantly.

8th day. Still in constant and acute pain; leg less swelled, will not allow it to be touched.

9th day. Still suffering severely, and constitutionally ill: was destroyed.

Examination. External wound healed. In the situation of the leather the nerve denuded and red, and behind it a layer of gelatinous matter corresponding to the breadth of the leather; about half an inch below this, three fibrillæ passing off from the nerve, varying in length from one to three inches each, terminated in a ganglion or nervous tumor. The cellular membrane around these was of natural appearance; the ganglions, each of the size of a small horse-bean and somewhat of that figure, were of a pink color and soft; upon section striated, and the nerves could not be traced through them. They were situated just in the place where he would not be touched.

The absolute suspension of sensation supervening on the immediate result of pain from intumescence where the nerve was encompassed simply by the linen, is the remarkable feature of the first experiment; add to this the restoration of feeling and motion, which had been affected in a less degree, and

the subsidence of swelling after the removal of the linen on the fifth day.

In the second experiment, the foreign substance, though simply laid beneath the nerve, allowed to remain, excited the neurilemmatous inflammation, the formation of ganglion, and the horrid pain peculiar to that organic change. The later accession of symptoms, and the integrity of sensation and motion until inflammation was evidenced by the constitutional and local symptoms, are plainly to be referred to the different circumstances of the experiments. Variations of such experiments might easily be suggested to illustrate further the effects of local irritation in different modes, and of the several degrees of pressure or obstruction and of inflammation; but they are attended with so much suffering as not to be vindicated by the objects of physiological inquiry.

It is plain, however, that nerves are affected to different results by the interruption of their vascular and of their proper structure, and by the presence of inflammation in their covering and connecting tissue. A tumor upon a nerve causes pain in one case throughout its ramifications, in another numbness and defective power, in a third actual palsy of sensation or of motion, or both. In some instances, the removal of the tumor relieves the pain, in others it aggravates it. In a young woman who had a cartilaginous tumor pressing upon one of the palmar digital nerves, so painful that she could not bear to have it touched, the same pain affected the whole inner surface of the arm to the axilla, after the re-

moval of the tumor, which had before been confined to the swelling and its immediate vicinity. There is every reason to believe that the neurilemmatous affection, when it proceeds from external causes, as cold and uniform compression insufficient to cause numbness, seldom mounts beyond a state of congestion; that this is not enduring but variable, determined by the state of the circulation, whence the intermissions and paroxysms so observable in neuralgic affections,—as the brow ague, the toothache, the facial tic, &c., and that even when by such circumstances neurilemmatous inflammation is set up, it does not often proceed the length of adhesive deposition, which is the cause of the ganglionic tumor. The bulbous, olive-shaped or lenticular, and generally uniform figure of the swelling, its investment by the sheath, and its appearance of condensation on section, the fibres being split or separated by a dense deposit of a similar color, but more opaque, seem to convey but one idea of the formation and origin of these tumors, viz. from inflammation of the covering and connecting tissue. When of long duration, they lose all resemblance to nervous matter and all trace of fibrils, and acquire a cartilaginous hardness.

These tumors appear under various circumstances, and present some varieties in themselves. The origin of one of these appears to be constitutional, affecting nerves in all parts of the body. I refer the reader for the most remarkable history of this form of the disease hitherto recorded, to Mr. Lawrence's valuable Observations on Tumors, in the 17th volume of the

Medico-Chirurgical Transactions*. The case is that of a gentleman whose leg was amputated by Sir W. Blizard in 1819, after an unanimous opinion delivered by the four most experienced and celebrated surgical practitioners of the period, that the disease was malignant, and that the operation would not be justifiable. The case is introduced to shew the liability to error in the diagnosis.

"We found him," says Mr. Lawrence, "with a tumor of elastic feel, undefined in its circumference, about four inches in diameter, with the skin shining and bright red, on the anterior and inner part of the left thigh, a little above the knee. There was a firm indolent swelling, about as large as a hen's egg, imbedded in the soft parts at the back of the pelvis, and a similar one in the back near the spine; one as large as a nut over the left eye, and several smaller ones just under the skin in various parts. All the smaller productions had shewn themselves subsequently to the appearance of the large tumor in the thigh. The patient was almost worn out by pain and want of rest; he was excessively emaciated, with profuse fetid perspirations. I considered the case quite hopeless, not only from the multiplication of the external swellings, but also from the probability that disease had occurred in internal organs. To Sir W. Blizard it appeared in a light rather less unfavorable; he thought there was a chance of success from amputation, and he performed the operation two days afterwards (March 1819). This was half

* Page 31.

a year after the first appearance of the swelling. The more serious and distressing symptoms were immediately relieved, and the patient eventually recovered. The tumor in the eye-brow, which had increased and become painful, was removed in 1825. In December 1828, I was consulted by this gentleman, on account of a tumor in the forearm, as large as a walnut, situated over the course of the ulnar nerve, and causing severe pain, with indescribable sensations like electric shocks, upwards and downwards in the direction of that nerve. Mr. —— had enjoyed tolerable health, without being strong. At this time he was nervous and irritable, with an anxious countenance and an aged appearance. I removed the disease in February 1829 : it was situated between the flexor carpi ulnaris and the bone, and the nerve adhered so closely to it, that a portion was removed with the tumor. The latter was of firm texture, but not so hard as scirrhus. The part healed favorably, and remains well. Mr. —— again came to me in December 1830, on account of a tumor, the size of a goose's egg, imbedded in the flesh of the stump. He had not been aware of its existence when the last operation was performed, and it had become troublesome only during the preceding six weeks. He now experienced most severe shooting pains in the part, with frequent recurrence of the electric dartings from the stump into the body. I removed the tumor, finding it necessary to make a large incision, on account of its size and its deep situation. The growth, although it had been loose, and felt circumscribed, appeared to be prolonged to the tuber ischii,

and I removed it up to the bone. The part removed consisted of a circumscribed oval tumor, and of a firm fibrous prolongation connected to it externally, and consisting of one of the flexors of the knee, which had been divided in the amputation, converted into a tough fibrous texture of light brown tint. The swelling was covered with a thin white capsule, and was homogeneous; in compactness, toughness, and color it approached to the characters of scirrhus. The extensive wound of this operation healed without any unfavorable occurrence.

"The pelvic and dorsal tumors remain nearly as they were twelve years ago. Several small subcutaneous knots can be felt in the arms and head, by passing the hand firmly over the surface; but they are less than when the thigh was amputated. There are a few small softish cutaneous growths in the face. The appetite, health, and strength are tolerably good; but there is of late increase of suffering. Strange sensations, sudden dartings and shootings occasioning convulsive movements, and compared to the effects of electricity, are often experienced."

The description of the symptoms of this patient impresses the belief that the nerves of the affected parts were especially implicated in the morbid growth.

With the assistance of Mr. Owen, I have examined the original disease, in the College collection. It is a large irregular tumor filling the popliteal space, of a medullary aspect and consistence, and in parts towards the exterior surface broken up and half dissolved by ulceration; the popliteal nerve can be traced to and is lost in it, the neurilemma evidently

continues over it. I make no doubt that this was the seat of the original disease, and that the neighboring joint and surrounding textures were secondarily destroyed. From the great similarity in appearance and consistence of these tumors to some which I have seen in the cerebral medullary substance, I much incline to the opinion that they consist of the medulla of the nerve in a state of morbid hypertrophy or conversion. The variations of consistence conform to the differences of volume and the supervention of the inflammatory, *i. e.* ulcerative process, as is seen in comparing the ulnar and popliteal tumors in this case. The tendency to appear in many and remote parts of the same texture is not peculiar to nervous, but belongs equally to bony, vascular, glandular, bursal, and other tumors, equally free from all malignant tendency; and I cannot refrain from thinking that some of the large tumors called "medullary," which have so involved surrounding parts as to obscure their real origin, but which, having been removed under an impression of their malignity, have not returned elsewhere, and have admitted of the patient's perfect recovery, have been of this species. A tumor filling the globe of the eye, presenting the same colour, degree of consistence, and homogeneous section, for which that organ was extirpated in infancy from the belief that it was malignant, the patient being now a healthy adult—and another, in which the organ presenting a similar appearance was left and finally absorbed under a prolonged mercurial course, the patient some years afterwards dying of a morbid change in the brain, have come under my observation, among others which

have belied the prognosis of malignity, though pronounced by eminent authorities.

The tumor removed from the arm is also preserved in the museum of the College. It is of albuminous consistence, presents the appearance of "the fibres terminating abruptly in a tumor above and below," described with other forms of nervous tumor, page 350, and a contiguous nerve is adherent to its side. This nerve, which appears to be the median, had a bulbous swelling at its cut extremity, and upon section I found it to present a beautiful specimen of the disease in its earliest stage, the fibres diverging to enclose a compact white substance of an oval shape, lying like the kernel of a nut in its shell.

A section of the stump tumor, above mentioned, is preserved in the rich museum of Mr. Langstaff. The sciatic nerve, imbedded in the diseased growth, presents, in each particular fibril, ganglionic swellings symmetrically disposed at short and regular intervals, like the joints of sea-weed, throughout its course.

Cases of small and isolated tumors of a gristly firmness, varying in size from a grain of wheat to a large pea, exquisitely painful, and requiring extirpation from that cause, are met with in the course of subcutaneous nerves. They are generally traceable to a blow or a sprain. I have seen them in the breast, the thigh, the spermatic cord, the fingers, the instep, and various parts of the body. It is not always easy to determine if the tumor is in the nerve or superjacent and adherent to it. Both these cases occur, and in the latter, I believe the removal of a portion of the nerve would be a safer practice

than the simple extirpation of the adherent tumor. The latter proceeding, at least, I have twice found ineffectual in removing the pain, which is the gravamen of the disease.

But the most frequent occasion of the ganglionic tumor is amputation; and I entertain no doubt that the origin of it is due to an inflammation of the neurilem in the process of healing*. The conical and skin-bound stump is most liable to be so affected; but the nerves being little elastic, if the cut extremities are compressed against the bone, or compressed together during the healing process; if the bone is splintered, and presents a ragged edge, the nerves become inflamed, form irregular shaped bulbs, or one large bulb by their cohesion in strings, and sometimes an ossific table from the edge or extremity of the bone is present, and the ganglia adherent to and supported by it on the face or side of the stump. Specimens of this disease are to be seen in all the anatomical collections. Mr. Langstaff possesses many. That gentleman is so satisfied that the circumstances above noticed are productive of the ganglion, that he invariably divides the nerves above the surrounding muscles and bone; and he informs me that he has not met with the disease, in a single

* Bichat, who followed Haller in regarding the medulla of nerves as the exclusive seat of the sentient principle, considered the origin of inflammation to be from exposure of the section to the air, and not only Meckel, but other modern writers, entertain a similar opinion. The supposition is so directly confuted by the comparative rarity of the occurrence, without reference to the qualities of the atmosphere, that I am only surprised it should have been entertained by any practical surgeon.

instance, in which this practice had been adopted. In my own practice, I have had two examples of the painful stump, one of the fore-arm and one of the leg. I have never approved of skin-stumps; and I believe, if sufficient muscular cushion is left to cover and pad the bone and soft parts, and make what is called a fleshy stump, there will be little danger of this consequence. But in the fore-arm and leg this is not always to be effectually done, especially in thin and wasted subjects; and I have no question that Mr. Langstaff's precaution is the best security against the formation of the ganglion. The tendency to reproduction upon resection, is the most distressing circumstance connected with these cases, and which is not always overcome by this or any precaution. I have several times known the second amputation performed; but a short time since a young woman's arm was removed at the shoulder-joint by Mr. Bransby Cooper, whose case, up to that time, was singularly unfortunate.

Her own statement is, that a tumor following a blow from a fender upon the back of the hand, in 1828, led to her becoming a patient of Mr. Green, in St. Thomas's Hospital; that it was opened in several places without relief; that she was afterwards a patient of Mr. Vincent, in St. Bartholomew's Hospital, that there, caustics were applied and no relief obtained. She then again obtained admission at St. Thomas's, when Mr. Tyrrell amputated the hand two inches above the wrist. This was in November 1830; that the disease returning, a second amputation was performed by Mr. Langstaff, of Basinghall

Street, three inches above the elbow, and that the diseased portions of the nerves were afterwards removed by that gentleman, by two incisions of the stump. Still unrelieved, she tried St. Bartholomew's a second time, as a patient of Mr. Earle, and from thence migrated eastward, and was the subject of another operation for excision of the nerve, performed by Mr. Luke of the London Hospital; that having other gentlemen's advice without benefit, and getting no ease night or day, she at length placed herself under Mr. Bransby Cooper, in Guy's, and had the stump removed at the shoulder-joint, in 1834, from which period she remained free from pain*. In a case in which Baron Larrey amputated at the shoulder-joint, the disease appeared upon the nerves of the axillary plexus†. The girl died some years afterwards, at the Hotel Dieu, of pthisis, where this fact was ascertained.

