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CLINICAL LECTURES.

I HAVE thought it probable that the Lectures which have been inserted in the MONTHLY JOURNAL OF MEDICAL SCIENCE might prove useful to my Pupils in a separate form. I intend, therefore, to republish them, from time to time, in Numbers, the first of which is now issued. It will be found that a considerable amount of new matter, with extra cases and woodcuts, have been added, so that the present publication is not to be considered as a mere reprint of what has appeared in the above-named periodical.

As the Lectures themselves were delivered extemporaneously, partly in the lecture-room, and partly at the bed-side, it is not pretended that the words and arrangement are exactly the same as were given on any one occasion to the students; but, with regard to the doctrine and modes of practice inculcated, they are identical with what were stated in the course. The cases were recorded by the Clinical Clerks whose names are appended to them, in the Ward books, from which I have carefully condensed what has appeared to me of value, and I think they will be recognised by all those who studied them as faithful descriptions of the facts observed.

J. HUGHES BENNETT.

30, QUEEN STREET,
March 1850.

CLINICAL LECTURES.

INTRODUCTION.

Gentlemen,—The study of medicine has been regarded in a two-fold aspect, as a science and as an art; as regards the theory and the practice—the principles and their application. We can trace the germs of theory and practice in medicine to a very early period. At first, indeed, the art must necessarily have consisted of experience and observation alone. It was Hippocrates who added philosophy and reasoning to experience, and introduced those discussions which led to the overthrow of empiricism, and final triumph of dogmatism, six hundred years later, in the time of Galen. Since then, although the medical profession has uniformly conjoined the results of reasoning and experience, each of these two methods has had its favourite supporters. Even at the present day, you will find persons who complacently call themselves practical men, and who sneer at all modern advances in pathology. Others are apt to attribute too much importance to theory, and regard with feelings approaching to contempt, him whom they denominate a routine practitioner. Hence, unfortunately, it too often happens that practical men are, comparatively, unacquainted with physiology and pathology; whilst those who dedicate themselves to the latter studies, are very sceptical as to the effects of remedies. On this subject, Cullen observed, 80 years ago, what equally applies at present:—"Every one now-a-days pretends to neglect theory, and to stick to observation. But the first is in talk only, for every man has his theory, good or bad, which he occasionally employs; and the only difference is, that weak men who have little extent of ability for, or who have had little experience in, reasoning, are most liable to be attached to frivolous theories; but the truly judicious practitioners and good observers, are such as have the most extensive views of the animal economy, and know best the true account of the present state of theory, and, therefore, know best where to stop in the application of it."

There can be no doubt that a too exclusive attention either to theory or practice, tends to circumscribe the usefulness of the physician, whilst it is the proper cultivation of both which constitutes the rational medicine of the present day. Thus, while we lose no opportunity, and employ all the means

which the improved state of science furnishes us with, of investigating the morbid anatomy and causes of disease, we correct the theoretical conclusions to which these alone might lead us, by practical experience and observation. Our active and speculative powers should go hand and hand, so that, by a union of theoretical knowledge and practical skill, we may advance both to their farthest limits. It is by cultivating medicine in this spirit that the clinical school of Edinburgh has rendered itself so famous. Those who taught the theoretical branches of medicine from their chairs in the University, were those who taught the practice in the wards of this Infirmary. They were enabled to demonstrate how, on the one hand, correct observation led them to just deduction, and on the other, how a knowledge of general principles caused them to be more accurate and acute in observation. Nor was this the only advantage derived from our system of clinical instruction. The student having an opportunity of hearing the opinions and seeing the practice of several teachers: at one time following the Professor of the theory, at another the Professor of the practice of medicine; now the Professor of Materia Medica and Therapeutics, and now the Professor of Botany, or of Anatomy, obtained that freedom from exclusiveness, and that power of self-judgment which is so much to be desired in medical practitioners. Indeed, it is impossible to estimate too highly the advantages which have resulted from such a system, as it has been carried on uninterruptedly by the Professors of this University, for upwards of one hundred years.

Your object, Gentlemen, in coming here, is, I presume, to observe disease for yourselves. To observe, with advantage, two things are necessary: 1st, the correct appreciation of actual facts, as communicated to the senses of the practitioner or of his patient; 2d, deducing from these a correct judgment as to the nature of the disease, and the proper indications of cure. Both these processes are very difficult. Some men have a natural aptitude for one, and some for the other. Again, they are frequently confounded together, some considering to be facts what are only theories, and others imagining that to be theoretical which is truly fact. Thus the assertion that a man is labouring under apoplexy, pneumonia, pericarditis, and so on, is only stating the opinion or theory, the practitioner holds with regard to his case, although such assertion is generally received as a fact. Again, when it is said that porrigo favosa consists of vegetable fungi, growing on the scalp, the statement, though generally received as mere theory, is truly a fact, inasmuch as the vegetations may actually be demonstrated, and rendered as visible to the eye as trees growing in a plantation. Indeed, the just distinction between theory and fact is a matter which has excited lively discussion, and hence the celebrated saying of Cullen, that there are more false facts than false theories in medicine.

If, in medical observation, we define a fact to be anything which is obvious to the well-cultivated senses of the observer, we, perhaps, approach as near accuracy as is possible. Remark, I say well-cultivated, because the senses require to be educated before they can receive proper impressions. In this lies the great difficulty in teaching practical medicine, for what is obvious to the sight of an experienced practitioner, is overlooked by the student; the sound

which is heard by the one, is inaudible to the other; what the first feels distinctly is not tangible to the second. Now this instruction of the senses constitutes a kind of information which cannot be obtained from others; you must acquire it for yourselves. Of late years, also, the detection of facts has been greatly facilitated by the appropriate use of instruments, whereby what at one time was conjectural is now rendered certain. Thus, the existence of many diseases, which could formerly only be arrived at by a happy speculation, or by a rare sagacity, is easily demonstrated by those who know how to employ, judiciously, chemical tests, microscopes, stethoscopes, pleximeters, specula, &c. To carry observation, then, to its utmost extent, we must learn how to avail ourselves of all these means in the examination of the signs and symptoms of disease.

On the other hand, Gentlemen, a sound and correct judgment is equally necessary, in order that the cultivation of the senses may lead to a proper end, and indicate the direction in which you must act for the benefit of the patient. For this purpose a certain degree of preliminary instruction is absolutely essential before you can be qualified to attend an hospital with advantage. Indeed, I must take it for granted, that before coming here you are tolerably well acquainted with anatomy and chemistry; that you have studied the institutes of medicine, that is, the present state of histology, physiology, and pathology, and that you have a notion of the materia medica, and of the effects of remedies on the economy. Thus prepared, you commence a series of visits to the bedsides of your fellow-creatures, labouring under disease, in other words, a course of clinical instruction.

What should we understand by clinical instruction? It is not attendance on clinical lectures—it is not learning the opinions of your teacher—in short, it is not deriving knowledge from others. It is acquiring medical information for yourselves—it is the learning how to observe—it is that education of the senses to which I have alluded; and, from thence, the formation of that sound judgment which will enable you to act for the benefit of your patients. Medicine is not only a science, it is an art. The laws and facts of science you will learn elsewhere. Here you must endeavour, keeping those laws and facts in remembrance, to found upon them an art. No art can be communicated. It must be learned by continual practice and experience; and it has always appeared to me that the great aim of clinical instruction should be to enable the student to acquire that art for himself.

How are all arts acquired? A young mechanic, when he makes a chair, follows exactly the same process as those who study what are called the fine arts. That is, he learns how to do what his master did before him. He imitates his plan of proceeding. His first attempts are rude and uncouth; his subsequent ones are more perfect, until, at length, by continual practice, he is enabled to equal, or surpass, his instructor. In painting, sculpture, and music, there are principles which must be attended to, and which are learnt from others; but no man can become a painter, a sculptor, or a musician, without obtaining practical skill as an artist, in the way now alluded to. It is thus, and thus only, that art descends from the old to the young.

Now, it will be my endeavour to afford you every facility for learning medicine as an art. For this purpose the course will consist of two kinds of instruction. 1st, lectures; 2d, the examination of, and the prescribing for, the patients by the student. In the lecture I shall direct your attention to the histories of the cases we have previously examined, notice the difficulties in diagnosis, or peculiarities they may have presented—speak of the treatment which has been employed, or of the recorded experience of those who are acknowledged to be worthy guides for our imitation—and lastly, touch upon such points of doctrine or speculation as may be serviceable to us in our efforts at cure. At the bedside I shall call upon such of you as wish to exercise yourselves in observation, to examine the patient, according to a plan which I shall subsequently communicate to you: then, having elicited the facts, to form a judgment as to the nature of the case; and lastly, to suggest a plan of treatment, and prescribe for the patient. In doing this, numerous opportunities will present themselves for the communication of practical instruction in the use of various instruments, of improving the observing and reflecting powers, and of obtaining a familiarity with the method of combining medicines in extempore prescriptions.

This plan of clinical instruction has been for a long time practised on the Continent, and especially in Germany. It was also followed by Dr Graves, in Dublin. I have myself taught in this way for the last nine years, to classes not exceeding twenty-five, at the Royal Dispensary; and last year it was tried with the large University class, in this Infirmary. I have never found that it produced the smallest inconvenience to teacher, student, or patient, or was open to the slightest objection; but, on the contrary, that it has been productive of good to all parties. It gave me much pleasure to observe, last year, the readiness with which the students entered into this plan, and the evident advantage they derived from it; nor can there be any doubt that, this session, we shall unite and co-operate in like manner, for our mutual advantage.

SIMPLE, CANCEROUS, AND TUBERCULAR EXUDATIONS—THEIR PATHOLOGY AND GENERAL TREATMENT.

There are three varieties of exudation, which, occurring as they do in one or other of the textures, occasion the great majority of those diseases we shall be called upon to treat. A knowledge of the manner in which these are produced, the characters of each, their specific differences and natural progress, constitute the foundation of modern rational medicine. I propose, then, describing them to you generally, before directing your attention to the special peculiarities they present in individual cases.

The term exudation has been introduced into pathology, not only to express the act of the liquor sanguinis passing through the vascular walls, but to denominate the fibrinous portion of the liquor sanguinis itself, when it has coagulated on the surface, or in the substance of any tissue or organ of the body. This term meets a difficulty which morbid anatomists have long experienced; and hence it has of late years been extensively used to signify various kinds of morbid deposits. Thus it has been applied to all those processes hitherto termed inflammatory, tubercular, and cancerous; to all kinds of tumour and morbid growth, and to what has been called melanosis and typhous deposit. It is often the cause of many concretions, and frequently constitutes the soil for parasitic vegetations or cryptogamic plants of a low type, which communicate essential characters to certain diseases. Indeed exudation, as a morbid process, comprises the greater part of organic, as distinguished from functional diseases; of lesions of nutrition, as separated from lesions of innervation.

I.—*Early Phenomena of Exudation.*

Exudation in every case results from a previous series of changes which has taken place in the capillary vessels, and blood contained in them. These changes, as we are enabled to follow them in the transparent parts of animals under the microscope, are seen to occur in the following order:—1st, The capillary vessels are narrowed, and the blood flows through them with greater rapidity. 2d, The same vessels become enlarged, and the current of blood is slower, although even. 3d, The flow of blood becomes irregular. 4th, All motion of the blood ceases, and the vessel appears fully distended. 5th and lastly, The liquor sanguinis is exuded through the walls of the vessel, sometimes accompanied by extravasation of blood corpuscles, owing to rupture of the capillaries.

The first step in the process, viz., narrowing of the capillaries, is readily demonstrated on the application of acetic acid to the web of the frog's foot. If the acid be weak, the capillary contraction occurs more slowly and gradually. If it be very concentrated, the phenomenon is not observed, or it passes so quickly into complete stoppage of blood, as to be imperceptible. Although we cannot see these changes in man under the microscope, certain appearances indicate that the same phenomena occur. The operations of the mind, for instance, as fear and fright, and the application of cold, produce paleness of the skin; an effect which can only arise from contraction of the capillaries, and a diminution of the quantity of blood they contain. In the majority of instances, also, this paleness is succeeded by increased redness, the same result as follows from direct experiment on the web of the frog's foot, constituting the second step of the process. In other cases, the redness may arise primarily from certain mental emotions, or from the application of heat. In either case it depends on the enlargement of the capillaries, and the greater quantity of blood they contain.

The variation in the size of, and amount of blood in, the capillaries, is conjoined with changes in the movement of that fluid. Whilst the vessels are contracted, the blood may be seen to be flowing with increased velocity. After a time the blood flows more and more slowly, without, however, the vessel being obstructed: it then oscillates, that is, moves forwards and backwards, or makes a pause, evidently synchronous with the ventricular diastole of the heart. At length the vessel appears quite distended with yellow corpuscles, and all movement ceases.

Again, these changes in the movement of the blood induce variations in the relation which the blood corpuscles bear to each other, and to the walls of the vessel. In the natural circulation of the frog's foot, the yellow corpuscle may be seen rolling forward in the centre of the tube, whilst on each side a clear space is left, only filled with liquor sanguinis, and a few lymph corpuscles. There are evidently two currents, the centre one very rapid, that at the sides (in the lymph spaces, as they are called), very slow. The coloured corpuscles are hurried forward in the first, occasionally mixed with some lymph corpuscles. These latter, however, may frequently be seen clinging to the sides of the vessel, or slowly proceeding a short distance down the tube in the lymph space, and then again stopping. Occasionally they get into the central torrent, when they start off with great velocity, and accompany the yellow corpuscles. It has been said that these corpuscles augment in number, accumulate in the lymph spaces, and obstruct the flow of blood. In young frogs their number is often very great; but then they constitute a normal part of the blood, and in no way impede the circulation. In old frogs, on the other hand, all these, and subsequent changes, may be observed, without the presence of colourless corpuscles. When the capillaries enlarge, however, the central coloured column in the smaller vessels may be seen to enlarge also, and gradually approach the sides of the tube, thus encroaching on the lymph spaces. The slower the motion of the blood, the closer it comes, until at length the coloured corpuscles come in contact with the sides of the vessel,

and are more or less compressed and changed in form. At length the vessel is completely distended with coloured corpuscles, the original form of which can no longer be discovered, and the tube appears to be filled with a homogeneous deep crimson fluid. This is congestion. If the morbid process continue, the vessel may burst, causing hemorrhage, or the serum and liquor sanguinis may transude through its walls, without rupture, into the surrounding texture. This is exudation.

Fig. 1.

Fig. 1 —Portion of web of the frog's foot, viewed with a magnifying power of 250 diameters, after a drop of strong alcohol had been placed upon it. On the left of the figure the circulation is natural; in its middle portion the column of blood is oscillating, and the corpuscles crowded together; on the right the circulation has stopped, and exudation has taken place. About the centre hemorrhage has occurred, owing to laceration of a capillary vessel.

II.—*Theory of Exudation.*

It is of the utmost importance in pathological inquiries to separate facts from theories. Our facts may be correct, although the conclusions derived from them are wrong. This proposition, however generally admitted, is seldom acted on; for in medical writings and statements we frequently find fact and hypothesis so mingled together, that it often requires considerable critical and analytical power to separate the one from the other. We are, however, in all cases, insensibly led to theorise—that is, to attempt an explanation of the phenomena observed, in order that we may derive from them some general principle for our guidance. Such speculation is always legitimate, so long as we consider opinions to be mere generalisations of known facts, and are ready to abandon them the moment other facts point them out to be erroneous. The phenomena of exudation, previously described, may easily be demonstrated—they constitute the *facts*. Let us now examine how they have been attempted to be explained—in other words, what is the *theory*.

1. The contraction and dilatation of the capillaries is explicable, by supposing them to be endowed with a power of contractility analogous to that existing in non-voluntary muscles. John Hunter thought they were muscular, from the results of his observations and experiments; and they may be

shown by the histologist to consist of a delicate membrane, in which permanent nuclei are imbedded. In structure, then, they closely resemble the muscular fibres of the intestine, and we know that, like them, they may be contracted or dilated by emotions of the mind, or by local applications. The narrowing of these tubes, therefore, may be considered, as Cullen thought it was, analogous to spasm, while their dilatation is similar either to the relaxation which follows such spasm, or to muscular paralysis.

2. The rapid and slow movement of the blood is explicable on the hydraulic principle, that when a certain quantity of fluid is driven forward with a certain force through a tube, and the tube is narrowed or widened, while the propelling force remains the same, the fluid must necessarily flow quicker in the first case and slower in the second. It has been supposed, from the throbbing of large vessels leading to congested parts, that they pump a larger quantity of blood than usual into them. This was called "determination of blood," by the older pathologists, but is now known not to be a cause, but a result, of the changes going on in the capillary vessels. The oscillatory movement, seen in the transparent parts of small animals, has not been seen to exist in man, and probably depends, in the former, on a weakened power of the heart.

3. It is the stoppage of the blood, and exudation of the liquor sanguinis, however, which it is most difficult to explain; for why, so long as there is no mechanical obstruction (and during this process none has ever been seen) should the circulation through the capillaries of a part cease? It has been endeavoured, indeed, of late years, to establish a mechanical obstruction, by supposing the formation of colourless corpuscles, in large numbers, which cling to the sides of the capillaries, and so cause interruption of the stream. But this hypothesis is negatived by the following facts:—1st, In young frogs the vessels may be seen to be crowded with colourless corpuscles, while the circulation is in no way affected. 2d, In old frogs, oscillation and gradual stoppage of the stream may be seen, without any colourless corpuscles being present. 3d, The colourless corpuscles, as shown by Remak, are increased, after large venesections, in the horse, without ever causing active congestion.[1] And 4th, Cases have occurred in man, where all the vessels have been crowded with colourless corpuscles, associated with hypertrophied liver and spleen, and yet no active congestion in these vessels, nor exudation of any kind, has been occasioned.[2]

We cannot ascribe the stoppage of the circulation in the capillaries to venous obstruction, or to mechanical pressure of any kind, because all observation proves that such causes, while they induce effusion of serum, never occasion exudation of liquor sanguinis. We are compelled, therefore, to ascribe the

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[1] Diagnostische und Pathognetische Untersuchungen, &c., 1845. He also found that in man the colourless corpuscles of the blood were few in number during inflammations, and were augmented during successive bleedings, so that he concluded the *fewer* there are of these the higher is the degree of inflammation.

[2] See cases by Craigie and the author, Edinburgh Med. and Surg. Journ., October 1845; also by Virchow, Froriep's Notizen, 1845; and Archiv. für Patholog. Anat. und Physiol., 1848. Fuller, in the Lancet, July 1846, &c.

vital force producing these changes, not to anything residing in the blood, or in the vessels, but to the tissues which lie outside the vessels. Whether we give to this force the name of attraction, or whether we consider it a modification of the power which, in a state of health, attracts nutritive materials from the blood, is of little consequence—such seems to be the only active agency to which we can ascribe the approach of the coloured particles to the capillary walls, and the passage through them of the exudation.

III.—*Resulting Phenomena of Exudation.*

When the liquor sanguinis is exuded, it generally coagulates, and constitutes a foreign body in the texture of the parts affected, which it becomes the object of nature either to remove from the system, or so to modify that its presence may be rendered conducive to the wants of the economy. In order to accomplish this, two kinds of changes may take place—1st, The exudation serves as a blastema, in which new vital structures originate and are developed; 2d, It exhibits no power of becoming organised, and the exuded matters, together with the textures involved in them, die. In the former case corpuscles spring up in the exudation, which differ in form, size, constitution, and power of further development, and give rise to those various appearances and changes which in some cases have been denominated the result of inflammation, in others various kinds of deposits.

We find that the peculiar constitution of the blood, or the general vital power of the organism, exercises a very powerful influence on the development of the exudation. This has been long recognised by pathologists in certain conditions, denominated respectively diathesis, dyscrasia, or cachexia. I propose at present to direct your attention to some of the facts connected with exudation as it occurs in the body during health, as well as when connected with scrofulous and cancerous constitutions. I shall call the former *simple* exudation, to distinguish it from what may be denominated *tubercular* and *cancerous* exudations.

1. Simple Exudation presents four principal forms—(*a*) As it occurs on serous membranes, when it exhibits a finely fibrous structure, and has a strong tendency to be developed into molecular fibres; (*b*) As it occurs on mucous membranes, or in areolar tissue, when it is generally converted into pus corpuscles; (*c*) When it occurs in dense parenchymatous organs, such as the brain, where it assumes a granular form, and is associated with numerous compound granular corpuscles; (*d*) As it is poured out after wounds or injuries, and occurs on granulating sores. In these cases the superficial portion is transformed into pus corpuscles, while that deeper seated is converted, by means of nuclei and cells, into nucleus and cell fibres, which ultimately form the cicatrix.

(*a*) On examining the minute structure of the exudation on a serous surface when recently formed, and when it presents a gelatinous semi-transparent appearance, it may be seen to be made up of minute filaments mingled with corpuscles. (Fig. 2.) The filaments are not the result of the development of either

a nucleus or a cell, but are formed by the simple precipitation of molecules, which arrange themselves in a linear manner, in the same way as they may be seen to form in the buffy coat of the blood. As the exudation assumes firmness, the filaments become more distinct and consolidated, and vary from $\frac{1}{800}$th to $\frac{1}{500}$th of a millimetre in diameter. Bundles, or different layers of them, often cross each other. As the lymph becomes older, they assume more and more the character of those in dense fibrous tissue. The corpuscles, when newly formed, are delicate and transparent, but in a short time become more distinct, and are then seen to be composed of a distinct cell wall, enclosing from three to eight granules. They vary in size from $\frac{1}{100}$th to $\frac{1}{75}$th, and the enclosed granules from $\frac{1}{700}$th to $\frac{1}{500}$th of a millimetre in diameter. On the addition of water and acetic acid, the corpuscles undergo no change, although sometimes the latter re-agent causes the cell wall to contract and thicken; and at others, to be somewhat more transparent. I have been in the habit of calling these bodies *plastic* corpuscles, from the frequency of their occurrence in plastic lymph. By Valentin and others, they have been named *exudation* corpuscles; and by Lebert, *pyoid*, from their resemblance to pus.

Fig. 2

Fig. 3.

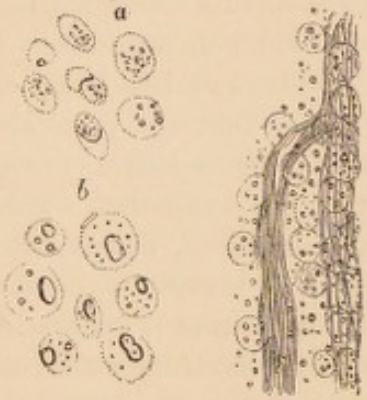


Fig. 2.—Molecular fibres and plastic corpuscles, in simple exudation on a serous surface. *a*, The latter, after the addition of acetic acid.

Fig. 3.—Exudation from the surface of the peritoneum passing into pus. *a*, Isolated corpuscles; *b*, after the addition of acetic acid; *c*, plastic corpuscles and filaments.

(*b*) Exudation poured out on a mucous membrane sometimes presents a fibrous mass, as in cases of croup and diphtheritis, but more generally it passes into an opaque, unctuous, straw-coloured fluid long known under the name of pus. When poured into the meshes of the areolar tissue, the same transformation occurs, constituting an abscess. On examining the minute structure of pus, it is seen to be composed of numerous corpuscles floating in a clear fluid. These corpuscles are perfectly globular in form, and vary in size from the $\frac{1}{100}$th to the $\frac{1}{75}$th of a millimetre in diameter. Their surface is finely granular. They have a regular well-defined edge, and roll freely in the liquor puris upon each other. On the addition of water, they become much increased in size, their finely granular surface disappears, and they become more transparent. Weak acetic acid partially, and the strong acid completely, dissolves the cell-wall, and brings into view an included body, generally composed of two or three granules close together, and rarely of four or five, each

with a central shadowed spot. These are usually about the $\frac{1}{400}$th of a millimetre in diameter.

In some cases the pus corpuscles now described are surrounded by a distinct though delicate cell-wall. (Fig. 4, *a*.) The cell so formed is about the $\frac{1}{50}$th of a millimetre in diameter, and is highly elastic, assuming different shapes, according to the degree and direction of the pressure to which it is subjected. Water and acetic acid cause the cell-wall to be at once dissolved, whilst the nucleus, which, before the addition of re-agents, exactly resembles an ordinary pus corpuscle, exhibits the usual body composed of two or three granules. What have hitherto, therefore, been called pus corpuscles, are the nuclei of cells, the delicate walls of which have been dissolved.

Fig. 4.

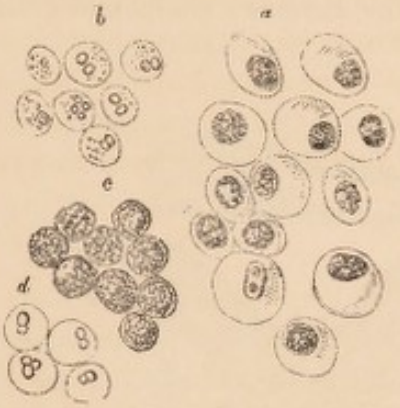


Fig. 5.

Fig. 4.—Pus cells. *a*, Fully formed; *b*, the same, after the addition of acetic acid; *c*, liberated nuclei—ordinary pus corpuscles; *d*, the same after the addition of acetic acid.
Fig. 5.—Granular exudation, and compound granular masses, from cerebral softening.

(*c*) In parenchymatous organs, the exudation insinuates itself among the elementary tissues of which they are composed, so that when it coagulates, these are imprisoned in a solid plasma, like stones in the mortar of a rough cast wall. The whole then constitutes a firm mass, giving increased density to organs, a circumstance well observed in the lung, where, however, a mucous surface extensively prevails, and where the exudation is commonly transformed into pus. In the brain and spinal cord, we find it to be deposited in the form of minute molecules and granules, which are frequently seen coating the vessels externally, and filling up the inter-vascular spaces. (Fig. 5.) The granules vary in size from the $\frac{1}{650}$th to the $\frac{1}{300}$th of a millimetre in diameter. They always contain among them round transparent globules, varying in size from the $\frac{1}{300}$th to $\frac{1}{150}$th of a millimetre in diameter. These are the nuclei of round or oval cells which may frequently be observed in various stages of development. When fully formed, they vary greatly in size, for the most part measuring from the $\frac{1}{50}$th to $\frac{1}{35}$th of a millimetre in diameter. They sometimes contain a few granules only, at others they are so completely filled with them, that they assume a brownish-black appearance. Water and acetic acid cause no change in them, although the latter re-agent on some occasions renders the cell-walls more transparent. They are immediately soluble in ether, and break down into a molecular mass on the addition of potash and ammonia. These are compound granular cells. Masses of these granules may be occasionally seen

floating about, of irregular shape, without any cell-wall. They are produced either by the solution of the cell-wall in which they were contained, or from the separation, or peeling off, of such masses from the external wall of the vessels. These are compound granular masses. (Fig. 5.)

The granules, masses, and cells just described are found in the colostrum secreted by the mammary glands; in the exudative softening of parenchymatous organs; on the surface of granulations and pyogenic membranes; in the pus of chronic abscesses, combined with cancerous, tubercular, and all other forms of exudation; in the tubes of the kidney when affected with Bright's disease; and in the contents of encysted tumours. Reinhardt and Virchow have shown that they indicate a fatty degeneration, and that there is no form of cell-growth, whether healthy or morbid, that may not, under certain conditions, accumulate fatty granules in its interior, become a compound granular corpuscle, and thus be rendered abortive.

Fig. 6.

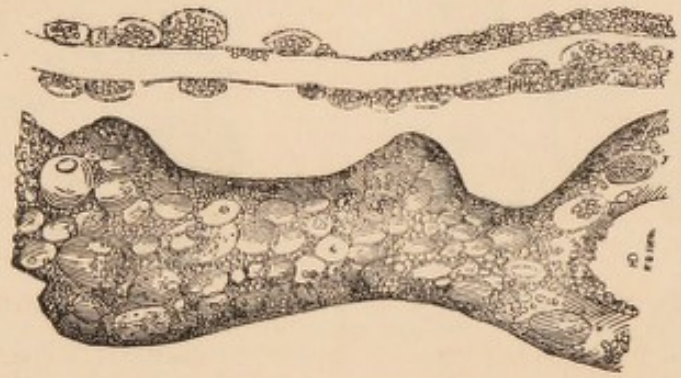


Fig. 6.—Two vessels coated with exudation from spinal softening. Compound granular cells may be seen forming in it.

(*d*) If a recently formed granulation on the surface of a healing sore be examined, numerous cells will be observed, of various shapes, and in different stages of development. Some are round, others caudate, spindle-shaped, elongated, or splitting into fibres, as originally described by Schwann. (Fig. 7.) In many cases there may be seen a number of free nuclei, imbedded in a slightly fibrous blastema, elongating at both ends, becoming fusiform, and splitting up the surrounding exudation, as described by Henle. (Fig. 8.) Not unfrequently the nuclei may be seen developing themselves into elastic fibres, in the same ex-

Fig. 7.

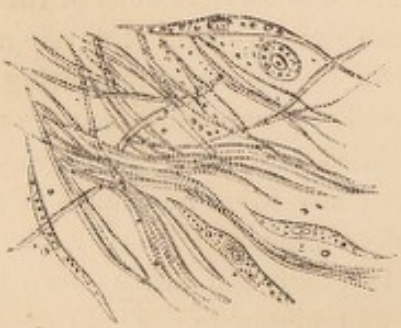


Fig. 8.

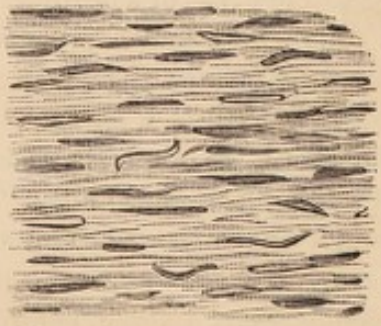


Fig. 7.— Cells developing themselves into fibres from a fibrous tumour.
Fig. 8.—Nuclei developing themselves into fibres from simple stricture of the pylorus.

udation containing cells that are passing into white fibres. Indeed, the process of cicatrization in its various stages, and in different tissues, offers the best means of studying the manner in which nucleus and cell fibres are respectively formed. As these fibres are developed in the deeper layers of the exudation, the superficial ones are converted into pus-corpuscles, and after having served to protect the more permanent growths, are thrown off in the form of discharge. When the fibrous structure becomes more consistent and dense, the amount of pus diminishes, and a greater tendency is manifested by the exudation to pass into permanent tissue. At length pus ceases to be developed; the whole remaining exudation is transformed into fibres; a new surface is produced, which, after a time contracting, forms the permanent cicatrix.

2. Cancerous Exudation presents three principal forms, which are dependent on the relative amount and arrangement of the cells and fibres formed in it. (*a*) The structure is very hard, and is principally formed of fibres (*scirrhus*). (*b*) The structure is soft, containing a copious milky fluid, in which numerous corpuscles swim (*encephaloma*). (*c*) The structure has a fibrous basis, so arranged as to form areolæ or loculi, containing a gelatinous gum or glue-like matter (*colloid cancer*).

(*a*) *Scirrhus* presents to the naked eye a whitish or slightly yellowish tinge; is dense and hard to the feel, and offers considerable resistance to, and often crunches under, the knife. On making a thin section of the growth, it is seen to be

Fig. 9.