It appears then, that the ganglionic tumor occurs without wound, as 1st, in clusters upon the fibrillæ of a nerve; 2d, single or isolated upon

* The document in my possession, which I give literatim, thus concludes. "I sufferred both night and day, and could not gain ease. I went under Sir Brandsby Cooper, the 15th April, 1834, in Guy's Hospital. I was for six weeks and could get no ease, and had it taken out of the shoulder-joint; and most sacredly thank Almighty God for his goodness. E. Thomas."

† Vide Cruveilhier's "Anatomie Pathologique du Corps humain." Livraison VI. Planche 5. "Cicatrice à la suite de l'amputation dans l'articulation Scapulo-humerale."

Another specimen is preserved in the Museum of St. Bartholomew's Hospital.

a nerve subcutaneous or deep seated, movable, or adherent to contiguous parts; 3d, after section and resection, as in amputation, in an irregular shaped knot or knots, all the nerves of the limb, or on the same side of the limb, running into it or them, both trunks and branches, and so bound together at their termination.

In addition to this statement, I may add, that tumors of various structures lying upon and adherent to nerves, sometimes occasion the neurilemmatous inflammation, and are equally productive of the peculiar pain which constitutes the disease, and that it is indispensable in such cases to remove a portion of the sound nerve above and below the diseased portion, to give the patient a chance of relief.

Nerves sometimes partake of the medullary disease affecting the parts through which they course, and their fibres and neurilem are loaded and separated by the morbid deposit, so as totally to alter their natural appearance, and identify them with the morbid mass, just as the fibres of muscles so situated. They are also sometimes found ulcerated in abscesses and ulcers, and partially or entirely divided by that process.

Dr. Ley, of the Middlesex Hospital, in an interesting paper, recently published*, 'On the Pathology of Nerves,' comprehends their morbid affections under the two heads of excitement and defective energy: the former, including the results of mechanical impulse, vascular congestion or irritation, inflammation,

* Medical Gazette, Nos. 370 to 380.

structural disease, and sometimes of mere functional disorder; the latter, the results of extraneous pressure upon a healthy nerve, or of such disorganization of the nerve itself as destroys the continuity of the medullary filaments. Dr. Ley considers the twofold composition of nerves confirmed by the phenomena of their pathology, as the pain, the shrinking of muscle, and the paralysis attending neuralgia; and their influence over the capillary circulation proved by the suffusion and perspiration characterising their injuries and inflamed condition. In simple erysipelas the inflammation is external, he thinks, to the nervous expansion on which the sensation of the surface depends; but in phlegmonoid erysipelas and whitlow, it extends to the cushion on which the sentient extremities are expanded. In proof of their inflammatory changes of color, size, texture; of the deposition of lymph and effusion of blood, serum, and pus between the fibrils, he quotes cases related by various authors*, and describes the ascertained effects of wound, ligature, puncture, pressure, and the ganglionic tumor of stumps†. He considers pain and paralysis, as not incompatible consequences of the interception of a nerve, i. e. the combination of pain affecting the parts on which the nerve is distributed, with muscular paralysis and insensibility of the surface.

The commonly received opinion that pressure is a source of irritation and pain, Dr. Ley strongly combats, and although he admits congestion and vascular

* Cotugno, Martinet, Earle, Swan, Home, &c.

† Denmark, Swan, Larrey, Descot, Bell, Brodie, Norris, &c.

excitement as sources of irritation, he refers nearly all the cases, which have been attributed to compression and stretching of the nerves, to inflammation, insisting that no degree of pressure upon a healthy nerve can be a cause of pain. He distinguishes the small fibro-cartilaginous tumors in the substance of superficial nerves, of the size of a pea, lateral or central to the nerve, and grating upon section, from larger tumors of various consistence in the deep-seated nerves, accompanied with intense pain, spasm, and paralysis, central to the nerve, the fibres running over it, and varying in size from a hazle-nut to a melon. Examples of both are quoted from unexceptionable authorities *. He refers neuralgia to disease or inflammation of the root, course, or termination of the nerve affected †, or extended to it from irritation or inflammation of neighbouring or surrounding parts ‡, as from a decayed tooth or a firm tumor. In addition to the results of his personal experience, Dr. Ley has collected and arranged the materials, ancient and modern, available for the elucidation of the subject.

I doubt whether inflammation of nerves is so frequent an occurrence as Dr. Ley supposes, and so uniform an explanation of neuralgic affections; and I cannot admit, that the effect of compression is confined to torpidity, if not productive of inflammation. Although compression, if complete, will produce paralysis, and

* Berard, Descot, Wood, Cheselden, Camper, Home, Portal, Lawrence, Pearson, Windsor, &c.

† Serres, Ollivier, &c.

‡ Percival, Mitchell, Bell, Madden, Abercrombie, &c.

if permanent, even though incomplete, will set up inflammation, and neuralgia may thence ensue; the absence of the signs of inflammation, the paroxysmal or intermittent form of attack, and the evidence of the existence of pressure insufficient to destroy sensation or motion, though affecting both, are circumstances in which we too often meet with neuralgia, to refer it in most cases to inflamed or altered structure. In many cases gentle pressure will create pain which firm pressure relieves, showing the difference in its effects according to its degree. Modified pressure is combined with every conceivable source of irritation operating upon the nerve, or its connecting tissue, or its surrounding parts, occasioning a larger local determination of blood. Congestion is eminently sufficient to create pain, and is the most obvious explanation of the pain attendant upon increased action, where it does not go the length of inflammation or permanent change. It is true we cannot define the amount of pressure which is productive of pain, or fix the limit beyond which it passes into torpidity, but we cannot separate the sense of pain from the modifications of pressure incidental to the varied states of the circulation. The numerous cases of neuralgia surviving the operation of the ostensible cause of pressure are explained by the slow recovery from a loaded to a free state of the vessels; and the frequent successful exhibition of invigorating remedies, local and general, and the ultimate completeness of recovery conspire to show that the affection in many such cases does not amount to inflammation or altered structure of the nerve.

CHAPTER IV.

OF THE OPERATION AND EFFECTS OF POISONS UPON THE NERVOUS SYSTEM.

ALTHOUGH no department of pathology would admit of a more extended illustration of my subject than that which stands at the head of this chapter, it is not my intention to do more than glance at it, from an unwillingness to occupy my pages with matters purely physiological, and which bear so indirectly upon surgical practice.

The analogy to be observed between the effects of severe injuries, which I have formerly described as symptoms of direct irritation, and those of poisons operating rapidly upon the system, is remarkable. Prostration or mortal faintness and syncope, coma, convulsion, and tetanic spasm are the same affections, whether produced by the shock of burn, or complicated injury, or by the prussic acid or woorara. If such symptoms supervene with more rapidity and certainty in one case than in another, it shews only that the particular agent is more powerful in the one case than in the other. This is by no means uniform as regards the poison or the injury. The direct fatality of injury not disorganizing vital parts or involving loss of blood, is sometimes equal to that of the most active poison, as a blow on the pit of the stomach, or the head, a fall from a height, or a stroke of the electric fluid. The suddenness of death in lingering diseases, and even in health, is often not to be explained by post

mortem appearances, as on a change of posture, or the effort of dejection, or in sleep, where the features of the patient and the composure of the countenance are unaltered*. The slower effects produced by destructive poisons in smaller doses or of less intensity, are equally resembling those of pure prostration, or prostration mixed with re-action and excitement, consequent upon grave injuries.

The conclusion is, that the modus operandi in the two cases is identical, the nervous system in whole or in part being the system directly and fatally affected.

There can be no doubt that poisonous substances, whether acting rapidly or slowly, are taken up by the blood; but there is conclusive evidence that it is not by an alteration in the quality of the blood that the most rapidly destructive poisons produce their effects. Even those which are corrosive of animal texture destroy by irritation or nervous derangement antecedent to the destruction of the mucous surfaces, as the mineral acids, the oxalic acid, and arsenic. The circulation of the blood is necessary to the activity of the sentient surfaces which receive the first impression of the poison, and the blood is the vehicle of the poison, as it is the only medium of direct substantive transmission in the system. The circulation is therefore a condition indispensable to the action of the poison, but by no means compelling the conclusion that the blood is more than the vehicle.

* See an account of three cases of sudden death, with the appearances on dissection, by Thomas Chevalier, Esq., F.R.S., Medico-Chirurgical Transactions, Vol. I. p. 156.

If the nerves alone of a limb are left continuous, the poison is introduced without effect. If the soft parts of a limb, including or excluding the nerves, be subjected to constriction by a ligature, the inoculation below the ligature is also ineffective; on releasing the circulation the poison acts immediately. Thus a ligature upon the limb is used to prevent the action of the snake's poison. If the veins of a limb be intercepted and the limb inoculated below the ligature, the animal is unaffected by the poison; but the blood drawn from one of the veins and injected into the vein of a healthy animal, proves as destructive to it as if inoculated*. If the general circulation be relieved by venesection and diluted by the injection of water, and the vein below the ligature freely blooded, the ligature may be removed with impunity†. Again, if the circulation of two animals be identified by inter-communication of their carotid arteries and jugular veins, and one animal be inoculated, it is destroyed, while the other remains uninjured‡. If a poison be included in a tube between two ligatures in a vein or artery, and the circulation be restored by removing the ligatures, the poison which was in the first case inert becomes active, and this though the ligature removed be that nearest or farthest from the heart, and the vessel tied be situ-

* Vernière. Journal des Progrès des Sciences Medicales, 1827, III. 121.

† Ibid.

‡ Essay on the operation of poisonous agents on the living body. By Morgan and Addison, 1829.

ated in the neck or the hind extremity*. These facts clearly prove, first, that the motion of the blood is necessary to the action of the poison; secondly, that the blood is capable of conveying the poison; and thirdly, that it holds it only in a free and separable state until it has come in contact with the nervous fibre of the lining membrane, the action of the poison being then instantaneously evinced.

In the case of injuries there can be no question concerning absorption: the effect of the shock is suspension of the nervous power, the effect of remedies, where they can be brought to bear, is re-excitement and restoration of the nervous power. So it is with the poison.

The lining membrane of the blood vessels is continuous with the corresponding sides of the heart. The sentient properties of these membranes is pre-eminently adapted to be impressed by the introduction of foreign substances or alterations in the condition of the blood—their nerves are derived from the sympathetic or organic nervous system. Dividing the lumbar spine does not prevent the action of poisons†; i. e. it does not destroy the action of the sympathetic system. Tying the aorta does not absolutely arrest the circulation, and therefore does not prevent their action, unless introduced, as in Emmert's experiment, in parts situated below the liga-

* Essay on the operation of poisonous agents on the living body. By Morgan and Addison, 1829.

† Wedemeyer, quoted by Christison from Marx. p. 661; also Morgan and Addison.

ture*. Stopping the circulation, as in the ligature of a limb, locks up the poison inserted below it, and prevents its contact with the nervous centres; but it is not thus only that it prevents its fatal operation, but by locking up the nervous extremities and suspending their sensitivity.

If it be inquired why the poisoned blood concentrated below a ligature and transferred into the vein of a healthy animal proves destructive, while the blood of their common circulation affects only the one of two animals which is the subject of the inoculation, the answer is obvious—that either the mechanical impulse fails, or the activity of the poison is exhausted before, in the latter case, it reaches the second animal.

Upon the whole, I consider the final experiment of Mr. Morgan and Dr. Addison an experimentum crucis, as regards the hypothesis of absorption by the blood, and all above cited as incontrovertibly establishing the facts—that nervous impression transmitted in the case of poison, as it is transmitted in health, is the modus operandi of poisons;—that the blood may be the vehicle of introduction;—and that the susceptibility of the sentient extremities depends on its circulation, which is therefore indispensable to the action of the poison.

An important question remains, whether the action of poisons so admitted is general and diffused over the system, or is specifically exerted on particular organs.

* Dissert. Inaug. de Venen. Acid. Boruss. effectibus. Tubingæ. 1805.