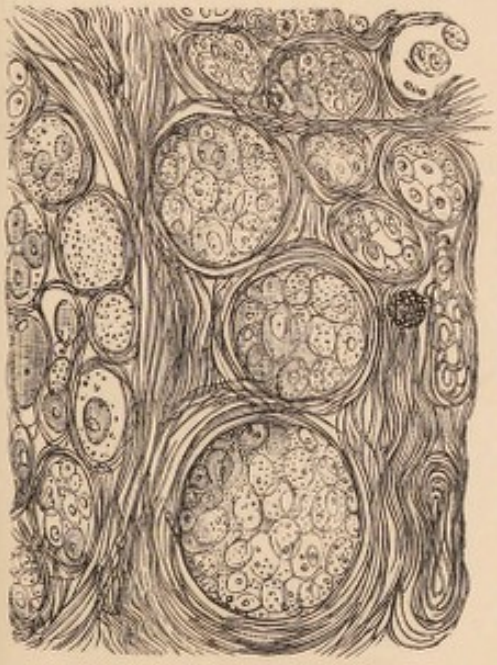
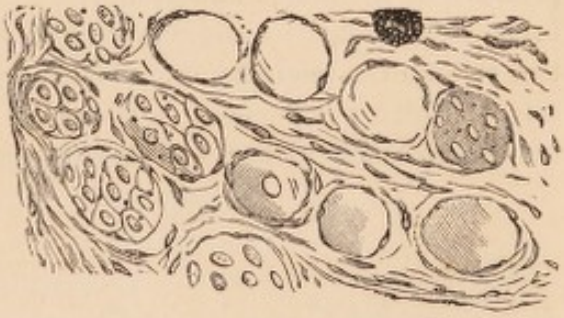


Fig 10.



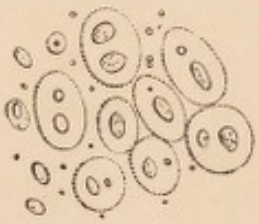


Fig. 12. Fig. 11.

Fig. 9.—Section showing the arrangement of cells and fibres in scirrhus of the mamma.
Fig. 10.—The same, after the addition of acetic acid.
Fig. 11.—Isolated cancer cells, from the same growth.
Fig. 12.—The same, after the addition of acetic acid.

principally composed of filaments, which vary in size, and run in different directions, sometimes forming waved bands, at others an inextricable plexus,

among which, however, nucleated cells may be seen to be infiltrated. Occasionally the fibrous structure forms loculi or cysts, enclosing similar cells.

The so-called *cancer-cells* may be round, oval, caudate, spindle-shaped, oblong, square, heart-shaped, or of various indescribable forms, from pressure on their sides. In size they may vary from the $\frac{1}{100}$th to the $\frac{1}{10}$th of a milli-

Fig. 13.

Fig. 14.

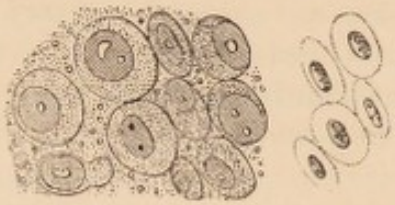


Fig. 13.—Young cancer cells from the lung, before and after the addition of acetic acid.
Fig. 14.—The same, from the testicle.

metre in diameter. The cell-wall, when young, is smooth and distended; when old, it is more or less corrugated and flaccid. Each cell contains at least one nucleus, often two, and sometimes they increase in number from three to nine. Most commonly there is only one, which is round or oval, generally the latter, and contains one or two granules or nucleoli. The nucleus, like the cell itself, varies in size, and may occupy from one-sixth to four-fifths of its volume; between the nucleus and cell-wall there is a colourless fluid, which, at first transparent, becomes afterwards opalescent, from the presence of molecules and granules. On the addition of water, the cell-wall becomes distended by endosmosis, and is enlarged. When acetic acid is added, the cell-wall is rendered more transparent, and in young cells is entirely dissolved, whilst the nucleus, on the other hand, either remains unaffected, or its margin becomes thicker, and its substance more or less contracted.

Fig. 15.

Fig. 16.

Fig. 15.—Older cancer cells from a tumour in the duodenum, before and after the addition of acetic acid.
Fig. 16.—Advanced cancer cells, including secondary cells, from a tumour of the toe.

(*b*) *Encephaloma* also presents a fibrous texture, which, however, is very loose when compared with that of scirrhus. In the denser parts of the growth, in-

deed, it closely resembles that form of cancer; but where it is pulpy and broken down, often no traces of fibres, or at most some fragments of them, are visible.

The whitish cut surface is often more or less mottled, with a greyish, pinkish, reddish, yellowish, or black colour. The two first are owing to different degrees of vascularity. The reddish spots are owing to extravasations of blood, of greater or less extent; and these, when very large, constitute what has been called by some surgeons *fungus hæmatodes*. The yellowish colour, when it surrounds bloody extravasations, is owing to imbibition of their colouring matter; but when reticulated over the surface, or collected in masses, it is generally dependent on fatty degeneration of the cancerous tissue, and forms the so-called reticulum (*cancer reticulare of Müller*). The yellow matter is usually of cheese-like consistence, friable, and often resembles tubercle, for which it has been mistaken. The blackish tinge is owing to black pigment which may be infiltrated among the cancerous elements, and exist within the cells, constituting the malignant melanosis, or melanic cancer, of authors.

Fig. 17.

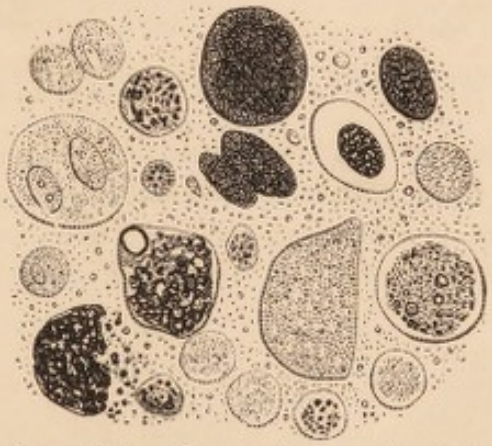


Fig. 17 —Cancer cells containing pigment, from a melanotic tumour of the face.

A small portion of the cream-like fluid, examined with a microscope, always presents a large number of the cancer cells formerly described, which in some specimens of encephaloma reach a higher degree of development than in other forms of cancerous growth. (Fig. 16.) These are mingled with a large number of molecules and granules, compound granular cells, blood corpuscles, and more or less of the fibrous element. The fibrous structure is the same as that in

Fig. 18.

Fig. 19.

Fig. 18.—Altered nuclei, with granules and molecules, from the reticulum of cancer of the testicle.
Fig. 19.—The same, with crystals of margarine from the reticulum of cancerous masses in the liver.

scirrhus, but the filaments are often finer, and always more widely separated; while the pulpy matter and cells contained in the interstices are correspondingly increased. The yellow reticulum is sometimes composed of loose granules and compound granular cells, at others of granules alone. Not unfrequently it contains nuclei, disintegrated and altered in shape, with crystals of margarine or of cholestrine. (Figs. 18 and 19.) In some instances the encephaloma is more or less impregnated with irregular masses of mineral matter, and occasionally almost entirely converted into a calcareous substance.

Fig. 20. Fig. 21.

Fig. 20.—Retrograde cancer, with earthy matter, from the liver.
Fig. 21.—The same, from a cancerous tumour in the abdomen.

(*c*) *Colloid cancer* consists of a fibrous structure so arranged as to form areolæ or loculi, which are filled with a grey or amber coloured glutinous matter, sometimes transparent, at others opalescent or semi-opaque. This matter is occasionally found quite structureless, or exhibits only a finely molecular ap-

Fig. 22. Fig. 24. Fig. 23.

Fig. 25.

Fig. 22.—Structure of colloid cancer; appearance of the fibrous areolæ and enclosed cells.
Fig. 23.—The same, after the addition of acetic acid.
Fig. 24.—The cells isolated.
Fig. 25.—Fibrous stroma deprived of the cells by pressure and washing.

pearance. Under these circumstances the term *colloid tissue* has been applied to it. At other times numerous nucleated cells, presenting all the characters of cancer cells, in various stages of development, are found in it as a blastema; and we observe that the growth has a tendency to spread. This is colloid cancer, which, when it is formed on a free surface, as on the peritoneum, often presents small grains of a grey colour, resembling coagulated gum-arabic. When collected in masses, these have an irregular nodulated aspect. I have never seen the fibrous structure of colloid contain permanent nuclei, or afford any evidence of being developed from nuclei or cells.

All the three forms of cancer now described are vascular, but in different degrees. Scirrhus is least so, but is still rich in blood-vessels. Encephaloma is always very vascular, and often to such a degree, that it readily bleeds during life—(*fungus hæmatodes*). Colloid cancer is also well supplied with vessels, which ramify among the fibrous tissue. I have already stated that these forms pass into each other, and need only remark here, that this is often so gradual in many specimens, as to render their classification with either very difficult. This is especially the case with scirrhus and encephaloma.

3. Tubercular exudation has been spoken of as presenting a miliary infiltrated or encysted form ; but these distinctions have no reference to structure, but merely to the extent and age of the exudation. It generally presents a yellowish or dirty-white colour, and varies in consistence from a substance resembling tough cheese to that of cream. Sometimes it is soft at one place, and indurated at another. On section, when tough, it presents a smooth or waxy, and when soft, a slightly granular surface. On pressure it is friable, and may break down into a pulpy matter, but never yields a milky juice.

A small portion squeezed between glasses, and examined under the microscope, presents a number of irregular shaped bodies approaching a round, oval, or triangular form, varying in their longest diameters from the $\frac{1}{120}$th to $\frac{1}{75}$th of a millimetre. These bodies contain from one to seven granules, are un-

Fig. 26. Fig. 27. Fig. 28.

Fig. 26.—Corpuscles, with and without acetic acid, from tubercular exudation into the lung.
Fig. 27.—Corpuscles, granules, and debris, from tubercular exudation into the brain.
Fig. 28.—The same, from tubercular infiltration of a mesenteric gland.

affected by water, but rendered very transparent by acetic acid. They are what have been called tubercle corpuscles. They are always mingled with a multitude of molecules and granules, which are more numerous as the tubercle is more soft. Occasionally, when softened tubercle resembles pus, constituting scrofulous purulent matter, we find the corpuscles more rounded,

and approaching the character of pus cells. They do not, however, on the addition of acetic acid, exhibit the peculiar granular nuclei of these bodies.

The gray granulations described by Bayle may be seen on careful management of the light, after the addition of acetic acid, to contain similar bodies to those described as tubercle corpuscles, closely aggregated together, with their edges indistinct, and containing few granules.

Fig. 29.

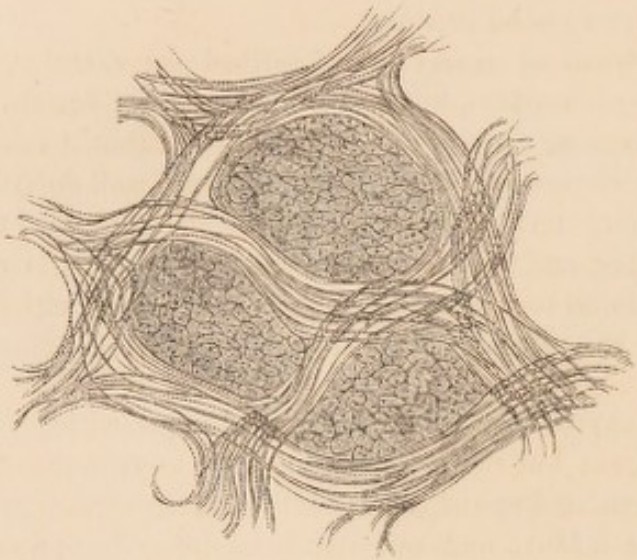


Fig. 29.—Section of a grey granulation in the lung, showing the pulmonary vesicles filled with tubercle corpuscles.

Cretaceous and calcareous tubercles, on the other hand, contain very few of these bodies, their substance being principally made up of numerous irregular masses of phosphate of lime, and a greater or less number of crystals of cholesterine.

Fig. 30.

Fig 30.—Irregular masses of phosphate of lime, crystals of cholesterine, and a few tubercle corpuscles in a cretaceous concretion from the lung.

IV.—*Pathology of the Three Kinds of Exudation.*

We have seen that the liquor sanguinis transudes through the coats of the capillaries, and, coagulating outside the vessels, constitutes an exudation more or less solid. Much of the serum which accompanied it is rapidly absorbed, but what remains constitutes a blastema, which becomes, as has been described,

organised in various ways, according to the seat and nature of the exuded matter. In simple exudation we observe differences according as it is poured out on a serous, mucous, or granulating surface, or into a dense parenchyma. These differences are certainly owing to the seat of the exudation. But in cancerous or tubercular exudations, we observe no such distinctions, although it has been observed that fibrous cancer or scirrhus is most common in fibrous organs, and cell cancer or encephaloma is most common in cellular organs. The most important characters of the three kinds of exudation may be shortly stated as follows :—

We observe in a simple or inflammatory exudation, that it may occur at all epochs in life ; that it may attack all tissues, and most commonly those which are very vascular ; that it may be poured out in large or small quantities ; and that it may occur with greater or less rapidity—hence the terms acute and chronic. We further observe, that the acute exudations are generally attended with symptoms of a peculiar character (inflammatory), and have a great tendency to cell or temporary formations, which rapidly break down, are absorbed and excreted by the emunctories : that the chronic exudations, on the other hand, have a tendency to fibrous or permanent formations, producing adhesions, strictures, hypertrophies, &c.

We observe, in a cancerous exudation, that it occurs for the most part in persons of adult or advanced life ; that it may also occur in every tissue, but is by far most common in glandular or fatty organs, such as the liver or female mamma, and is very apt to attack the lymphatic glands *secondarily* ; that its progress, although sometimes slow when very fibrous, becomes rapid when corpuscles abound in it ; that there is a great tendency to the formation of the most perfect forms of cell life, which have the power of self-development, and thereby of spreading to neighbouring tissues ; and lastly, that when, by pressure, ulceration is produced on free surfaces, it bursts through these in exuberant fungoid excrescences.

We observe, in a tubercular exudation, that it occurs for the most part in young subjects, between the periods of dentition and of adult age ; that it may also occur in all tissues, but is by far most common *primarily* in the lymphatic glands, and afterwards in fibrous or albuminous textures, as the lungs and serous surfaces ; that its progress is generally exceedingly slow; that there is no disposition to the formation of perfect cell-formation, but rather to abortive corpuscles, which form slowly, and slowly break down ; that there is little tendency to absorption, but great liability to disintegration and ulceration ; and finally, that the local changes are almost always preceded by derangement of the primæ viæ, and a group of symptoms known under the name of dyspepsia.

Taking, then, the products of simple inflammation (say pus) as a standard, we cannot fail to remark, that whilst the cell development of tubercle is below, that of cancer is above, this standard. Of the three kinds of exudation, tubercle is the lowest, and cancer the highest, in the scale.

On what this difference in the formative power of the exudation depends, we are ignorant, but every kind of reasoning must lead us to the conclusion, that these different changes and effects depend, not upon the vascular system, which

is the mere apparatus for the production of exudation; not upon the nervous system, which leads to the necessary arrangement of that apparatus for the purpose; and not on the texture, which is the seat of the exudation, as that varies, whilst the cancerous or tubercular formation is the same—but in the inherent composition or constitution of the exudation itself. On this point most pathologists are agreed, and hence the supposed existence of various kinds of dyscrasiæ, originating in the blood, which it is imagined explain the different results produced. But here pathologists pause—once traced back to the blood, they are content; and they have not sufficiently taken into consideration, that the blood itself is dependent for its constitution on the results of the primary digestion in the alimentary canal on the one hand, and the secondary digestion in the tissues on the other. Yet it must be evident to every physiologist, that if it be the constitution of the blood which determines the constitution of the exudation, the causes which produce this must be sought in those circumstances which operate on the composition of the former fluid.

Now, numerous facts, to which I shall allude on some future occasion, render it probable that while the blood is normal in simple exudation, it contains an excess of nutritive materials in cancerous, and a deficiency of them in tubercular, exudation. These are points, however, which can only be established after examining instances of such exudations in detail. But it must not be forgotten, in the meantime, that as the blood is continually undergoing changes, is receiving and giving off new matters, it can scarcely happen that it remains the same for many hours together. An exudation at one time may be very different from that at another. At one period it may abound in elements which do not exist in it at the next. Hence it may often happen that a concurrence of circumstances is necessary to occasion a certain result. A cancer once formed, may remain local until such a concurrence of events arises, comprising, first, a peculiar constitution of the blood, secondly, the phenomena leading to and producing an exudation, and thirdly, the occurrence of this exudation in some other tissue or organ sufficiently predisposed for the purpose. Hence why the histologist is continually finding all kinds of intermediate formations between the three leading kinds of exudation, and why, even when the constitution is thoroughly cancerous or tubercular, simple exudations may be poured into tissues as the result of recent wounds or injuries. But, whilst a recent cancerous or a tubercular exudation may be found to accompany, or alternate with, a simple exudation, they are seldom, if ever, met with together—a circumstance which still further points out the wide difference between the constitutional causes producing them.

The final termination of either kind of exudation may be the same, only each has its peculiarities. We have noticed the tendencies of simple exudation to be transformed into pus or fibres, according to its seat. In the former case, the pus cells break down, and are re-absorbed in a disintegrated and fluid condition into the blood; in the latter, permanent fibrous tissue is produced, constituting chronic adhesions or cicatrices. The cells of a cancerous growth may also degenerate or decay, but this rarely takes place throughout the whole structure. But it is not uncommon to find in certain encephalomatous tumours, yellow

matter either in masses or reticulated through its substance—(*Cancer Reticulare of Müller*). This is generally owing to fatty degeneration of the cancer cells. The fibrous structure of cancer may also increase, and occasionally produce cicatrization. Tubercle possesses no such fibrous stroma, which is almost always vascular. This, indeed, is the reason why a cancerous tumour increases by growth, which tubercle cannot be said to do; the former is vascular, the latter is not: in the one, cells are formed which have the power of re-development, in the other, no re-productive cells are produced. In cancer the morbid matter circulating in the blood (whatever that is), is concentrated or attracted to the cancerous part, and should none afterwards be present, the healthy blood is made subservient to the purpose of nourishing a foreign growth. In tubercle, successive fresh exudations only are made, which, by their accumulation, augment the volume or amount of the morbid product.

All three forms of exudations may be rendered abortive by the animal matter being broken down and absorbed, while the mineral matter remains, constituting a cretaceous or calcareous concretion. This is not unfrequently seen as the result of simple exudation; is rare in cancerous, but very common in tubercular, exudation.

During the disintegration of simple, cancerous, and tubercular exudations, the animal matter broken down is again rendered fluid, re-passes into the blood, and then constitutes that excess of fibrine detected by chemists. The amount of this will, of course, vary according to the amount of the exudation and the activity of the disintegrating process. In the blood this effete matter undergoes chemical changes, preparatory to its excretion by the different emunctories, but more especially by the kidneys, in the form of various sediments. The resolution of simple exudation is generally accompanied by the presence of such urinary sediments, which indicate pretty clearly in what way, after it has passed through the phases of development described, it is at length discharged from the body. In the same manner the amount of these sediments frequently points out the extent of absorption going on in cancerous and tubercular exudations.

V.—*General Treatment of Exudation.*

The foregoing facts and considerations must lead us to the conclusion, that practically the medical man may be called upon, 1st, To prevent or diminish the extent of an exudation; 2d, When it has coagulated, to further its removal from the economy; or, 3d, If this cannot be accomplished, to render its products as little injurious to the system as possible. In each case, we can only proceed rationally by knowing the manner in which nature operates, and assisting those curative changes which she invariably attempts. We have seen that exudation follows certain preliminary alterations in the capillary vessels, and is immediately dependent on relaxation or paralysis of their coats, and transudation through them of the liquor sanguinis. Once formed, it passes through certain changes or developments, dependent on the texture in which it occurs, its amount, the rapidity with which it is formed, and its inherent constitution. Lastly, that the exudation, by means of these changes, is ren-

dered soft, more or less disintegrated, and is absorbed into the blood, to be excreted from the economy. A correct treatment, therefore, will be influenced by the stage and nature of the exudation.

1. To prevent or diminish the extent of an exudation, we must adopt measures to overcome the dilatation of the capillaries, their distension with blood, and the attractive power (whatever that is) which draws the liquor sanguinis into the surrounding textures. This is accomplished—1st, By topical applications of cold and astringents, which stimulate the capillaries to contraction. 2d, By topical bloodletting, which, by drawing blood from the neighbourhood of the part, favours the onward flow of blood through the obstructed capillaries. 3d, By general bloodletting, which, by diminishing the quantity of blood in the system, is supposed to act indirectly in the same manner, as well as in favouring absorption of the exudation before it becomes organised. 4th, Soothing topical applications, such as warm fomentations, opiates, &c., which relieve the irritability of the nerves in the part, on which, hypothetically, the attractive force in the textures is supposed to depend. The indications for employing one or the other of these means, I shall discuss under the head of special cases.

2. When the exudation has coagulated, it constitutes a foreign body, which can only be removed by its becoming organised, or by its dying. In the one case it acts as a blastema, in which structures are developed that ultimately break it down, and render it capable of being absorbed, or converted into a tissue that becomes permanent. In the other case, it disintegrates slowly, constituting ulceration, or putrefies, forming gangrene, when it is separated from the economy in discharge or as a slough. It is by regulating the formative power of the exudation that we check or favour resolution ; and we can only do this by employing those means which lessen or advance growth in all living organisms. Thus, locally, cold checks, and heat favours, growth ; and we further observe that moisture, room for expansion, and locality, exercise considerable influence. Hence lotions favour, and pressure checks, organic development.

With a view of diminishing the general excitement that prevails, tartar emetic has been recommended, and to assist the absorption of the exuded matter, calomel is a favourite remedy ; but the manner in which these act has been disputed, and whether it be by producing an influence on the nervous system, as a solvent of the effete matters in the blood, or by stimulating the excretions, is yet undetermined. In the same way the action of counter-irritants, although undoubtedly useful in causing absorption of chronic exudations, is little understood, and belongs to the most mysterious department of therapeutics.

3. In order to favour the excretions of the effete matters in the blood, purgatives, diaphoretics, and diuretics, alone or combined, will be found very useful. The influence of these remedies, indeed, is not confined merely to removing matters which have been absorbed as the result of the secondary digestion ; but, by their depurating qualities, they favour indirectly the rapid absorption of the exudation.

4. In tubercular exudation, the organisation of which is imperfect, and

leads to ulceration and wasting, we have to combat the preliminary phenomena of exudation locally, whilst we improve the nutritive powers of the economy generally. To meet the first indication, counter-irritation and an equable climate are useful ; whilst for the second, we must overcome the dyspepsia so hostile to a correct primary digestion, and supply the system with easily assimilable animal oils, without which nutrition cannot proceed.

5. In cancerous exudations we must endeavour to restrain the advance of growth, by cold, dryness, and pressure ; attempt its eradication by excision, if this can be appropriately practised; and diminish the tendency to accumulation of nutritive materials in the system, by keeping the excretory functions in full activity.

The general indications for treatment now alluded to, of course admit of infinite variations and modifications in individual cases. In the meantime, what I have to tell you with respect to these, will, I think, be more readily comprehended from the preceding considerations.

SIMPLE EXUDATION INTO THE LUNG (PNEUMONIA), AND ITS TREATMENT.

CASE I.[1]—John Foreman, æt. 54, a bookseller, and a stout plethoric individual, was admitted into the Clinical ward, November 30, 1849. He states that he has always enjoyed robust health until three days ago, when he was exposed to an unusual degree of cold by travelling in an open railway carriage. On his return home, he was seized with a violent rigor, which lasted some time, and was succeeded by slight febrile symptoms. He went to bed and slept, but was awakened by a dull gnawing pain in the left side, accompanied with cough and great difficulty of respiration. In the morning he attempted to go out to his work, but owing to weakness and soreness in his limbs, he was speedily obliged to return. His cough became worse, the pain more severe, and he expectorated brown-coloured matter. He had headache, loss of appetite, great thirst, and considerable dyspnœa. These symptoms continued until his admission. At the visit on the following day (December 1st), he complained of pain on the left side of chest, most severe under the left nipple, and increased on taking a full breath. He has constant cough, and copious expectoration of a tenacious, viscid, rusty-coloured matter. On percussion, the right side of chest is everywhere clear and resonant. On the left side, the chest anteriorly is resonant above the nipple ; below this it is dull. Posteriorly, on the same side, percussion shows the lung to be resonant in its superior third, but the two inferior thirds are completely dull. On auscultation, the respiratory murmurs on the right side of chest are normal. On the left side, anteriorly and superiorly, the breath murmurs are somewhat puerile, and inferiorly hoarse and tubular. In the external part of the mammary region, the respiratory murmurs are suppressed. In the axillary region there is a slight friction murmur ; posteriorly and inferiorly there is distinct crepitation. Over the lower two-thirds of this lung, especially posteriorly, there is loud bronchophony. The pulse is 100, full and strong ; the cardiac sounds normal. The skin is hot and dry. The tongue is furred ; there is no appetite ; great thirst ; nausea and occasional vomiting ; bowels open ; micturition is natural, and the urine loaded with lithates. ℞. *Antim. tart. gr. vj ; pulv. opii gr. iss. ; sacchari alb.* ʒ*ss. M. et divide in pulv. vj. One to be taken every hour ; low diet.* In the evening, it was found that during the afternoon he had been severely purged. The breathing is now easier ; pain relieved ; pulse 96, soft. *To omit the powders.* ℞ *Vin.*

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[1] Reported by Mr Bickersteith, clinical clerk.

Ipecac. ℥ij; *sol. mur. morph,* ℥iiss; *liq. ammon. acet.* ℥ij.; *aquæ.* ℥vss. *M. ft. mist. Two table-spoonfuls to be taken every four hours.* On the next day (*December* 2), at the visit, the pain in chest is still severe, but the cough is easier, and the dyspnœa less urgent. The friction sound has disappeared. Crepitation is more abundant, and the tubular harsh murmurs are greatly diminished. Expectoration still copious; pulse 80, soft; skin moist; urine still loaded with lithates. *December 5th.*—Crepitation and dulness have now disappeared. There is no pain or dyspnœa; expectoration decreased in amount; urine clear. He was now convalescent. On the 12th he was ordered a bottle of porter daily, and full diet. On the 17th he was dismissed quite well.

Case II.[1]—Robert Hogg, æt. 18, a teacher, admitted December 10, 1849. He states that, a fortnight ago, after unusual exposure to cold, he was seized with a severe rigor, followed by loss of appetite, thirst, pain in the head, and heat of skin. He was subsequently troubled with difficulty of breathing, aching pain in the chest, and cough, with a copious glairy expectoration of a rusty colour. About four days afterwards he was bled from the arm; he was subsequently twice blistered, and was purged with marked benefit. *One grain of tartrate of antimony was ordered by the clerk to be taken every two hours; and the following morning two purgative pills. December 12th.*—When carefully examined before the class, it was found that he complained of no pain in the chest, and had very little cough. The expectoration was scanty, consisting of frothy muco-purulent matter. He breathed easily, and the chest expanded tolerably well. The report says, that on percussion there is distinct dulness on the right side, posteriorly. Anteriorly the chest is resonant on both sides. On auscultation, tubular respiration is heard all over the right side, and the expiration is slightly prolonged. The vocal resonance is increased on both sides, but especially on the right. The pulse is natural; skin moist. The appetite is bad, and he feels nausea, apparently the effect of the mixture. He complains of slight pain in the bowels, which are costive. The urine is high coloured, but otherwise natural. *Omit antimonial mixture. To have a domestic enema. December 13th.*—The dulness and vocal resonance on the right side are much increased. Coarse crepitation is now also heard over the posterior and inferior part of right back. In the evening, the bowels not having been opened, he was ordered a "black draught." From this time until the 21st, he continued much in the same condition. There is now considerable dulness on both sides of chest, posteriorly, with loud bronchophony, but no moist râles. *A blister 6 inches by 4, to be applied to the left side of chest. December 22.*—Crepitation is to-day heard on both sides of chest, mingled with dry bronchial râles during expiration. ℞. *Antim. tart. gr. xij.; aquæ,* ℥vi.; *M. ft. mist.* ℥ss.—*to be taken every four hours. To have a calomel and opium pill in the evening. 23d.*—The medicines ordered yesterday have caused slight diarrhœa, which had disappeared on the 24th. There are now loud mucous râles heard during inspiration, and sibilant râles with the expiration pretty generally over the chest.

[1] Reported by Mr Hugh Balfour, clinical clerk.

Expectoration is again copious, and tinged slightly of a rusty colour. ℞. *Vin. Ipecac.* ℥ij. ; *sp. æther. nit.* ℥ss. *mist. scillæ.* ℥v. *M. ft. mist. A teaspoonful to be taken three or four times a-day.* On the 27th loud mucous râles are audible over the back of chest on both sides. Dulness on percussion and bronchophony continue. Expectoration copious—muco-purulent and tinged with blood. Pulse 120, weak ; skin hot ; great weakness. *To have* ℥iv. *wine daily. January* 2, 1850.—He has continued in the critical state mentioned at last report until to-day. *The wine has been increased to* ℥viij. *daily.* There is now an evident amendment, the pulse is stronger, and the urine loaded with lithates. From this time convalescence commenced. For six days the urine continued to be loaded with lateritious sediment, the moist râles disappeared from the chest, and the expectoration diminished. *January* 22.—He is now nearly well. The chest is everywhere resonant on percussion. The natural breath-sounds are everywhere heard on the right side, mingled with an occasional sibilant râle during inspiration. The appetite is good, and he walks about the ward. Dismissed, *February* 14*th.*

Commentary.—The two cases of pneumonia just described were similar in their origin, and attended with similar symptoms, up to the fourth day. The first, a strong man of fifty, then entered the Infirmary ; he was treated with tartar emetic and opium. Resolution of the exudation was completed on the 5th day, and he was discharged well on the 17th day. The second case was bled, blistered, and purged, before entering the Infirmary, which he did not do until the 14th day. Resolution commenced on the 23d, and was not completed until the 28th day. His strength returned very slowly, so that he was not dismissed until the 64th day.

Now, although it is very probable that these two cases were of different degrees of severity, and although, in the second case, exudation occurred in both lungs, whereas in the first it was confined to one, the histories of the two, will, I think, show, that whereas, in Foreman, the disease ran its natural course towards a happy termination ; in Hogg, this was interfered with by the active treatment to which he had been subjected before entering the Infirmary. There is every reason to suppose, from the well-marked symptoms with which the disease commenced, that exudation had taken place on the fourth day, when he was bled, and although we do not know to what extent venesection was carried, we may easily imagine that it must have been considerable, for he expressed himself as having been much relieved by it. Such a bleeding, followed by purgatives, must have greatly diminished the vital power of the economy, and interfered with the formative tendency just at that moment when it was most required to transform the exudation into cell structures, in order that they might rapidly disintegrate it, and render it absorbable. In consequence, the necessary changes took place very slowly ; the respiratory organs were greatly embarrassed for a considerable time ; the exudation even extended itself, and it was only after a very critical period of six days, during which it was impossible to say whether the vital powers would rally, although they were assisted by stimulants, that resolution ultimately took place.

Of late years a remarkable revolution has taken place in the treatment of pneumonia. Formerly such cases were almost always bled, if the pulse was frequent and strong. Now, it has been satisfactorily shown, that these symptoms do not constitute a good guide to the treatment of the disease by bleeding. Patients seldom enter hospitals before the third or fourth day, by which time exudation has occurred to a considerable extent,—most commonly the disease is of much older standing—and the experience in these institutions is, that after bleeding the disease is very fatal, and the recovery, if it take place, unusually protracted. In private practice, medical men still occasionally find venesection useful. Now, why is this? Some have ascribed it to a change of type in the disease; others to the more active use of tartar emetic, and calomel and opium. I am inclined to think that it depends on a more accurate knowledge of the physical signs of the disease, and a conviction that when hepatization has taken place, loss of blood is not favourable to its removal. The reason of this our previous observations on exudation will explain, for how, if the vital power be suddenly and excessively lowered by an antiphlogistic treatment, can those new structures be produced whereby only resolution can be accomplished? If, then, you be called to a case shortly after the rigor, when dyspnœa and pain in the chest are coming on, and *before* hepatization and bronchophony are well pronounced, you will still find, with proper precautions, that a good bleeding will strangle or cut short a pneumonia. But if the exudation has coagulated, as indicated by dulness on percussion, and increased vocal resonance, then bleeding, as a general rule, is more injurious than beneficial. The following case illustrates still further the correctness of these observations:—

Case III.[1]—John Kell, æt. 40, labourer, admitted January 28, 1850. He states that, on Thursday afternoon, January 24, after exposure to cold, he was seized with a rigor, and felt chill during the whole of that afternoon and night. On the following day this was succeeded by feverishness, heat of skin, loss of appetite, and thirst. He then also felt a dull gnawing pain in his left side, aggravated on taking a deep breath. There was a short, hard cough, accompanied by sputa, tinged with blood. He states that for more than three weeks previously he had been indulging freely in the use of spirits. On admission, he appears strong and plethoric. His face is livid; the skin is hot; his respiration hurried and short; pulse 100, of good strength. On percussion, the right side of the chest sounds clear, both in front and behind. The left side is clear superiorly, but dull over the lower half, both in front and behind. On auscultation, the respiratory sounds and the vocal resonance are normal on the right side. On the left side, distinct crepitation is heard over the lower half of the chest, accompanying both inspiration and expiration, and the vocal resonance is somewhat increased. The left side of the chest does not expand well on inspiration. Sputa tenacious, frothy, of a rusty colour. Has no palpitation at the heart. Cardiac sounds rather faint, but normal in character.

[1] Reported by Mr Hugh Balfour, clinical clerk.

Tongue furred, appetite lost, great thirst, bowels regular. He complains of hoarseness, and loss of voice to some extent. Urine, sp. gr. 1020, not coagulable—no deposit. *Ordered to have low diet, and to take a grain of Tartar Emetic every two hours.* 29*th*.—There is now slight crepitation on the right side, posteriorly and inferiorly. On the left the crepitating râle is coarser than yesterday. ℞. *Antimon. Potas. tart. gr. xij.; Tinct. Opii.* ℥*i.; Aquæ,* ℥*vi., Solve. Half an ounce to be taken every hour.* 30*th*.—Was very delirious last night. Pulse 90, soft. *To have three ounces of whisky, and in the evening a grain of solid opium every two hours, till sleep be produced.* 31*st*.—Last night he slept soundly, after taking gr. iv. of opium. To-day his skin is moist, and he feels much relieved. The sputa are still rusty. There is a considerable deposit of lithates in the urine. The antimony has not sickened or purged him. From this time he made a rapid recovery. On February 5, it is noted that all cough and expectoration have ceased, and he has no pain. There is still slight dulness posteriorly, but the respiration is nearly natural. *Ordered to omit the antimony, and to have a better diet. February* 16.—Dismissed cured.

Commentary.—There can be very little doubt that the old practice of bleeding would have been very dangerous in this case; for, although the pulse was 100, and strong, on admission, it was easily affected by the tartar emetic, and this, together with his previous habits, induced me latterly to order stimulants. The pulmonary condensation was here considerable, and yet the treatment pursued favoured resolution; for excretion of the exudation was evident in the form of lithic deposits in the urine on the 7th day, from which time he began to recover, and he was discharged cured on the 19th day. I am in the habit, whenever crisis, by the urine, is to be anticipated, of administering, in conjunction with the salines, the Sp. Æther. Nit., or some other diuretic, to assist the discharge of the effete matter in this way.

You will see, from the cases that have been detailed, that I place my chief reliance in the treatment of pneumonia, when hepatization has taken place, on the combined use of tartar emetic and opium, in large and frequently-repeated doses. The effect of these remedies is to diminish the force of the circulation, to relieve the pain, and favour the natural crisis of the disease. The true action of tartar emetic on the blood is not very well understood, but it would seem to facilitate the solution of the effete exudation which is circulating in the vessels, and so predispose its more ready separation by means of the emunctories of the skin, lungs, or kidneys. The utmost pains should be taken, not only to favour this natural progress of the disease, by the judicious use of purgatives, sodorifics, and diuretics, but to prevent any circumstance that may check it, such as lowering the vital strength by blood-letting, or exposure of the surface to cold. Frequently it will be found necessary to support the system by stimulants at the latter part of the process, especially when, as often happens, no nourishment has been taken for several days, and the pulse, though still frequent, becomes soft and feeble.

I have never yet been able to satisfy myself that calomel favours the absorp-

tion of the exudation, in cases of pneumonia; but, from the very confident manner in which this remedy is employed by practitioners of great experience, it would be presumption in me to oppose its employment. On the contrary, whenever the exudation does not disappear in the usual and natural manner, I would recommend its use, although I am inclined to think that, if the disease be properly managed from the beginning, such cases will be rare. Blisters, on the other hand, will be found at all times serviceable in causing more rapid absorption from the lung of the last portions of the exudation.

CANCEROUS EXUDATION INTO THE LIVER, SIMULATING SCIRRHUS OF THE PYLORUS—CANCEROUS ULCERATION OF ŒSOPHAGUS—SIMPLE STRICTURE OF PYLORUS—PROFUSE HÆMATEMESIS—ANEURISM OF THORACIC AORTA, BURSTING INTO THE LEFT PLEURA.[1]

Thomas Stewart, æt. 54, bookseller; admitted November 28, 1849. States that about six years ago he had an attack of hæmoptysis, but with this exception, he has always enjoyed good health, till about four months ago. At that time his appetite began to fail, and he felt sick after eating; occasionally vomiting his food. Since then the sickness has been increasing, and about three or four weeks ago, he began to vomit blood. He has also been affected with pain in the throat on attempting to swallow, and a sense of constriction in the œsophagus, opposite the superior border of the sternum. He states, that he can very seldom take food without exciting vomiting; but occasionally, when he succeeds in retaining it for half an hour, the sense of sickness passes off. He further states, that he vomits blood mixed with clots of dark-brown masses. This does not occur after eating, but generally between three and five in the morning; occasionally, however, it occurs during the day, and is then preceded by a fit of coughing. He states, that he has been losing flesh lately to a great extent, but was formerly of a stout and robust habit of body.

On admission, he appears pale and emaciated. Complains of great general weakness. Tongue much furred, and the superior surface fissured. Complains of pain and constriction on attempting to swallow. Is sick, and generally vomits after every meal, and this whether his diet be solid or fluid. Vomits a great deal of florid blood, mixed with dark grumous masses, and clots of a black colour. On examining this fluid under the microscope, it is seen to consist chiefly of blood corpuscles and epithelial scales; no cancer cells can be detected. He states that on Friday last (Nov. 23), he vomited about half a gallon of blood, and on the following day even a larger quantity. There is great tenderness over the region of the stomach; and on examination, a hard lobulated oval tumour is discovered on the right side of the epigastric region, measuring four inches transversly, and two inches from above downwards. The appetite is bad, and has been getting worse of late. Bowels usually regular. He complains of cough, which has existed for about four months; no dyspnœa. On percussion, the chest sounds well, except that there is dulness over the lower

[1] Reported by Mr Hugh Balfour, clinical clerk.

third of the left lung posteriorly. On auscultation, the expiration is prolonged anteriorly, and crepitation is heard over the part where dulness is elicited on percussion. Pulse 90, of tolerable strength. Complains of occasional palpitation, and the impulse of the heart is somewhat increased ; but on auscultation, the heart's sounds are normal. Urine, sp. gr. 1020, natural in quantity, not coagulable ; deposits, on cooling, an abundant lateritious sediment of lithate of ammonia. Complains of giddiness, and is unable to walk well, owing to weakness. *Ordered a purgative powder.* 29th—Bowels opened. *Four leeches to be applied over the tumour in epigastrium.*—℞. *Pulv. Opii gr. ij. ; Extract Hyoscyam. gr. xii. M. et divide in pil. iv. One to be taken morning and evening.*—℞. *Napthæ Medicin.* ℥*i. Mist. Camphoræ,* ℥*iij. M. Half an ounce to be taken every three hours.* December 1st—Pain and tenderness are somewhat relieved by the leeches. Still vomits, but not to so great an extent as formerly. From this time he went on, with occasional exacerbations and remissions, but on the whole becoming manifestly weaker. Every now and then he vomited large quantities of florid blood, and on one occasion the quantity amounted to thirty-six ounces. *Gallic acid* and *acetate of lead and opium* were given at these times. After each attack of hæmatemesis, for some hours small quantities of blood came welling up into his mouth, and were expectorated. On December 14th—It is noted that his weakness is increasing, and appetite diminishing. He was then ordered *eight ounces of wine daily, and beef tea enemata.* 17th—Extremely weak, and quite unable to take food, evidently sinking. 18th—Died this morning at four A.M.

Sectio-Cadaveris, December 19th, twenty-one hours after death.—The body was livid, and greatly emaciated.

On reflecting the integuments from the thorax and abdomen, a nodulated portion of the liver, nearly separated from the rest, very moveable, containing a large mass of cancerous exudation, and measuring four by two inches across, projected as a distinct tumour into the epigastrium, and was evidently the same swelling as had been felt during life, through the integuments.

Thorax.—The cavity of the left pleura contained about a pound and a-half of recently coagulated blood. The pericardium contained about six ounces of clear straw-coloured serum. Heart much contracted. The whole of the thoracic viscera, together with the trachea, and great vessels, were removed *en masse.* The blood in the pleura was then seen to have issued from between the lobes of the left lung, through a laceration of the pleura, at the external and back part of that organ. The aorta being slit up, was found to be somewhat rough internally. At the outer part of the arch, where it joins the descending aorta, the left side of the vessel was perforated by a nearly circular aperture, two inches in diameter, with smooth edges, which led into an aneurismal sac, the size of a large cocoa nut, filled with a soft coagulum. The aneurismal sac pressed and encroached on the left lung inferiorly, and communicated with the pleural cavity through a recent ragged laceration in the pleura costalis, three inches in length. Here and there, immediately round the sac, the lung was infiltrated

with blood, and greatly softened. In these places it was very thin, and presented several perforations, through which hemorrhage into the lung must have taken place. No communication could be discovered between the aneurismal sac and the stomach or œsophagus. The whole arch of aorta was slightly dilated; the valves healthy. Between the thoracic aorta and the œsophagus, there were two masses of glands, greatly enlarged from cancerous infiltration. The œsophagus itself was ulcerated about its middle, and the enlarged glands before mentioned projected into its cavity. This ulceration surrounded the tube internally, and extended about three inches from above downwards, presenting a soft pultaceous surface, the result of disintegrated cancerous exudation. The lung presented, throughout, a number of small irregular-shaped masses of exudation, not larger, in most instances, than four or five lines in diameter, and resembling masses of crude tubercle, but somewhat softer, and slightly redder in colour. There were also one or two larger masses, nearly globular in form, from one-fourth to three-fourths of an inch in diameter, of soft consistence, yielding a cream-coloured juice, and marked with one or two red vessels and reddish points. The bronchial glands were infiltrated with black matter, and mostly contained masses of cancerous exudation, similar to, but smaller than, those in the lung.

Abdomen.—The peritoneum covering the diaphragm, as well as that in the pelvis and several other places, showed fungus-like projections and nodules of irregular form—the largest two inches in diameter, flattened on their surface—of a yellowish white colour, mottled with numerous red vessels externally. Internally they were of a similar colour and appearance—crossed by fibres, which included matter of the consistence and general appearance of boiled ground rice. In the pelvic cavity, at its most depending parts, there were about two ounces of bloody pus and lymph, infiltrated with blood, and here and there these existed in small patches on the surface of the intestines and parietal peritoneum. The liver was much enlarged, and weighed six pounds ten ounces. It contained numerous nodular masses, which on the surface were cup-shaped. The largest were nearly four inches across, and were usually softened in their centre. On section, they presented the ordinary appearance of encephaloma of the liver, with the exception, that in many places their substance was partly diffluent, and on section excavations or cavities were left in the mass. Some of them contained a creamy yellowish fluid, mixed with red, and others olive-coloured serum, with a large amount of flocculent and granular pinkish debris. Here and there, also, masses of reticulum were infiltrated among the whitish and greyish cancerous exudation. The liver itself was pale fawn coloured and very fatty. The stomach was perfectly healthy; but there was a simple stricture at the pylorus, which with difficulty admitted the introduction of the little finger, and which depended on hypertrophy of the areolar tissue between the muscular and mucous coats. The intestines were extremely contracted; the colon not being above one-half inch in diameter. *Kidneys* pale, containing numerous small cysts. The epithelium, however, was nearly healthy, exhibiting under the microscope only a small quantity of granular matter. The mesenteric and lumbar glands were healthy.

Microscopic Examination.—A small portion of the white and tolerably consistent cancerous exudation in the liver presented numerous cancer cells, varying greatly in size and shape, but none exceeding the $\frac{1}{50}$th of a millimetre in its longest diameter. Many were nucleated, and several were evidently breaking up and disintegrating. They were associated with some free nuclei, and a multitude of molecules and granules—(Fig. 31). The reticulum was wholly composed of fatty molecules and granules—(Fig. 32). The broken-down matter on the surface of the œsophagus, where it was ulcerated, closely resembled that represented in Fig. 31, but was even more disintegrated. The milky juice squeezed from the glands between the thoracic aorta and the œsophagus presented large cancer cells, which presented the various appearances characteristic of their undergoing the fatty degeneration—(Fig. 33).

Fig. 31. Fig. 32. Fig. 33.

Fig. 31.—The appearance of the cells in the white masses of the liver.
Fig. 32.—Granular structure of the reticulum.
Fig. 33.—Appearance of the cells in the glands behind œsophagus.

Commentary.—During life, the pain in the stomach, the vomiting after food, the black bloody coagula rendered, and the distinct nodulated and somewhat moveable tumour in the epigastrium, left little doubt in the minds of all those who examined the case, that we had to do with cancer of the pylorus. On examination after death, however, the tumour which had previously been felt, was found to be a nodule of cancerous exudation developing itself in the liver, a part of which had been pushed forward so as to occasion the swelling. As the rest of the liver was entirely hid under the ribs, it was scarcely possible to have suspected this occurrence during life. The simple stricture, however, that really existed in the pylorus, conjoined with the pressure exercised by the tumour on the valve, caused the vomiting that formed the principal feature of the disease.

The appearance of the matters rendered by the mouth, proved that they must have come from the stomach; because, although a considerable quantity of red blood was evacuated, this was commonly mingled with rusty brown, and even perfectly black, coagula. Besides, on one occasion, he was actually seen by the clerk to render the blood by the act of vomiting; and the same thing was repeatedly observed by the nurse. At first, then, I considered that the cancer of the stomach had ulcerated internally, and poured out the blood evacuated; but, latterly, from the large quantities discharged, my suspicions were fixed on the presence of an aneurism pressing on the lung, and communicating with the trachea, in which case he must have swallowed the blood. This

supposition seemed to be confirmed by the existence of limited dulness on the left side, and by crepitation—an almost invariable concomitant of aneurism so situated.

On attempting, after death, to ascertain by what means the blood entered the stomach, I could not find any direct communication between the aneurism and that viscus, or the œsophagus. I concluded, therefore, that the blood must, in the first instance, have been infiltrated into the substance of the lung, have passed through the bronchi, trachea, and larynx, into the pharynx, and been thus swallowed. At least, such is the only supposition that the facts of the case seem to warrant.

This man presented in a very marked degree the so-called peculiar cachectic aspect of malignant disease. I have always noticed that this aspect is best marked in individuals labouring under cancer of the stomach, which interferes with the process of nutrition. It is stated in the report that he had previously been stout and fat—a condition I have pointed out in another place[1] to be favourable to the development of cancer generally. I am inclined to think that this malignant aspect, so much dwelt on by practitioners, is the mere result of emaciation from interference with the nutritive processes, or from pain and want of sleep, and is in no way distinctive of cancer in organs where such effects are not occasioned.

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[1] On Cancerous and Cancroid Growths. Edinburgh. 1849.

TUBERCULAR EXUDATION INTO THE LUNGS (PHTHISIS PULMONALIS)—TREATMENT BY COD-LIVER OIL.

CASE I.[1]—Patrick Barclay, æt. 15, admitted June 25, 1849. His previous history indicated that he had been of scrofulous habit from infancy. He had attended school regularly until a week ago, but could not take much exercise on account of a sore leg, which originated, twelve months previously, in a fall. His diet has, for a long time, been very poor. On the 18th he was attacked with cough, and this has continued till admission. He also complains of dyspnœa, on exertion. On admission, he is excessively emaciated. He complains of cough, which is sometimes very prolonged, but has no pain, nor difficulty of breathing. The chest expands well on inspiration. Cough easily excited, and occasionally severe. Sputa viscid, frothy, and tinged with blood. On percussion, there is great dulness on the right side, especially under the clavicle; the left side is also dull to a slight extent. On auscultation, distinct bronchophony, loud friction râle, and mucous râle approaching cavernous, are heard in the upper right side, in front; and these become more faint towards the lower part of the lung. On the left side, friction râles are also heard in the upper part in front. Behind, on the right side, vocal resonance, not so distinct, but râles the same as in front. Pulse 114, strong and sharp. The heart's apex beats below sixth rib; impulse increased; but percussion does not indicate lateral expansion. On auscultation, a chirping musical murmur is heard over the apex of the heart, at the end of the first sound. This murmur becomes much more faint towards the base. To the left of the manubrium of the sternum, a bellows murmur takes the place of the second sound. This murmur is quite concealed by loud friction râles, when respiration is going on, but is immediately perceived when the patient holds his breath. Tongue slightly furred; appetite good; some thirst. Bowels regular; urine natural. Sp. gr. 1020—not coagulable. The chest, face, and arms, are covered with an eruption of prurigo, which he has had several times. On the right thigh, towards the lower part, there are several cicatrices, and three sinuses, which communicate with dead bone. Is much troubled with sweating, which at night is very profuse. *To have good diet, with sweet milk morning and evening, and a dessert spoonful of Cod-Liver Oil three times a-day.* ℞ *Mist. Scillæ* ℥iv., *Tinc. Opii Ammon.* ℥ss., *Aquæ Cinnam.* ℥iss., *Aquæ font.* ℥ij. M. *Half-an-ounce three times*

[1] Reported by Mr Hugh Balfour, clinical clerk.

a-day. 30th.—Friction râle less. Gurgling râle, on right side. Upper part of *chest to be rubbed with Tartar Emetic Ointment.* July 2d.—Chirping murmur has become faint, and occasionally is inaudible. Has vomited his food several times. *Naphthæ* ℥iss., *to be added to mixture: to have beer for drink.* 5th.—Chirping murmur quite gone. 8th.—Chirping murmur returned. Cough severe—causing vomiting. Eruption, brought out by ointment, painful. *Omit the Ointment and Mixture.* ℞ *Pulv. Tragacanth. Co.* ℥i., *Naphthæ medic.* ℥i., *Sol. Mur. Morph.* ℥iij., *Syrup. Aurantii* ℥ss., *Mist. Scillæ* ℥v., M. *A table spoonful thrice a-day.* 21st.—A seton was introduced beneath the right clavicle. Still vomits in the morning, but takes food and medicine better. August 6th.—The expiratory murmurs under right clavicle are now quite dry. Vomiting is diminished. *Omit the mixture.* ℞ *Ferri Citrat.* ℥ss., *Tinc. Aurantii et Syrupi, āā* ℥ss., *Infus. Columbæ* ℥vi. M. *A table spoonful three times a day.* 12th.—The seton discharges freely, causing great irritation, and is to be withdrawn. Sept. 7th.—Appearance of patient much improved. Sounds of cavity in chest continue dry. *Takes now again a table spoonful of the oil three times a day.* Oct. 28th.—Musical murmur has entirely disappeared. He is becoming quite fat, and is able to go about the ward all day. Complains only of slight cough at night, and palpitation on exertion. The right infra-clavicular region is becoming flat. *Omit the mixture and also the Cod-Liver Oil.* Nov. 18th—Cough has returned with slight mucous expectoration; and, on auscultation, mucous and sibilant râles are heard all over the chest. Ordered to recommence the oil. ℞ *Mist. Scillæ* ℥vss., *Vini Ipecac.* ℥ij., *Sol. Mur. Morph.* ℥i., M. *A table spoonful three times a-day.* From this time he rapidly improved. The cavity became perfectly dry, and respiration over it was accompanied by blowing murmurs. Cough and expectoration greatly diminished. His general appearance is healthy, and he is very stout. On Jan. 13th, it is noted, that, on percussion, a distinct crackpot sound is heard in the right infra-clavicular region, and faintly also on the left side. On auscultation the heart's sounds are loud all over the chest, the second sound being accompanied with a distinct bellows murmur. Musical murmur has never returned. There is bronchophony and prolonged expiration in the right infra-clavicular region, but no moist sounds. Sleeps well, and is very little troubled with cough. Does not sweat; is very fat; appetite good. This boy, as far as all general symptoms are concerned, may be regarded as having been in good health for the last two months.

He was dismissed from the Infirmary, February 27, and visited me on the following day, when I ascertained, on careful examination, his condition to be as follows:—On percussion, the chest was tolerably resonant on both sides; but there was slight dulness under the right clavicle. On auscultation, the inspiration is loud, and of a blowing character, in right infra clavicular region; but the murmur is much softer than formerly. Expiration is still prolonged, and there is considerable vocal resonance, but not amounting to bronchophony —no moist râles. In the corresponding situation on the left side, the inspiration is somewhat harsh, and respiration slightly prolonged; vocal resonance normal; loud bellows murmur, with the second sound of the heart, heard over

nearly the whole chest. His general health is good; he expresses himself as being quite well. He appears stout and strong; but his countenance is somewhat sallow and cachetic. He has no expectoration or sweating, and the cough is trifling, and only present in the morning. He is about to return to the Industrial School, and resume the learning of his trade as a shoemaker.

Commentary.—This case offers a good instance of the advantages of cod-liver oil in phthisis pulmonalis. On admission, he presented the wasting characters of the disease in its last stage. The emaciation was extreme; the cough and sweating most distressing; and the physical signs demonstrated a cavity as large as the fist, in the right lung. Under the use of the oil his strength rallied. After a time it was given up, on account of his becoming so fat. Gurgling râles, and other signs of softened exudation, however, once more became apparent, and again disappeared when the use of the oil was resumed. He has continued to take it ever since, and the cavity is evidently contracting. With the exception of very slight cough in the morning only, he may be considered as enjoying good general health when he was dismissed from the Infirmary.

During no part of the time this boy was under treatment did he experience any difficulty in taking the oil. On the contrary, it occasioned no uneasiness in the stomach, and was readily digested, and this although the food was at one period frequently vomited, owing apparently to the violence of the cough. Its influence on his general health was most remarkable, as well as upon the local disease in the lungs. From a state of extreme emaciation he became so stout that it was feared the oil would occasion obesity; and was therefore, for a time, discontinued. It was observed, however, that during its suspension the pulmonary symptoms returned, and that these, on again resuming the use of the remedy, once more disappeared. His appetite was always good—a circumstance I have noticed as being very favourable, not only for the beneficial action of cod-liver oil, but for the successful treatment of phthisis generally. Indeed, it is the anorexia nausea and dyspeptic symptoms which constitute the great difficulty the physician has to overcome in the management of the disease, as is well illustrated in the following case:—

Case II.[1]—Jane Hamilton, a dressmaker, æt. 18, admitted September 12, 1849. She stated that last April her general health began to fail; the appetite was bad; cough with expectoration came on; cold sweats appeared on the face, hands, and feet; the catamenia, which had never been very regular, were suppressed; and she became so weak that she could not stand. Since then there has been a temporary improvement; but for some time back she has again become worse.

On admission she was pale and emaciated, and so weak that she was unable to sit up above a few minutes at a time. There was copious perspiration during sleep, a severe cough, with abundant yellowish viscid sputa—no pain in the chest, which was well formed externally. The tongue was covered with a

[1] Reported by Mr Alexander Struthers, clinical clerk.

brown fur; appetite capricious and bad; bowels open every second day. The treatment consisted of tonics, expectorants, and counter-irritation to the chest, which produced considerable amendment. I took charge of the case in the middle of *October*, and found, on careful percussion, dulness below the right clavicle, with loud mucous râle over the upper third of right chest. There were also sonorous and sibilant râles over the greater part of both lungs, anteriorly and posteriorly. By means of expectorants and counter-irritants, the bronchitic symptoms and signs were subdued by the *1st of November;* but the dulness and moist râles under the right clavicle still continued. *A tablespoonful of cod-liver oil was then ordered to be taken three times a day.* The remedy was suspended on the 8th, on account of a febrile attack she then experienced, which was ushered in with headache and rigors, and accompanied with accelerated but soft pulse, heat of skin, loss of appetite, frequent nausea and vomiting, and considerable spinal irritation. It was not until November 30th that these symptoms were so far removed, and the tone of the stomach augmented—by means first, of antimonials, and subsequently of naphtha, alkalies, vegetable bitters, and stimulants—that the oil was again ordered. It produced considerable nausea, however, so that, after persevering in its use for ten days, it was again suspended. It was once more had recourse to on the 14th of December, and was readily retained on the stomach. A few days subsequently the dose was increased to four tablespoonfuls daily. *December* 30.—There is now a very evident improvement in the general health. Her strength is so far increased that she sits up a considerable portion of the day. The perspirations have nearly disappeared. The expectoration is still thick and purulent, but not so copious. She is evidently much stouter, and the skin is of a more healthy colour. The catamenia have also reappeared. There is still dulness under the right clavicle on percussion. The coarse moist râle has disappeared, and a fine crepitating murmur only is heard with the inspiration towards the acromial end of the clavicle. There is prolonged inspiration, and increased vocal resonance. From this time she continued to improve. On the 1st of January the oil was reduced to three table spoonfuls daily. A small blister was occasionally applied to the upper part of right chest anteriorly, and an expectorant mixture given to facilitate the expectoration, which, though diminished in quantity, retained its viscid and purulent character. On the *30th of January* the inspiratory murmur had acquired a certain degree of harshness, but here and there very fine crepitation could still be detected. She left the Infirmary on the 24th of February.

I examined the chest carefully on the 7th of March. There was still dulness, but not so marked as formerly, under the right clavicle; no crepitation on auscultation, but harshness of the inspiratory murmur, prolonged expiration, some friction noises, and increased vocal resonance. She was stout, of healthy appearance, and expressed herself as being quite well; but the expectoration of purulent matter still continued to a slight degree, with occasional cough.

Commentary.—In this second case the local disease had not proceeded to the advanced stage observable in the former one; for the physical signs in the girl

exhibited at most bronchitis, with softening of the tubercular exudation at the apex of the right lung, whereas in the boy they demonstrated that a large cavity existed in one lung, whilst the other was also affected. There was the same general prostration, however, and the same emaciation, excessive weakness, profuse perspiration, purulent expectoration, and distressing cough. But there was this difference in the antecedent circumstances of the two cases—namely, that the boy had a good appetite, but had been subjected to an insufficient diet, whilst the girl had no appetite, but possessed the means of gratifying it. In the first case nutrition was affected, from food being in deficient quantity, the digestive organs being tolerably healthy ; in the second, it was brought about on account of the dyspepsia and disordered state of the stomach rendering it impossible that a sufficient quantity could be consumed. The result in both was the same—namely, impoverishment of the blood, and tubercular exudation into the pulmonary organs.

The practical management of these two cases was considerably modified by the circumstances to which I have just alluded. In the boy, there was no difficulty in overcoming the imperfect nutrition. We have seen that he took the cod-liver oil, and digested it and his food with the greatest facility. In the girl, all thoughts of food caused disgust, and the cod-liver oil produced nausea, and for some time could not be tolerated. For a considerable period, therefore, my exertions in the treatment of this case may be considered as preparatory to the diminution of the phthisical symptoms, and directed to the removal of those complications which prevented any successful attack on the more important disease.

Thus my first efforts were directed to removing the bronchitis, which was accomplished by means of expectorants and counter-irritants, in the manner I shall describe more particularly when I consider the treatment of that disease. Cod-liver oil was then ordered, but it occasioned nausea, and was suspended on account of a febrile attack she now experienced. On her recovery from this, the nausea, vomiting, and dyspeptic symptoms were treated by means of naphtha, alkalies, vegetable bitters, and carminatives, with apparent success ; but, on recurring to the oil, they again returned ; so that, after persevering for ten days, it became again necessary to give up its employment. In a few days, however, it was once more tried, and on this occasion with success. It was taken readily, a marked amendment followed ; the dose was increased to four table spoonfuls daily, and it was astonishing to see how rapidly she improved. Her strength increased, the emaciation and cachectic look disappeared, the skin assumed a healthy colour, and she became positively stout and fat, so that she was scarcely recognisable. The cough almost ceased, the expectoration greatly diminished, the perspirations did not appear at night, the catamenia returned, she sat up the entire day, and at length considered herself so well, that, on being allowed to leave the hospital for a day, she did not return. She called on me a few days afterwards, when I found that, although the constitutional symptoms had almost entirely disappeared, and her general health might be called good, traces of the local disease were still apparent, as stated in the report. This case, therefore, exhibits the obstacles which the physician has not unfre-

quently to overcome before he can carry out that line of treatment by means of which the anormal nutrition is to be obviated, and the tubercular exudation checked ; but it also inculcates the importance of perseverance, and exhibits the good effects which may result from persisting in a treatment dictated by correct pathological principles.

Notwithstanding the great benefit produced in both these cases, they cannot be considered as cured. So far is this from being the case, that there is every reason to fear that a return to the imperfect diet in the one case, and the sedentary employment in the other, will once more induce all the symptoms and dangerous effects which in the hospital were removed with so much trouble. Nor, unless we could convert such institutions into establishments for the permanent support and surveillance of phthisical cases, is it easy to see how this can be prevented. Certain it is that nothing is more common than, by means of judicious treatment, completely to check the progress of phthisis, and restore the patient to such a state of health that, if he be in a public hospital, he almost always insists on going out, and, if a private case, he abandons those remedies and precautions which are absolutely necessary to his existence. Hence it too frequently happens, that, even after such considerable amendment as we have seen to take place—after restoration from a state of the most complete prostration to one of almost vigorous health—the causes which originated the disease induce its return, and the patient sinks, after one or more relapses. It is of all things most important, therefore, to keep a careful watch over phthisical cases long after the constitutional symptoms have disappeared, and, in fact, so long as the physical signs indicate any traces of the disease. This, for obvious reasons, can be accomplished much better in private than in hospital practice.

On some future occasion, it is my intention to enter more at length into the subject of phthisis pulmonalis, and to speak of its pathology, and the method of treating the important complications it occasionally presents. At present I have confined myself to a consideration of the good effects of cod-liver oil in the two cases we have had under our observation.

THE CLASSIFICATION AND DIAGNOSIS OF CUTANEOUS DISEASES.

NOTWITHSTANDING the great advances which have been made in our knowledge of diseases of the skin, it cannot be denied that very inexact notions prevail regarding this class of disorders. I do not here allude to the eruptive fevers, which, from their frequency and danger, necessarily demand the attention of every professional man, so much as to the lighter and more chronic disorders to which the skin is subject. Ignorance, however, here, although it seldom occasions danger to human life produces great inconveniences, exasperates the progress of other maladies, renders life miserable, and frequently destroys those social relations and ties which constitute happiness.

A lady was seized with an eruption on the genital organs, which rendered the slightest contact unbearable. Her husband suspected that she laboured under syphilis, and accused her of infidelity. A medical man, who was consulted, pronounced her disease venereal,—a separation took place between the parties ; the lady always maintaining her innocence, but anxious to escape the unfounded suspicions and ill-treatment of her husband. Mercury and an anti-venereal treatment were continued for some time, but the disease increased in intensity. At length another physician, skilled in the diagnosis of skin diseases, was consulted, who pronounced it to be an *eczema rubrum*, quite unconnected with syphilis ; and, on the application of appropriate remedies, a speedy cure confirmed his diagnosis.

A lady in the country sent one of her servants into town, to obtain advice for an eruption which had broken out on her body, and which she was afraid might be communicated to her children. The practitioner consulted was much puzzled, and asked me to see the patient, who, according to him, was labouring under a rare form of skin disease. I found a *herpes zoster* extending round one half the trunk, and told him it would disappear spontaneously in a few days, which it did.