If coma be the first symptom, the brain is supposed to be the organ; if tetanic spasm, the spinal chord; if direct syncope, the heart; if vomiting, the stomach, &c. There can be no question that particular substances act energetically upon particular organs, from our observation of the effects of medicines which are for the most part in their nature poisons, and it is well known that arsenic acts upon the stomach, though injected into the rectum or introduced into the cellular membrane; but then oxalic and the mineral acids, arsenic, and other corrosives, do not kill by chemically destroying the stomach or inflaming it to gangrene, but by inducing coma, mortal faintness, tetanus, &c.; and, in fact, they are most rapid when considerably diluted and when the stomach is least affected. "There is not," says Dr. Christison, "a better instance of the remote action of poisons than the oxalic acid. It has been already mentioned that concentrated oxalic acid is a corrosive, yet it never kills by destroying the functions of the stomach. Man, as well as the lowest animals, will live several days or weeks without nutriment. Now this poison has been known to kill a man in ten and a dog in three minutes. Neither does it always induce, when swallowed, symptoms of an injury of the stomach; for death is often preceded by tetanus or apoplexy or mortal faintness. Nor is the violence of the poisoning proportional to the extent of the local injury. In fact, death is most rapid under circumstances in which the stomach is least injured, namely, when the acid is considerably diluted."* A certain uniformity

* A Treatise on Poisons. By Robert Christison, M.D. Pro-

is observed in the symptoms set up by particular poisons; but the heart and intestinal canal have been found inirritable to galvanism in some cases and acting spontaneously in others; in some the left side has been empty, in other cases full, even where the same poison has been employed.

If truncating the arterial and nervous systems, as by tying the aorta, or dividing the spinal chord, be not a bar, as it is not, to the operation of the poison in equal times,—if poison injected by the femoral artery to the foot, or by the jugular vein to the heart, produces effects contemporaneous with its injection by the carotid to the brain, it is clear that the operation is diffused and not limited, and that the fatal impression travels over the whole nervous system with a celerity which defies the experimenter's observation as to the order of its effects by the succession of symptoms or the varying appearances post mortem, otherwise than as the phenomena may be those ascribed to the nerves of the great intercostal, or the spinal, or the cerebral system. For that the action is upon this or that organ or set of muscles amounts in fact only to this.

If the term sympathy is meant to imply a consentaneous, and not a transmitted impression, it is erroneous; the interval, be it more or less, measures the rate of transmission, and is as short in certain cases as an act of respiration; when the poison reaches the nervous centres the extinction of organic life is instantaneous.

fessor of Medical Jurisprudence and Police in the University of Edinburgh, &c. &c. p. 4.

The most curious observations of M. Bouillaud * and Mr. Morgan †, that the instant effects of a fatal poison may be modified by introducing more or less, and thus be stayed short of destruction; the interesting discovery that the effects of others may be overcome by the sustained injection of atmospheric air to the lungs (Brodie), and by the dilution of the blood of a poisoned animal (Vernière), are strong evidences in corroboration of their diffused as well as instant action upon the nervous system, and of the merely vehicular function of the blood. But the indivisibility and essential co-operation of blood and nerve to the entertainment of every vital function, frustrates all the devices and more or less embarrasses all the inferences of experimenters who labor to prove the predominance or prior agency of either; and it is next to impossible so to concert an experiment or draw a conclusion as not to admit a construction upon either hypothesis.

In such cases we are thrown upon general laws and collateral facts and analogies, and they derive additional weight from the circumstances. But though it has been fairly argued that it is unphilosophical to admit two methods of explaining a phenomenon when one suffices, it cannot be denied, that absorption by the blood may extend to the disintegration of it and its incapacity of so acting on the nerves as to entertain life, any more than that it may be the vehicle of a subtle poison, which, upon reaching the sentient nerve, is instantly diffused over the nervous system and puts a stop to its power.

* Archives générales de Médecine, 1826.

† Lecture on Tetanus, 1833.

Whether a poison acts on simple contact with the surface, or by inoculation, by inspiration, or by injection into the stomach or the veins; whether it is detectible or not in the mass of blood; whether it decomposes and renders the blood unfit to maintain life, or the blood is simply a carrier and undergoes no alteration, as evinced by its innocent introduction into another system after performing a round of the circulation in a poisoned animal, or its fatal effect when transfused prior to its circulation in the inoculated animal; it is equally to be explained by an action destructive of the nervous agent. The embarrassment of this inference has only arisen from the indispensable connexion just adverted to—the necessity of the circulation to the excitability of the nerve, and therefore to the action of the poison. When a ligature was tied upon the limb, six drops of prussic acid applied to a wound of the foot produced no impression, while in another animal, whose limb was not tied, the same dose caused death in two minutes and a half*. That the nervous mass and nervous trunks are not primarily concerned, is proved by the absolute non-agency of poisons directly applied to their cut surfaces†. And the difference in respect of activity of poisons introduced by this or that medium, depends either on the different quality or form of the poison, or the difference in the facility of access or susceptibility of one or another surface.

Thus then, it would be correct to say that there is but one principle on which poisons operate, viz.

* Essay on poisonous agents.

† Experiments of Emmert, Coullon, and Krimer. Christison, p. 660.

upon the nervous system; but many different media of introduction, as by the lungs, the cutaneous and mucous surfaces, the lining membrane of the alimentary canal and of the blood and absorbent vessels, and especially the blood itself; and though some may act without entering the blood, we must admit that many do enter it prior to their fatal operation; and further, that it is through this medium that their deleterious agency is first transmitted to the nervous system upon which they act destructively.

It does not invalidate the theory of the uniform operation of poisons upon the nervous system to shew, that they come into contact with it by different routes and in different intervals of time; that intensity more or less of quality in some, and a certain charge of the system by quantity in others, are circumstances necessary to the production of their effects. Neither does the interval, if but a few seconds, prove that the poison is not absorbed, for absorption is a process of paramount rapidity. Hering, of Stuttgardt, found a poison in the opposite jugular and the saphena vein of the hind leg in thirty seconds, and in the substance of the kidneys in one minute after injection into the jugular vein *. Krimer detected the hydrocyanic acid in the blood of the heart of an animal killed in thirty-six seconds by a few drops put on the tongue †. Nor, on the other

* Zeitschrift für die Physiologie, iii. 1. 81, quoted by Christison, p. 8.

† Journ. Complementaire, xxviii. 37. Christison, note, p. 660.

hand, does the long interval amount to proof that the poison does not act direct upon the nerves. How are we to explain the operation of many diseases, as assuredly fatal from their establishment as if they occupied but a day or an hour, which we see protracted for months and even years, but by the gradual destruction of the nervous principle, when their termination is but in exhaustion, independent of any sudden or recent change? The slow effects of mercury, opium, lead, arsenic, and such medicines in general as are said to act by accumulation, are similar to those which over-doses of the same produce, with the allowance to be made for gradual impression, and for the unceasing diminution of the patient's powers after such impression is confirmed. A substance which in fact only becomes a poison when accumulated in a certain quantity, may require to be concentrated upon or diffused over a certain district of nervous surface before its special deleterious action on the system is manifested.

It may require time to evolve its noxious elements, or may slowly and unobservedly impair the energies of the nervous system before its specific effects are developed. The disease known by the name of delirium tremens, the mania of drunkards, is an example of the reflected irritation set up by alcohol, as true as the slow change produced by conversion or deposit in the parenchyma of the liver. So also are the constitutional effects of opium when carried to the habitual excess which constitutes abuse, as evinced by the symptoms of pallor, tremor, vigi-

lance, alternate excitement and despondency, destroyed appetite, disordered sensation, imagination, and even moral perceptions. The effects of mercury acting as a poison are well illustrated in the following extract:—

"Two marked examples of the effect of the poison of mercury on the constitution occurred about the same time, the one, however, more severe than the other. Both these patients were employed in silvering mirrors, and in applying the amalgam to the concave surface of convex mirrors, had been under the necessity of retaining the hand immersed in mercury for a long time daily. After being engaged a few weeks in this employment, they were altogether disabled from work by the paralytic tremor and debility which ensued. The one who was most severely affected had quitted his work about three weeks before I saw him, at which time he had suffered a moderate degree of salivation, which had now disappeared. The principal affection under which he now labored was not, as has been sometimes described in these cases, a constant tremor of the limb and see-saw of the head, such as occur in old paralytic persons, but a sort of rapid convulsive agitation of the limbs whenever the act of volition was exerted upon the muscles, which moved the extremities quickly in all directions except that which the will prompted. Thus he could sit on his chair still and nearly unmoved; but the moment he got up and attempted to walk, his legs began to dance as it were in despite of himself, and performed very rapid and irregular motions with so much violence as to compel him to drop on his chair

again, or to throw him down. Somewhat similar motions were performed by his arms if he attempted to use them, so that he was unable to carry any thing to his mouth, and the smallest quantity of liquid was immediately dashed out of any vessel from which he made an attempt to drink. He was under the necessity therefore of being fed like a child; his articulation was also rendered somewhat indistinct. These spasmodic tremors, however, were greatly increased by any circumstance that agitated his mind or occasioned any anxiety. His bowels were constipated, and he complained of much pain in his limbs and loins, which, together with the muscular agitations, rendered his sleep very imperfect; he frequently awoke, starting and frightened, and was troubled with incessant unpleasant dreams. The appetite was good, and the pulse apparently natural, although it was at first difficult to ascertain its beats in consequence of the tremor of the tendons which came on when his attention was directed to his arm for the purpose of feeling the artery. He complained much of a general sense of great debility, and of being startled and flurried by slight causes.

"Many instances of this state of body, induced by an impregnation of the system with mercury, in various artisans, but especially in water-gilders as they are called, and in those who are occupied in the mines which produce mercury* have been recorded;

* "An account of the effect of the mercury on the labourers in the mines of Friuli, in the Venetian States, was given in the Philosophical Transactions for April, 1665."

and they are familiarly known to practitioners in large towns."*

The poisonous operation of arsenic, lead, copper, and other metals, is observed among the artisans employed in working them, and sometimes from their incautious exhibition in medicine. I saw a case several years ago, in which the absorption of arsenic from an extensive fungous ulcer of the leg, which was sprinkled with the white oxyde and calamine in the form of a fine levigated powder, produced vomiting and alarming gastritis, and this being relieved, proved eventually fatal by a series of anomalous symptoms, among which were destroyed appetite and digestion, hectic emaciation, and bullæ on many parts of the cutaneous surface†. But it is superfluous to say more on this subject, than that by incautious or too continued exhibition, the articles in constant use in medicine, from the vegetable as well as mineral kingdom, viz., colchicum, digitalis, &c., are capable of producing and do occasionally entail consequences more formidable than the diseases which they were employed to cure.

The following description of the slow operation of arsenic is extracted from the admirable Treatise of Dr. Christison, a perusal of which leaves little to be desired on the subject under consideration.

"In the present place may also be considered the

* Edinburgh Medical and Surgical Journal, Vol. VIII., Report of the Carey Street Dispensary.

† See a case by Roux of the directly fatal effect of arsenical paste applied to an ulcer of the breast. Elémens de Médecine Operatoire, Première Partie, p. 63.

supposed effects of the celebrated aqua Toffana, or acquetta di Napoli, a slow poison, which in the sixteenth century was believed to possess the property of causing death at any determinate period, after months, for example, or even years of ill health, according to the will of the poisoner.

"The most authentic description of the aqua Toffana ascribes its properties to arsenic. According to a letter addressed to Hoffman by Garelli, physician to Charles the Sixth of Austria, that emperor told Garelli, that being governor of Naples at the time, the aqua Toffana was the dread of every noble family in the city, and when the subject was investigated legally, he had an opportunity of examining all the documents,—and that he found the poison was a solution of arsenic in aqua cymbalariæ. The dose was said to be from four to six drops. It was colourless, transparent, and tasteless, just like water. Its alleged effects are thus eloquently described by Behrends, a writer in Uden and Pyl's Magazine: —'A certain indescribable change is felt in the whole body, which leads the person to complain to his physician. The physician examines and reflects, but finds no symptom either external or internal,—no constipation, no vomiting, no inflammation, no fever. In short, he can advise only patience, strict regimen, and laxatives. The malady, however, creeps on, and the physician is again sent for. He infers that there is some stagnation or corruption of the humors, and again advises laxatives. Meanwhile the poison takes firmer hold of the system; languor, wearisomeness, and loathing of food continue; the nobler

organs gradually become torpid, and the lungs, in particular, at length begin to suffer. In a word, the malady is, from the first, incurable; the unhappy victim pines away insensibly even in the hands of the physician; and thus is he brought to a miserable end through months or years, according to his enemy's desire.' An equally vigorous and somewhat clearer account of the symptoms is given by Hahnemann. 'They are,' says he, 'a gradual sinking of the powers of life, without any violent symptom,—a nameless feeling of illness, failure of the strength, slight feverishness, want of sleep, lividity of the countenance, and an aversion to food and drink, and all the other enjoyments of life. Dropsy closes the scene, along with black miliary eruptions and convulsions, or colliquative perspiration and purging.'

"Whatever were its real effects, there appears no doubt that it was long used secretly in Italy to a fearful extent; the monster who has given her name to it having confessed that she was instrumental in the death of no less than six hundred persons."*

The operation of the poison of rabies canina involves points truly problematical, on which, notwithstanding the numerous examples on record, and the voluminous tracts which have been written, we are still very imperfectly informed. The disease is communicated by the saliva of the rabid dog, independent of the form of wound, and active only when introduced by the external surface;—the contagion is of the fixed species, i. e. propagable only by inocula-

* A Treatise on Poisons, by Robert Christison, M.D., p. 287.

tion. It is communicable by the froth or foam gathered after death from the mouth of the dead animal, within a period of twenty-four hours. Mr. Youatt informs me that a silk thread drawn backwards and forwards through the mouth, and thus charged with the saliva of the rabid dog, inserted as a seton in the skin of the nape of a sound dog, probably communicates the disease to one or two in six; but that the bite of the infected dog or dogs would certainly communicate the disease to all.

Mr. Cline and Sir Astley Cooper both failed in several attempts to communicate the disease by inoculation to different animals; the first with the saliva of a hydrophobic patient, the second with that of the rabid dog*. These facts shew the delicacy and rapid decomposition of the poison by the atmosphere.

It is also communicable in a certain proportion (about two in eleven) by the injection of the blood of the rabid animal into the cellular tissue of a sound one. About twenty-four in a hundred dogs were affected with true rabies by the several modes of express inoculation—a bite, and the injection of blood under the skin. Dr. Hertwig, veterinary physician, of Berlin, the authority I refer to, communicated rabies to a dog with the saliva of a man who had died of hydrophobia; and this dog communicated the disease by biting two other dogs. "The morbid matter produces, in the dog, no perceptible effect, either local or general, till the malady breaks forth. The wounds heal like other lacerated wounds. The disease breaks out in

* Babington, in Medical Records and Researches.

the dog within fifty days after the inoculation. It does not always assume, in inoculated animals, the same form as in the animal from which it is communicated."* Death is commonly preceded by gradual exhaustion of the strength. From six to eight days is the ordinary duration; some animals die sooner, and others live ten days.

With regard to morbid appearances, the subcutaneous veins are full, the brain and spinal chord turgid with blood. The stomach is generally more diseased than any other organ. Its outer surface dark red, its inner surface, particularly near the pylorus, dark, sometimes cherry red, looser and thicker in texture than natural; and contains mucus and various indigestible substances, both hard and soft. Patches of color are sometimes seen upon the intestines, inside and out, as in the stomach, particularly the duodenum. The larynx, epiglottis, and ventricles, often red, sometimes not; trachea and bronchia the same. Lungs much loaded with blood, sometimes inflamed in patches. Heart and great vessels natural. The eighth pair of nerves, the great sympathetic, and the phrenic nerves, are not affected. This is the result of nearly 200 dissections, examining the collateral appearances in healthy dogs at the same time. "I must confess," says Dr. Hertwig, "that with all the pains I took, I have been unable to discover any constant change of structure, or one peculiar to rabies." The grand total of dissections of the human subject

* Contributions towards a better knowledge of Rabies Canina. Hufeland's Journal, 1828. Edin. Med. and Surg. Journal, Vol. XII.

amounts to just as much, and no more. I have examined, or been present at the examination, of a few human subjects, and of several rabid animals, and found nothing but such appearances as the circumscribed patch of inflammation of the larynx, stomach, and intestines, turgescence of vessels of the brain and chord, arachnoid effusion, &c., but no permanent appearance to throw any light upon the disease; for such appearances are as strictly those of the symptoms, as the indigestible matters contained in the stomach.

I have seen the disease in a child of five years, in a woman turned seventy-four years, and at various intervening ages. Two of the most severe cases which have fallen under my observation, were from the bites of cats.

I have not met with any trustworthy record of its cure, nor do I believe such a one exists, or that any article of the Materia Medica is at this moment known to possess the least control over the disease. The mock disease, of which I once witnessed a strongly marked example in Guy's Hospital, might impose upon persons who had not seen the genuine case. Yet the symptoms of the real disease evince no inconsiderable variety, if it do not present the two forms observed in the dog, of fierceness and mildness. Some are marked by sullenness and mental despondency, others by wildness and suspicious vigilance; and the terror and aversion produced by liquids is so far from being always present in the same degree, that some patients have actually dabbled in water, drank copiously, and desired to drink incessantly;

again, some have been altogether without tetanic spasm or general convulsion. Difficulty or pain in performing a natural function is sufficient to produce a mental association of dread or aversion to its performance. Thus dysphagia, dysuria, and dysmenorrhæa, operate upon a healthy nervous system. The origin of the dread of fluids as a symptom, is partly to be explained upon this principle, applied in the case of a highly morbid nervous system, which the motions of an attendant, the passage of an insect, even the currents of the atmosphere, and the undulations or sound of a fluid, throw into convulsions.

The records of medicine abound with histories of this disease, many of them well authenticated and detailed with great minuteness and vividness of description; others, altogether wanting in these characters, are rather gratuitously assumed than proved to be examples of it, in exemplification of the virtues of a supposed remedy, or coupled with the most groundless and extravagant opinions. I think it would be easy to show that the cases reported by Nugent, Tymon, Shoolbred, Wynne, Houlston, Moseley, Brera, and others, as having yielded to venesection or mercury, were not examples of the disease, but the dread of it, either in the patient or his attendant; or of some inflammatory spasmodic affection; but the object of further analysis is superseded by the facts since established upon a large scale, that both these supposed remedies are good for nothing. And the same may be said of all the reported cures.

It would be labor lost to discuss certain absurd opinions which have been propounded concerning

this extraordinary disease; e. g. that it is to be ascribed to the form of wound inflicted, and might be communicated by a healthy animal infuriated at the moment; that it is an effect of mental terror, and not the result of a specific virus; not to mention the strange accounts of the patient's propensity to bark and bite, which we still read in newspapers, or the communication of the disease to an attendant whose face was besprinkled by the patient's saliva, or by the act of kissing, or biting off the thread after sewing a torn vestment, sucking the wound, and more of the like kind.

Dr. Hamilton gives the eleventh day as the earliest, and nineteen months as the latest period known of the accession of symptoms*. The period of survival ranges, according to Dr. Bardsley†, from thirty-six hours to six days after the accession of symptoms. A small proportion only of persons bitten by dogs actually rabid take the poison. One out of twenty persons bitten by the same dog, had the disease, as stated by Dr. J. Hunter‡; Hamilton states the proportion at one in sixteen. Two practical points, which are of the last importance, are now well established; first, the necessity of a free excision of the bitten part, or the destruction of it by a quick and powerful caustic, whenever the animal is unknown; or, being known, is in any manner or degree morbidly affected or unlike himself. Second,

* Hamilton on Hydrophobia, Vol. I.

† Manchester Memoirs, Vol. IV.

‡ Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. I.

the efficacy of this practice at any period prior to the appearance of symptoms. I have not known one case of rabies in which this practice has been adopted, but have known several attesting its value.

A case is however recorded by Mr. Oldknow, of Nottingham, in which excision and free cauterization did not prevent the accession of the disease, which appeared on the forty-sixth day. The following fact has also been stated to me on good authority. Two gardeners were bit at the same time, by the same dog, in the neighborhood of Islington; one took alarm and got the bite excised by a well known hospital surgeon two days afterwards: the other was hardy, ridiculed his fellow-laborer's fears, and did nothing. The gentleman who related the case to me happening to see the latter and hear this story, a fortnight after the injury, examined the recent cicatrix in the fleshy part of the man's thumb, re-opened and destroyed it with caustic; he took no harm; his comrade fell a victim to the disease in the sixth week. It is needless to add, that if there be any accuracy in the computation above stated, this man was placed in comparative safety by his companion taking the malady. So in the striking case related by Dr. Marcet, in the first volume of the Medico-Chirurgical Transactions, the patient's master was bitten by the same dog, and escaped. Of several persons bitten by a dog in passing through a village, I have known one only take the disease; and many similar instances are recorded. But this and all fortuitous circumstances, such as the clothing of the part or its nakedness, and the greater uncertainty of communication to the human subject than to an animal

of the same species taken into account, the evidence of the insulation of the virus in the wound, furnished by the satisfactory results of almost all the cases in which excision has been performed, is such, that no argument can avail against its efficacy as a preventive, or rather no apology can be admitted for its neglect.

Many years ago, a timber merchant was bitten in the leg and thigh by a mastiff in Whitechapel, which a quarter of an hour afterwards flew at a chimney-sweeper, and bit him in the face. I was called to the merchant, and found the bites penetrating the fascia. I excised the parts freely, and washed the bottom of the wounds with strong nitric acid. He is still alive and well. The sweep was carried to a hospital, where the surgeon treated the case lightly; excision was not performed. He was attacked with the disease, and died in a month after his admission.

The following is part of a communication to me on this subject, from my valued friend, Mr. Hodgson, of Birmingham.

"The efficacy of excision of the bitten part at any period before the accession of symptoms is illustrated by the following fact, which occurred in my own practice. A dog on the same day bit a child, and subsequently a man, the man immediately destroyed the dog. A few weeks afterwards the child was attacked with hydrophobia, and died. After the child was seized with the symptoms of hydrophobia, I cut out the bitten parts in the man's arm. The disease did not occur in the man, although he had been exposed to the fullest chance of taking it, his arm being

bare at the time of the bite, and as was proved by the occurrence of the disease in the child, the dog being certainly at that time in a state capable of communicating it. The appearances which have been described as existing in the stomach and spinal chord of persons destroyed by hydrophobia, are not peculiar to that disease. I am not acquainted with any case upon record in which hydrophobia occurred after the bitten parts had been freely excised at any period before the accession of the symptoms."

Case. A little boy was bitten in the lip by a domestic terrier with which he was playing. The father sent for me in much anxiety, as the dog was pronounced distempered. I directed the dog to be sent to Mr. Youatt, and immediately performed an operation similar to that for hare-lip on the child, the bite having included the substance of the lip. The father was taunted by his friends for having submitted his son to the operation on my opinion, which rendered him more uneasy and dissatisfied on this account than he had before been alarmed for his child's safety. The following report, however, effectually calmed his mind. My patient is now a very fine young man, a student at Cambridge, and the line of the incision, though a considerable piece was removed, scarcely perceptible.

Mr. Youatt's Report. "The brain presented no morbid appearance. The tongue was very slightly and indeed scarcely perceptibly discolored. The pharynx presented evident but not intense inflam-

mation, and the rima glottidis was surrounded by a faint tinge of red; neither the trachea nor the œsophagus presented the slighest inflammation.

"The blood-vessels on the external surface of the great curvature of the stomach were very turgid, and indeed in all the vessels the blood was almost perfectly fluid. The stomach contained a mingled mass of undigested meal, and substances (principally hair and straw) perfectly indigestible, and throughout the whole of its inner surface was exceedingly inflamed—a very few of the rugæ only retained any thing approaching to their natural color. This inflammation extended down the intestines to rather more than half the ileum, where it began gradually to abate, and was soon completely lost. The mucous and not the peritoneal coat of the intestines was chiefly affected. The lungs on both sides were of a uniform beautiful rose color, and crepitated much.

"Such, Sir, is the history of the dissection of your dog. The medical gentlemen will draw their own conclusion; I have sent the stomach and fauces for their inspection. Although I acknowledge that the case is somewhat singular, and many of the usual symptoms of rabies were wanting during the animal's life, and some of the characteristic marks on dissection were not so evident as they sometimes are, yet I feel no hesitation in deciding that the dog was rabid.