Nothing is more common in practice than to meet with cases among servants, where prurigo has been mistaken for itch, causing great alarm to the family, and much injury to the servant. The various diseases of the scalp also are continually confounded together. Indeed, examples might easily be accumulated, proving the inconvenience which an unacquaintance with skin diseases may occasion both to patient and practitioner. A young medical man is especially liable to be consulted in cases of trifling skin eruptions ; and nothing is so likely to establish his credit, as the ready diagnosis and skilful management of such disorders, especially when (as frequently happens) they

have been of long standing, and baffled the efforts of older practitioners. Conceiving then that this subject deserves more careful consideration than it usually meets with in a clinical course, I propose directing your attention to the classification and general diagnosis of these disorders, before alluding to the individual cases which are in the wards.

CLASSIFICATION.

Skin diseases are so various in appearance and in their nature, that many experienced practitioners have endeavoured to facilitate their study by arranging them in groups.

There are three kinds of classification which deserve notice :—1st, The artificial classification of Willan ; 2d, the natural arrangement of Alibert ; and 3d, a pathological arrangement founded on the supposed morbid lesions.

Of these, the best, and the one which most facilitates the study of cutaneous diseases, is certainly that of Willan. No doubt it has its faults and inconveniences, but many of them have been removed by Biett. This classification is founded upon the character presented by the eruption, which, when once known, determines the disease. It is an old saying, that it is much easier to play the critic and to find fault, than to construct something better. This remark may be well applied to those who have ventured to set aside Willan's arrangement and bring forward others. The natural classification of Alibert can never be followed by the student, and presupposes a considerable knowledge of the subject. The pathological arrangement again is decidedly faulty. The morbid anatomy and pathology of many skin diseases are unknown ; how, then, can we found a classification upon them ? Indeed, the very principles on which such classifications are based, are continually undergoing changes as pathology advances.

On the whole, therefore, the arrangement best suited to the student and for practical purposes is that of Willan and Bateman, with the modification introduced into it by M. Biett.

Definitions.—Before we can proceed to refer any particular disease to its appropriate class, we must be acquainted with the characteristic appearances which distinguish the different orders. They are as follows :—

1. *Exanthema* (Rash).—Variously formed irregular sized superficial red patches, which disappear under pressure, and terminate in desquamation.

2. *Vesicula* (Vesicle).—A small, acuminated, or orbicular elevation of the cuticle, containing lymph, which, at first, clear and colourless, becomes often opaque or pearl-coloured. It is succeeded either by scurf or a laminated scab.

3. *Bulla* (Bleb).—This differs from the vesicle in its size, a large portion of the cuticle being detached from the skin by the interposition of a watery fluid, usually transparent.

4. *Pustula* (Pustule).—A circumscribed elevation of the cuticle, containing pus. It is succeeded by an elevated scab, which may or may not be followed by a cicatrix.

5. *Papula* (Pimple).—A small, solid, acuminated elevation of the cuticle, in appearance an enlarged *papilla* of the skin, commonly terminating in scurf, and sometimes, though seldom, in slight ulceration of its summit.

6. *Squama* (Scale).—A lamina of morbid cuticle, hard, thickened, whitish, and opaque, covering either small papular red elevations, or larger deep-red, dry surfaces.

7. *Tubercula* (Tubercle). — A small, hard, indolent, primary elevation of the skin, sometimes suppurating partially, sometimes ulcerating at its summit.

8. *Macula* (Spot).—A permanent discoloration of some portion of the skin, often with a change of its structure. These stains may be white or dark-coloured.

The different appearances thus described characterise the eight orders of Willan and Bateman, viz. 1. Exanthemata; 2. Vesiculæ; 3. Bullæ; 4. Pustulæ; 5. Papulæ; 6. Squamæ; 7. Tuberculæ; 8. Maculæ. The principal modifications made by Biett are removing from these groups certain diseases which have no affinity with them, and constituting them into extra orders of themselves. Thus he makes altogether fifteen orders, as seen in the following classification given by his pupils Schedel and Cazenave, which also indicate the subdivisions into which each order is divided.

ORDER I.—*Exanthemata.*
- Rubeola.
- Scarlatina.
- Erythema.
- Erysipelas.
- Roseola.
- Urticaria.

ORDER II.—*Vesiculæ.*
- Eczema.
- Herpes.
- Scabies.
- Miliaria.
- Varicella.

ORDER III.—*Bullæ.*
- Pemphigus.
- Rupia.

ORDER IV.—*Pustulæ.*
- Variola.
- Vaccinia.
- Ecthyma.
- Impetigo.
- Acne.
- Mentagra.
- Porrigo.
- Equinia.

ORDER V.—*Papulæ.*
- Lichen.
- Prurigo.

ORDER VI.—*Squamæ.*
- Psoriasis.
- Pityriasis.
- Icthyosis.

ORDER VII.—*Tuberculæ.*
- Lepra Tuberculosa.
- Lupus.
- Molluscum.
- Frambœsia.
- Cheloidea.

ORDER VIII.—*Maculæ.*
- Lentigo.
- Ephelides.
- Nævi and Vitiligo.

ORDER IX.—*Purpura.*

X.—*Pellagra.*

XI.—*Radesyge.*

XII.—*Lepra Astrachanica.*

XIII.—*The Aleppo Evil*, or *Malum Alepporum.*

XIV. — *Elephantiasis Arabica.*

XV.—*Syphilidæ*, or *Syphilitic Eruptions.*

Even this classification is very complicated, and appears to me to admit of still further modifications, which will render the subject more simple and practical at the bed-side. I shall point out to you, in the first instance, the reasons which have induced me to make these modifications, and then give, in a tabular form, the classification which we shall in future adopt.

In the orders *Exanthemata* and *Pustulæ*, we find several diseases which are characterised by excessive fever, so that they have long been spoken of under the term of eruptive fevers, as well as under that of febrile eruptions. With them, in short, fever is the characteristic, and they are influenced by laws of a peculiar character, altogether different from those which regulate the production of other cutaneous affections. I propose, then, removing these disorders from the category of skin diseases altogether, which will only leave three in the

first order, namely, erythema, roseola, and urticaria. I am aware that, strictly speaking, these may be accompanied by slight fever, which may also occur in several other skin diseases. But I do not pretend to form a classification which is perfect, or even pathological, but one which some experience in the teaching of these diseases has convinced me is useful and practical for the student.

In the order *Vesiculæ* we find five diseases. I propose cutting out miliaria, as being very unimportant, and a trifling sequela of fevers. Varicella I believe to be a modified small-pox, and I omit it for the same reasons as I do variola.

I propose expunging the order *Bullæ* altogether. We find in it two diseases. The first of these, pemphigus or pompholyx, is a vesicular disease in every point, appearing in successive crops, and forming a laminated scab. Rupia, on the other hand, is evidently a pustular disease, forming a prominent scab, producing ulceration, and leaving a cicatrix. I shall, therefore, add pemphigus to the order vesiculæ, and rupia to that of the pustulæ.

From the *Pustulæ*, for the reasons formerly stated, I expunge variola, vaccinia, and equinia. Mentagra, so far as I have been able to study it in this country, has always consisted of eczema or impetigo on the chin of the male. In syphilitic cases, it is more or less tubercular, and it has been described also as consisting of a vegetable parasite. Although I have never seen the appearance figured by Cazenave (Plate 16), I can understand that such a mentagra might really consist of vegetable fungi. At all events, mentagra is not a special pustular disease. Porrigo means any eruption on the head, whether vesicular pustular, or squamous. Favus, to which it has long been applied, is undoubtedly a vegetable parasite, and ought, with others of a like nature, to constitute a class of themselves. Hence the class of pustulæ will with us contain only impetigo, ecthyma, acne, and rupia.

The orders *Papulæ* and *Squamæ* remain the same. The strophulus of many English writers is certainly only lichen occurring in the child; and what has been called lepra, as distinguished from psoriasis, is the latter disease presenting an annular form.

From the class *Tuberculæ* I cut out framboesia, as being a disease unknown in this country, together with cheloidea, which, as I understand it, means either cancer or tubercle of the skin.

As regards the order *Maculæ*, I place in it, as did Willan, purpura, because, although sometimes it may depend on constitutional causes of an obscure nature, and at others be allied to scurvy, it still, in an arbitrary classification of this kind, constitutes an undoubted spot or macula.

All the other orders of Biett I shall take the liberty of expunging—pellagra, lepra Astrachanica, and malum Alepporum, are unknown in this country. I agree with Hebra in thinking that radesyge is only a modified form of lupus. The elephantiasis Arabica is an hypertrophy of the areolar tissue or chorion, and belongs more to the subject of fibrous growths than that of skin diseases. Syphilitic diseases I do not regard as a distinct order, but as any of the ordinary skin affections, more or less modified by a peculiar state of the constitution.

Whilst I have cut out many diseases from the eight orders originally established by Willan, and subsequently modified by Biett, I find it necessary to add two orders, which the advance of pathology and histology shows ought to be considered apart. I allude to those which depend on the presence of parasitic animals and plants, and which may be called respectively *Dermatozoa* and *Dermatophyta*. I am not quite sure whether *every* case of scabies depends upon the presence of an insect. Certainly it is not always discoverable. If this point were established, it would, perhaps, be correct to remove scabies from the order vesiculæ, and place it among the dermatozoa. I must confess I should do this very reluctantly, however, because the peculiar vesicle of that disease is so characteristic. As it is, I shall put acarus among the dermatozoa, although it certainly forms, when present, a constituent of itch. Among the dermatophytes will be placed favus and mentagra,—both removed from the class pustulæ. Other diseases, such as plica Polonica, and pityriasis, have been considered as parasitic, but the former is unknown in this country, and the latter, though frequently presenting epiphytes among the scales, owes none of its essential characters to this circumstance.

The classification, then, we shall in future adopt is as follows:—

ORDER I.—*Exanthemata.*
- Erythema.
- Roseola.
- Urticaria.

ORDER II.—*Vesiculæ.*
- Eczema.
- Herpes.
- Scabies.
- Pemphigus.

ORDER III.—*Pustulæ.*
- Impetigo.
- Ecthyma.
- Acne.
- Rupia.

ORDER IV.—*Papulæ.*
- Lichen.
- Prurigo.

ORDER V.—*Squamæ.*
- Psoriasis.
- Pityriasis.
- Icthyosis.

ORDER VI.—*Tuberculæ.*
- Lepra Tuberculosa.
- Lupus.
- Molluscum.

ORDER VII.—*Maculæ.*
- Lentigo.
- Ephelides.
- Nævi.
- Purpura.

ORDER VIII.—*Dermatozoa.*
- Entozoon folliculorum.
- Acarus.
- Pediculus.

ORDER IX.—*Dermatophytæ.*
- Achorion Schonleini (Favus).[1]
- Achorion Grubii (Mentagra).[1]

DIAGNOSIS.

The recognition of skin diseases, and the separating one class from the other, is of essential importance to a proper treatment. On this point I fully agree with a recent writer, who says "the treatment of a great many cutaneous diseases is of but secondary importance, compared with their differential diagnosis. Many of them will get well without any treatment, provided they are allowed to pursue their natural course; and, on the contrary, a mild

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[1] It has been objected to the words porrigophyte and mentagraphyte, introduced by Gruby, that they are unclassical; and, as the celebrated botanist, Link, after carefully examining these vegetations, has described the former as a new genus, under the head of achorion (from *achor*, the old term given to a favus crust by Willan), I have thought it best to adopt that term. To mark the variety in favus, he has added the name of its discoverer, Schonlein; and I have ventured, at all events provisionally, to distinguish the one described as existing in mentagra, by adding to it, also, that of its discoverer, Gruby.

and simple eruption, by being mistaken, from a similarity of external appearances, for one of a severe or rebellious character, and treated accordingly, may be aggravated and prolonged for an indefinite period." (Burgess.) This differential diagnosis, however, to the inexperienced, is a matter of great difficulty, because considerable tact is often necessary, not only to discover the original element each disease presents, such as a rash, vesicle, pustule, scale, and so on, but this is often impossible. Under such circumstances the diagnosis is frequently derived from the scab, or other appearances presented, such as the cicatrix. The whole subject has been rendered very confused and complicated by systematic writers, who have often given different names to the same disease, or unnecessarily divided them into forms and varieties. I advise you not to pay any attention to these forms and varieties for the present, and confine your efforts only to the detection of the diseases enumerated in the table under each order ;—and with a view of facilitating your endeavours, the following short diagnostic characters and definitions should be attended to :—

I. Exanthemata.

1. *Erythema.*—A slight continuous redness of the skin in patches of various shapes and sizes.

2. *Roseola.*—Circumscribed rose-red patches, of a circular, serrated, or annular form.

3. *Urticaria.*—Prominent red patches of irregular form, the centre of which is often paler than the surrounding skin.

II. Vesiculæ.

Eczema.—Very minute vesicles in patches, presenting a shining appearance, yielding a fluid which dries into a laminated or furfuraceous crust. The skin is of a bright red colour.

Herpes.—Clusters of vesicles, varying in size from a millet seed to that of a pea, surrounded by a bright red areola. They yield a fluid which dries into a thin incrustation, that drops off between the eighth and fifteenth day.

Scabies.—Isolated vesicles of an acuminated form, commonly seated between the fingers, and flexor surfaces of the arms and abdomen—never on the face.

Pemphigus.—Large vesicles or blebs (bullæ), surrounded by an erythematous circle, the fluid of which forms, when dry, a laminated crust. When chronic, they appear in successive crops, and the disease is called *pompholyx*.

III. Pustulæ.

Impetigo.—Small pustules, commonly occurring in groups, and forming an elevated crust.

Ecthyma.—Large isolated pustules, depressed or umbilicated in the centre, and leaving a cicatrix.

Acne.—Isolated pustules situated on a hardened base, which form and disappear slowly. They only occur on the face and shoulders.

Rupia.—Large pustules, followed by thick prominent crusts, and producing ulcerations of various depths.

IV. Papulæ.

Lichen.—Minute papulæ occurring in clusters or patches.

Prurigo.—Larger and isolated papulæ generally seated on the extensor surfaces of the body.

V. Squamæ.

Psoriasis.—Whitish laminated scales slightly raised above the reddened surface of the skin.

Pityriasis.—Very minute scales, like those of bran, seated on a reddened surface.

Ichthyosis.—Induration of the epidermis, and formation of square or angular prominences, not seated on a reddened surface.

VI. Tuberculæ.

Lepra Tuberculosa.—(Elephantiasis of the Greeks.)—Tubercles varying in size, preceded by erythema and increased sensibility of the skin, and followed by ulceration of their summits.

Lupus.—Induration or tubercular swelling of the skin, which may or may not ulcerate. In the former case, ulceration may occur at the summit or at the base of the tubercles, and frequently extends in the form of a circle more or less complete.

Molluscum.—Pedunculated, globular, or flattish tubercles, accompanied by no erythema or increased sensibility, occurring in groups. They are filled with atheromatous matter.

VII. Maculæ.

Lentigo or Freckle.—Brownish-yellow or fawn-coloured spots on the face, bosom, hands, or neck.

Ephelis.—Large patches of a yellowish-brown colour, accompanied by slight desquamation of the cuticle.

Nævi or Moles.—Spots of various colours and forms, sometimes elevated above the skin. They are congenital.

Purpura.—Red or claret-coloured spots or patches, which do not disappear under pressure of the finger.

VIII. Dermatozoa.

These minute animals require a lens of considerable power to ascertain their characters, which need not be particularised here, as they do not modify the appearances of the diseases previously stated, such as scabies or prurigo senilis.

IX. Dermatophytæ.

These minute plants also require a high magnifying power to distinguish them. But they communicate peculiar characters to certain cutaneous diseases, as follows :—

Favus.—Bright yellow, umbilicated crusts, surrounding individual hairs, which agglomerate together to form an elevated friable crust, of a peculiar musty or mousey smell.

Mentagra.—Greyish or yellowish dry crusts, of irregular form, originating in the hair follicles of the beard.

In forming your diagnosis, therefore, you will be guided principally by three characters :—1st, The primitive and essential appearance—that is, whether a rash, vesicle, pustule, and so on. 2d, The crust,—whether laminated or prominent, composed of epidermis only, &c. 3d, Ulceration—whether present or absent ; and if so, the kind of cicatrix. These and other characters I shall point out at the bedside, so as to familiarise you with their appearances.

You will remember that the classification formed by Willan is wholly artificial. It is like the Linnæan classification of plants. The difficulty for the learner is to recognise the essential character, the more so as many diseases pass through various stages before this is formed. Thus herpes presents, 1st, a rash; 2d, papules ; 3d, vesicles; 4th, pustules; yet the disease is considered vesicular. Ecthyma passes through the same stages, yet it is considered pustular. In the vesicular disease, however, the crust is laminated,—in the pustular, it is more or less prominent.

Again, it not unfrequently happens that two or more diseases are combined together in one eruption. Thus it is very common to meet eczema and impetigo combined, when the disease is called *Eczema-Impetiginodes.* Favus occasionally causes considerable irritation, producing a pustular or impetiginous margin around it. The vesicles of scabies are often accompanied by the pustules of ecthyma, and so on.

In very chronic skin diseases, it may happen that it is impossible to say what the original disorder was, whether vesicular, pustular, scaly, or papular. In such cases the skin assumes a red colour, the dermis is thickened, the epidermis rough and indurated, and a morbid state is occasioned, in which all trace of the original disease is lost, and what remains is a condition common to various disorders.

As regards varieties, little need be said, and as formerly stated, I advise you to postpone their study until you are acquainted with the diseases themselves. Even then an acquaintance with them is of secondary importance. These varieties have been formed on account of the most varied circumstances, such as, 1st, Duration, most of them may be *acute* or *chronic ;* 2d, Obstinacy, hence the terms *fugax, inveterata, agrius,* &c. ; 3d, Intensity, hence the terms *mitis, maligna,* &c. ; 4th, Situation, hence the terms *capitis, facialis, labialis, palmaris,* &c. ; 5th, Form, hence the terms *circinatus, scutulata, iris, gyrata, larvalis, figurata, tuberosa, guttata,* &c. ; 6th, Constitution, hence the terms *cachectica, scorbutica, syphilitica,* &c. ; 7th, Age, hence the terms *infantilis, senilis,* &c. ; 8th, Colour, hence the terms *album, nigrum, rubrum, versicolor,* &c. ; 9th, Density, hence the terms *sparsa, diffusa, concentricus,* &c. ; 10th, Feel, hence the terms *lævc, indurata ;* 11th, Sensation produced, hence the terms *formicans, pruritus, urticans,* &c.; 12th, Geographical distribution, hence the terms, *tropicus, Ægyptiana, Norwegiana,* &c.

Notwithstanding I have endeavoured to place this subject before you in as simple and uncomplicated a form as possible, I am conscious that at first you

will still experience considerable difficulty in the diagnosis of skin affections. This can only be removed by practical experience at the bed-side, and by constantly exercising your powers of observation in detecting the essential elements which their varied forms present. At the same time, I think the modified classification and short characters I have given, will materially assist your studies in this important department of practical medicine. It must be remembered, however, that they only refer to those cutaneous diseases which you are liable to meet with in this country. Should you ever be called upon to practise in the tropics, or in other places where peculiar skin disorders prevail, it will, of course, be your duty to study them in an especial manner. Here, as they cannot be made the subject of clinical observation, they are altogether removed from our consideration.

FAVUS.

Case I.[1]—Isabella Fergusson, æt. 22, a somewhat stout servant girl, with fair skin, and scrofulous aspect, was admitted into the clinical ward of the Royal Infirmary, May 6, 1849. She states that there has been an eruption on her head for the last twelve years. Four months ago the catamenia ceased, since which time she has been subject to occasional headach, constipation, and slight dyspepsia. Nearly the whole of the scalp is covered with a thick yellow friable crust, of uneven surface, and irregular margin, emitting a highly offensive odour, like cat's urine, and causing great itching and irritation. Up to the middle of July she was treated with various internal remedies, which subdued the constipation and dyspepsia, and caused return of the catamenia. The crusts on the scalp were removed by poultices, and an ointment, composed of *ammon. mur.* ℥j.; and *ung. sulphuris*, ℥j., applied locally. I first took charge of the case on the 14th of June. The head was then again covered with favus crusts, some isolated, others compressed together, and forming an elevated scab. A small portion, examined under the microscope, presented the branches and sporules of the cryptogamic plant, so characteristic of the disease. *The crusts were again removed by poultices of linseed meal, the head shaved, and cod-liver oil ordered to be applied to the scalp morning and evening,—the whole to be covered with an oil-silk cap.* This treatment was continued for six weeks, but on suspending it the favus crusts returned. During the months of August and September iodine and pitch ointments were applied; portions of the scalp were even blistered, but without effect.

At the commencement of October, the scalp being at the time perfectly clean and closely shaved, all local treatment was suspended, and the reappearance of the disease carefully watched. In three days the entire surface presented a scaly eruption, the epidermis being raised, cracked, and broken up over the whole scalp, which was exceedingly dry and harsh. The furfuraceous condition of the scalp continued, becoming more and more dense, until the fourteenth day, when there were first perceived minute bright sulphur-coloured spots in it. These, on being examined microscopically, were seen to be composed of fine molecular matter mingled with epidermic scales, from which delicate branched tubes were apparently growing. The crusts were now once more removed by repeated poulticing, and cod-liver oil applied as formerly.

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[1] Reported by Mr William Johnston, clinical clerk.

The scalp continued free from eruption until the 20th of November, when she was seized with febrile symptoms, which ushered in a very severe attack of typhus, that ran its usual course. She was not considered fully convalescent until the 8th of December. During this period, no local application was made to the scalp, with the exception of the cold douche to alleviate the head symptoms, delirium and coma having been severe. The surface latterly once more became covered with furfuraceous scales; and on the 11th December the bright yellow minute spots again made their appearance. As her strength improved, the favus crusts increased in size and number, and the progress of this very singular disease was again carefully watched. Each individual crust, at first the size of a small pin's head, gradually flattened out, and became circular. Its centre was cupped and umbilicated, and many, which were more isolated than the rest, grew until they measured a quarter of an inch in diameter. More generally, however, they came in contact with others, and groups of twos, or threes, and sometimes a dozen, became compressed together, and presented the hexagonal form of the honey-comb. Gradually the concavity disappeared. Each crust presented an external dark ring, and an internal lighter centre, which became considerably elevated. The various groups became aggregated together, and she complained of great itching and irritation, and it was evident that, if allowed to proceed further, the condition she presented on admission would be soon produced. The crusts were, therefore, again removed by poultices, cod-liver oil once more applied, and the scalp remained clean and free from irritation until 17th January, when the cure appearing to be hopeless she was dismissed. She was enjoined to continue the use of the oil, which, whilst applied, and covered with the oil-silk cap, had the power of preventing the formation of fresh crusts on the scalp.

Case II.[1]—Margaret Bryer, æt. 12, of scrofulous and cachectic appearance, was admitted June 19, 1849, with favus crusts on the scalp. The crusts are most numerous and dense on the crown of the head; but others, isolated, or in small groups, are scattered over the temples, forehead, and occiput. The scalp is bald, here and there, in patches, varying in diameter from half an inch to an inch. On examining the crusts microscopically, they were seen to contain the cryptogamic branches and sporules pathognomonic of favus. The disease is of three years' standing, and is attributed to the use of a comb, belonging to another girl who had a sore head. The crusts have been several times removed by means of pitch plasters and a variety of ointments, but have always returned. At first, the crusts were removed, and the scalp kept moist by means of an alkaline lotion, which succeeded in removing the irritation. Early in July she was ordered ℥ss. *of cod-liver oil, three times a-day. The oil was also directed to be applied to the shaved scalp twice daily, which was to be kept constantly covered with an oil-silk cap.* This treatment was persevered in until August 18, when she was dismissed cured.

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[1] Reported by Dr J. Smith, clinical clerk.

This girl was readmitted September 5, and remained in the Infirmary five days, under observation. Up to this time the disease had not reappeared, so that, when dismissed on the 10th, a permanent cure was undoubtedly produced.

Case III.[1]—Margaret Cameron, æt. 5, an ill-nourished, cachectic-looking child, admitted July 23, 1849, on account of an eruption on the scalp. In some places the hair was matted together by a recent pustular eruption; groups of impetiginous pustules and eczematous vesicles being scattered here and there. In others, where the disease was more chronic, hard, nodulated, elevated masses, and friable crusts, existed. The disease was eczema impetiginodes. No favus was present, as was proved by careful examination, and microscopic demonstrations of the scabs. *Poultices were ordered to the scalp, to remove the crusts; and afterwards an alkaline wash, with cod-liver oil internally.* My colleagues taking charge of the ward during the months of August and September, I lost sight of this patient; but, on resuming duty in the beginning of October, I was surprised to find the child's head covered with favus crusts, with the branches and sporules fully developed, as proved by the microscope. It appeared that the girl was a great favourite with Isabella Fergusson (Case I.), and frequently slept in her bed. It was, therefore, supposed that she had caught favus from her. The child's general health, however, had greatly improved; and *the crusts were ordered to be removed by poultices, the head shaved, and cod-liver oil applied locally twice daily, and an oil-silk cap to be worn constantly.* This treatment was continued for seven weeks. At the end of that time all treatment was suspended, and the scalp watched daily. In fifteen days the head was covered with a slight furfuraceous desquamation; but the hair was abundant. Another week elapsed without any return of favus; and, her health being now good, she was discharged, December 6.

Case IV.[1]—Margaret Adie, æt. 12, thin, and of weak appearance, admitted July 24, 1849, says that as long as she can remember she has had an eruption on the scalp, which has been treated in a variety of ways, without effect. All her brothers and sisters have been similarly affected. On admission, the entire hairy scalp is covered with prominent crusts of favus, forming an entire mass, emitting an offensive mousey odour. Here and there small portions have scaled off, leaving a bright red surface, presenting here and there impetiginous pustules. From below some of the scales a purulent fluid exudes, and she complains of occasional great itching and irritation. The parasitic nature of the crust was established by microscopic examination. *The same practice as in the last case was adopted.* She was treated by my colleagues during the months of August and September, and then discharged, to make room for a more urgent case.

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[1] Reported by Mr Alexander Struthers, clinical clerk.

Case V.[1]—Jane Kirkwood, æt. 6, admitted October 11, 1849. The scalp is scattered all over with bright yellow, circular, cup-shaped crusts. On the sides of the head and forehead these are more or less aggregated together, of hexagonal form, presenting in mass the honey-combed appearance. On the summit of the head they are more isolated, the intervening scalp being bald. Posteriorly there is a dense, elevated crust, in which the hairs are imbedded, and where the original form of the eruption is lost. The whole exhales the peculiar odour of the disease, and produces considerable itching and irritation. She is of a cachectic, scrofulous appearance, seems ill-nourished, and says she caught the disease three months ago, from her brother. The digestive and other functions are normal. The crusts on examination presented, under the microscope, the vegetable branches and sporules characteristic of favus. *The crusts were ordered to be removed with successive poultices, the head then to be shaved, and cod-liver oil smeared over the scalp twice a-day; an oil-skin cap to be constantly worn; a tea-spoonful of cod-liver oil to be taken three times a-day; full diet.* This treatment was continued up to November 24, when she was dismissed, and has not returned.

Case VI.[2]—Jessie Somerville, æt. 14, admitted December 27, 1849. She has been affected with an eruption on the scalp for two years, which has caused continual itching. Otherwise she has enjoyed tolerable health, until a fortnight since, when she caught scabies from another girl with whom she slept. On admission the scalp presents the crusts of favus in their advanced stage, forming a dense, irregular scab, below which, here and there, purulent matter escapes. Impetiginous pustules are also observable here and there. There is a papular and vesicular eruption of scabies on the hands, arms, and chest—in the former situation, mingled with pustules of ecthyma. *The scalp was treated in the same manner as the last case, and simple lard was ordered to be rubbed over the parts affected with scabies.* The ward book says she was dismissed cured, February 5. All traces of scabies had then for some time disappeared, and the scalp remained clean. Whether the favus was eradicated is very doubtful.

Case VII.[3]—James Scott, æt. 15, a painter, applied for advice, January 27, 1850. He states that, a week ago, without any known cause, he observed a small spot, about the size of a pin's head, over the external angle of the left malar bone. On examination a circular reddened spot, about the size of a shilling, is seen over the external angle of the left malar bone, in the centre of which were several favus crusts, aggregated together. These examined under the microscope presented the branches and sporules pathognomonic of the disease. *The whole was then cauterised with nitrate of silver,* and he never returned.

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[1] Reported by Mr Alexander Struthers, clinical clerk.
[2] Reported by Mr Charles Harwood, clinical clerk.
[3] Reported by Mr Hugh Balfour, clinical clerk.

Commentary.—The seven cases of Favus above detailed, all of which have entered the clinical wards within a comparatively short time, must convince you that this is a very common disease among the lower orders of this city. The first case was that of an adult, and was of twelve years' standing. By means of poulticing, and excluding the air with oily applications, the scalp could easily be freed from the eruption, and kept so ; but, as soon as these means were discontinued, the disease returned. The second and third cases were permanently cured by the constant application of oil for six or seven weeks. They were children of the ages of twelve and of five years respectively. In the former, the disease was of three years' standing ; in the latter, it was altogether recent, and caught from another case in the ward. The fourth, fifth, and sixth cases were dismissed from the house, without its being known whether the cure was permanent or not. In the seventh case the disease was limited, and was at once destroyed by means of caustic.

These cases have furnished us with excellent opportunities of studying Favus in all its different stages, watching its mode of development, its treatment, and, indeed, most of the facts in connection with it. The disease is one which commonly lasts a very long time, even many years, is never easily eradicated when it has existed for any considerable period, and sometimes seems to be incurable. On this account it is rare that you are able to watch favus through its entire progress,—first, because it may be doubted how far a public charity of this kind ought to be made to support individuals so affected for months or years ; and, secondly, because it always happens that, when urgent cases demand admission, and beds are required, these are just the individuals who are discharged to make room for them. This will account for the unsatisfactory terminations of some of the cases above reported. At the same time, having studied the appearances presented in the seven instances referred to—some of which were recent, others of some standing, and others exceedingly chronic,—you will have had little difficulty in recognising the various aspects it presents.

Favus is a disease, with the true nature of which we have been made acquainted by the modern cultivation of histology. I propose, therefore, directing your attention to it in an especial manner. But, in the first instance, I propose saying a few words with regard to eruptions of the scalp in general, because they are exceedingly common, and because great confusion has been thrown over the subject by systematic writers.

There was a period in the history of skin diseases when they were arranged in two great divisions, viz., those affecting the scalp, and those affecting the rest of the cutaneous surface. All the disorders comprehended in the first of these divisions received the name of Porrigo, a word, said by some to be derived from *porrum*, on account of the scales or concretions of the scalp, resembling the layers of an onion ; by others, it is derived from *porrigo*, to spread. Willan described six kinds of Porrigo, viz., P. larvalis, P. furfurans, P. scutulata, P. favosa, P. lupinosa, and P. decalvans. It is now ascertained that none of these diseases are necessarily peculiar to the scalp,—and that, although they are more or less modified by being connected with and affecting the hairs of that region, they may also occur on other parts of the

skin. There can be little doubt, however, that the employment of the term Porrigo, as well as the corresponding word *Teigne* in France, has thrown great confusion over the subject of eruptions on the scalp. But, as this term is still in pretty general use, it will be well to explain to you what diseases these different kinds of Porrigo really are.

Porrigo larvalis (*larva*, a mask) is really Impetigo, or Eczema impetiginodes, of the scalp. The former is recognised by crusts more or less prominent or nodulated; the latter, by the circumstance that, in addition to these nodules, there is between them a laminated or brittle crust, spread more or less equally over the surface. They are both very common in infants and children; and, as the disease sometimes extends over the face, concealing the features, hence the term *larvalis*. A very characteristic representation of impetigo capitis, which I now show you, is given in *Willan* and *Bateman*, Plate xli., erroneously called Porrigo Favosa.—See also the disease on the face. *Ibid.*, Plate xxxvii. *Alibert*, Planches 13 and 15.

Porrigo furfurans (*furfur*, bran) is really Pityriasis of the scalp, although Psoriasis of that region has also received the same appellation. There is also a peculiar form of Eczema, or Eczema impetiginodes, in which the crust is friable, and breaks up, or crumbles into minute fragments, to which the term furfurans has been erroneously applied. The true Porrigo furfurans (Pityriasis) is well represented.—*Willan* and *Bateman*, Plate xxxviii. *Alibert*, Planches 14 and 15.