"I ground this opinion upon his having actually bitten a child, a dog, and a fowl, the perfectly characteristic howl, the peculiar delirium, the imaginary objects that floated before his eyes, his death about

the time that rabies generally has its termination. The circumstances alone would be almost satisfactory, and they become perfectly so, when on dissection I find the inflammation of the pharynx—the intense inflammation of the stomach—the peculiar one of the intestines, evidently propagated from the stomach, and gradually lost in the ileum, and particularly the existence of indigestible substances in the stomach, which I have never found, and I believe never were found, in any other disease, except perhaps occasionally in the stomach of a playful puppy.

"I am glad that the operation was promptly performed; with that all danger ceases, and I trust that no foolish and ignorant persons will be permitted for a moment to disturb your mind, or that of any of your family, or induce you to resort to ridiculous, and perfectly inert and useless preventives. The knife of the surgeon is the only preventive. That I have no doubt has been judiciously applied,—it is an absolutely certain preventive. *Your child is as safe from the disease as if nothing had happened.*

(Signed) "W. YOUATT.

"Nassau Street, Middlesex Hospital,
10 June, 1818."

The sister of George's ward in St. Thomas's hospital was bitten by her cat in the fore-arm, and somewhat reluctantly consented to have the part bitten excised and the wound cauterized by Mr. Henry Cline, forty-eight hours afterwards. To demonstrate the condition of the cat, this gentleman secured her in a cage, and exposed a rabbit to her at the bars, which

she instantly bit in the ear, and with fury. The cat died within twenty-four hours. The rabbit was the subject of true rabies, and died in the sixth week.

The following is a copy of a letter addressed to Mr. Hodgson by a gentleman at that time under considerable anxiety on account of his child, who had been bitten by a strange dog.

"London, Aug. 10th, 1818.

"Mr. Cline speaks so positively as to the point that a dog cannot communicate hydrophobia by his bite, unless he is himself at the time of the bite under the influence of canine madness, and is also so confident that when that disorder has once seized on a dog, he can never recover from it, nor survive many days, that it would be a satisfaction to me if you would consider that point further. Cline thinks the case you mentioned of a person dying of hydrophobia after being bitten three weeks, whilst the dog lived six weeks after the bite, must have been inaccurately observed. If you should have an opportunity of enquiring further into it, and of ascertaining on what authority the fact, as it is stated, rests, I should be much obliged by its being done, as all facts, the accuracy of which can be relied on, are of great importance in this obscure disorder. If it should turn out that this case cannot be authenticated, the opinion given so positively by Cline would afford great satisfaction to me. Madness in dogs is, according to his observation, a disorder more distinctly marked than almost any other, and one that cannot be mistaken by any one who has once observed it,

and unless a dog has this disorder either in its violent or an incipient state which will rapidly advance to it, he is confident such dog cannot communicate hydrophobia. He is therefore entirely opposed to the opinions as to the ill-defined or vague distinction between this and other disorders in dogs, and as to its doubtful origin in men, and considers those instances which have been given of the contrary, never to have been well authenticated."

Sir Astley Cooper gave the subjoined opinion in this case.

"No dog can communicate the disease which has not the symptoms at the time of his inflicting the bite.

"No dog will live more than a week, having the hydrophobia, in a state capable of communicating the disease.

"The removal of the parts is effectual at any period prior to the appearance of the symptoms.

"The child in question is, in my belief, perfectly safe.

"A. C."

As regards the practice of excision or cautery, it admits of decision only upon negative premises, but the proportion of escapes is differently estimated, and varies according to circumstances. Of twenty-three persons bitten by a wolf in the department of the Isere, in May 1817, fourteen died. Of thirteen persons bitten by a wolf in the neighborhood of Crema, on the 1st November 1804, nine died, and four escaped, neither of them being subjected to excision or cautery.

The tenth bitten was the first who perished*. The question whether the dog may communicate the disease before exhibiting its symptoms, as in a case stated by Dr. Alex. Thomson and Mr. Frankum before the Committee of the House of Commons, and that these may not be manifested until several days, even so late as the tenth after the infliction of the bite, as happened in a case mentioned by Mr. Oldknow in the paper before quoted, is one which can only be decided by the veterinary authorities†. The possibility, however, of such a case, only renders the prophylactic measures more imperative in the case of every strange dog. The real way in which to approach to an accurate judgment of the value of excision, would be to subject to it every individual of a given number of dogs bitten by one that was rabid, and note the result. The difficulty of doing this is that of discovering in all cases with certainty, in the dog, the existence and situation of a wound‡.

I could present the reader with several original and well marked cases of the disease, but refrain, as they present no fact in addition to those already well known and often recorded. The following, of very recent occurrence, I publish on account of the post mortem appearances, as ascertained and reported with accuracy by my son, who conducted the examination

* Commentario Clinico per la cura dell' Idrofobia. Brera in Mem. Soc. Scienz. Modena, Tom. XVII.

† Cases are not wanting, such is the credulity of some narrators, in which the animal has survived the malady, or has not been the subject of disease at all.

‡ See Mr. Youatt's evidence.

at my request, having collected the brief history from the medical attendant.

CASE. April 15th, 1835. A lad, aged eight years, was bitten by a puppy, in the neighborhood of Somers Town, on the inner and upper part of the right arm, about three months ago. The marks of the dog's teeth are visible externally. On the evening of Sunday, the 12th of April, he ran to his mother, complaining of pain in the head and tenderness of the axilla on the affected side. In the course of Monday morning, he was attacked with spasm, increased by the effort of deglutition, and other hydrophobic symptoms. These were treated by doses of hydrocyanic acid, and a blister along the spine; the exposed cutis being subsequently covered with an ointment containing acetate of morphia. A slight intermission occurred towards evening, but on Tuesday morning early the spasms recommenced with greater violence than before, and the child died within twenty-four hours of the occurrence of spasm, and about thirty-six hours after the first symptoms of indisposition.

EXAMINATION, 26 hours after death. Head. Vessels of the pia mater much loaded, particularly the veins and the various sinuses. Substance uniformly softened, so as to be easily miscible with water. Numerous vessels in the white structure containing red blood. The pons varolii, medulla oblongata, corpus striatum, and thalami, severally morbidly soft and vascular on section, particularly toward the centre. On laying open the theca vertebralis, the pia mater of the chord appeared

as if minutely injected. The lumbar and lowermost dorsal division of this structure was softened and pulpy, so as to be quite insusceptible of division with the knife. The cervical portion was much firmer, but its structure, in common with the filamentous origins of the nerves, was distinctly and considerably reddened. So also were the roots of the nerves passing to the brachial plexus; and here was found, in the centre of the chord, a delicate areola of vessels, occupying the place of the gray matter; an appearance which could not be detected lower down in the structure, upon repeated transverse section.

Chest. Lungs crepitated as in health; in common with the right side of the heart, they were much gorged with venous blood. The intercostal ganglia and the eighth pair within the mediastinum seemed to have undergone no change.

Abdomen. Stomach corrugated partially, as after sudden death; and containing very offensive matters. The cæliac ganglia were uniformly reddened; but their degree of morbid vascularity it would be difficult to determine, since this appearance is, to a certain extent, normal during childhood. With the exception of the spleen and intestinal canal, all the organs were loaded to congestion with venous blood. The cavity of the pharynx and upper laryngeal opening, also the bronchial membrane, were acutely inflamed. This condition did not extend to the œsophagus. The tonsillitic and the mucous glands situated at the base of the tongue, were enlarged to an extraordinary extent, and acutely inflamed.

The puppy bit, besides this poor lad, two dogs and a horse. One dog and the horse died; the dog within three weeks of the bite. The other dog continued well, but has since been destroyed.

On the subject of remedies for hydrophobia I shall only observe, that neither of the long catalogue proposed and tried are entitled to the smallest confidence. The fabulous accounts of a sublingual pustule, a depôt of the poison, the removal of which was an infallible cure in the Ukraine, and the vaunted efficacy of remedies which assumed the credit of cure, as it seems, solely because they were administered to persons bitten, who had a dislike to the bath, and could swallow wine but not water with readiness, should put us on our guard against imposition, whether of ignorance or design. On the other hand, it is more than probable that a remedy exists, though undiscovered, and we should be careful not to suffer experience to assume the shape of prejudice, and close our minds against the results of dispassionate observation, or relax our activity in search of an antidote.

The injection of the veins with water after depletion, and even the injection of morphia, have proved utterly inefficacious, though the latter is reported to have procured a cessation of spasm for several hours. The narcotic poisons, especially opium and belladonna, have been carried to a dangerous if not fatal extent, and venesection and prussic acid have, in my belief, anticipated the crisis of the malady. Lead, iron, arsenic, musk, camphor, ammonia, chlorine, cantharides, the guaco, the genista, cold affusion, the sea-

bath, the oil-bath, and others, are entitled to no higher confidence than the famous Ormskirk composition of oyster shell-powder and Armenian bole.

If poisons tending to produce similar symptoms are to be remedial, according to the doctrine of Hahnemann, or the opposite, according to that of Morgan, there is every probability that each principle will be fully tried, the practitioner having no better clue to guide him than that offered by the operation of the poison itself, in behalf of others which display the most rapid and decided effects upon the nervous system. At all events, chemical neutralization is not the explanation of the influence of ammonia, chlorine, and cold affusion in the cases of poisoning with hydrocyanic acid, or of eau de luce and brandy in the bites of the cobra and rattle-snake. The effect of artificial respiration in persons asphyxiated, and, as in Mr. Brodie's experiment, to carry the animal over the deleterious action of so powerful a poison as the woorara; the effect of this poison to paralyze, and that to convulse, are data which seem to afford some promise to pathologists.

As regards the modus operandi, there seems no good reason, in the case of the hydrophobic poison, to question the application of the principle laid down by Messrs. Morgan and Addison. The following conclusions are, I think, fairly warranted.

1st. That of many persons bitten, a part only receive the virus.

2nd. They who receive the virus and allow it to remain, never escape the disease.

3d. The virus is localized during a period of un-

certain duration without affording any indication of its presence. In this respect it resembles the matter of small-pox, cow-pox, plague, syphilis, &c., and conformably to the laws regulating these poisons it requires a process of incubation before it sets up its peculiar action; it varies only in the uncertainty of the interval, which in them is more definite. It is therefore localized, not by the operation of mechanical causes, but by its primitive incapacity to affect the system as a poison. For it is not the original virus of which the dog's saliva is the vehicle, which does or can communicate the disease,—this is but the fomes of the contagion,—as the virus inserted by inoculation in the case of small-pox, or the matter of chancre in syphilis. In the best authenticated cases certain signs of restlessness in the part wounded have immediately preceded the outbreak of the symptoms, and the same is invariably observed in the dog. Its primary and local action is upon the nerves; of which pain and perhaps slight redness are the signs, but not those of absorbent or glandular inflammation.

4th. The activity of the poison is evinced from the moment of its introduction into the circulation.

5th. At any time prior to this event the practice of excision or destruction of the part in which the virus is resident is an effectual preventive.

6th. The specific action of the poison upon the nervous system is coincident and commensurate with its application to the nervous centres.

I know of no better statement of this physiological phenomenon than is given in the following animated passage.

"What then is this virus? It has never been

analyzed. That would be a process difficult to accomplish. It is not diffused through the air, nor communicated by the breath, nor by any effluvia, nor even by actual contact, if the skin be sound. It must be received into a wound; and there it lies dormant for a considerable but uncertain period, and longer in some animals than in others.

"It remains perfectly undecomposed. The absorbents are actively at work in removing everything around. The capillary vessels are depositing fresh matter, but it seems to remain the same. Whatever else is useless or would be injurious is taken up, and the tissue on which the virus rests is modified or changed; but this extraneous and fatal body bids defiance to all the powers of nature.

"It enters not into the circulation, or it would necessarily undergo some modification in its passage through the innumerable minute vessels and glandular bodies which are scattered through the frame. It would excite some morbid action, or if it were not thus employed, or in the purposes of renovation or nutrition, it would be speedily ejected.

"Whatever be the modus operandi, the parts in contact with the virus at length respond to the stimulus applied to them. The cicatrix generally begins to itch, and inflammation spreads around it. The diligent licking of some part where the mark of a bite can be traced, is an early and frequent symptom of rabies in the dog. The absorbents are now called into more powerful action, a portion of the morbific matter is taken up and carried into the circulation.

"At what period of time does this fatal activity

commence? It is different in different individuals and different animals. While the rabid virus lurks in the frame, any thing that produces considerable excitation in the system may rouse it to action. There are several instances of this in the annals of human medicine. If the pregnant bitch becomes rabid, it is within two or three days of parturition. The bitch not in pup is often attacked during the period of œstrum." *

* Youatt on Canine Madness, London, 1830.