Porrigo scutulata (*scutulum*, a small shield).—The nature of this disease has been much disputed. By some, it is said to be Favus (Erasmus Wilson), by others a form of Herpes (Cazenave, Neligan, Burgess). The disease is described by Willan and Bateman, and more recently by Burgess, to consist of oval or rounded, slightly elevated patches, covered with furfur, and having stunted or filamentous hair projecting from the surface. It is a form of skin eruption exceedingly rare in Edinburgh. It seems to be represented, *Willan* and *Bateman*, Plate xxxix. *Willis* (Trichosis Scutulata).

Porrigo favosa (*favus*, a honeycomb) is a disease, the true nature of which has been only lately determined. It consists essentially in an exudation on the skin, in which fungi or phytaceous plants grow. Round, isolated, bright yellow crusts are formed, which, when compressed together, assume an hexagonal shape. Hence the term *favosa*. It is well represented, *Willis*, (Trichosis lupinosa). *Erasmus Wilson*, Fasiculus I. *Alibert*, Planche 17.

Porrigo lupinosa (*lupinum*, the lupine).—This is the same disease as the last. The round or oval crusts when isolated, and at an early stage, present a concavity and form, resembling that of the lupine seed—hence its name.

Porrigo decalvans (*calvus*, bald).—Baldness is so common among the

aged, that it can scarcely be called a disease; but when it occurs in young persons, and is circumscribed, it constitutes the Porrigo decalvans of Willan. It is said by Gruby to depend on a vegetable parasite growing in the hair. It is well represented, *Willan* and *Bateman*, Plate xl. *Willis* (Trichosis Decalvans).[1]

From this analysis of the different kinds of the so-called Porrigo, you observe that there is nothing peculiar with regard to them. With the exception of baldness, none essentially belong to the hairy scalp. True favus is far more common on the head than elsewhere; but I have frequently seen it on various parts of the cutaneous surface, and occasionally on the cheeks or shoulders, without being on the scalp at all. (Case VII.) I propose, then, abolishing this term Porrigo altogether, and, in future, making use of the term Eczema Impetigo, Pityriasis, Psoriasis, or Favus of the scalp, as the case may be. It is this latter disease that I now propose to describe to you more particularly.

History of Favus as a Vegetable Parasite.—(Achorion Schoenleini of Link.)

The demonstration by Bassi[2] of the vegetable nature of the disease named muscardine in silk worms, which causes so great a mortality amongst those animals, opened up to pathologists a new field for observation, and led to the discovery, that certain disorders in the higher animals, and even in man himself, were connected with the growth of parasitic plants of a low type. Schönlein,[3] of Berlin, was the first to detect them in favus crusts,—an observation confirmed by Remak,[4] Fuchs, and Langenbeck.[5] Gruby[6] gave a very perfect description of these vegetations, in 1841, and made numerous researches as to their seat, origin, and mode of propagation. These were repeated by myself, and further extended in 1842.[7] In 1845 I succeeded in inoculating the disease in the human subject. Since then they have been made the subject of further investigation, by Lebert,[8] Remak,[9] Robin,[10] and numerous other inquirers, to whose observations I shall have occasion to allude subsequently.

Mode of Development and Symptoms of Favus.

By most writers, amongst whom may be cited Willan, Bateman, Biett, and Rayer, favus is described as commencing in a pustule, which breaks and

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[1] It is not every plate that is published that can communicate instruction to medical students about to study skin diseases. Those I have referred to are characteristic, and may be readily examined in the reading-room of the University.

[2] Del Mal. del Segno Calcinaccio o Muscardino. Milano, 1837.

[3] Müller's Archives. 1839.

[4] Medicinische Zeitung. 1840.

[5] Comptes Rendus de la Polyclinique de Göttingen.

[6] Comptes Rendus. Tom. xiii., p. 72 and p. 309. 1841.

[7] On Parasitic Vegetable Structures found Growing in Living Animals. Edinburgh Philosophical Transactions. Vol. xv., p. 277. 1842. Monthly Journal, June 1842.

[8] Physiologie Pathologique. Tom. ii. 1845.

[9] Diagnostische und Pathogenische Untersuchungen. 1845.

[10] Des Végétaux qui croissent sur l'Homme, &c. 1847.

forms the peculiar scab. Others, such as Baudelocque, Mahon, Alibert, and Gibert, deny its pustular nature, and state that it commences in a crust. With a view of determining the mode of its commencement, I made the following observations.

Observation 1.—All the crusts were removed from the head of a boy, labouring under the disease, by the application of poultices. In a few days the scalp was quite clean, presenting here and there, anteriorly, patches about the size of half-a-crown, deprived of hair. In these bald portions of the scalp, the skin looked somewhat injected and glossy on the surface ; but there was no pain on pressure, no abrasion on the skin, or other symptom of inflammation or local lesion. The disease was now allowed to take its natural course, and I watched its development daily. In two days, minute pustules were observed to be thinly scattered over the surface, the contents of which, when examined under the microscope, were found to consist of normal pus. In two days more, the number of pustules had considerably increased, and those formerly observed had become larger. I surrounded several of the latter with a ring of ink, in order that there might be no difficulty in following the changes they underwent, and distinguishing them from others. In another day two of the pustules under observation broke, and the matter exuded formed a scab, which, under the microscope, was found to be composed of epidermic scales and irregular amorphous masses, without any trace of vegetable structure. In the interstices of these scabs, the scalp was covered with a furfuraceous desquamation, consisting only, as shown by the microscope, of epidermic scales. On the sixth day the scabs were of a dirty yellow colour, but not of the peculiar tint or form of the porrigo crust. Only a few pustules remained, and the injected appearance of the skin was gone. On the tenth day, the head was covered with irregular agglomerated scabs, similar to those produced from impetigo. The furfuraceous desquamations also continued. On the twelfth day, I detected, for the first time, at the posterior part of the scalp, where the hair was most abundant, small bright yellow spots, the size of a pin's head, somewhat depressed below the surface. On removing one of these spots with the point of a lancet, and examining it by means of a biconvex lens of an inch focus, I found a smooth, cup-shaped, bright yellow capsule, the diameter of which was about $\frac{1}{20}$ of an inch. Its margin was continuous with several epidermic scales, which it was necessary to cut or tear through before the capsule could be removed. Having done this, it was readily separated from the parts below, except where the hair, which usually perforates these crusts, connected it inferiorly with the dermis. On pulling this out, or cutting it through, the capsule could be removed entire, leaving behind it a reddened inflamed concave depression, corresponding to the convexity of its inferior surface. On placing this capsule in a drop of water, pressing it between two slips of glass, and examining it with a magnifying power of 300 diameters, it was found to be composed of a finely granular mass, in which were numerous long-jointed filamentous tubes. These were seen coming from the edge of the capsule, as M. Gruby has described. At

this time the round and oval sporules were few in number, and did not appear in groups or chains until three days later.

Observation 2.—In a boy of well-marked scrofulous habit, who laboured under favus in its most characteristic form, the crusts over the two anterior thirds, and bald portion of the scalp, were numerous, round, and isolated, but matted together posteriorly, where the hair was still abundant. When these were examined microscopically, the cryptogamic vegetations were immediately detected, as in the last case. All the crusts were removed by the application of poultices, and the head rendered perfectly smooth and clean. In three days a furfuraceous desquamation of the cuticle appeared, which became more and more abundant until the eighth day, when the small bright yellow spots of the porrigo made their appearance, not having been preceded by the formation of any pustules. The crusts were removed several times in succession, and the disease again allowed to appear ; but in this case the presence of the peculiar favus crusts was never preceded by that of pustules.

In the other cases which have come under my observation, I have satisfied myself that the formation of pustules is not essential to the disease, although they are often present. (Case I.) Hence the mistake of those pathologists who classified favus amongst the pustulæ. M. Gruby says that they are *never* present, which is equally erroneous, although they appear to be a secondary result, attributable to the irritation the disease produces in some individuals.[1] On the other hand, I have never seen this affection produced, without having been preceded by desquamation of the cuticle, an observation which appears to me of some importance, in explaining the origin of the disease, as we shall subsequently see.

It would appear, then, that the first morbid change is increased vascularity of the skin, accompanied with a desquamation of the cuticle ; and that in a period varying from twelve to fourteen days, small spots of a bright yellow colour, like that of sulphur, may be detected. These gradually augment in size, but even at the earliest period, may be observed, with a lens, to have a central depression, through which a hair may generally be observed to pass. The crust or capsule may enlarge to about the size of a shilling, and if it be isolated, still retain its rounded form. Usually, however, its edges come in contact with other capsules, and then it loses its rounded shape, and assumes the hexagonal and honey-combed appearances described by authors. I consider, then, that the so-called porrigo lupinosa, and porrigo favosa, constituting distinct forms or varieties of some writers, are merely different stages of the same disease, and dependent upon the greater or less aggregation of the crusts. On the first appearance of the capsule, its edges are somewhat depressed below the surface of the cuticle ; but as it increases in size, the margins become more and

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[1] This explanation of the origin of pustules and purulent matter, when present, has been adopted by Lebert, Remak, and Simon.

more elevated and prominent, whilst a series of concentric rings or grooves may be observed in them. At first, also, the whole capsule appears of a homogeneous bright yellow, but when further developed, its centre assumes a whiter colour. This arises from the aggregation of the sporules of the plant, which are more abundant in this situation. As the development proceeds, this central yellow whitish mass assumes a mealy, powdery consistence, and encroaches upon the edges of the capsule, which gradually disappear, whilst its upper concave form becomes convex, as Gruby pointed out. In general, an inflammatory ring is seen round the crust, which, as the capsule becomes elevated above the skin, enlarges, and assumes a deeper colour, indicative of the increased local irritation. At length the whole cracks or splits up; all regular form is lost; a dense thick crust covers the scalp; an odour, like the urine of cats or mice, is evolved; and in chronic cases, vermin deposit their eggs in the interstices, and crawl in large numbers over the surface.

Fig. 34.

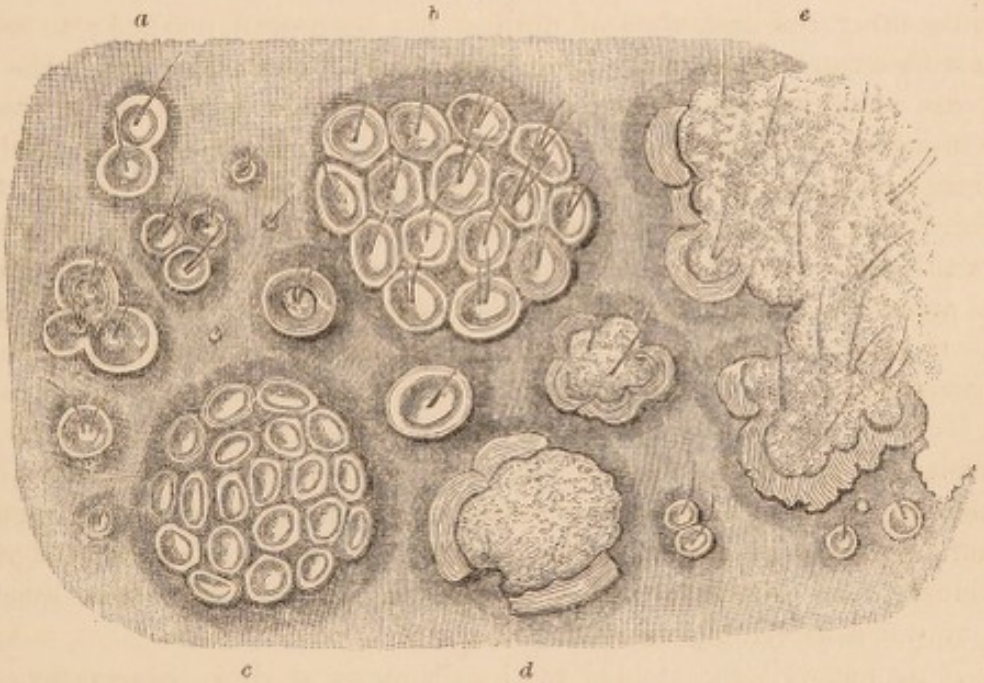

Fig. 34.—*a*, Isolated crusts of Favus, presenting the lupine seed-like depression in different stages of growth (so-called *Porrigo lupinosa*); some are arranged in groups of twos and threes. *b*, A larger group of these crusts, somewhat compressed at the sides, like a honeycomb (*Porrigo favosa*). *c*, Another group, which occurred on the shoulder of a young girl. No hairs passed through the centre of these crusts. *d*, Large isolated crusts in an advanced stage of growth, the external ring is cracked, and the friable centre is enlarged and elevated. *e*, Numerous crusts aggregated together, so as to form an irregular elevated mass. Traces of the original form may be observed in the cracked rings round the margin. (Natural size.)

The other local symptoms are merely those which result from the greater or less degree of irritation produced in different persons by the changes above referred to. At first, scarcely any uneasiness is felt; perhaps occasional slight itching of the part. As the disease progresses, however, the itching becomes more intolerable, and induces the patient to rub and scratch the scalp. By these means, several of the crusts are forcibly torn from their attachments, and considerable effusion of serous fluid and blood is produced. Sometimes inflam-

mation is thus occasioned. Impetiginous pustules are frequently formed, or suppuration produced, terminating in ulceration, and the discharge of an ichorous fluid from beneath the crusts. At an advanced stage of the disease, the peculiarly offensive odour exhaled is insupportable to those who surround the individual, and the ichorous discharge, vermin, and crusts, which cover the affected parts, present a most disgusting appearance.

Although the disease most commonly attacks the hairy scalp, it may occur on the forehead, temples, cheeks, nose, chin, ears, shoulders, arms, abdomen, lumbar region, sacrum, knees, and legs. Alibert gives a plate in which it is figured in all these situations. I have myself seen it on the cheek, shoulders, back, arms, and inferior extremities, and in some of these situations I could detect no hairs perforating the capsules.—(Fig. 1.)

The constitutional symptoms are of the utmost importance, but, generally speaking, receive little attention from practitioners. In most of the individuals affected, who have come under my notice, the general health has been greatly deranged, and a scrofulous or cachectic constitution more or less evident. In some the *facies scrofulosa* of authors has been well marked; in others there were engorgements of the lymphatic glands of the neck; and in the only fatal case which has come under my observation, there were found tubercular depositions in the lungs, mesenteric glands, and other textures. Indeed, the generality of individuals who die labouring under favus, perish from phthisis, or other forms of tubercular disease. The beautiful plates published by Alibert, are in this respect far from being true to nature; for whilst the capsules and crusts are accurately drawn, the individuals affected seem to me ideal personages, enjoying the most robust health, and possessing even the utmost beauty of form and feature. In the generality of cases, on the contrary, the patient is thin, the countenance is of a dirty yellow colour, and the whole aspect betrays depression of the vital powers. The appetite is often impaired, the alvine evacuations irregular, and the functions of digestion and nutrition are impeded. Numerous writers have observed the physical and mental development of the individual to be retarded; and Alibert gives instances where the epoch of puberty was considerably delayed.

By those not well accustomed to the diagnosis of skin diseases, favus has often been confounded with other eruptions of the scalp, more especially eczema and impetigo, or the combination of these diseases known as the eczema impetiginodes. In none of these eruptions, however, do the yellow crusts or scales present traces of vegetations when examined microscopically. This, therefore, furnishes the real diagnostic and pathognomonic character of the disease.[1]

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[1] I am not aware that this peculiar disease has ever been observed in any of the lower animals. I may, therefore, mention that I have seen it on the face of a common house mouse, in which animal the same cryptogamic vegetations were to be detected as in man.

Causes

Alibert considered the disease hereditary, and gives cases confirmatory of this view. As regards age, it is by far most common in children between the ages of three and twelve years. In infancy, and after puberty, it is more rare, although sometimes present; and in a few instances it has been observed in persons advanced in years. In almost all the cases which have come under my notice, the individuals have been exposed to causes which depress the vital powers, and are well known excitants of tuberculous disease. Close questioning will usually elicit that they are of a scrofulous family; have been exposed for some time to infected or corrupted air; inhabited small rooms, or confined streets, or dwellings situated in unhealthy situations; that the aliment has not been very nutritive, &c. &c. Hence why the disease is common in workhouses and jails, and most prevalent amongst the poorer classes of the population, and individuals who obtain a precarious existence.

Almost every writer on the disease considers it to be contagious. Bateman, Guersent, and others, speak of its spreading amongst school-boys, from the employment of the same towels, combs, caps, &c. Gibert has seen it propagated in the wards of St Louis from the same cause. It has been observed, he says, two or three times to be communicated by young people kissing each other, when it has appeared in the chin or neighbourhood of the mouth. Mahon even pretends to have contracted favus incrustations on his fingers, from having neglected to wash them after dressing the heads of those affected. Alibert, in his early writings, also thought it to be contagious. In his later works, however, he evidently doubts it, says that much exaggeration has been made use of on this subject, and states that the *amour propre* of parents usually induces them to ascribe the origin of so disgusting a disease to external communication. He further observes, "Mes élèves ont souvent tenté d'inoculer en notre présence, le produit de l'incrustation faveuse, sous plusieurs formes, et en variant les procedés. Le plus souvent il n'est rien resulté, dans d'autres cas est survenue une inflammation passagère, qui s'est bientôt évanouie—parfois une suppuration semblable qui pourrait s'établir par tout irritant mechanique, ou par l'insertion d'une substance étrangère dans le tegument."[1] Gruby also, on discovering its vegetable nature, inoculated thirty phanerogamous plants, twenty-four silk-worms, six reptiles, four birds, and eight mammifera, but only produced the disease once, and then in a plant. The human arm was inoculated five times, but, independent of a slight inflammation and suppuration, no effect was produced.

Remembering the ill success of these experiments, I thought it right to try whether the disease could be propagated in another part of the individual already affected; because if not susceptible of extending in a person already predisposed, it was not likely to be caught by one in perfect health. I accordingly made a

[1] Traité des Maladies de la Peau, fol., p. 443.

small oblique puncture in the neck of a boy labouring under the disease, about an inch below the occipital protuberance, and an inch and a-half from the large masses of crusts connected with the scalp. I introduced through this puncture, under and into the cuticle, some of the broken-down yellowish-white friable matter found in the centre of the capsules, which consists principally of the sporules of the plant. The wound healed up in a few days without presenting anything anormal. I also inoculated my own arm in the same manner, but without any result. I repeated these inoculations twice on the boy and on myself with the matter of the pustules instead of that of the crusts, but in every case without success.

It then occurred to me, that, as the disease usually appeared in the hairy scalp, it might be more readily produced in that part of the integuments. I therefore had my own scalp inoculated in two places with the pus taken from one of the pustules. It excited inflammation, suppuration, and ulceration. The matter discharged formed hard scabs, which, however, in no way resembled those of favus, or exhibited vegetations when examined with the microscope. After continuing three weeks, during which period one of the sores extended to the size of a shilling, and both ulcerations still spreading, they were destroyed by the frequent application of caustic. I subsequently had my head inoculated with the sporules of the parasite, but the wound healed up completely without producing any appreciable result.

I afterwards rubbed a mass of the white friable matter, constituted of the sporules, upon the arm, so as to separate several of the epidermic scabs, and induce erythematous redness. Slight superficial abrasions were produced, which healed in a few days, without presenting any evidence of the vegetations having germinated. I also sprinkled the sporules over an extensive accidental abrasion on the leg, which, however, healed up in the usual manner.

Thus, in none of these experiments, performed in various ways, and frequently repeated so as to avoid fallacy, could I succeed in causing the plant to germinate on parts different from those on which it was originally produced. In other words, I could not communicate the disease to other individuals, or from one part of the same individual to another.

At the time I did not consider these experiments (performed in 1841-2) as decisive of the question, although they show that it is with great difficulty inoculation succeeds. Shortly after, Dr Remak, of Berlin, communicated the disease to his own arm in the following way :—He fastened portions of the crust upon the unbroken skin, by means of plaster. In fourteen days, a red spot, covered with epidermis, appeared, and in a few days more a dry yellow favus scab formed itself upon the spot, which, examined microscopically, presented the mycodermatous vegetations characteristic of favus.[1] Mentioning this fact to my polyclinical class, at the Royal Dispensary, in the summer of 1845, one of the gentlemen in attendance volunteered to permit his arm to be inoculated. A boy, called John Bangh, æt. 8, labouring under the disease, was at the time the

[1] Medicinische Zeitung, August 3, 1842.

subject of lecture, and a portion of the crust, taken directly from this boy's head, was rubbed upon Mr M.'s arm, so as to produce erythematous redness, and to raise the epidermis. Portions of the crust were then fastened on the part by strips of adhesive plaster. The results were regularly examined at the meetings of the class every Tuesday and Friday. The friction produced considerable soreness, and, in a few places, superficial suppuration. Three weeks, however, elapsed, and there was no appearance of favus. At this time, there still remained on the arm a superficial open sore about the size of a pea, and Mr M. suggested that a portion of the crust should be fastened directly on the sore. This was done, and the whole covered by a circular piece of adhesive plaster about the size of a crown piece. In a few days, the skin surrounding the inoculated part appeared red, indurated, and covered with epidermic scales. In ten days, there were first perceived upon it minute bright yellow-coloured spots, which, on examination with a lens, were at once recognised to be spots of favus. On examination with the microscope, they were found to be composed of a minute granular matter, in which a few of the cryptogamic jointed tubes could be perceived. In three days more, the yellow spots assumed a distinct cupped shape, perforated by a hair; and in addition to tubes, numerous sporules could be detected. The arm was shown to Dr Alison; and all who witnessed the experiment being satisfied of its success, I advised Mr M. to destroy each favus spot with nitrate of silver. With a view of making some further observations, however, he retained them for some time. The capsules were then squeezed out, and have not since returned. Mr M. had light hair, blue eyes, a white and very delicate skin. There is every reason to believe that the strips of plaster employed in the first attempt shifted their position, and that the crust was only properly retained by the circular piece of plaster employed in the second experiment.

That the disease, therefore, is inoculable, and capable of being communicated by contagion, there can be no doubt, a result which accords with the observations of most practitioners, and with numerous recorded facts. (Case III.) It must also be evident that it does not readily spread to healthy persons, and that there must be either a predisposition to its existence, or that the peculiar matter of favus must be kept a long time in contact with the skin previously in a morbid condition.

Pathology.

I have shown, when describing the symptoms and mode of development of the disease, that it is not essentially pustular, and that the pustules occasionally present are accidental. On the other hand, it has been shown that the peculiar favus crust is composed of a capsule of epidermic scales, lined by a finely granular mass; that from this mass millions of cryptogamic plants spring up and fructify; and that the presence of these vegetations constitutes the pathognomonic character of the disease. In order to examine the natural position of these vegetations microscopically, it is necessary to make a thin section of the capsule, completely through, embracing the outer layer of epidermis, amorphous mass, and light friable matter found in the centre. It will then be

found, on pressing this slightly between glasses, and examining it with a magnifying power of 300 diameters, that the cylindrical tubes (*thalli*) spring from the sides of the capsule, proceed inwards, give off branches dichotomously, which, when fully developed, contain, at their terminations (*mycelia*), a greater or less number of round or oval globules (*sporidia*). These tubes are from the $\frac{1}{400}$ to $\frac{1}{600}$ of a millimetre in thickness, jointed at irregular intervals, and often contain molecules, varying from $\frac{1}{10.000}$ to $\frac{1}{1000}$ of a millimetre in diameter. The longitudinal diameter of the sporules is generally from $\frac{1}{300}$ to $\frac{1}{100}$, and the transverse from $\frac{1}{300}$ to $\frac{1}{150}$ of a millimetre in diameter (Gruby). I have seen some of these, oval and round, twice the size of the others. The long diameter of the former measured $\frac{1}{75}$ of a millimetre. The mycelia and sporules agglomerated in masses are always more abundant and highly developed in the centre of the crust. The thalli, on the other hand, are most numerous near the external layer. There may frequently be seen swellings on the sides of the jointed tubes, which are apparently commencing ramifications.

Fig. 35.

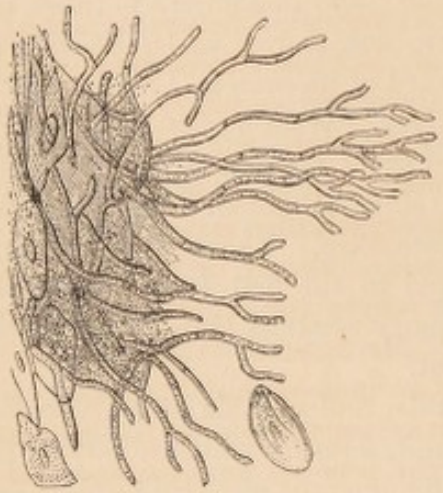

Fig. 36.

Fig. 35.—Branches of the *Achorion Schoenleini*, in an early stage of development, growing from a molecular matter, and mingled with epidermic scales, from a very minute Favus crust.
Fig. 36.—Fragments of the branches more highly developed, with numerous sporules and molecular matter, from the centre of an advanced Favus crust. (Magnified 300 diameters linear.)

On examining the hairs which pass through the favus crusts, it will often be found that they present their healthy structure. At other times, however, they evidently contain long, jointed branches, similar to those in the crust, running in the long axis of the hair, which is exceedingly brittle. I have generally found these abundant in very chronic cases ; and on adding water, the fluid may be seen running into these tubes by imbibition, leaving here and there bubbles of air, more or less long. There can be very little doubt, that the tubes and sporules after a time completely fill up the hair follicle, and from thence enter the hair, causing atrophy of its bulb, and the baldness which follows the disease. The various steps of this process, however, I have been unable to follow, never having had an opportunity of observing favus in the dead scalp, and of making proper sections of the skin.

Fig 37.

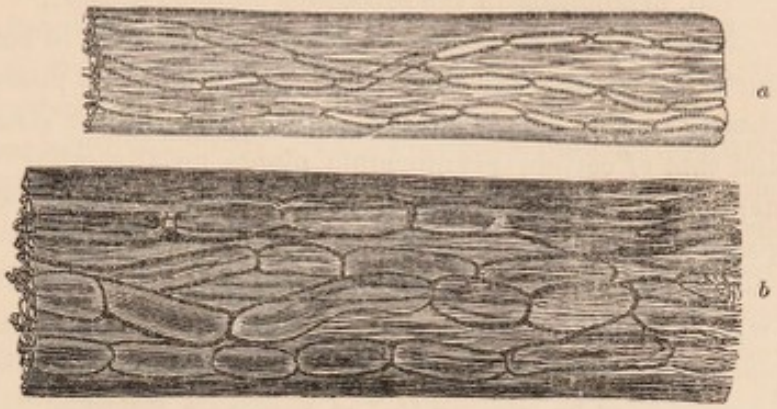

Fig 37.—*a*, A light hair, containing branches of the *Achorion Schoenleini*—(magnified 300 diameters linear). The wood-cutter has made the branches too beaded. *b*, A darker coloured hair, containing branches of the plant—(magnified 800 diameters linear).

Several writers on favus have treated its vegetable nature as a mere hypothesis. At first it was considered, as by Mr Erichsen,[1] to be "founded merely upon the outward appearance, sufficiently strong certainly, which the cup-shaped crust of favus offers to lichens, or vegetations of a similar description." Subsequently favus was supposed to consist of a mass of cells; and it was argued by Dr Carpenter[2] that the vesicular organization is common to animals as well as plants; and hence "to speak of *porrigo favosa*, or any similar disease, as produced by the growth of a vegetable within the animal body, appears to the author a very arbitrary assumption." Mr Erasmus Wilson, in his work on "Diseases of the Skin" (p. 430), as well as in a special "Treatise on Ringworm," is also opposed to the idea of favus owing its essential characters to a vegetable growth. He considers that the peculiar branches and oval bodies previously described, are mere modifications of epidermic cells, which, in some cases, he is of opinion may be transformed into pus cells—in others, into those observed in favus. The branches of the plant he calls "cellated stems," and the sporules, secondary cells; and argues, that mere resemblance to a vegetable formation is not sufficient to constitute a plant. He says, "The statement of the origin of the vegetable formations by roots implanted in the cortex of the crust is unfounded; the secondary cells bear no analogy to sporules or seeds; and it is somewhat unreasonable to assign to an organism so simple as a cell the production of seeds, and reproduction thereby, when each cell is endowed with a separate life, and separate power of reproduction."[3] Lastly, M. Cazenave, in a work just published,[4] although he acknowledges himself to be no histologist, says, he has sought for the sporules many times, and believes himself authorised to

[1] Medical Gazette, December 1841, p. 415.
[2] Principles of Physiology, p. 453.
[3] On Ringworm, 1847, p. 23.
[4] Traité des Maladies du Cuir Chevelu, 1850.

conclude, that their detection is not always so easy as is supposed (p. 225). Finally, he denies that favus is a vegetable parasite, and maintains it to be a peculiar secretion, originating in the sebaceous glands (p. 236).

With the exception of Mr Wilson, who appears carefully to have examined the favus crust, the opposition to the vegetable nature of this production, seems to have originated in very imperfect notions as to its intimate structure on the one hand, and that of certain cryptogamic plants on the other. For if long hollow filaments, with partitions at intervals, containing molecules within their cells, springing from an unorganized granular mass, and giving off towards their extremities round oval bodies, or sporules, arranged in bead-like rows, be not vegetables, what are they? The animal tissues present nothing similar, while numerous plants, long known to botanists, present the same identical structure. But not only must they be referred to the vegetable kingdom, but to a considerably elevated position among the cryptogamic plants. The *protococcus nivalis* and *torula cerevisiæ*, universally considered as plants, together with the *sarcina ventriculi*, described by Goodsir, are immeasurably beneath them in complexity of structure; and many of the *mucores* or moulds growing in damp places, are, as I have satisfied myself by repeated examination, much more simple in their organism. Any one who looks over the cryptogamia of Greville, will at once detect the strong analogy between the structures found in favus, and the *penicilium glaucum* of Link, the *aspergillus penicillatus*, *acrosporium monilioides*, *sporotorium minutum*, *nostoc cœruleum*, and other plants therein figured. Indeed, it seems to me surprising, how the vegetable nature of these structures can, for a moment, be doubted by any one who has personally examined them, especially under powers of from six to eight hundred diameters linear.

In considering whether the structures described, and now by every one acknowledged to exist in the favus crusts, really belong to the vegetable kingdom, we should remember that they are not the only formations of this kind which have been found to grow parasitically in living animals. In my original paper, I described others growing in phthisical cavities, in the sordes on the gums and teeth of typhus patients; and pointed out that they had been observed in the living tissues of mollusca, insects, reptiles, fishes, birds, and mammiferous animals. These observations have subsequently been confirmed by numerous pathologists and naturalists. Lastly, we cannot overlook the opinion of botanists themselves concerning this question. The most eminent mycologists, so far as I am aware, have no doubt of the vegetable nature of favus. Dr Greville, to whom I exhibited them, was quite satisfied of the fact. Brogniart, according to Gruby, and Messrs Link and Klotzsch, to whom they were shown by Remak, expressed a similar opinion. Brogniart considers them to belong to the genus Mycoderma of Persoon. J. Müller places them among the genus Oidium; but both Link and Klotzsch consider that they ought to constitute a distinct genus. The former, in consequence, has given it the generic name of Achorion (from achor, the old term for favus), and added to it the designation of the discoverer, Schönlein. The following is his description of the plant:—

"*Achorion Schoenleini nobis, orbiculare, flavum, coriaceum, cuti humanae praesertim capitis insidens; rhizopodion molle, pellucidum, floccosum, floccis tenuissimis, vix articulatis, ramosissimis, anastomoticis (?);*[1] *mycelium floccis crassioribus, subramosis, distincte articulatis, articulis inaequalibus irregularibus in sporidia abeuntibus; sporidia rotunda, ovalia vel irregularia, in uno vel pluribus lateribus germinantia.*"

With regard to the idea of Mr Erasmus Wilson—that they are modifications of epidermic cells—it must be observed that this touches upon a great question in pathology—namely, whether particular cells have certain definite characters and modes of development, or whether one kind of cell may be modified into others. I have frequently asked myself whether accidental circumstances might not transform an epithelial or hepatic cell into that of cancer, or whether various healthy cells might not become morbid ones. Without entering into this subject at length, I need only state my opinion that, in the present state of science, every fact leads to the conclusion, that cells, once formed from a blastema, always advance according to laws originally impressed upon them. Consequently, epidermic cells, though they may be transformed into hair, horn, or other epidermic structures, cannot be changed into pus cells on the one hand, or into those resembling vegetable growths on the other. If this view be correct, it follows that we must regard the branches and sporules in the favus crust, as consisting of true vegetable parasites, and as cryptogamic plants, growing in the animal textures.

The mode of development from sporules has now been determined with considerable exactitude. Remak made small grooves on the cut surface of a fresh apple; placed portions of the favus crust in them; then laid the apple, with the cut surface turned upwards, in moist sand; and covered the whole with a glass bell. Under these circumstances, he found that the sporules developed

Fig. 38. Fig. 39. Fig. 40.

Fig. 38.—Sporules developing on the surface of an apple, after three days.
Fig. 39.—The same, after four days.
Fig. 40.—The same, more fully developed on the human arm, after inoculation. *a*, Thalli, with pale walls; *b*, containing sporules (mycelia); *c*, mycelium separated from the thallus; *d*, sporules separated from the mycelium.—(*After Remak.*)

[1] I have never seen any anastomosis.

themselves, and he examined them frequently up to the sixth day, when the surface of the apple became of a brown colour, and was covered with a rapid growth of *Penicilium glaucum*, or other kind of mould, among which the structure peculiar to favus could no longer be traced. These observations, however, showed that the sporules of the Achorion undergo development in the same manner as those in other cryptogamic plants. That is, the membrane which surrounds them throws out one or more prolongations, which are converted into tubes; and these, in turn, present, generally towards their extremities, a number of sporules, which at length are pushed out, or are disintegrated, and so become free. Figs. 38 and 39 represent the changes observed in the sporules germinating on the surface of the apple; and Fig. 40 shows the thalli, mycelia, and sporules, seen in the crusts, produced by inoculation, on Remak's arm.

The method of reproduction and formation of sporules may be observed with great facility in any well-developed favus crust, especially under powers varying from 500 to 800 diameters linear. Thalli, with variable-sized cells, may be observed branching at the extremities, with sporules forming within them. These are conjoined with separated mycelia, containing well-developed sporules, many of which are also free, as in the figure below.

Fig. 41.

Fig. 41.—Thalli, mycelia, and sporidia, of the *Achorion Schoenleini*, showing the mode of reproduction. (Magnified 800 diameters linear.)

It follows, therefore, that all the circumstances connected with the development and mode of reproduction of the Achorion Schoenleini have been fully ascertained.

The seat of favus has been much disputed by authors. By some it has been located in the piliferous bulbs or follicles (Duncan, Baudelocque, Rayer), by

others in the sebaceous glands (Sauvages, Underwood, Murray, Mahon, and lately by Cazenave), and a third party in the reticular tissue of the skin (Bateman, Gallot, Thompson). According to Gruby, the plants grow in the cells of the epidermis, the true skin is compressed, not destroyed, and the bulbs and roots of the hairs and sebaceous follicles are only secondarily affected.

I have made observations to determine the correctness of this statement, and found that the whole inferior surface of the capsule is formed of epidermic scales, thickly matted together. These are lined by finely molecular matter, from which the plants appear to spring, and which unites the branches and sporules together in a mass. Superiorly, however, the epidermic scales are not so dense; and I have always found them more or less broken up, and not continuous. This observation is valuable, as indicating the probable mode in which these plants, or the sporules producing them, are deposited on the scalp. It will be seen, that the appearance of the peculiar porrigo capsule, was invariably preceded by a desquamation of the cuticle, that is, a separation or splitting up of the numerous external epidermic scales which constitute its outermost layer. Hence it is more probable, that the sporules or matters from which the vegetations are developed, insinuate themselves between the crevices, and under the portion of epidermis thus partially separated, than that they spring up originally below, or in the thickness of the cuticle.

M. Cazenave, in his recent work, supports the opinion, that the sebaceous glands are the primary seat of favus. He states that the disease *always* forms round a hair, and is never produced if the follicle be obliterated, or on a cicatrized surface devoid of hair. He considers the matter of favus to be a peculiar secretion, or a modification of the normal matter secreted by the sebaceous glands, analogous to what exists in *acne sebacea*. It is true that the favus crust most frequently, although not invariably, forms first round the external orifice of the hair follicle, for it can easily be removed from this situation, and the hair is then seen to perforate it, whilst its bulb is unaffected. As previously stated, it is later that the hair and its bulb contain jointed tubes. It cannot be denied, therefore, that M. Cazenave may be correct in his conjecture, although it is much to be regretted that, in a matter of this kind, he has not dissected the skin, made sections of it in proper directions, and *demonstrated* the fact, if such be really the case.

The chemical constitution of the matter originally exuded is supposed by M. Cazenave to be allied to fat, but it appears to me to be more probably albuminous, and allied to the molecular character of all broken down or disintegrated organic material in which fungi grow. We have seen (Obs. I. and II.) that, previous to the return of favus crusts, the head is always covered with broken-up epidermis, more or less disintegrated. Experiments have shown that the plants will not grow on the healthy skin, and that inoculation succeeds only in places where pustules have previously been formed. It is also exceedingly probable that, when favus is communicated from one person to another, the part affected (generally the scalp) has been the seat of some other eruption (Case III.), or is not particularly clean.

Mr Erichsen considered, "That the matter of favus is a modification of tubercle—that it is a tubercular disease of the skin. By tubercular I do not mean a disease like lupus, characterised by small firm tumours, but a disease, the nature of which consists in the deposition of that *heterologous* formation called tubercle." This view of the nature of favus I have long held; and it was distinctly stated by me, when treating of the pathology of scrofula, in a work published in 1841.[1] The favus crust, however, is not constituted alone of tubercular matter. This peculiar exudation only constitutes the soil from which the mycodermatous vegetations spring, as I shall now endeavour to show.

Gruby describes the mycodermata of favus as springing from an amorphous mass, of which the periphery of the capsule is composed. This mass undoubtedly exists, and, according to my observations, is composed of a finely molecular matter, identical in structure to certain forms of tubercle, or recently coagulated exudation. The cheesy matter, for instance, so frequently found on the secreting surface of serous membranes, and in tubercular cavities and other structures in chronic cases of tuberculosis, or general tendency to tubercular deposition, presents this character. Every pathologist who has minutely examined tubercle, recognises a granular form, in which there is no trace of nucleus or cell, and which, therefore, we are warranted in considering as unorganised. I have myself repeatedly examined this tubercular matter, and been unable to detect any difference between it and the mass in which the vegetations of favus appear to grow. Chemical analysis of this form of tubercle demonstrates it to be composed principally of albumen, with a minute proportion of earthy salts; sometimes there is combined with it a small quantity of fibrine or gelatine. If this general result be compared with the analysis, by Thenard, of favus matter, the identity between it and tubercle must appear highly probable. He found in 100 parts—coagulated albumen, 70; gelatine, 17; phosphate of lime, 5; water and loss, 8 parts. Thus the evidence furnished by morphology and chemistry, agrees in determining the molecular matter found in the crusts of favus and of tubercle to be analogous.

All the facts which recent researches have brought to light, only tend to confirm the conclusion which I arrived at on this subject in 1842,[2] as expressed in the following passage:—

"In man all the vegetations yet discovered have been found connected with the matter effused into the textures in scrofulous constitutions. The fungi found by myself, for instance, growing in the tuberculous cavities of the lungs, and those discovered by Schönlein, and described by Gruby, constituting scrofulous eruptions on the skin, grew on a finely granular amorphous mass, which presented no evidence of organisation. Chemical researches have shown, that this form of tubercular matter is principally composed of albumen,—which explains the large proportion of this animal principle present in the crust of

[1] Treatise on the Oleum Jecoris Aselli, p. 94.
[2] Edinburgh Philosophical Transactions.

the porrigo or tinea favosa, according to the analysis given by Alibert. The fungi found by M. Eudes Deslongchamps growing on the membranous lining of the air-passages in an eider-duck, sprung from an 'albuminous layer,' 'forming the soil on which they grew.' The mould, or mucor, discovered by Owen growing in the lungs of the flamingo, occupied the same situation as those observed by myself in the lungs of man,—viz., the lining membrane of tubercular cavities. The fungi found by MM. Rousseau and Serrurier in the parroquet grew on a species of false membrane. What the nature of this membrane was is not stated, but it is distinctly mentioned that the animal died of laryngeal and pulmonary phthisis. In pigeons, also, the same authors describe it as commonly induced by exposure to cold and moisture, circumstances well known to be the most common cause of scrofula and of tubercular depositions. According to the observations of Valentin, the parasitic confervæ found growing on fish are connected with a diseased state of the animal, and are induced by keeping them in narrow vessels and foul water. The gold fish was evidently unhealthy which furnished the vegetations which I have myself described; and I have shown that these were connected with a granular, inorganic, albuminous matter, identical with that found in the lungs of phthisical individuals, and in the crusts of porrigo favosa. The salamanders and frogs in which confervæ grow, as described by Hannover and Stilling, were decidedly in an unhealthy state, induced by circumstances which must necessarily impair the vigour of animal life, and induce cachexia. Vegetations attach themselves to, or grow on, insects generally when in a chrysalis state—that is, when the powers of life are sluggish or dormant. When seen in these animals during the most perfect period of their existence, they evidently laboured under disease, and soon perished. This was distinctly observed in the vegetable wasp of Gaudaloupe by Madianna, and in the dytiscus marginalis by Busk. Lastly, the discovery of M. Bassi has demonstrated that vegetations occur in silk-worms affected with the muscardine,—a disease which causes a great mortality among these animals; and the researches of M. Ardouin have shown that these vegetations are formed at the expense of the adipose tissue. Whether tubercular matter was present in the worms is not stated; but we know that the disappearance of fat is one of the constant symptoms attendant upon imperfect nutrition."

Remak found that, although the sporules underwent developmental changes on the cut surface of an apple, as well as in animal fluids to which sugar had been added, no such changes took place in spring or distilled water, in the serum of blood, solution of albumen, pus, muscle, substance of brain, cut pieces of skin, or animal fat. In these cases the animal tissues, as well as the portions of favus crust, became gradually disintegrated, and infusorial formations commenced. Hence the Achorion grows under the same circumstances only as all other moulds. Putrefaction of animal or vegetable substances is unfavourable to its production; but that peculiar acid change which occurs in milk or paste, exposed to the air for some days, and in which growths of mould and confervæ are favoured is also beneficial to the development of Favus. Hence why inoculation in healthy tissues fails, and why certain exu-

dations in peculiar states of the constitution, or disintegrated matters which have undergone particular chemical changes, probably from acid secretions of the skin, are necessary to the production of the disease.

I believe, therefore, that the pathology of favus is best understood by considering it essentially to be a form of anormal nutrition, with exudation of a matter analogous to, if not identical with, that of tubercle, which constitutes a soil for the germination of cryptogamic plants, the presence of which is pathognomonic of the disease.[1] Hence is explained the frequency of its occurrence in scrofulous persons, and among cachectic or ill-fed children ; the impossibility of inoculating the disease in healthy tissues, or the necessity for there being scaly, pustular, or vesicular eruptions on the integuments, previous to contagion. But as experiments have proved the possibility of inoculation in healthy persons, it follows that the material in which the vegetations grow, may at the commencement, in a molecular exudation, be formed primarily or secondarily. That is, there may be want of vital power from the first, as occurs in scrofulous cases, or there may have been production of cell forms, such as those of pus or epidermis, which, when disintegrated and reduced to a like molecular and granular material secondarily, constitute the necessary ground from which the parasite derives its nourishment, and in which it grows.

Treatment.

Almost every species of treatment has been had recourse to, in order to remove this disagreeable and intractable disease ; and there can be no doubt, that cases have recovered under the use of all or any of the methods recommended. In some instances, favus wears itself out, or rather, as the development of the frame proceeds, and the constitutional strength improves, the conditions necessary for its production and maintenance are removed, and it consequently disappears. In every case, however, it must be our object to get rid of the disease permanently as soon as possible, and this is only to be done by removing the pathological conditions on which it depends.

The notion that it originates in the bulbs of the hair caused an attempt to remove the disease by eradicating the structures with which it was supposed to be connected. Hence the barbarous and cruel treatment by means of the *Calotte*. This consisted in spreading a very adhesive plaster inside a cap, which closely fitted the shaven scalp. The hair was then allowed to grow and insinuate itself amongst the substance of the plaster,—when the whole was forcibly torn off. In this way, portions of the scalp were sometimes separated,—at others, pieces of the plaster remained firmly attached, and gave great trouble. A modification of this plan consisted in covering the head with the plaster in

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[1] This view has been adopted by Neligan and Burgess.

strips, which were removed separately from before backwards, and from behind forwards, so as to tear out the hairs. Even this plan failed. The practice I saw adopted in Berlin, in 1841, consisted in plucking out the hairs individually with a pair of pincers; but this tedious and painful method, also, was found to be of little service.

In Paris the above kinds of practice have generally been put aside, for the milder empiric treatment of the frères Mahon. Between the years 1807 and 1813, 439 girls and 469 boys, affected with favus, were cured by them at the Bureau Central des Hôpitaux, and the mean duration of the treatment was 56 applications. These applications are generally made every other day, so that the average length of treatment by this much boasted and successful method is three months and a-half.

I have endeavoured to show, however, that in many cases it is a constitutional disease, and dependent upon the causes which induce scrofulous diseases in general. The treatment, therefore, in such ought to be constitutional, and directed to removng the tendency to tubercular exudation, on which the malady depends. No doubt, however, a local treatment in this, as in all disorders which are at the same time general and local, is of the utmost service.

I consider, then, that the chief indications of treatment are, 1st, To remove the constitutional derangement; and, 2dly, To employ such topical applications as tend to prevent the development of vegetable life. This line of practice may be thought similar to that recommended long ago by Lorry, who advises, 1st, A modification of the fluids and solids of the economy by a general treatment; 2dly, A vigorous attack upon the local disease by topical applications, capable of removing the crusts, causing the skin to suppurate deeply, and substituting a solid cicatrix for the morbid ulceration of the hairy scalp. For the most part, however, the general treatment of physicians has been confined to diluent drinks, blood-letting, purging, and remedies which depress the vital powers, whereas it must be evident, that if the views of its pathology I have brought forward be correct, and it is in its nature allied to tubercular affections, a treatment exactly opposite ought to be pursued. The development of vegetable life may also be prevented by the application of much milder remedies than the escharotics, or irritating ointments usually employed.

The treatment of scrofula will be fully entered upon by me in a subsequent lecture. Suffice it to say at present, that I shall endeavour to show how this peculiar cachexia is caused and kept up by some fault in the digestive process; that the blood is secondarily affected, and its albuminous constituents proportionally increased; that the albumen at length becomes effused into the different structures of the economy, causing the various forms of tubercular disease; and, lastly, as the albumen in the blood becomes excessive, and its effusion into the textures increases, the fatty constituents of the frame diminish. It will be shown, by an appeal to numerous facts, that under such circumstances the internal and external exhibition of cod-liver oil has been attended with the most marked advantage, and often been made the means of cure when all other remedies have failed. The action of the oil appears to be the same in favus as in other forms of scrofulous disease, and its use should be com-

bined with appropriate diet and exercise, and with reference to the same indications and contra-indications. As it is my intention to describe these minutely on some other occasion, it is unnecessary for me to allude to them at present.

The local treatment I have employed for several years, is directed, in conformity with the pathological views previously detailed, to the exclusion of atmospheric air, so as to prevent vegetable growth. For this purpose, I direct, in the first instance, that the affected scalp should be poulticed for several days, until the favus crusts are thoroughly softened, and fall off. Then the head is to be carefully shaved, after which it will be found to present a shining clear surface. Lastly, cod-liver oil should be applied with a soft brush, or dossil of lint, over the affected surface morning and night, and the head covered with an oil-silk cap to prevent evaporation, and further exclude the atmospheric air. Every now and then, as the oil accumulates and becomes inspissated, it should be removed by gently washing it with soft soap and water. It is very possible common lard would do as well as cod-liver oil ; and I observe that Dr Girot has lately recommended olive oil as a local application.[1]

I have found the average duration of this treatment to be six weeks, which contrasts very favourably with the results of MM. Mahon's practice at the Hôpital St Louis. Some cases seem to be incurable, and these are most frequent among adults; but even in them, so long as the scalp is kept moist with oil, and the air is excluded, the eruption will not return (Case I.). In young subjects, in whom general as well as local treatment is admissible, and in whom a scrofulous disposition is manifest, the prognosis is more favourable, and the disease may be permanently eradicated (Cases II. and III.). Whenever favus is recent and of limited extent, it may at once be destroyed by cauterization with nitrate of silver (Case VII.).

Lebert is of opinion that poultices and oily applications soften the favi, and distribute the sporules over the skin. He, therefore, insists on removing the crusts dry, by means of a small spatula, sewing needles, or other instruments. He says that nothing is more easy than to detach it entire ; for, although pushed into the skin, it is not held there by any adhesion. But I think it will be found that, however dexterous a person may be in removing the crusts, that the majority are held firmly to the scalp, by means of the hair which perforates them, and that tearing these out is very painful. Besides, the crusts are easily broken, and the time and trouble required, even when they are thinly scattered, renders this plan impracticable in hospitals. When densely matted together, it, of course, cannot be done. I believe, then, that repeated poulticing is by far the best and most efficient method of freeing the skin from the eruption, whilst it has the extra advantage of doing so without irritation, and thereby diminishing the tendency to the formation of impetiginous pustules.

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[1] Gazette des Hôpitaux, May 18, 1850.

CHRONIC ECZEMA AND IMPETIGO.

Treatment by keeping the Parts moist with an Alkaline Lotion.

Case I.[1]—Donald Menzies, æt. 40, a painter, admitted October 8, 1849. States that he has had an eruption on his hands for twenty years. He attributes its origin to mixing paint with them. He says the disease began with redness, followed by cracking of the skin: the hands being often stiff and swollen. He has undergone many kinds of treatment. On admission, the backs of both hands are red and swollen: the skin is indurated, and rough to the feel, and covered here and there with patches of laminated crusts. Between the fingers, and over several of the joints, are deep cracks with indurated margins. There is intense itching in the affected parts, which often prevents sleep. Functions generally natural. ℞ *sodæ subcarb.* ʒij.; *aquæ font.* ℥xx., *solve, fiat lotio.* Lint, saturated with the wash, was ordered to be applied to both hands morning and night, and the whole to be covered with oiled silk to prevent evaporation. *October 22d.* Hands are now smoother and softer; the itching disappeared from the commencement of the treatment. Cracks evidently healing. He was dismissed from the house, November 9th. This man continued the treatment for about four weeks after leaving the Infirmary; at the expiration of which time the cracks had closed, the skin was soft, and he might be considered perfectly cured. Up to this time—June 12, 1850—he has remained free from the disease.

Case II.[2]—Anne Murphy, æt. 26, widow, admitted December 19, 1849. States that she has enjoyed good health up to five months ago, when she fell down and struck her elbow a severe blow. A month afterwards, there appeared on the arm minute pimples, which spread over the whole extremity from the shoulder to the wrist. Thin scabs were formed, which, on separating, were succeeded by others. On admission, her general health is good. The right arm is covered with laminated scabs, below and between which the skin presents a dark red colour. There is considerable smarting, and often burning pain, in the affected skin. In many places, groups of minute vesicles can be observed. The same lotion as in the last case was ordered; lint, saturated with which, was to be applied to the affected parts, night and morning, and

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[1] Reported by Mr Alexander Christison, clinical clerk.
[2] Reported by Mr Charles Harwood, clinical clerk.

the whole covered with oiled silk to prevent evaporation. From this time all irritation ceased, the eruption gradually disappeared, and she was discharged cured, January 24th.

Cases III. and IV.[1]—George Angus, æt. 10, and James Angus, æt. 8, brothers, admitted December 18, 1849. The former has been affected for four months, and the latter four weeks. On admission, they are both pale, thin, and of scrofulous aspect. Patches of elevated greenish crusts, varying in size from a pea to that of half-a-crown, are scattered over the scalp, face, arms, trunk, and inferior extremities, here and there mingled with small round pustules. The scalp in both cases is most affected, and in the younger boy it is considerable behind the ears, and on the neck. James Angus is weaker and more cachectic-looking than his brother. The same lotion as in the last case was applied to the affected parts, and the scalp, legs, and arms kept moist with it by means of oil-silk. The younger boy was also ordered a teaspoonful of cod-liver oil three times a-day. On the 19th of January the eruption was completely cured. The younger boy, however, caught scabies from another patient, and underwent a course of sulphur ointment. They were dismissed February 23; their general health having greatly improved.

Commentary.—Eczema essentially consists of diffuse crops of minute vesicles, seated on an inflamed red surface, which, on breaking, yield a thin serous-looking fluid that coagulates on the surface, so as to form a flat laminated scab. There is almost always intense itching, or a feeling of burning or smarting, often very painful; symptoms most intense in acute, but also present in chronic, cases. In these last, the skin often assumes an unusual degree of induration, a more or less deep red colour, and presents cracks and fissures, giving rise to great uneasiness. The first case above detailed is one of this kind, and presented all the characters of extreme obstinacy. The second case was more acute. Both were treated with local applications only, and with the best results.

Impetigo consists of groups of small pustules, which breaking, and their contents concreting on the surface, form an elevated scab, which, after adhering to the skin for a period more or less long, falls off, without leaving any mark or cicatrix. In eczema, as just stated, the scab is thin and laminated; in impetigo, it is rough, knotty, and prominent; and in eczema-impetiginodes, we observe the prominent crusts of the one united with the laminated, and often furfuraceous, surface of the other. These characters, although they are easily distinguished in acute cases, become gradually more and more obscure in such as are chronic, although even then there may frequently be observed round the margin pustules more or less numerous, which indicate the impetiginous nature of the disease. Pain and itching are invariably present. Such were cases III. and IV. above recorded.

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[1] Reported by Mr Hugh Balfour, clinical clerk.

The acute form of these diseases will frequently be found connected with general derangements of the economy, without a proper management of which no local treatment will be of much advantage. Of these in young persons, a scrofulous taint, and in older ones, various forms of dyspepsia, connected with oxaluria, or the lithic acid and phosphatic diathesis, are the most common. I need not dwell upon the importance, in all such cases, of instituting an appropriate constitutional treatment, which not unfrequently is in itself sufficient to remove the local disease. It is in this manner that sometimes acids, sometimes antacids, and at others cod-liver oil, or nutritive diet, and the mineral tonics, especially arsenic, are so useful.

There are other cases, however, where there is little, if any, constitutional disturbance, and where the disorder originates in, and is maintained by, local irritation, as on the hands and arms of stone-masons, grocers, bakers, cooks, reapers, and so on; and between cases almost purely local, and others almost purely constitutional, there is an infinite number of gradations, in which the one or the other is more or less predominant.

It may almost invariably be observed, however, that the more chronic the disease becomes, and the more dense the crust or subjacent integument, the more it seems to localise itself. The irritation and the adherent crust appear to perpetuate and keep up the disorder. This is especially perceptible whenever it attacks parts covered with hair, where the scabs are separated with greater difficulty, from the exudation forming a dense mass with the imbedded hairs; so that chronic eczema and impetigo of the scalp, chin, and pubes may be regarded, sooner or later, as almost entirely a local affection.

It is in cases of this kind that local applications are essential, and constitute the chief part of the treatment; whereas, in more acute cases, although they may be very useful, they are secondary in importance to internal remedies. The application I employ is a solution of ʒ ij. of the subcarbonate of soda, in a pint and a-half of water. But an alkaline lotion in itself, applied from time to time, as is most commonly done, will not prove of any great service. I have found it necessary to place lint, saturated with the solution, over the affected parts, and to cover the whole with oil-silk, in order to prevent evaporation. Keeping the surface moist seems to me a necessary part of the treatment. The usual effect is soon to remove all local irritation, and especially the itching or smarting so distressing to the patient; to keep the surface clean, and prevent the accumulation of those scabs and crusts which in themselves often tend to keep up the disease. After a time, even the indurated parts begin to soften, the margins of the eruption lose their fiery red colour, merge into that of the healthy skin, and finally the whole surface assumes its normal character.

I am quite satisfied that this local treatment is far superior to the stimulating ointments and lotions, which are so frequently used one after the other, in the hope of overcoming these obstinate forms of eruption. Many of them, indeed, only seem to augment the disorder. In these cases there is an increased exudation from the skin, not only of sebaceous but of purulent matters. Alkalies, we know, have the property of dissolving these, and acting as a calmative and emollient to the irritated part. Their constant action on the skin,

therefore, in the manner I have described, may easily be imagined to be productive of benefit. But if, as is usually done, alkaline lotions and baths are only employed from time to time, they remove the sebaceous matter, leave the skin dry and harsh, and thus these applications often irritate. Keeping the surface covered with moist lint, on the other hand, while it serves to protect, removes the results of exudation, and prevents incrustation.

I have now treated a great number of persons affected with chronic eczema and impetigo, and have succeeded in curing them in this way, after almost every other kind of local application had been tried in vain. Both diseases are exceedingly common among the middle and higher classes of society; and it may be useful, as illustrative of the value of the treatment I have recommended, to cite a few of the cases that have occurred in my private practice. Here I cannot too strongly impress upon you that it is a matter of great practical importance that the diagnosis should be correct, because the chronic forms of lichen, prurigo, and pityriasis, which are often mistaken for eczema or impetigo, require a totally different treatment.

Chronic Eczema of the Cheek.—Mr B——, a native of Riga, æt. 35, arrived in this country in the summer of 1847, with an eruption of chronic eczema on the left cheek. It presented a firmly adherent elevated yellow crust, about the size of a five shilling piece, a third of which encroached upon the left whisker, composed of thick and strong black hair. It had commenced nine months previously in Paris, in a small spot, and in three months had reached its present size. He had sought the advice of several eminent dermatologists in Paris, and had applied numerous kinds of lotions and ointments, besides taking internal remedies, without effect. His general health was good—the tongue slightly furred. The digestive and urinary organs in every respect normal.

He was ordered to take *five drops of the liq. arsenic., and tr. cantharid., in a bitter infusion, three times a-day, and to apply lint saturated in the alkaline solution to the affected part, which was to be kept moist by a covering of oil-silk.*

In a fortnight he was in no way better, and I found that, owing to the prominent hair, the lint and oil-silk could not be brought in contact with the surface, and that the former was not kept moist. With some trouble I induced him to sacrifice a semicircular portion of his whisker, so that the surface could be kept moist with the alkaline solution. In a few days there was a marked improvement; the dry crust separated, exposing a bright red indurated surface —and the smarting and itching he formerly experienced entirely disappeared. Satisfied of the benefit which had been produced, he now cheerfully prosecuted the treatment. When he went out, and during the night, he fastened the lint, covered by the oil-skin, down by a broad piece of black ribbon, passing from the vertex of the head, in front of the ears, and tied under the chin. When engaged at home, he simply kept the lint continually moist with the lotion. In three weeks the eruption was only half its former size, and in another four weeks it had entirely disappeared. The whisker had been again allowed to grow, and the skin is in every respect healthy.

That the local treatment was here the cause of cure I feel persuaded; for, although the arsenical drops were continued throughout the treatment, the marked effect which followed the local applications, left little doubt in the patient's mind, as well as in my own, of their great benefit.

Chronic Eczema of the Face.—In the case of an unmarried lady, aged about 45, affected with chronic eczema, which covered the entire face, I persuaded her to apply pieces of lint, soaked in the alkaline solution, so as to cover the whole of the affected surface. This, with the assistance of her maid, she did every night, and a considerable portion of the day, keeping the whole moist with oil-silk. The result was immediate relief from the itching and smarting, and in the period of three weeks a complete cure, although the disease had resisted various remedies for a period of five months.

Chronic Impetigo of the Chin.—A clergyman, æt. 38, otherwise in good health, consulted me, in the autumn of 1848, on account of an eruption which covered his chin. He had been affected with it upwards of three years, and had employed a variety of greasy applications, numerous lotions, and even submitted to the whole being cauterised on more than one occasion. When I first saw him, the chin was covered over with an irregular crust, of a greenish-yellow colour, round the margins of which numerous impetiginous pustules, in all stages of development, existed here and there in groups. Independent of the pain and uneasiness, he was under the necessity, on account of the deformity occasioned, of keeping the lower part of the face constantly covered, and of late years had felt himself unable to perform his ministerial duties. I commenced the treatment of this case by, 1st, removing the crusts, by means of successive poultices; 2d, causing the hair to be cut short with sharp scissors, and forbidding the use of the razor; and, lastly, after a week had elapsed in cleansing the surface, ordering it to be kept moist with the alkaline lotion. For this purpose, a sort of cup was made, of black silk, lined with oil-silk, which fitted closely to the diseased surface, and was kept on by means of attached strings tied firmly behind. In this manner the surface was made constantly moist by the lotion, and he was enabled to take exercise readily. In a couple of days all smarting and irritation ceased; the beard was kept short by the scissors, and no other treatment was employed for two months, at the expiration of which time he was perfectly well.

In this case the treatment was altogether local, and of its good effects there could be no question.

Chronic Eczema and Impetigo of the Scalp.—I pursue the same practice, only in this case the head may be shaved from time to time, while the surface can easily be kept moist by means of an oil-skin cap, with a flap more or less long to cover the neck behind, should *it* be affected.

These diseases are so common that it is unnecessary for me to cite instances of their cure. I need only mention, that the Crusta Lactea in infants, as a general rule, ought not to be treated locally at all; and that in young child-

ren of scrofulous habit, good diet, exercise, and cod-liver oil, constitute the essential part of the treatment, although continued moisture with the alkaline lotion will, in proper cases, prove a valuable auxiliary.

Chronic Eczema of the Pubes and Abdomen.—In the winter of 1841 I treated an old gentleman for chronic eczema of the pubes, extending over the abdomen as high as the umbilicus. He was 60 years of age, and had laboured under the disease for upwards of eight years. The affected surface was of a dark red colour, covered with thin laminated crusts, which separated in triangular or square-shaped scales, some of which were an inch in diameter. He stated that the itching and smarting which he occasionally felt were often unbearable, and obliged him to leave any society he happened to be among, and to wash the parts with cold water, from which he always experienced temporary relief. He had taken arsenic, and a variety of internal remedies, and tried all kinds of ointments, washes, and baths. He thought that a weak solution of the sulphate of copper did him more service than anything else. His general health was good, although the urine was strongly loaded with phosphates.

In this case the alkaline wash could not be kept constantly applied to the parts affected, on account of their position. I therefore advised him to procure a hip-bath, and use it for one or two hours twice a-day, with the alkali dissolved in the water. He had previously tried alkaline baths, and always with temporary benefit, and, therefore, willingly had recourse to them again. They produced such good effects, that he was in the habit of sitting in a bath for several hours consecutively, so arranged that the fluid just covered the genitals, hips, and abdominal surface affected. The phosphatic deposits in the urine were also removed by acid tonics. In two months the eruption was greatly diminished, both in extent and intensity, when he went to Harrogate, the water of which spring he drank for six weeks, but still continuing the alkaline baths. A short time afterwards he was entirely cured.

In this case, I think, there can be little doubt that the *continuous* bath was the chief agent in the cure. It is unnecessary for me to multiply cases, which would be merely repetitions of what has been stated, and which only vary on account of the mechanical expedients adopted to keep the affected parts moist, and an appropriate constitutional treatment, the importance of which I by no means undervalue. Neither do I wish it to be understood that this is the *only* local application which can be useful in these cases, but that I have found it more extensively applicable, and more uniformly serviceable, than any other.

TREATMENT OF SCABIES BY SIMPLE LARD.