CHAPTER VI.

SUMMARY.

CONCLUSIONS, PATHOLOGICAL AND PRACTICAL.

THE impregnation of the blood with the nervous principle, I believe to be as essential to the maintenance of life, as its impregnation with the oxygen of the atmosphere, whether we regard nourishment, the production and maintenance of animal temperature, or the diseases incidental to its morbid conditions. The action of blood so endowed upon the solids of the body, is essential to their action and reaction. The mechanical contrivance of the blood's distribution is subordinate to its due preparation to nourish and excite the nervous organ, and through this indispensable medium, all the organs of which the body is composed*.

* It will sufficiently appear, from a perusal of former parts of this work, that I do not separate, in my view of the subject, the motive power of muscles from the nervous agent. The heart's action discerned at the earliest period of fœtal life, and the action of the respiratory muscles coeval with its independent existence, are conditions inseparable from a certain nervous endowment. It solves no difficulty, but rather creates one, to imagine an independent motion, by whatever term designated.

It is therefore impossible to contemplate the phenomena of life in health, or in disease, beyond the circle of the reciprocal influences of the nervous and vascular actions. The adjustment of quantity and distribution is depending on this reciprocity, as may be inferred from what we see of the effects of its interruption. The influence of the nervous system over the capillary circulation is illustrated in the inflammatory affections of the sentient surface and the reticular membrane of all parts; and of the origin of nervous affections from, and their dependence upon, the state and variations of the capillary vascular apparatus, the proofs are innumerable.

resident in any structure. The reaction of the nervo-muscular solid upon the innervated blood, or that which is duly prepared by the nervous agent, supersedes the unphilosophical hypothesis of an independent motivity of tissue. And it is no real refutation of this statement to cite the examples of a continued or a renewed action of the heart detached from the body by aid of external agents, the nature of which has some affinity to that of the nervous agent. If it were independent of the nervous supply, why is there so brief a term to the duration of this action? We are as ignorant of the intimate structure of muscles as of nerves, and of the connexion between them. Some have supposed muscles to be the actual seat of disease in spasmodic and convulsive affections. We know that muscles are depending on nerves for their sensitive and their acting powers, and it would throw no new light on the nervous agent to demonstrate, that each muscular fibre was a nervous chord modified in conformity to its office and properties, since the division of its nerves paralyzes and their irritation throws the muscle into spasm, and, in common with all organs, the circulation of the living blood is essential to its phenomena.

All the phenomena of health and disease, confirmed by the results of experiment and observation, turn upon these fundamental reciprocities. Spoil the blood, or in any way interrupt or disturb the nervous or vascular action, and you have changes corresponding to the first cause of disturbance, its nature and extent, in the associated systems, whether the change be limited to the capillary system and sentient surfaces, or extend to the centres of the nervous and vascular systems.

The phenomena of irritation admit of explanation only on the hypothesis of a disturbance in the balance subsisting between the nervous and vascular actions. In disease they are seldom, if ever, uniformly and permanently exalted or depressed in a corresponding ratio; if it were so, diseases might be more simple, but they would be more destructive. A disturbance, therefore, of the relation subsisting between the vascular and nervous actions, is the theory of constitutional irritation.

Now notwithstanding the intimate mutuality above insisted upon, it appears to me that a large and important class of diseases originates in the nervous system, contradistinctly to those in which the vascular is primarily implicated; and that this distinction obtains in a degree sufficient to enable us to refer them to their fountain head, and thus to discriminate organic and functional affections, as well as to enable observant pathologists to appreciate the reciprocal influence of the two systems where the combination prevails, and to analyze and trace symptoms to their real source. Treating of any one division of the

economy, unavoidably involves the remainder more or less, so utterly incapable is any portion of a separate existence. Yet this should not lead us to confound the secondary with the original malady—or that which is eventually set up in other systems and parts with that which first received the morbid impression. Neither should it operate to prevent our detection of that which is functional only,—the existence of which the instant anatomy of the part would fail to recognise—and its characters of distinction from those of organic change. Some organs reflect so instantaneously and seriously the injuries of others, that they are not only the first to rouse the patient's attention, but continually mislead him, and sometimes, it is to be feared, his physician, to suppose the responsive organ or symptom to be the source of the real malady.

It may be questioned whether in any case of organic change that ever occurred something of previous indication has not transpired, though often overlooked, which might have announced the change sooner or later to take place, and of this announcement the nervous system alone could be the medium. In the greater number of cases such indications are too obvious to escape notice. Functional irregularities constitute the demonstration of organic disease, but they may not be limited to the organ, nor even to the system, which is the seat of the disease, and it is thus that symptoms become complicated, organic disease entailing functional disorder, direct and indirect, immediate and remote. This observation ap-

plies with equal accuracy to those physical alterations of structure which are the result of injury, and amount in fact to a proof of its truth. Certain temporary organic conditions, as loaded bowels, the presence of foreign bodies, vascular congestions from any cause, exhibit an analogy to structural changes in their tendency to produce functional disorder, and continued functional disorder leads up to organic change.

Functional diseases, a very large and important class, belong to the nervous system, organic to the vascular; and either may set up the other. From this it results that they are in one case symptomatic, in another original. As soon as the organic change amounts to a disturbance of the natural relations of the two systems, functional disorder, symptomatic of such disturbance, is set up in the nervous system. The point at which the functional becomes organic is when the vascular system takes up the morbid action. This action is not of necessity inflammatory; we have shown that many changes are not primarily of that character, they may be of excess or defect, of the arterial or venous, exhalant or absorbent side of the circulation, and a corresponding variety is exhibited in the functional affections symptomatic of organic disease. The great sympathetic system of active yet unconscious life, over which the will has no control, which is not only the combiner, but the preserver of the unities of properties and actions in the combination of the several nervous centres, that prevents their mutual collision and interrup-

tion, is the instrument of these changes. But though independent of direct control, it is open to all the influences, moral and physical, of which the sentient and intelligent being is susceptible, and by these it makes its disordered actions manifest. Enquire into the origin of established maladies, and it will not be difficult to trace them to some source of predisposition, if not actual suffering, mental or bodily. The female system especially, as society is constituted, exhibits melancholy examples of the tendency of constraint, moral and physical, to the institution of organic disease; an evil not less than the opposite extreme, incidental to an artificial state of existence, and augmented unhappily in the ratio of its refinement. The remedy appears to be equally beyond the reach of the moral and political philosopher.

To resume: we have seen that functional disease continually runs its course to a fatal termination in the severe affections of the nervous system which we have been lately considering, without inducing any actual change of structure. The truth is, its disorders are not embodied to our observation in permanent phenomena as those of inflammation; they are presented only, as are the functions of the system to which they belong, in the language of sensation, expression, action, modified or perverted by a morbid influence; but that it is a language not to be disregarded is evinced by the cases in which acute disease exhibits such vehemence or calls for measures of such severity that life is put to jeopardy, if it do not sink under the natural struggle or the action of remedies,

when the malady which caused the alarm is so far spent or overcome as to be no longer formidable*.

I admit at its proper worth the force of the axiom "Nil quod non demonstrandum," and am alive to the prudent and prevailing jealousy of speculation as a substitute for reality, in the physical sciences inadmissible and in all unsatisfactory; but the animal movements are not, and never can be, subjected to mathematical adjustment, and unless we conclude that the actual operations of the nervous system are mere fictions, dreams like those which emanate from it, because we cannot unfold them, the argument drawn from their perversions and obliquities rests on the same foundation and is equally valid and tenable.

The history of any constitutional disease taken by itself would be of little use as a guide to the treatment of a patient, we must know the 'entourage', if I may so express it, how the system at large has been influenced by its previous state and ordinary habits, the natural temperament and the physical form, how far they have aided or kept back the development and are prognostic of its course, together with many other circumstances pertaining to the individual and the malady. If we want the character of a man's mind, we refer to his education and habits, and in the same way we must refer to the constitution if we would know its ailments. Now one of the chief

* Some naturalist physicians of the modern French school seem to entertain an opinion that a table, shewing the results of cases in which disease is left to run its course, and of those in which its progress is arrested by treatment, would exhibit a balance in favour of the first division.

points of such inquiry in a case of disease, is to ascertain whether the nervous or the vascular system predominates; and as regards the patient, whether he is an inflammatory or an irritable subject; than which no two constitutional characters are more strongly in contrast, or respectively more important in their influence. Nor are such inquiries of less weight in surgical maladies, even in casualties; they point as strongly to the nature of the constitutional disorder to be anticipated, as they explain that which has actually occurred, to inflammatory or to typhoid fever, to cerebral or hepatic derangement, to erysipelas or gangrenous inflammation, or tetanus, and even in the sequel, to scrofulous or carcinomatous action.

It being admitted that a large class of diseases are strictly speaking functional, i. e. of nervous origin, a classification of them which would present the means of accurately distinguishing these from those of organic origin, and those which threaten an early from such as induce a slow change of organization; and again, such as tend to terminate in fatal prostration by sudden collapse, or through the medium of excitement; and lastly, such as may be regarded devoid of danger in their issue and susceptible of relief or removal by medical treatment, would be a contribution of no small value to pathology. Practically this analysis obtains to a certain extent. "Is the disease organic?" being the first question which suggests itself to the mind of the medical enquirer. But here he too often stops and shuts the book, satisfied with the discovery that it is not so, or perhaps

deterred by the difficulty, or not aware of the importance of further pursuing the investigation. Now this is precisely the point at which the interrogatory would commence with real advantage; for although, if it be organic, palliation is all that can be expected, if it only tend that way, it often admits of being arrested. 'Principiis obsta,' is at no time and under no circumstances a maxim of more pertinent application.

The degree of command respectively possessed by the two great powers which are the immediate sources and agents of vitality, over each other as well as over the system at large, is the fundamental question involved in this undertaking. This may and should keep clear of the idle contentions about priority of formation, and the possible curtailment of proportions from abortion, disease, or mutilation. Let us look at the peculiarities of the circulation of the brain, the passage of its arteries through bony canals, their tortuosities, the arterial circle at its base, the mechanism of the sinuses, the absence of valves, and the increasing obliquity of direction, as well as increase of diameter of the pia matral veins in relation to the longitudinal sinus, as we trace it from the forehead to the occiput, retarding by an opposition of currents the passage of the returning blood: and especially consider the motion not synchronous with the arterial pulse communicated to the entire organ, the arrest of which motion is never witnessed during life, and which, whether it results from a direct or reflected impulse, points with the before-mentioned provisions to the same end, of securing the brain as much as possible against the embarrassments which the inequalities

and irregularities of the heart's action would otherwise occasion.

The peculiarity in the circulation of the spine is the large allotment of veins forming plexuses upon its pia matral membrane, possessing no valves, and very freely communicating with the veins external to the vertebral canal, resources against defective and interrupted circulation.

We cannot contemplate the texture of the brain and the exquisite arrangements for its protection and supply, and carry our views forward to its complicated phenomena, without admitting its susceptibilities and its powers derived from this source. But the pathological evidence is conclusive. How else shall we explain that one individual recovers sense and motion while the blood is flowing copiously from his jugular vein, and another is restored from a state equally senseless and motionless by a glass of brandy poured into his stomach? the pulse of the former being broad and heavily oppressed, of the latter a very thread, if perceptible at all, fluttering under the finger.

A physician of my acquaintance having been called to a lady of rank in a state approaching syncope, the side of whose face was just let down by palsy, and finding no pulse at the wrist, restored her so completely by a glass of raw brandy, that in a few minutes the distortion had entirely disappeared. She was the subject of diseased heart, and her brain was doubtless partially deprived of blood at the instant. But examples of the influence of the cerebral

circulation are numberless; they meet us at every turn *.

It is plain that in the case just stated, the restoration of the circulation of the brain was attributable to the stimulus of alcohol on the nerves of the stomach and its transmission to the central organ of the circulation; and that its operation was analogous to that so often observed in the restoration, by the same means, of persons asphyxiated and in a state of syncope. If the circulation had actually ceased, the nerves of the œsophagus and stomach would have been insensible to the stimulus, as we have seen in the case of poisons; and if the source of nervous power had been utterly exhausted, the circulation would have ceased and have been inexcitable by the stimulus. But the involuntary organic nervous system, as we have also seen, is so far independent of cerebral influence as that the vital functions, although impaired, can go on for a time in the state of cerebral torpor, and the power of recovery turns on this provision. Thus though we cannot get out of the circle, since if the circulation is necessary to the nervous sensitivity the nervous supply is necessary to the circulation, yet the train of restorative actions in the case of syncope plainly commences with the susceptibility and responsiveness of the sentient nerves, and their influence through the medium of the organic nervous system over the arterial action.