Since the connection of scabies with a peculiar insect (*Acarus Scabiei*) has been understood, it has been suggested, that the good effects of sulphur ointment are not so much to be attributed to any specific properties of the sulphur, as to the destructive operation of the fatty matter, which, by stopping up the respiratory pores of the insect, causes its death. Some time ago I saw, in the "Annales de Thérapeutique," an account of the treatment of scabies by Mr Griffi of Sardinia, who cured the disease by the simple application of olive oil or lard. The following cases, which have occurred in the clinical wards, will illustrate the effects of this practice :—

Case I.—A boy (of whose case I cannot at present find the record), about 10 years of age, entered the clinical ward at the commencement of the session 1848-9, with the back of his hands covered with numerous ecthymatous pustules, associated with vesicles of scabies, which were most abundant between the fingers and on the wrists. They had existed for some weeks, and caused great irritation and itching. The hands and wrists were ordered to be covered with simple lard morning and night. On the next day it was found that the parts were dry, and that he was continually irritating them by scratching. To prevent this, and to keep the parts moist, the hands and wrists were ordered to be enveloped in oil-silk bags. A continuance of this treatment for five days entirely removed the eruption.

Case II.[1]—Anne Daly, æt. 17, a bleacher, was admitted November 20, 1849, with an eruption on the hands and flexor surface of the arms, consisting of large ecthymatous pustules, mingled with numerous accuminated vesicles of scabies. These latter were most numerous between the fingers. The disease was of twelve days' standing, and no contagion could be traced. The affected parts were ordered to be smeared with simple lard, and enveloped in oil-silk bags, as in the last case. This practice was continued until the 26th, when the pustules had disappeared, leaving bluish-red spots devoid of cuticle. A few vesicles were still visible. In two more days these also had disappeared, although she was not dismissed until December 4th, when no trace of the eruption was discernible.

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[1] Reported by Mr Alexander Struthers, clinical clerk.

Case III.[1]—James Monro, æt. 20, admitted November 7, 1848. His hands, arms, and lower portion of abdomen are scattered over with vesicular scabies, which everywhere produces the most intense itching, especially at night, and when near a fire. On the arms numerous hemorrhagic points and deep grooves, in connection with the vesicles, have been produced by scratching. There are similar appearances on the abdomen. The hands and arms were ordered to be smeared with lard twice daily, and enveloped in oil-silk. In six days the eruption had disappeared from these parts. On the abdomen, however, it still continued, and the lard was then ordered to be also applied there. Here it could not be covered with oil-silk, and the surface was continually dry. Still, great amelioration was produced, and he was discharged cured, November 28th.

Case IV.[2]—John Henley, æt. 17, admitted December 3, 1849, a labourer's son, affected with intense emphysema and bronchitis, of which diseases it is unnecessary now to speak. The hands, flexor surface of the arms, and abdomen, were, as you saw, closely covered with vesicular scabies, which induced great itching and scratching, and, as a result of the latter, grooves and bloody marks of the nails. On the 4th, the hands were smeared with lard, and enveloped in oil-silk, as in the former cases. On the 8th of December the eruption on the hands and wrists was completely cured, but still continued in all its intensity on the arms and abdomen, clearly showing the curative power of the remedy. The lard was now ordered to be applied to the arms, which were to be enveloped in oil-silk to keep them moist. On the 15th, the arms were freed from the eruption. Lard was now ordered to be rubbed three times a-day on the abdomen ; and in a week all traces of the eruption had disappeared.

It is well known that scabies may be cured by numerous local applications, although experience has generally decided that sulphur ointment is the one which is most certain and rapid in its action. The cases above detailed, with several others which might have been cited, have satisfied me that the efficacy of the ointment is altogether dependent on the unctuous matter, and that the sulphur has little to do with its therapeutic effects. It appears to me important, however, that the parts should be kept moist, and that the use of oil-silk for this purpose greatly facilitates the cure. The action of fat seems to render pustules and vesicles abortive, both disappearing in a few days, leaving the skin they covered slightly reddened, with the shrivelled walls of the pustule and vesicle more or less adherent to it.

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[1] Reported by Mr F. Hunter, clinical clerk.

[2] Reported by Mr Hugh Balfour, clinical clerk.

Various methods have been proposed, for the purpose of arresting the development of the eruption in variola, and preventing the cicatrices which are likely to form. The treatment, called *ectrotic* (ἐκτιτρώσκω, to render abortive), has been practised principally in France. Serres, Bretonneau, and Velpeau, cauterized each vesicle as it appeared, with nitrate of silver, which immediately arrests its further progress. This is a very tedious process, while painting the surface with a solution of the caustic, causes so much pain and febrile disturbance, that it cannot be safely employed. Dr Oliffe, of Paris, recommended the vigo-plaster of the French Pharmacopœia ; and having seen, in some of the journals, that mercurial ointment, thickened with starch, has proved very serviceable in the practice of M. Briquet, and others, in the Paris hospitals, I tried it in the following tolerably severe case, which entered the clinical ward last year :—

Case I.[1]—Mary Greig, æt. 27, a servant, was admitted September 16, 1848. Says she has been vaccinated, but no mark is discernible. She stated that on the morning of the 13th, she was seized with rigors, followed by heat of skin, and other febrile symptoms. On the 15th, there appeared, on the forehead and face, a papular eruption, which, on the day of admission, had extended itself to the arms, wrists, trunk, and thighs. On examination, I found the eruption partly vesicular on the face, though still papular on the other parts of the body. She complained of sore throat, and difficulty of deglutition. The tongue and throat were red and swollen, scattered over with bright red points, some of which were already vesicular. The pulse was 90, and strong ; tongue furred, but moist ; the bowels confined ; the urine scanty, with a slight lateritious sediment. She was ordered a *purgative powder ; a saline mixture ; an astringent gargle; and the following ointment* :—℞. Ung. Hydrargyri, ℥j—Pulv. Amyli, ℥ij M., *to be smeared over the face night and morning.* The disease went through its usual course, the eruption was confluent on the neck, arms, and trunk, but discrete on the inferior extremities. The secondary fever was rather severe, but she was discharged cured, November 4.

The ointment formed a thick hard crust, which, as it cracked and peeled off, was renewed by a fresh application. It was observable that she never com-

[1] Reported by Mr J. N. Fanning, clinical clerk.

plained of the face ; there was no swelling of the eyelids, and when the whole was allowed gradually to separate from the skin, which was accomplished on the 14th of October, the latter was perfectly smooth, and of its natural colour. I determined to try this practice again should a favourable opportunity occur, and the following very severe case, which you have observed throughout, has convinced me of its great advantage :—

Case II.[1]—Ann Short, aged 19, servant, six months pregnant, was admitted November 27, 1849. Says she was vaccinated when a little girl, but picked off the crust. She is of a robust habit of body, and states that she experienced headach and other uneasy symptoms on the 21st. It was on the 25th, however, that the eruption first appeared on the face, and, on the 26th, had extended to the arms and trunk. On admission, she complains of considerable pain in the head and loins. There is intolerance of light ; the voice is husky ; there is cough, with scanty mucous expectoration. On percussion, the chest is everywhere resonant, but over the lower part of right lung a mucous rale is heard. The tongue is furred ; the tonsils, uvula, and mucous membrane of the mouth, generally red and swollen. There is great thirst and nausea, but no vomiting. The pulse is 108, strong ; the surface is hot ; the face is covered with an elevated papular eruption, of dark red colour, among which a few vesicles may be seen to have formed. The upper part of the chest and superior extremities were thinly covered with the eruption, in a papular form. The abdomen is only slightly affected, and the inferior extremities are free.—*Laxative—Saline Mixture.* On the 29th all the symptoms are increased ; the pain more intense ; the face, mouth, and throat, covered with vesicles, closely set together ; the bronchitis is more urgent, the voice hoarse, the eyes suffused, and intolerance of light intense. *The mercurial ointment, thickened with starch, was ordered, as in the last case, to be applied to the face—an astringent gargle—Lemonade for drink.* By the 5th of December maturation was complete over the whole body, and mucous membrane of mouth and throat. The pustules, in many places, extensively confluent. The pain, however, was diminished, but the bronchitis and sore throat continued ; no pain of face or swelling of eyelids; she picks off the plaster from around the mouth. On the 7th, there was some return of the fever ; no inconvenience felt in the face ; thick scabs adhere to upper extremities and trunk ; slight diarrhœa. *December* 12.—No fever ; diarrhœa ceased ; appetite returned ; a most offensive odour emitted by the body ; the scabs have separated from the neck and upper extremities, but are still adherent to trunk and inferior extremities. An abscess formed over the whole surface of each foot below the epidermis. *Soles of feet to be kept moist with tepid water. December* 17.—The mercurial plaster is now separated from the face, the surface of which is quite smooth. The arms and shoulders are deeply indented with pits, where the scales have separated. The cuticle over the soles of the feet is separating, and

[1] Reported by Mr Alexander Struthers, clinical clerk.

a purulent discharge flows from the surface. *December* 21.—This woman is now convalescent. There are no pits on the face, except round the mouth and that portion of the forehead in contact with the hair, which was not covered by the plaster. Dismissed cured, December 31.

This was a very severe case of confluent small-pox, and the good effects of the mercurial plaster in locally modifying the intensity of the inflammation, and preventing cicatrices, were unequivocal. The absence of swelling in the eye-lids, the freedom from pain in the face throughout the whole course of the disease, and the presence of pit-marks *only* in such situations there as were not covered by the plaster, show most satisfactorily the advantages of the remedy.

The results of these cases, so far as the cicatrices in the face are concerned, contrast very favourably with another case, that of Anne Henderson, whom I found convalescent from variola, on taking charge of the clinical wards, June 15, 1850. This girl, in whom the disease was certainly not more severe than it was in Ann Short, had simple lard only applied to the face, which I found covered all over with deep marks and seams.

PSORIASIS.

Case I.[1]—Thomas Brown, æt. 36, baker, admitted July 20, 1849. He has a scaly eruption over the inferior extremities, and various parts of the trunk. On the thighs and legs it forms large diffuse patches; and here, as well as on the trunk, there are also smaller spots, varying in size from that of a pea to that of a five shilling piece. The tongue is furred, the appetite capricious; otherwise the digestive system, and the other functions, are normal—℞ *Liquor. Arsenicalis gtt.*, xv.; *Aquæ font.*, ℥iij. *M. ft. Mist.* An ounce to be taken three times a-day. To rub simple lard on the affected parts morning and night. *August 8th.*—Eruption freed of scabs, and the red colour not so deep. Pitch ointment ordered to be applied to the affected parts. *August 24th.*—It was found that the pitch ointment caused so much irritation that it had to be discontinued; the simple ointment, therefore, resumed, and the arsenical solution continued. *September 13th.*—All traces of the eruption had now disappeared, and he was dismissed.

Case II.[2]—Agnes Watt, æt. 36, a washerwoman, admitted August 15, 1849. About eight months ago, on recovering from an attack of cholera, red spots appeared on various parts of the body, which subsequently became covered with whitish scales. These have increased in size and number until now. On admission, the body and limbs are covered with patches of a scaly eruption, seated on a red surface. A diffuse patch, the size of the hand, is seated over the right ilium. The inferior and superior extremities, as well as the trunk, are scattered over with patches varying in size from a fourpenny piece to that of the palm of the hand—the larger present an annular form. All the characters described under the names of Lepra vulgaris, Psoriasis diffusa, and P. guttata, are observable in this individual. The eruption has occasionally caused itching and irritation, sensations at present originating in the hip, knees, and elbows. Digestive system in good order; urine loaded with lithates; other functions normal.—℞ *Liq. Arsenic*, ℥j.; *Tr. Lyttæ*, ℥j.; *Aquæ* ℥v. *M. ft. Mist.* A tablespoonful to be taken morning and evening. *Ung. Picis* to be rubbed over the surface night and morning. On the 24th of August, the arsenical mixture was suspended from its causing constitutional symptoms, and the

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[1] Reported by Mr William Johnston, clinical clerk.
[2] Reported by Mr Alexander Struthers, clinical clerk.

ointment at first induced some local irritation. Gradually, however, the skin became soft, the redness of the eruption faded, and she was dismissed cured, October 24, 1849.

Case III.[1]—Catherine Balderston, æt. 15, a servant, admitted December 4, 1849. Eight months ago a scaly eruption appeared, first, on the inferior, and then on the superior extremities. She entered the clinical wards last August, and, after five weeks' treatment with pitch ointment, went out, the eruption having nearly disappeared. Fourteen days after dismissal, however, it was as intense as before, and has continued until now. On admission, the superior and inferior extremities are covered with the rings of lepra vulgaris, mingled with patches and round spots of psoriasis. The former are largest about the knees and shoulders. They occasion itching, but no pain. The digestive and other functions are normal. Pitch ointment was ordered to be applied to the affected surface twice daily. The scabs rapidly disappeared, the reddened spots faded, the skin became soft, and on February 2d she was dismissed without a trace of the disease.

Commentary.—So-called lepra vulgaris, psoriasis diffusa, psoriasis gyrata, psoriasis guttata, and psoriasis inveterata, are one disease, more or less chronic. In the works of systematic writers, the varieties of this affection are multiplied indefinitely, even to giving minute separate descriptions of it, as observed on the eyelids, lips, prepuce, palms of the hands, nails, &c. &c. &c. The sooner you disembarrass yourselves of all such useless distinctions the better.

The real nature of psoriasis is altogether unknown. I am not aware that any researches have been made as to the alterations which the structure of the skin undergoes in the disease. All that can be said is, that, as we see a considerable redness, there can be little doubt of there being a congested state of the vessels, combined with increased amount and desquamation of the cuticle. There is no exudation, properly so called, but an increased growth, or a hypertrophy of the epidermis.

Observation has shown that this, like many other skin diseases, is sometimes connected with a deranged state of the digestive organs, sometimes with a constitutional disorder, very little understood, whilst in others (but these are comparatively few) it is more or less dependent on local causes. A judicious treatment of this disease will materially depend on a correct appreciation of one or the other of these circumstances, or of their various combinations.

The constitutional treatment which I have found to be most efficient in cases of psoriasis, is the administration of equal parts of Fowler's solution, and of tincture of cantharides, in doses commencing with ten drops, gradually increased to fifteen or twenty. The effects of this medicine must, of course, be carefully watched. Of all the local applications, most dermatologists are agreed that the best is pitch ointment. It seems to exert a specific action on the skin

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[1] Reported by Mr Robert W. Crighton, clinical clerk.

in these cases, and of its value there can be no question. You will occasionally find, however, that it causes considerable irritation, in which case it should be diluted with an equal part of lard. In Case I. this occurred, and simple ointment only was employed, which, combined with the internal use of arsenic, was sufficient to produce a cure. In Case II., the arsenical and cantharides drops, combined with pitch locally, brought about recovery; whilst, in Case III., the same result was obtained by the local application alone. Such is a fair specimen of what you may expect in the treatment of this disease. Some cases getting well under arsenic alone; others, under pitch ointment alone; whilst a third class will require the action of both.

EXAMINATION OF THE PATIENT.

It is absolutely necessary that an examination of patients at the bed-side should be conducted with order, and according to a well understood plan. I have observed that some students, on being called upon, in their turn, to interrogate a case, have felt great embarrassment, and have been unable to proceed. Others have put their questions, as it were, at random, without any apparent object, and wandered from one system of the economy to another, in a vain search for a precise diagnosis, and a rational indication of cure. But continual practice, and the adoption of a certain method, will remove all difficulty. No doubt, the questioning a patient, to arrive at a knowledge of his condition, requires as much skill in the medical practitioner, as examining a witness does in counsel at the bar. They make it an especial study, and you must do so likewise. You should remember that, in proportion as this duty is performed well or ill, is the probability that your opinion of the case may be correct or incorrect; and that, not only will the reputation you hold among your colleagues greatly depend on your ability in this matter, but that the public itself will promptly give its confidence to him whose interrogations reveal sagacity and talent.

The method of examination differs greatly among practitioners, and must necessarily vary in particular cases. Men of experience gradually form a certain plan of their own, which enables them to arrive at their object more rapidly and securely than that adopted with, perhaps, an equally good result by another. In a clinical class, however, and in order that every one present may follow and understand what is going forward, the method adopted must be uniform. I hold it to be a matter of great importance, that every one standing round the bed should take an equal interest in what is proceeding, and this he cannot do unless he is fully aware of the manner and object of the examination. The plan which appears to me the best, and which we shall follow, is the one I learnt when myself a clinical student in the wards of Professor Rostan, of Paris. Its object is to arrive, as quickly as possible, at a knowledge of the existing condition of the patient in a way that will insure the examiner that no important organ has been overlooked or escaped notice.

For this purpose, we ascertain, in the first instance, the organ principally affected, and the duration of the disease, by asking two questions, "Where do you feel pain?" and, "How long have you been ill?" Let us suppose that the patient feels pain in the cardiac region, we immediately proceed to examine

the heart, functionally and physically, and then the circulatory system generally. We next proceed to those organs which usually bear the nearest relation to the one principally affected—say, the respiratory system,—and we then examine the lungs functionally and physically. We subsequently interrogate the nervous, digestive, genito-urinary and integumentary systems. It is a matter of little importance in what order these are examined,—the chief point is, not to neglect any of them. Lastly, we inquire into the past history of the case, when we shall have arrived at all the information necessary for the formation of a diagnosis.

The following is the arrangement of symptoms and circumstances demanding attention under each of the seven heads into which the examination is divided :—

I. Circulatory System.—*Heart.*—Uneasiness or pain ; its action and rhythm ; situation where the apex beats ; extent of dulness determined by percussion ; its impulse; murmurs—if abnormal, their character, and the position and direction in which they are heard loudest. *Arterial pulse*—Number of beats in a minute ; large or small, strong or feeble, hard or soft, equal or unequal, regular or irregular, intermittent, confused, imperceptible, &c. If an aneurismal swelling exist, its situation, pulsations, extent, and sounds, must be carefully examined. *Venous pulse*—If perceptible, observe position, force, &c.

II. Respiratory System.—*Larynx and Trachea.*—Voice, natural or altered in quality, hoarse, difficulty of speech, aphonia, &c. ; if affected, observe condition of epiglottis, tonsils, and pharynx, by means of a spatula. *Lungs*—State of respiration ; easy or difficult, quick or slow, equal or unequal, laboured, painful, spasmodic, dyspnœa, &c. Expectoration, trifling or profuse, easy or difficult ; its character, thin or inspissated, frothy, mucous, purulent or mucopurulent, rusty, bloody, &c. Hemoptysis ; cough, rare or frequent, short or long, painful or not, moist or dry. External form of the chest, unusually rounded or flattened, symmetrical or not, &c. Movements—regular, equal, &c. Resonance, as determined by percussion, increased or diminished, dulness, cracked-pot sound, &c. Sounds determined by auscultation, if abnormal, their character and position.

III. Nervous System. — *Brain.* — Intelligence—augmented, perverted, or diminished ; delirium, stupidity, monomania, idiocy ; sleep, stupor, coma. *Spinal cord and nerves*—General sensibility, increased, diminished, or absent ; special sensibility—sight, hearing, smell, taste, touch, their increase, perversion, or diminution ; spinal irritation, as determined by percussion ; motion, natural or perverted, fatigue, pain on movement ; trembling, convulsions, contractions, rigidity, paralysis.

IV. Digestive System.—*Mouth.*—Teeth and gums. *Tongue*—Mode of protrusion, colour, furred, coated, fissured ; condition of papillæ, moist or dry. *Pharynx and œsophagus*—Deglutition—if impeded, examine the pharynx with

a spatula, the cervical glands, neck, &c. *Stomach*—Appetite, thirst, epigastric uneasiness or pain, swelling, nausea, vomiting, character of matters vomited, borborygmi, flatuosity, eructations. *Abdomen*—Pain, distension or collapse, tumours, constipation, diarrhœa, character of dejections, hemorrhoids. *Liver*—Size, as determined by percussion, pain, jaundice. *Spleen*—Size, as determined by percussion. If enlarged, examine blood microscopically.

V. Genito-Urinary System.—*Uterus.*—Condition of menstrual discharge, amenorrhœa, dysmenorrhœa, menorrhagia, leucorrhœa, &c. If pain, or much leucorrhœal discharge, examine os uteri and vagina with speculum; uterine or ovarian tumours. *Kidney*—Lumbar pain; quantity and quality of urine, colour, specific gravity; precipitates, as determined by the microscope, and by chemical tests; action of heat; nitric acid, &c.; action on test papers; stricture.

VI. Integumentary System.—External surface generally; obesity; emaciation; colour; rough or smooth; dry or moist; sweats; eruptions (see diagnosis of skin diseases, p. 50); temperature; morbid growths or swelling; anasarca; emphysema, &c.

VII. Antecedent History.—Age; constitution; hereditary disposition; trade or profession; place of residence; mode of living as regards food; epidemics and endemics; contagion and infection; exposure to heat, cold, or moisture; irregularities in diet; commencement of the disease; rigors.

Such are the principal points to which your attention should be directed during the examination of a case. A little practice will soon impress them on your memory, and in this manner habit will insure you that no very important circumstance has been overlooked. At first, indeed, it may appear to you that such a minute examination is unnecessary; but we shall have abundant opportunities of proving that, whilst a little extra trouble never does harm omission of any part frequently leads to error. It is surprising, also, how rapidly one thoroughly conversant with the plan, is able to examine a patient so as to satisfy himself that all the organs and functions have been carefully interrogated. Remember that the importance of particular symptoms is not known to the patient, and that, consequently, it is not in his power voluntarily to inform you of the necessary particulars. It is always your duty to discover them.

In carrying out the examination, the following hints may be attended to:—

1. It should never be forgotten that you are examining a fellow creature, who possesses the same sensitiveness to pain and the same feelings as you do, and that everything that can increase the one or wound the other should be most carefully avoided. Prudence, kindness, and delicacy, are especially enjoined upon those who treat the sick.

2. The questions should be precise, simple, and readily comprehended. When an individual has a limited intelligence, or is accustomed to a particular dialect, you will not arrive at your object by becoming impatient, or talking in a loud

voice, but by putting your interrogations in a clear manner, and in language proportioned to the intelligence of the individual.

3. It is often necessary, after asking the first question, "Where do you feel pain?" to tell the patient to put his or her hand on the part. An Irish peasant applies the term "heart" to an indefinite region, extending over great part of the chest and abdomen; and a woman, in speaking of pain in the stomach, often means the lower part of the abdomen.

4. When pain is referred to any circumscribed part of the surface, the part should always be examined by palpation, and, if possible, seen. Rostan relates very instructive cases where the omission of one or the other of these rules has led to curious errors in diagnosis.

5. Although the question, "How long have you been ill?" is sufficiently plain, it is often difficult to determine the period of commencement of many diseases. In acute inflammatory or febrile disorders, we generally count from the first rigor. In chronic affections, a lengthened cross-examination is frequently necessary to arrive at the truth.

6. In endeavouring to ascertain the cause of the disease, great tact and skill in examination are necessary. We must guard ourselves against the preconceived views of the patient on the one hand, and be alive to the possibility of imposition on the other. Sometimes, with all our endeavours, no appreciable cause can be discovered; and at others we find a variety of circumstances, any one of which would be sufficient to occasion the malady.

7. In forming our diagnosis,—that is, in framing a theory deduced from the facts elicited by examination,—we should be guided by *all* the circumstances of the case, and be very careful that these are fully known before we hazard an opinion. Even then it is not always possible to come to a satisfactory conclusion, and in such cases the diagnosis should be deferred until further observation has thrown new light upon the nature of the disease.

8. In recording a case, it is, for the most part, only necessary to put down, under each head, the symptoms or signs present. If any system be quite healthy, it should be said that it is normal. In many cases, however, it is necessary to state what are called negative symptoms. This demands great tact, and exhibits a high degree of medical information. For instance, an attack of epilepsy generally commences with a cry or scream; but sometimes there is none,—when this should be stated. Symptoms which are usually present in the disease, but are absent in the particular case, constitute negative symptoms.

9. All mention of size should be, according to its exact measurement, in feet and inches. Extent should be determined by proximity to well-known fixed points. All vague statements, such as large, great, small, little, &c., should be carefully avoided.

10. In conversing on, or discussing, the circumstances of the case at the bedside, we should always use technical language. Thus, instead of saying, a man has a cavern at the top of the lung, we should speak of a vomica under the clavicle; instead of saying, a man has diseased heart, we should speak of cardiac hypertrophy, or of insufficiency of the mitral or aortic valves, &c.

Having formed a diagnosis, and prescribed for the patient, the further examination should be conducted at intervals, varying, as regards time, according to the gravity of the case. In addition to the changes which may occur in the signs and symptoms previously noticed, the effects of remedies should be carefully inquired into. Whenever a record of the case is to be kept, I cannot too strongly impress upon you the importance of noting these down in a book at the time, rather than trusting to the memory. For a long series of years the reports of cases, dictated aloud by the professor, and written down at the bedside by the clerk, has formed a leading feature of the Edinburgh system of clinical instruction, and constitutes the only trustworthy method of drawing up cases with accuracy.

When a patient dies, the examination is not completed. The time has now arrived when an inspection of the dead body confirms or nullifies the diagnosis of the observer. You should consider this as a most important part of the clinical course. It is invariably regarded with the greatest interest by those who practise their profession with skill. It is only in this manner that any errors they may have committed can be corrected; that the value of physical diagnosis can be demonstrated and properly appreciated, and the true nature or pathology of diseases, and the mode of treating them rationally, can ever be discovered.

But here, again, method and order are as necessary in the examination of the dead as of the living, and it is of equal importance that no viscus be overlooked. The three great cavities should always be investigated. Nothing is more injurious to the scientific progress of medicine than the habit of inspecting only one of them, to satisfy the curiosity of the practitioner, or to determine his doubts on this or that point. Many medical men direct their attention to a certain class of diseases, and are apt to attribute too much importance to a particular lesion. It has frequently happened to me, when pathologist to this institution, to observe, that after the physician has examined this or that organ, to which he has attributed the death of his patient, and left the theatre, that further examination, according to the routine I always practised, has revealed important lesions that were never suspected. Thus, a person supposed to die of Bright's disease of the kidney, may have a pneumonia that was latent and overlooked. Large caverns and tubercular deposits in the lungs may satisfy the physician, and he may leave the body, when afterwards intense peritonitis may be discovered, arising from intestinal perforation. A man has hypertrophy, with valvular disease of the heart; he dies suddenly, and everything is referred to the cardiac lesion. On opening the head, an apoplectic extravasation or yellow softening may be discovered. I cannot too strongly, therefore, impress upon you the necessity of always making a thorough *post-mortem* examination, and for this purpose you should, if possible, obtain permission to inspect the body, and not any particular cavity.

The object of a post-mortem examination is threefold,—1st, the cause of death; 2d, an appreciation of the signs and symptoms; 3d, the nature of the disease. These inquiries are very distinct, but practitioners generally have only in view the two first. It frequently happens, that on the discovery of a

lesion that seems to explain the fatal termination, they feel satisfied, and there is an end to the investigation. In medico-legal cases, this is the only object. But even here it is necessary to examine all the organs, to avoid a possibility of error, for how can any conscientious man form an opinion, that an abdominal disease has been fatal, if he be not satisfied by inspection that the chest and brain are healthy? Again, it often occurs that a particular sign or symptom is unusual or mysterious, and this, if explained by the examination, is sufficient for the practitioner. But it must be obvious that this throws no light upon the nature of the disease, or its mode of cure. To do this, morbid changes must be sought for, not in that advanced stage where they cause death, or occasion prominent symptoms, but at the very earliest period that can be detected. Hence we must call in the microscope to our assistance, and with its aid follow the lesion into the ultimate tissue of organs; we must observe the circumstances which produced it, as well as the symptoms and physical signs to which it gives rise, the secondary disorders, and the order of their sequence; their duration and mode of termination. This is the kind of extended investigation which can alone be serviceable to the advancement of medicine, and such, I trust, will be the object all of you will have in view, in examining dead bodies. At all events, such are the views that I shall constantly endeavour to place before you during this course of clinical instruction.

The following is an arrangement of the organs, textures, &c., which demand your attention:—

I. External Appearances.—Number of hours after death. General aspect and condition of the body. In cases of suspected death by violence great minuteness in the external examination is necessary.

II. Head.—Scalp; calvarium; meninges; sinuses; choroid plexus; brain, its form and weight; cerebellum, its weight; cortical and medullary substance of brain; ventricles, exact quantity of fluid in each, which should be removed with a pipette, its character; nerves, and arteries at the base of the brain; sinuses.

III. Spinal Column.—Vertebræ; Meninges; Cord; Nerves.

IV. Neck.—Thyroid gland; larynx and its appendages; trachæa; tonsils; pharynx; œsophagus.

V. Chest.—Thymus gland; lining membrane of bronchi; bronchial glands; pleuræ; parenchyma of lungs; large thoracic veins; pericardium; general aspect and position of the heart; its weight; right auricle; coronary veins; auricular septum; right ventricle, size of its cavity; thickness and degree of firmness of its walls; endocardium; tricuspid valve; pulmonary artery, its calibre; pulmonary veins; left auricle; mitral valve; left ventricle; thickness and condition of its muscular tissue; size of its cavity; sigmoid valves; coronary arteries; thoracic aorta, its structure and calibre.

VI. Abdomen.—Peritoneum and peritoneal cavity; position of abdominal viscera; stomach; duodenum; small and large intestines; liver, its weight, form, and structure—its artery, veins, and ducts; gall-bladder and its contents; portal system; pancreas and its duct; mesenteric and other absorbent glands;

spleen, its weight, size, and structure; supra-renal capsules; kidneys, weight of each; secreting and excreting portions; pelvis; ureters; bladder, with the prostate and urethra in the male; in the female, uterus, ovaries, Fallopian tubes, vagina; abdominal aorta and vena cava; ganglia of the sympathetic system.

VII. Blood.—Appearance in the cavities of the heart, in aorta, vena cava, vena portæ, &c.

VIII. Microscopic Examination of all the morbid structures and fluids, the blood, &c. &c.

In carrying out the post-mortem examination, the following hints may be attended to:—

1. As I have already said, the head, chest, and abdomen should always be examined, but the spinal cord and neck need not be disturbed unless the symptoms indicate some lesion there.

2. Great care should be taken never to disfigure the body. Incisions through the skin, therefore, should be made in such directions that when the edges are afterwards sewn together, the necessary dissections below may not be visible. Neither should the body be exposed more than is needful, and delicacy demands that the genitals should always be kept covered. The wishes and feelings of the friends and relations should invariably be held in consideration.

3. You should seize every opportunity of opening dead bodies with your own hands, and acquiring dexterity in exposing the cavities, taking out the viscera, &c. Nothing is more painful than to see the brain cut into or contused, in removing the calvarium; or the large vessels at the root of the neck wounded in disarticulating the sternum, so that the surrounding parts are deluged with blood; or the cardiac valves cut through, instead of being simply exposed; or awkward incisions made into the intestines, whereby fæces escape; slipping of ligatures, &c. &c. Coolness, method, knowledge of anatomy, and skilfulness in dissection, are as necessary when operating on the dead as on the living body.

4. In examinations made at private houses, it is not always necessary to remove the viscera. The heart, lungs, liver, kidneys, &c., may be readily examined *in situ*. But here, where every facility exists, the viscera are invariably taken out, and after describing the morbid alterations they present, I shall always pass them round, so that every one present may examine them.

5. It is a good rule never to omit the examination of a morbid texture or product microscopically, until experience has made you perfectly familiar with its minute structure. This is generally done by the pathologist immediately after the examination.

6. Notes of the examination should always be made at the time. If organs are healthy, this should be distinctly stated, so that hereafter all doubt as to their having been carefully examined may be removed. Here negative appearances are often of as much consequence as negative symptoms.