* See some interesting observations on this subject in the review of "Professor Mayer's Anatomico-Pathological Inquiry" in the Edinb. Med. and Surg. Journal, No. 123.

The skin might be the organ acted upon, or the pituitary membrane, or the pulmonary surface; it is immaterial which, as regards the argument.

Now the same order by analogy may be supposed to prevail in the production of those diseased actions of which we are cognizant only by the signs of disordered function, and as sensation animal and vital, and organic as well as voluntary motion are the proper endowments of the nervous system, so this in its nature and constitution forming the only medium of communication with things alien or things pertaining to the system, we might conclude, without any stretch of imagination, that it was the instigator as well as the informant of morbid actions.

The immediate influence of nervous shock, and yet more of the compression or læsion of the brain or marrow in its inferior cervical or superior dorsal portion, is to reduce the heart's beat about one-half in number, and to give it a heavy, swelling stroke. The intermediate or indirect effect of shock is to render the pulsations unequal or irregular both in time and volume. The effect of acute irritation or inflammation of any organ is to give hardness, if not wiriness, as well as frequency, to the pulse, and this in proportion as the natural sympathy of the nervous system prevails. When the nervous system is the source and seat of disordered action, the pulse is subject to the varieties of its state and phenomena, and in the intervals of paroxysms little if at all affected. The numerous cases of injuries of the brain and spine shew in the most marked manner the influence of the nervous system over the circulation, tempera-

ture, and secretions of the body*. They shew also the share which the nervous organ takes in the processes of reparation.

A man had his fourth and fifth lumbar vertebræ fractured and dislocated by the falling of a load of gravel upon his loins as he was working in a pit. At the same time the bones of his right leg and his left upper arm were fractured. These were adjusted and set; the lower limbs, bladder, and rectum were paralysed immediately, but the loss of sensation was gradual, and both sensation and motion were partially restored before his death. He lived eight weeks, notwithstanding two attacks of peritonitis. At the end of five weeks the fractured arm was perfectly united; the bones of the leg were unchanged, and exhibited not the slightest advance towards union; but at the time of his death some thickening of the fractured ends had taken place, and the process of union seemed to be at length commencing.

Another man broke his thigh; the bone protruded above the patella; at the same time a diffused aneurism of the popliteal artery was produced by a spiculum of the fractured bone penetrating that vessel, though it was discovered only on the fourth day. The femoral artery was immediately tied by Mr.

* There is much to be done on this subject towards the elucidation of the nervous pathology, not by such rude experiments as the injection of wax and quicksilver, &c., into the carotids, nor even by tying the vessels and nerves of living animals, but by minute and careful study of the cases of cerebral and spinal injury, their symptoms and termination, and faithfully comparing, analyzing, and reporting their varieties. The great hospitals afford abundant opportunity.

Bransby Cooper, whose patient he was. The ligature came away on the sixteenth day; in another week the aneurismal swelling had disappeared, and the fracture was soundly united in six weeks.

It would appear from these cases, viewed conjointly, that an interruption to the direct current of blood offers no impediment to the healing process, such as follows interruption to the direct supply of the nervous agent, which cannot be absolutely withdrawn in any case while the circulation continues. Thus it may be inferred that the integrity of the nervous function is more indispensable to the extraordinary action of the capillaries than the quantity or impulse of the general circulation.

But it may be said, since the reciprocity of the systems is undeniable, that the evidence derived from all sources is insufficient to shew that the influence of the nervous centres on the vascular, or of the nervous extremities over the capillary circulation, entitles it to be considered as the leader of the train or series of actions, healthy or morbid; and that the nervous organ being by constitution the communicant to our senses, of changes incidental to the latter, by no means warrants the inference that it serves the same purpose in the economy. It may be said, that the effect of the variations in the heart's stroke upon the brain, is the first palpable observation that we are capable of making; and if I believed that the heart could act in continuance, independent of the brain, using the term in a general sense, I should yield to the conclusion. But that it is not so, the solitary fact so often witnessed and so often

cited, of the maiden's blush upon excitement, which led Bichat, bound by the trammels of his own ingenuity, into the absurdity of supposing that the passions directly influenced the heart—thus separating them from their source and the operations of the sensorium,—is, to my plain thinking, sufficient proof. Whether the nervous system is, in cases of organic change, equally with those purely functional, the 'primum mobile,' I cannot say, but no phenomenon of such change occurs to my mind as contra-indicatory of this conclusion; and if the opinions which I entertain, that this system, of which the influence is universal both by solid and fluid throughout the body, forms the portal as well as herald of all diseases, be correct, it follows, that no altered action, of whatever description, can be instituted but by its medium. We have seen that the substances which act most rapidly on the frame, act only when brought in contact with nerve, and then instantaneously. We have no equally certain means of knowing whether such as act more deliberately operate in the same way, but because one agent is rapid and another slow, because one is destructive and another life-saving, we have no reason to suppose it to be otherwise; and in addition to the uniformity and simplicity which prevails in all natural operations, we have this important ground for believing that all follow by the same track, viz., that smaller proportions of those substances are salutary, of which larger are destructive. It is not because arsenic in one dose destroys by prostration, and in another gives tone to the capillary circulation, that we have any right to

infer that it enters the system by a different route, or that the natural order of its operation varies;—more than it would be right to say so of the breeze that wafts a vessel across the sea and the hurricane that sweeps it from its bosom,—or to suppose that ammonia and iron may not both enter by the common door of the nervous system, because the effect of the first is to bring the blood to the surface in a few seconds, while that of the latter requires as many weeks. The doctrines of disease and of remedy are co-illustrative.

If functional diseases belong to the nervous system, it follows that the treatment of them should be directed to the sources, the quantity, and the distribution of nervous power. With this view the circulation in all its bearings and dependencies, comprehending the due action of all the secreting organs, and the formation and adequate distribution of healthy blood, always becomes a primary object of inquiry. If in this important survey cause of disorder should be apparent, however remote, the affection is probably symptomatic, and the removal or redress of the disorder may be equivalent to the cure of the disease. If no such deviation can be detected, the affection may be regarded as at present purely functional, and in addition to the removal of all aggravants, be treated as the quality of the organ and the character of the morbid action suggest, with especial reference to the probability that the functional is warning of the future organic malady. If organic disease be established, the functional disorder is symptomatic, and admits of palliation only, so long as the disease is

in existence. But the symptom is of such importance, as indicating the mode and degree of pressure, and careful prescription to it so instrumental to relief, that it often prolongs life by soothing its misery. This forms no small part of the study and duties of every humane and intelligent physician.

If the functional disease be neither partial, i. e. confined to an organ, nor chronic in its character, but acute and affecting the whole system of nerves, or blood vessels, no exciting cause being apparent or in present operation, the symptoms must be taken to constitute the disease, and to them our remedies must be directed. The treatment, therefore, of symptomatic functional disease will be with reference to the causes and the characters conjointly; of pure functional disease, as prospectively organic, if of a chronic form; and if acute, directed by the prevailing symptoms.

"Sublatâ causâ, tollitur effectus," though good in logic, is not invariably true in pathology, i. e. the effect itself becomes a cause, and involves other organs and parts when the original evil has been removed, and, as we have seen, may re-act and re-excite the mischief which had been allayed, or retard if not prevent recovery. This brings it within the scope of pure functional affections,—a morbid train established by habit, perhaps favored by predisposition; and the treatment must be similar, i. e. in conformity to the existing symptoms, and not in violation of constitutional indications.

Secondary diseases, or those which succeed to maladies or injuries previously existing, require a

plan of treatment materially modified by such circumstances. No practical pathologist would treat the affections of which I last discoursed as inflammatory, though he will not deny that spasm and convulsion are often symptomatic of inflammation. Neither will he consider erysipelas, or gangrene, or the cachexiæ, to be examples of nervous disease; yet he will have given but little attention to these diseases, if he do not admit that the nervous system plays a very important part in their etiology. Secondary diseases are for the most part diseases of reflected irritation, in which the vascular are subservient to the nervous phenomena; therefore the due regulation and support of the nervous power will constitute a leading indication of treatment, since in the neglect of this the patient sinks. The remedies applicable, and with equal effect applied, to moderate the excess or supply the defect of vascular and nervous action where they are associated, are not, it is to be presumed, eligible in cases where these actions are not in concert. What have bloodletting and mercury done for tetanus or spasmodic diseases? What have they not done for acute inflammation? In an ague or an erysipelas, whether idiopathic or symptomatic, let the strict antiphlogistic principle be carried out, as in inflamed serous membranes, till it has made its full impression upon the system, and what will be the fate of the patient?*

* Twenty years ago, a London physician, generally acknowledged to be the most skilful in the profession, and I should say one the least open to prejudice, was consulted in the case of a lady whose head was enveloped in erysipelas. He prescribed

The reader will perceive that in the second part of this volume, I have selected for illustration diseases which I refer to the pure functional class, with the exception of the fourth chapter, in which the organic changes of the nerves are briefly described: these ranging, along with other organic affections, under the head of inflammatory and other alterations of structure. A great analogy runs through and connects these functional diseases, of which pain and irregular muscular action in all their varieties are the principal symptoms. They illustrate practically the reflected irritation, whether set up by predisposition, by transmission of diseased action, or by morbid sympathy; whether the effect of injury, or of inflammation, or of local irritation, temporary or permanent, present or to all appearance past and gone; or of poisons, foreign or morbid, acting especially on the nervous system.

Most of the cases exhibiting extraordinary reflected irritation, both after injury and operation, will be found, on inquiry into the history of the patient, to have manifested strong predisposition in the morbid mobility, if not actual derangement of the nervous system.

The transmission of diseased action is never more strongly exemplified than in the gradually extended chain of convulsive and paralytic affections.

bark at short intervals. She was afraid and refused to take it. Her husband acquainted Doctor ——— with her refusal, to which he replied "Then it is all over with her; I know of no other remedy: Dr. F. has just expired of the same disease, because he would not take bark." This anecdote I had from the husband, Lord ———.

The influence of morbid sympathy is instanced more strikingly in the nervous than in the vascular actions; and the enumeration of its examples, as characterised by sensation, or by action, contiguous or remote, in vital and non-vital organs, forms a large chapter in the history of those diseases which fall to the province of the physician. As a general principle, the treatment of organic disease is retrospective to its cause: on the other hand, the treatment of functional disease is often necessarily empirical, the cause being in fact hidden from us in life and in death. From our ignorance of the nervous agent, its morbid changes can only be recognised in their effects.

In conclusion: it appears to me that the nervous system has a larger influence than is generally ascribed to it in the production and maintenance of disease: that, admitting the relations of the vascular system to their full extent, and the reciprocities subsisting between them, many and serious forms of disease have their origin in this system, and that the course and progress as well as manifestations of all are determined by it; that its power is underrated, partly from the obscurity of its phenomena, from the natural and to a certain extent proper bias of professional minds in favor of physical demonstration and organic causes,—though our ignorance of the nervous and a thousand other palpable agencies in nature might be expected to modify this prejudice,—and in part from a generally prevailing misconception of the distinction between the fancies and realities, the delusions and the dreadful certainties exhibited through the same medium, and

the levity and ridicule extended even to the term under this vulgar and erroneous impression. If the term escapes a medical man in consultation, the patient is offended at such an imputation, and assures him that he or she is far too sensible a person to be nervous; and on the other hand, reasonable and even strong minded persons really suffering under irregular and enfeebled nervous action, by which the enjoyment of life is for the time suspended, are ashamed to avow, and apologize for the detail of maladies which all their resolution is incapable of combating or suppressing. The truth is, that though susceptibility, from the influence of temperament, education, and habits, varies in different individuals, rich and poor are upon a level when so afflicted, and the least tutored and most cultivated are alike open to sensations of exquisite disease in infinite variety, proceeding from similar morbid conditions of the nervous system, and affecting their moral and intellectual as well as their physical organization.

I have only to add that the cases which have been adduced in the preceding pages were selected to illustrate and enforce general principles, and not with reference to details of treatment. These are better left to the judgement of the conscientious practitioner who, under the guidance of general principles, considers that the proper treatment of disease consists in a scientific adaptation of the remedy to the circumstances of each particular case.

THE END.

G. Woodfall, Printer, Angel Court, Skinner Street, London.

[LIST, No. 3.]

Upper Gower Street, September 1, 1835.

A LIST

OF

NEW PUBLICATIONS,

PRINTED FOR JOHN TAYLOR,

BOOKSELLER AND PUBLISHER TO THE UNIVERSITY OF LONDON,

AND SOLD BY SIMPKIN AND MARSHALL, STATIONERS' HALL, COURT.

*** *Some of the Books in the following List are in use at the University or its School.*

Mathematical Works.

I.

THE ELEMENTS OF ARITHMETIC.

By Augustus De Morgan, Esq. Second Edition, considerably enlarged, 12mo, 3*s.* 6*d.* cloth.

"Since the publication of the first edition of this work, though its sale has sufficiently convinced me that there exists a disposition to introduce the *principles* of arithmetic into schools, as well as the *practice*, I have often heard it remarked that it was a hard book for children. I never dared to suppose it would be otherwise. All who have been engaged in the education of youth are aware that it is a hard thing to make them think; so hard, indeed, that masters had, within the last few years, almost universally abandoned the attempt, and taught them rules instead of principles; by authority, instead of demonstration. This system is now passing away; and many preceptors may be found who are of opinion that, whatever may be the additional trouble to themselves, their pupils should always be induced to reflect upon, and know the reason of, what they are doing Such I would advise not to be discouraged by the failure of a first attempt to make the learner understand the principle of a rule. It is no exaggeration to say, that, under the present system, five years of a boy's life are partially spent in merely learning the *rules* contained in this treatise, and those, for the most part, in so imperfect a way, that he is not fit to encounter any question unless he sees the head of the book under which it falls. On a very moderate computation of the time thus bestowed, the pupil would be in no respect worse off, though he spent five hours on every page of this work. The method of proceeding which I should recommend, would be as follows:—Let the pupils be taught in classes, the master explaining the article as it stands in the work. Let the former, then, try the demonstration on some other numbers proposed by the master, which should be as simple as possible. The very words of the book may be used, the figures being changed, and it will rarely be found that a learner is capable of making the proper alterations, without understanding the reason. The experience of the master will suggest to him various methods of trying this point. When the principle has been thus discussed, let the rule be distinctly stated by the master, or some of the more intelligent of the pupils; and let some very simple example be worked at length. The pupils may then be dismissed, to try the more complicated exercises with which the work will furnish them, or any others which may be proposed."—*Preface.*

II.

THE ELEMENTS OF ALGEBRA,

Preliminary to the Differential Calculus, and fit for the higher classes of Schools in which the Principles of Arithmetic are taught. By Augustus De Morgan, Esq. Royal 12mo.

III.

ARITHMETICAL ALGEBRA.

By G. J. P. White, Professor of Mathematics in the University of London. One vol. 8vo. (Preparing.)

IV.

LESSONS ON NUMBER,

As given at a Pestalozzian School at Cheam, Surrey. Second Edition.

The Master's Manual. 12mo. 4*s.* 6*d.* cloth.
The Scholar's Praxis. 12mo. 2*s.* bound.
} (Sold separately.)

V.

A TREATISE ON ARITHMETIC,

Theoretical and Practical. By the Rev. Dionysius Lardner, LL.D. Foolscap Octavo, 6*s.* cloth.

VI.

CONVERSATIONS ON ARITHMETIC,

Adapted for the Use of Preparatory Schools and for Domestic Instruction. Part I. Foolscap 8vo, 3*s*. cloth.

"It has been the especial purpose of the author of the present work to address the *memory* of the pupil through his *reason*, and to ask his assent to nothing, the truth of which he is unable to perceive. Evidence or proof of a nature suited to the immature capacity of children is, accordingly, given for every process and rule; and it is hoped that nothing will be found in the following pages which cannot be made intelligible to children, of ordinary capacity, under the age of ten years."—*Preface*.

VII.

A SYSTEM OF ARITHMETIC,

Practical and Theoretical. By the Rev. William Ritchie, LL.D., Professor of Natural Philosophy and Astronomy in the University of London. 12mo, 3*s*. bound.

VIII.

PRINCIPLES OF GEOMETRY,

Familiarly illustrated, and applied to a variety of useful purposes. Designed for the Instruction of young Persons. By the Rev. Professor Ritchie, LL.D., F.R.S. 12mo, with 150 Wood Cuts. 3*s*. 6*d*. cloth.

"The practical applications which are added, must render the study very delightful to the young, since the Exercises on the Principles will be found as amusing as the ordinary sports of childhood."—*Athenæum*, Sept. 28, 1833.

"Dr. Ritchie's little elementary work is excellently well adapted to its object. It is brief, plain, and full of all that is necessary; curious and useful in its application, and beyond any other of the kind now existent, in its familiar and distinct explanation of some of the instruments required in the practical application of the principles laid down and demonstrated."—*Spectator*, Sept. 7, 1833.

AN INSTRUMENT FOR TEACHING GEOMETRY,

Convertible into a Theodolite, Spirit Level, Hadley's Sextant, and Wollaston's Goniometer, has been prepared, and may be had of the publisher. Price 2*l*. 12*s*. 6*d*.

IX.

CONVERSATIONS ON GEOMETRY,

Adapted for the Use of Preparatory Schools and Domestic Instruction. Foolscap 8vo, 3*s*. cloth.

"In the following pages an attempt is made to present a subject too often looked upon as hard, dry, and repulsive, in an easy, amusing and attractive form. To accomplish this, the rigour of geometry has been somewhat relaxed, the province of axioms and postulates has been a little extended, strictness of arrangement has not been made a matter of great moment; but, on the other hand, nothing is proposed for the assent of the pupil without some palpable evidence of its truth; much of the spirit and closeness of geometrical reasoning has been preserved; not a single principle or proposition of any practical or theoretical importance has been omitted, and all the explanations, proofs, and illustrations, are such as a child of ordinary capacity, under ten years old, may easily be made to understand."—*Preface*.

X.

THE ELEMENTS OF EUCLID,

With a Commentary and Geometrical Exercises. By the Rev. Dionysius Lardner, LL.D. Fourth edition, 8vo, 7*s*. boards. (*Just Published.*)

XI.

AN ANALYTICAL TREATISE ON PLANE AND SPHERICAL TRIGONOMETRY.

By the Rev. Dionysius Lardner, LL.D. Second Edition. Corrected and improved. 8vo, 12*s*. cloth.

XII.

AN ELEMENTARY TREATISE ON THE DIFFERENTIAL AND INTEGRAL CALCULUS.

By the Rev. Dionysius Lardner, LL.D. 8vo, 21*s*.

XIII.

DARLEY'S SCIENTIFIC LIBRARY,

FOR THE USE OF SCHOOLS, PRIVATE STUDENTS, ARTISTS, AND MECHANICS.

It is the purpose of this Work to furnish a Series of Elementary Treatises on Mathematical Science, adapted to the wants of the public at large. To youth of either sex at public and private schools; to Persons whose education has been neglected, or whose attention has not been directed in early life to such studies; and to Artists and Mechanics, these little works will be found particularly suited. The principles of the various Sciences are rendered as familiar and brought as near to our commonest ideas as possible; the demonstrations of propositions are made plain for the mind, and brief for the memory; and the Elements of each Science are reduced not only to their simplest but to their shortest form.

---

1. A SYSTEM OF POPULAR GEOMETRY.

Containing in a few Lessons so much of the Elements of Euclid as is necessary and sufficient for a right understanding of every Art and Science in its leading Truths and general Principles. By GEORGE DARLEY, A.B. Third Edition. Price 4*s.* 6*d.* cloth.

2. COMPANION TO THE POPULAR GEOMETRY.

In which the Elements of Abstract Science are familiarised, illustrated, and rendered practically useful to the various purposes of Life, with numerous Cuts. Price 4*s.* 6*d.* cloth.

3. A SYSTEM OF POPULAR ALGEBRA,

With a Section on Proportions and Progressions. Second Edition. Price 4*s.* 6*d.* cloth.

4. A SYSTEM OF POPULAR TRIGONOMETRY,

Both Plane and Spherical, with Popular Treatises on Logarithms, and the Application of Algebra to Geometry. Second Edition. Price 3*s.* 6*d.* cloth.

"For Students who only seek this limited knowledge of these Sciences, there are perhaps no Treatises which can be read with more advantage than Darley's Popular Geometry and Algebra."—*Library of Useful Knowledge, Article "Mechanics."*

Natural Philosophy.

I.

THE STEAM ENGINE.

Explained and illustrated in a familiar style, with its application to the Arts and Manufactures, more especially in transport by Land and Water; with some Account of the Rail Roads now in progress in various parts of the World. By the Rev. DIONYSIUS LARDNER, LL.D. Fifth Edition. One vol. 12mo. Illustrated with numerous Engravings and Wood Cuts. (*In the Press.*)

II.

FAMILIAR ASTRONOMY.

By GEORGE DARLEY, A.B., Author of a System of Popular Geometry, &c. 12mo, with Engravings, 5*s.* cloth lettered.

"There is a vast deal of astronomical information conveyed in a most winning and unassuming manner in this delightful little volume, which, not less for the novelty of its plan, than the extent of its intelligence, reflects infinite credit on the taste and talents of its projector and editor, Mr. Darley."—*Sun*, April, 5, 1830.

History.

I.

ON THE ORIGIN OF UNIVERSITIES AND ACADEMICAL DEGREES.

By Henry Malden, M.A., late Fellow of Trinity College, Cambridge; Professor of Greek in the University of London. Foolscap 8vo, 3*s.* 6*d.* cloth.

II.

NIEBUHR'S HISTORY OF ROME. Vol. I.

Translated by Julius C. Hare, M.A., and Connop Thirlwall, M.A., Fellows of Trinity College, Cambridge.

Second Edition, revised, with the Corrections and Additions made in the Third Edition of the Original, 8vo, 16*s.*

NIEBUHR'S HISTORY OF ROME. Vol. II.

Translated by Julius C. Hare, M.A., and Connop Thirlwall, M.A., Fellows of Trinity College Cambridge. 8vo, 16*s.*

"Niebuhr undertook to write the History of Rome from the earliest ages of the city to the establishment of the empire of Augustus. Of this great work he accomplished only a portion; and his History will remain to succeeding ages as a fragment, but it is a fragment which may be compared to the unfinished colossal statues that are found lying in the granite quarries of Syene, conceived with all the vastness and precision of Egyptian art, which, had they been finished, might have overtopped the gigantic Memnon, but which, when they were relinquished by the hand that first fashioned them, were destined to remain for ever imperfect. We should as soon expect an artist to arise, who should elaborate, and erect amid the Theban temples, a half hewn Rameses, as a scholar who should complete the Roman History of Niebuhr."—

"Here we close our remarks upon this memorable work; a work which, of all that have appeared in our age, is the best fitted to excite men of learning to intellectual activity; from which the most accomplished scholar may gather fresh stores of knowledge, to which the most experienced politician may resort for theoretical and practical instruction, and which no person can read as it ought to be read, without feeling the better and more generous sentiments of his common human nature enlivened and strengthened."—*Edinburgh Review*, Jan. 1833.

III.

A VINDICATION OF NIEBUHR'S HISTORY OF ROME

From the Charges of the Quarterly Review. By Julius Charles Hare, M.A., Fellow of Trinity College, Cambridge. 8vo, 2*s.* 6*d.*

Geography.

I.

BRIEF OUTLINES OF DESCRIPTIVE GEOGRAPHY,

To which is subjoined a Table of Latitudes and Longitudes. By Henry H. Davis. Foolscap 8vo, with Maps, 2*s.* 6*d.* cloth.

"The Outlines here presented to the Public, are the *results* of actual extemporaneous Lessons."—*Preface.*

II.

GEOGRAPHY SIMPLIFIED;

Being a brief Summary of the principal Features of the Four Great Divisions of the Earth, with a more detailed Account of the British Empire. Also, a familiar Explanation of the Use of the Globes, and an Appendix. By an Experienced Teacher. 12mo, 4*s.* bound.

III.

OUTLINE MAPS.

Mercator.—Europe.—British Isles.

Three Maps, folio, stitched in cover, 1*s.* Single Maps, 4*d.* each.

PROJECTIONS.

Mercator.—Europe.—British Isles.

Three Maps, folio, stitched in cover, 1*s.* Single Maps, 4*d.* each.