7. In describing morbid appearances, we should be careful to state the phy-

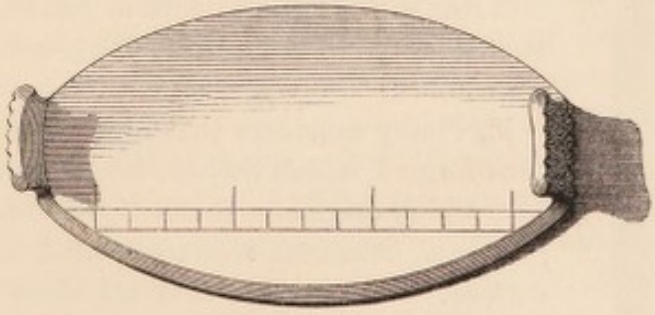
sical properties of an organ or texture, such as the size, form, weight, density, colour, position, &c. ; and avoid all theoretical language, such as its being inflamed, tubercular, or cancerous, as well as such indefinite description as small and large, narrow and wide, increased or diminished, &c. &c. Size should always be stated in feet and inches, and the amount of fluid in quarts, pints, or ounces.

During the examination of a patient in the manner described, it will be found necessary to employ three modes of proceeding that require more especial attention than I have given to them in the foregoing summary. These are percussion, auscultation, and the use of the microscope. I propose, then, giving you a short account of each of these methods of exploration.

PERCUSSION.

The object of percussion is to ascertain the density and size of organs. It may be practised directly, or through the medium of an interposed body (mediate percussion). Without knowing how to strike, and to produce clear tones, we can never educate the ear, or the sense of resistance. This preliminary part in the art of percussion, requires a certain dexterity, which some find it very difficult to obtain. The difficulty seems to depend, in some cases, on a deficiency in the proportions usually existing between the length of the fingers. Thus, I have seen more than one person who had the index finger nearly an inch shorter than the middle one, and who, consequently, found it impossible to strike the pleximeter fairly with the tips of two fingers at once. By far the most common cause of failure, however, is want of patience and perseverance to overcome the first mechanical difficulties; and there is every reason to believe, that could this be surmounted, accurate percussion would become more universal and better appreciated. Without entering into the numerous discussions which have arisen as to the superior advantages of one plan as compared with another, or of using this or that instrument, I may mention, that for the last nine years I have employed a pleximeter and a hammer. These instruments I can confidently recommend to you as the readiest means of obtaining accurate results at the bedside by means of percussion.

Fig. 42.

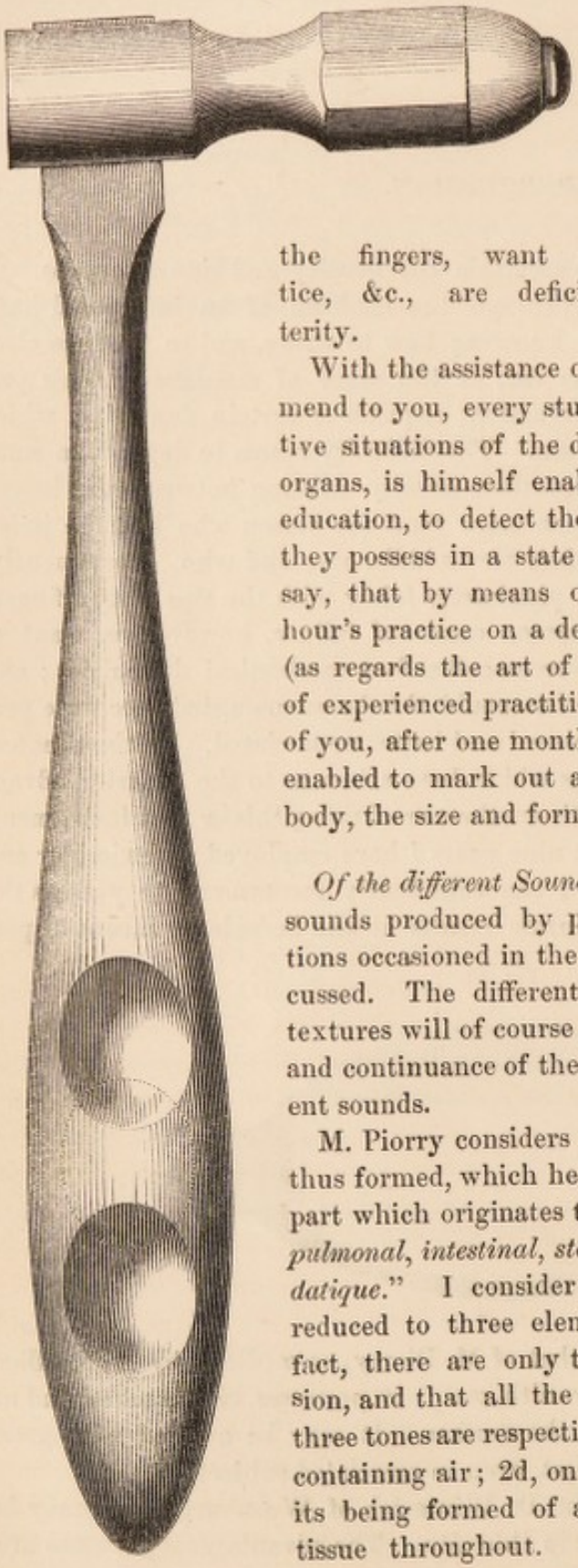


The ivory pleximeter I use is that of M. Piorry, as modified by M. Mailliot. Its length is two inches, and breadth one. It possesses two handles, and an inch and half scale drawn upon the surface. It may be applied with great precision to every part of the chest, even in emaciated subjects.

The hammer is the invention of Dr Winterich of Wurzburgh, and may be procured at all the cutlers' shops in this city. The advantages it possesses are,

1st, That the tone produced, in its clearness, penetrativeness, and quality, far surpasses that which the most practised percussor is able to occasion by other means. 2d, It is especially useful in clinical instruction, as the most distant student is enabled to distinguish the varieties of tone with the greatest ease. 3d, It at once enables those to percuss, who, from peculiar formation of the fingers, want of opportunity, time, practice, &c., are deficient in the necessary dexterity.

Fig. 43.



With the assistance of the instruments I now recommend to you, every student acquainted with the relative situations of the different thoracic and abdominal organs, is himself enabled, without other preliminary education, to detect the different degrees of sonoriety they possess in a state of health and disease. I may say, that by means of these instruments, after one hour's practice on a dead body, he is placed on a par (as regards the art of percussion) with the generality of experienced practitioners in this country; and any of you, after one month's employment of them, will be enabled to mark out accurately on the surface of the body, the size and form of the heart, liver, spleen, &c.

Of the different Sounds produced by Percussion.—The sounds produced by percussion arise from the vibrations occasioned in the solid textures of the organ percussed. The different density and elasticity of these textures will of course more or less modify the number and continuance of the vibrations, and give rise to different sounds.

M. Piorry considers that nine elementary sounds are thus formed, which he has designated, from the organ or part which originates them, "*femoral*, *jecoral*, *cardial*, *pulmonal*, *intestinal*, *stomacal*, *osteal*, *humorique*, and *hydatique*." I consider that all these sounds may be reduced to three elementary ones; that, in point of fact, there are only three tones occasioned by percussion, and that all the others are intermediate. These three tones are respectively dependent,—1st, on the organ containing air; 2d, on its containing fluid; and, 3d, on its being formed of a dense uniform parenchymatous tissue throughout. These tones, therefore, may be

termed the *tympanitic*, the *humoral*, and the *parenchymatous*. Percussion over the stomach gives the best example of the first kind of sound; over the distended bladder, of the second; and over the liver, of the third. Certain combinations of these sounds occasion the *metallic* and the *cracked-pot* sound. The terms jecoral, cardial, pulmonal, intestinal, and stomacal, however, may be used to express those modifications of sound produced in percussing respectively the liver, heart, lungs, intestines, and stomach.

No description will suffice to convey proper ideas of the various modifications of tone occasioned by percussing over the different thoracic and abdominal viscera. To become acquainted with these, it is absolutely necessary to apply the pleximeter to the body, and then half an hour's practice with this instrument and the hammer will be sufficient to render any one conversant with those which may be heard in a normal state.

It must be remembered, however, that the tones even then may vary according to circumstances. Thus, immediately after a deep inspiration, the pulmonal sound will be rendered more tympanitic, and, after expiration, more parenchymatous. In the same manner, the stomach and intestines may give out different sounds according as they are more or less full of contents. In the left or right iliac fossa a clear tympanitic sound will be heard when the intestine below is empty, and a dull parenchymatous sound when it is full of fæces.

A study of the different modifications of sound, which various organs thus produce in a state of health, readily leads to the comprehension of the sounds which may be elicited in a morbid state. Thus, the lungs may occasion a dull or parenchymatous sound, from solidification, the result of exudation, or, on the other hand, become more tympanitic, from the presence of emphysema. The abdomen may give out a parenchymatous sound, from enlargement of the uterus or an ovarian tumour; or a humoral sound, from the effusion of fluid in the cavity of the peritoneum.

Of the Sense of Resistance produced by Percussion.—By the sense of resistance is understood the peculiar sensation resulting from those impressions which are communicated to the fingers on striking hard, soft, or elastic bodies. It is of the greatest service in determining the physical condition of the organ percussed. The sense of resistance bears relation to the density of the object struck,—hence firm and solid textures offer more resistance than those which are soft or elastic. Of all the thoracic and abdominal organs, the liver presents the greatest degree of resistance, and the stomach the least. The presence of fluid in the hollow viscera, offers a medium of resistance between the parenchymatous organs on the one hand, and those containing air on the other. But air much condensed, or fluid contained within the rigid walls of the thorax, may offer a considerable degree of resistance.

The sense of resistance should be as much educated by the physician as the sense of hearing, and it would be difficult for an individual, practised in the art of percussion, to say which of these two points is the more valuable to him. Both are only to be learnt by practice, and considering it perfectly useless to describe that in words which may be learnt in half an hour, by the use of the

pleximeter and hammer on a dead body, or the living subject, I shall now proceed to describe the

General Rules to be followed in the Practice of Mediate Percussion.—1. The pleximeter should be held by the projecting handles between the thumb and index finger of the left hand, and pressed firmly down upon the organ to be percussed. Much depends upon this rule being followed, as the sound and sense of resistance are considerably modified according to the pressure made by the pleximeter. A very easy experiment will prove this. If, for instance, the pleximeter be struck while it rests lightly on the abdomen over the umbilicus, and again, when it is pressed firmly down amongst the viscera, the change in tone will be at once perceived. In the first case, a dull sound is produced, from the muscles and integuments being alone influenced by the force of the blow ; in the second case, a clear tympanitic sound is occasioned from the vibration of the walls of the intestine. In every instance, therefore, the pleximeter should be so held and pressed down, as to render it, so to speak, a part of the organ we wish to percuss.

2. Great care must be taken that no inequality exist between the inferior surface of the pleximeter and the skin. Firmly pressing it down will always obviate this when the abdomen is examined. As regards the thorax, the groove over the anterior mediastinum, the prominence of the clavicles and of the ribs, in emaciated subjects, may allow a hollow to exist under the instrument, by which a deceptive tympanitic sound is occasioned. By a little management, however, with the small and oval pleximeter I have recommended, this may readily be avoided.

3. The hammer should be held, as advised by Dr Winterich, between the thumb and the first and third fingers, the extremities of which are to be placed in the hollows prepared for them in the handle of the instrument. By some these are considered useless, but in all cases where slight differences in tone are to be appreciated, I have found this the best mode of employing it. Ordinarily, however, it will be sufficient to hold it by the extremity of the handle, merely in such a manner as will enable the practitioner to strike the pleximeter lightly, or with force, as occasion may require.

4. Care must be taken to strike the pleximeter fairly and perpendicularly. Unless this be done, vibrations are communicated to textures in the neighbourhood of the organ to be percussed, and fallacious results are the consequence. If, in percussing the lungs, for example, the blow be made obliquely, we obtain the dull sound produced by the rib, and I have seen considerable error in the diagnosis thus occasioned.

5. A strong or gentle stroke with the hammer will modify the tone and sense of resistance, inasmuch as the impulse may be communicated by one or the other to a deep-seated or a superficial organ. Thus a gentle stroke will elicit a pulmonal tympanitic sound just below the fourth rib, where a thin layer of lung covers the liver, but a strong one will cause a jecoral parenchymatous sound. At the inferior margin of the liver, on the other hand, where a thin layer of the organ covers the intestines, the reverse of this

takes place, a gentle stroke occasioning a dull, and a strong one a clear sound.

6. By withdrawing the hammer immediately after the blow, we are better able to judge of the sound ; by allowing it to remain a moment, we can judge better of the sense of resistance.

7. The integuments should not be stretched over the part percussed, as when the stethoscope is employed, for an unnatural degree of resistance is thus communicated to the hand of the operator from the muscular tension. In every case, especially where the abdomen is examined, the integuments and superficial muscles should be rendered as flaccid as possible.

8. It is always best to percuss on the naked skin. It is not absolutely essential, however; and in cases where, from motives of delicacy, it is desirable that the chest or abdomen be not exposed, it only becomes necessary that the covering of linen or flannel be of equal thickness throughout, and not thrown into folds.

9. The position in which the individual examined should be placed, will vary according to the organ explored. In percussing the thoracic organs and the liver, a sitting position is most convenient. The stomach, intestines, uterus, bladder, and abdominal tumours or effusions, are best examined when the patient is lying on the back, with the knees flexed so as to relax the abdominal walls, and, if necessary, the head and neck bent forward, and supported by pillows. In percussing the spleen, the individual should lie on the right side, and when the kidneys are examined, he should lie on the breast and abdomen. In cases of effusion into the serous cavities, a change of position furnishes most valuable indications.

10. In percussing any particular organ, the pleximeter should be first applied over its centre, where the sound and sense of resistance it may furnish, are most characteristic. Two blows with the hammer are generally sufficient to determine this. From the centre, the pleximeter should be moved gradually towards the periphery, or margin of the organ, and struck as it proceeds with the hammer, now forcibly, now lightly, until the characteristic sound of the next organ be elicited. The pleximeter is then gradually to be returned towards the organ under examination, until the difference of tone and sense of resistance become manifest. In this manner having first heard the two distinct sounds well characterised, we shall be better enabled to determine with accuracy, the limit between the one and the other. This may be done exactly after having determined, whereabouts the line of separation is, by placing the long diameter of the pleximeter transversely across it, and striking, first one end of the instrument, and then the other, till the precise spot is determined. This spot should now be marked, by placing with a pen a dot of ink on the skin. The opposite and then other portions of the margin of the organ should be limited in the same manner, and these in turn should be marked with dots of ink, until the whole organ be completely examined. Then by uniting all these dots with a line of ink, we have the exact form of the organ drawn upon the skin. When it is thought necessary to render the first mark permanent,

in order to see if any subsequent change take place in the size of the organ, or extent of the dulness, it may be rendered so, by carrying lightly a stick of argent. nit. over the ink line, while it is still moist.

Special rules to be followed in percussing particular organs.—The short rules and practical remarks about to be given, are derived partly from the precepts of M. Piorry, as I have heard him deliver them in the wards of La Pitié, and partly from my own experience.

Lungs.—Percussion of the lungs generally bears reference to a change in density, which is only to be detected by comparing the healthy with the morbid portions. The great practical rule here to be followed is, to apply the pleximeter to both sides of the chest in succession, with the same firmness, exactly in the same situation, and let the blow with the hammer be given with the same force. Care must be taken that the position of both arms be alike, as the contraction of the pectoral muscles on one side more than on the other may induce error. In short, every circumstance must be the same before it is possible to determine, in delicate cases, either from the tone or sense of resistance, whether change of density exist in the lungs. When circumscribed alterations are discovered in the pulmonary tissue, their limits may be marked out on the surface of the skin, in the manner previously indicated. In this way I have frequently succeeded in determining with accuracy the size and form of circumscribed indurations, arising from partial pneumonia and pulmonary apoplexy. Under the clavicles, the pleximeter must be applied with great firmness. Inferiorly, a thin layer of lung lies over the superior surface of the liver; and to determine the exact place where its inferior border terminates, the blows with the hammer should be very slight. Posteriorly, also, the pleximeter must be firmly applied, and the force of the blows considerable; but they should decrease in force inferiorly, where a thin layer of lung descends over the liver much deeper than anteriorly.

In a healthy state, a distinct difference may be observed in the sonoriety of the lungs immediately after a full expiration and a full inspiration. This does not take place when the tissue becomes indurated from any cause; and thus we are furnished with a valuable diagnostic sign. Congestion of the lung, and pneumonia in its first stage, cause only slight dulness and increased resistance, which, however, are readily detected by the practised percussor. In the second and third stage of pneumonia, and in apoplexy of the lung, this dulness and resistance are well-marked, and even an impression of hardness and solidity communicated to the hand. When, however, the lung is studded with tubercles, the induration is most intense, and the greatest degree of resistance communicated.

Partial indurations from apoplexy, or simple cancerous and tubercular exudation, may be detected by percussion, even when deep-seated and covered by healthy portions of the lungs. In this case, by pressing with the pleximeter, and striking lightly, a tympanitic sound only is heard; but by pressing the pleximeter down firmly, and striking with force, the dull

sound may be elicited and circumscribed. When indurations, however, exist inferiorly in those portions of the lungs which overlap the liver, it requires great practice to detect them with certainty. Caverns in the lungs, when large and filled with air, induce a tympanitic sound; but they are generally more or less full of viscous and fluid matters, and give rise to dulness.

Two or three ounces of fluid may be detected in the pleural cavity, by causing the patient to sit up. The height or level of the fluid is readily determined, and should be marked daily by a line made with nitrate of silver. If the effusion be only on one side, the increased dulness is more easily detected. It disappears on placing the patient in such a position as will cause the fluid to accumulate in another part of the pleural cavity, when the space which was previously dull becomes clear. When the effusion entirely fills the pleural cavity, no limit, of course, can be detected; but, even then, the dulness is distinguished from that of the liver by the diminished feeling of resistance.

When air is effused into the pleura, the sound is like that of a drum, and readily detected.

Heart.—To mark out the precise limits of the heart, constitutes the first difficult lesson in the art of percussion. M. Piorry commences by determining the clear sound at the upper end of the sternum, and bringing the pleximeter gradually downwards till the dull sound of the heart be heard. I have found it best to place the instrument first under the left nipple, where the cardial dulness is most intense; then to draw it upwards, striking it continually with the hammer until the clear sound of the lung be elicited; then, by bringing it down again towards the heart, we shall readily distinguish the line where cardial dulness commences, and thus limit the superior margin of the organ. The same method is to be followed in determining the situation of the lateral margins, only drawing the pleximeter outwards or inwards, striking more and more forcibly with the hammer, until the clear tympanitic sound of the lung only be heard. It is more difficult to determine the situation of the apex of the heart; for as this rests on the diaphragm, and this again upon the left lobe of the liver, it cannot readily be distinguished from them. The size of the heart, however, may be pretty accurately estimated, by limiting its superior and lateral margins. In females, the left mammary gland should be drawn upwards and outwards by an assistant.

The normal size of the heart differs in different persons. As a general rule, however, it may be considered that, if the transverse diameter of the dulness measure more than two inches, it is abnormally enlarged. It has been known to measure seven inches. (Piorry.) In hydropericardium, the dulness has been remarked to exist rather at the superior part of the sternum, than on one side or the other. (Piorry, Reynaud.) In hypertrophy and dilatation of the right ventricle, the increased extent of the dulness stretches towards the median line, and sometimes passes over it. In similar hypertrophy of the left ventricle, the dulness extends on the left side more or less, accord-

ing to the increased size of the heart. In concentric hypertrophy, there is little or no enlargement, but the density is greatly increased, which is readily detected by the feeling of resistance.

The presence of tubercles in the lungs surrounding the heart ; aneurisms or other tumours pressing upon, or in the neighbourhood of, the organ ; hypertrophied liver, extensive empyema, &c. &c., may render its mensuration difficult or impossible.

Liver.—Limitation of the size of the liver should be commenced by placing the pleximeter over the organ on the right side, where the dulness and resistance are greatest. It should then be carried upwards, until the clear sound of the lung be distinguished, when it ought again to be brought down, and the limit marked. This limit, however, may indicate either the inferior margin of the lung, or superior convex surface of the liver. Now, as a thin layer of lung descends in front of the liver, it will be necessary to determine where the tympanitic sound ceases inferiorly, by striking gently with the hammer, and where the parenchymatous sound ceases superiorly, by striking forcibly, so that vibrations may be communicated to the organ through the layer of lung. The space between these two lines thus marked on the surface is wider in some individuals than in others, and deeper and more extensive posteriorly than anteriorly. By carrying the pleximeter from the right side anteriorly, and then posteriorly towards the left of the patient, the whole superior margin may be thus detected, and marked with ink upon the surface, except where the liver comes in contact, through the medium of the diaphragm, with the apex of the heart. The inferior margin is for the most part readily detected. It must be remembered, however, that in the same manner as a thin layer of lung covers the upper margin, so a thin layer of liver descends on the right side over the intestine. It is, therefore, necessary to be cautious in determining the inferior margins, for a tolerably strong blow with the hammer will give rise to a tympanitic sound from the intestine, heard through the liver. The lower margin must be percussed in an inverse manner to the superior, and as we proceed downwards the force of the blow should be diminished. The inferior margin of the liver is in general readily detected, from the contrast which its dulness and density produced on percussion present, contrasted with the tympanitic and elastic feel of the intestines and stomach.

The superior limit of this organ is generally found about two inches below the right nipple, or corresponding with the fifth rib. Its inferior border descends to the lower margin of the ribs. The extent of the jecoral dulness in the healthy state is in general two inches on the left side, three inches in the hepatic region anteriorly, and four inches in the hepatic region laterally. (Piorry.)

Variations in the size of the liver, from congestion, inflammation, abscesses, hydatids, tumours, atrophy, &c. &c., may often be exactly determined by means of percussion. In icterus, the increase and diminution of this organ, as evinced by lines marked on the skin, will generally be found to bear a proportion to the intensity of the disease. When tumours are present, the inferior

border often presents an irregular form. If the inferior lobes of the lung be indurated by tubercles or hepatisation, it becomes difficult or impossible to draw the limit between them and the liver. When fluid effusion exists in the pleura, the increased density of the liver still serves to distinguish it, through the humoral sound of the fluid ; and, by changing the position of the patient, its upper edge in the majority of cases may be limited. In cases of ascites, we must lay the patient on the left side, in order to measure the right lobe, on the right side to measure the left lobe, and on the abdomen to percuss it posteriorly. Sometimes the right lobe of the liver is so enormously hypertrophied, that its inferior margin extends nearly to the right illac fossa. (Piorry.)

When the gall-bladder is much distended with bile, or contains gall-stones to any amount, it may readily be detected by percussion, and the dulness it occasions immediately under the inferior margin of the liver, anteriorly and somewhat laterally, be marked off. M. Piorry is enabled to do this in almost every case : but I must confess that I have often failed in detecting dulness caused by distended gall-bladder.

Spleen.—In percussing the spleen, it is necessary that the patient lie on the right side, and it is advantageous that the examination be made before, rather than after, meals. Anteriorly the sonoriety of the stomach and intestines causes the margin readily to be distinguished. Posteriorly, however, where the organ comes in contact with the kidneys, this is impossible. Its superior and inferior margins may be made out by striking the instrument with some force, and following the rule (No. 10) previously given. This organ offers great resistance on percussion.

The general size of the spleen is about four inches long and three inches wide. (Piorry.) In diseased states it may be atrophied or enlarged. I have seen it measure upwards of twelve inches long and eight wide. A pleuritic effusion, ascites, pneumonia, or tubercular deposition in the inferior lobe of the left lung, may render a limitation of this organ difficult or impossible. If the dulness cannot be detected, we may infer that its dimensions are small. (Mailliot.)

Stomach and Intestines.—The sounds elicited by percussion of the stomach and intestines are of the greatest service to the practitioner :—1st, As furnishing him with the means of determining the form of other organs, as the liver, spleen, or bladder ; 2dly, As enabling him to distinguish the presence or absence of fæcal or alimentary matter ; and, 3dly, as the means of diagnosing abdominal tumours. Hence it is incumbent on every physician to be able at once to recognise the difference between the tones furnished by the stomach, small and large intestines, under various circumstances. To arrive at this knowledge, it is necessary to be acquainted with the relative positions of the different abdominal viscera, and the regions of the abdomen to which they correspond.

In exploring the abdomen by means of percussion, the pleximeter should

first be placed immediately below the xiphoid cartilage, pressed firmly down, and carried along the median line towards the pubes, striking it all the way, now hard, now gently, with the hammer. The different tones which the stomach, colon, and small intestines furnish will thus be distinctly heard. The pleximeter should then be carried laterally, alternately to the one side, and then to the other, till the whole surface be percussed. In this manner, the different tones produced by the cœcum and ascending colon on the right side, and descending colon on the left, will be respectively distinguished from that furnished by the small intestines. The sounds and sense of resistance will be modified according as the different viscera are full or empty, as any one can determine on his own body by means of the pleximeter and hammer. When the intestines are full of fluid or solid contents, such portions may be circumscribed and marked out on the surface of the skin. I have thus often succeeded in determining the internal margin of the colon, in its ascending, transverse, or descending portions. Sometimes a portion of intestine is found lying between the abdominal walls and the stomach. The latter, however, may be readily limited, by pressing down the pleximeter, causing the patient to eat or drink, or by examining after dinner. The small intestines are almost never deprived of the tympanitic sound—a circumstance by which they may readily be distinguished from the stomach and large intestines. The distance of any particular knuckle of intestine from the abdominal walls may be pretty accurately calculated by the force necessary to be employed in pressing down the pleximeter, and striking with the hammer, in order to elicit a tympanitic or dull sound.

It is unnecessary to point out the numerous circumstances, and morbid conditions, in which percussion of the abdomen may prove useful in practice. Displacements of the stomach or intestines, femoral and scrotal hernia, mesenteric, ovarian, and other tumours, peritoneal adhesions and effusions, may all frequently be diagnosed, and their limits determined, by a careful examination with the pleximeter and hammer. By means of percussion, even the nature of the tumour may often be arrived at; as for instance, whether it be fungus hematodes, scirrhous, encysted, osseous, &c., by the different degrees of resistance they possess. Care, however, must be taken not to confound with tumours an enlarged spleen or liver, a distended uterus or bladder, stomach full of alimentary matter, &c.

In a practical point of view, it is often useful to determine, by means of percussion, whether an enema or a purgative by the mouth is likely to open the bowels most rapidly. If, for instance, there be dulness in the left iliac fossa, in the track of the descending colon, that part of the intestine must be full of fæces, and an enema is indicated. If, on the other hand, the left iliac fossa sound tympanitic, and the right sound dull, an enema is of little service, as it will not extend to the cœcum, and purgatives by the mouth are indicated.

Effusion of fluid into the peritoneum may be determined with great exactitude by means of percussion, and the height of the fluid marked, as in the case of pleuritic effusion. In the same manner, a change of position furnishes similar results.

Bladder.—This viscus is only to be detected by percussion, when it is more or less distended, and rises above the pubes. It may then be distinguished, and its circular margin limited, by observing the tympanitic sound of the intestines, on the one hand, and the dull humoral sound furnished by the bladder, with increased resistance, on the other. When covered by intestines, it will be necessary to press down the pleximeter with tolerable firmness, but not in such a manner as to give the patient pain. In the infant, the situation of the bladder is not so deep in the pelvis, and a small quantity of fluid renders it cognizable by means of percussion.

A ready approximation of the state of the bladder will be found of great service in cases of fever, apoplexy, delirium, imbecility, paraplegia, &c. &c. In several cases it has been found dangerously distended, on percussing the abdomen to determine the state of the intestines.

I have here only noticed those circumstances in the art of percussion which may be readily accomplished, and which every one may master in a few months by care and attention. For a description of the more delicate points, such as percussion of the kidneys and fœtus, accurately limiting the left from the right ventricle, determining and marking out the ascending and transverse portions of the arch of the aorta, &c., I must refer you to the admirable works of MM. Piorry[1] and Mailliot.[2]

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[1] De la Percussion Médiate, &c., Paris, 1828. Du Procédé Opératoire, Paris, 1831. De l'Examen Plessimêtrique de l'Aorte Ascendante, et de la Crosse Aortique, &c. Archives Gén. de Méd., vol. ix., 1840, p. 431. On Percussion of the Uterus, and its Results in the Diagnosis of Pregnancy: Monthly Journal, 1846-7, p. 857.

[2] Mailliot (L.) Traité de la Percussion Médiate, &c., Paris, translated into English, with notes, by Dr George Smith of Madras.

AUSCULTATION.

The object of auscultation is to ascertain and appreciate the nature of the various sounds which occur in the interior of the body. It has been found most useful when applied to the pulmonary and circulatory organs. Auscultation of the abdomen is occasionally serviceable, especially in certain cases of pregnancy, and during labour. It has also been applied to the head, although I have never been able to make out any useful results from the practice.

General Rules to be followed in the Practice of Auscultation.—1. Auscultation may be practised directly by applying the ear to the part, or indirectly through the medium of a stethoscope. Generally speaking, direct auscultation answers every necessary purpose except when the surface is unequal, or when it is desirable to limit the sounds to a small region, as during auscultation of the heart. In either of these cases a stethoscope is necessary. The instrument is also useful to confirm or nullify the existence of certain fine sounds which may be detected by the naked ear; to remove the head of the practitioner a respectable distance from the bodies of persons not distinguished for cleanliness; and lastly, as the most delicate method of auscultating the chest anteriorly in women. You should regard the stethoscope as a mere means to an end,—that end being, 1st, the education of the ear; and, 2d, a right appreciation of the pathological changes indicated by certain sounds.

2. In the choice of a stethoscope, you should observe, 1st, That the ear-piece fits your own ear; 2d, That the trumpet-shaped extremity is not above an inch and a-half in diameter, and is rounded so as not to injure the patient's skin when pressure is made upon it; 3d, That it is light and portable. The instruments recently made of gutta percha fulfil all these conditions.

3. In applying the ear, the surface should be covered only with a smooth piece of linen or a towel. In using the stethoscope, it should be applied to the naked skin, and held steady immediately above the trumpet-shaped extremity by the thumb and index finger, pressed down with tolerable firmness, whilst the second, third, and fourth fingers enable you to ascertain that the circular edge is perfectly applied—a circumstance absolutely essential.

4. The position of the patient will vary according to the part examined. In auscultating the lungs anteriorly the erect or recumbent positions may be chosen, when the two arms should be placed in a symmetrical position by the side. If the chest be examined posteriorly, the individual should lean some-

what forward and cross the arms in front. The practitioner, also, should choose such a position as will prevent too much stooping or straining. Generally speaking, the beds in the Infirmary are too low, and render auscultation very fatiguing to the physician.

5. Whenever individuals are thrown into such a state of agitation as to interfere with the regular action of the heart or lungs, the examination should be deferred until their fear diminishes, or the greatest caution should be exercised in drawing conclusions. Non-attention to this rule has led to many errors.

6. Before examining patients in a hospital, it is necessary that you should have made yourselves perfectly acquainted with the sounds which are continually going on in the healthy body. Omission of this rule not only renders the examination of patients useless, but betrays great want of consideration. For, as it is only from the alterations the healthy sounds undergo, or their being replaced by others, that we draw conclusions, how can this be accomplished if we are ignorant of their character in the first instance? It is expected, therefore, of every examining pupil, that he should be familiar with the character and theory of the various sounds heard in the healthy body before coming to the bedside. This study belongs to the Institutes of Medicine, rather than to that of Clinical Instruction.[1]

Special Rules to be followed during Auscultation of the Pulmonary Organs.—1. In listening to the sounds produced by the action of the lungs, we should pay attention to three things,—1st, The natural respiration; 2d, The forced or exaggerated respiration; and, 3d, The vocal resonance. For this purpose, having listened to the sounds during ordinary breathing, we direct the patient to take a deep breath, and then, still listening, we ask him a question, and during his reply judge of the vocal resonance.

2. You should commence the examination immediately under the centre of one clavicle,—and having ascertained the nature of the sounds and vocal resonance there, you should immediately listen in exactly the corresponding spot on the opposite side. The examination should be continued alternately from one side to the other, in corresponding places, until the whole anterior surface of the chest is explored. The posterior surface is then to be examined in like manner.

3. When, in the course of the examination, anything different from the normal condition is discovered at a particular place, that place and the parts ad-

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[1] Before commencing the actual examination of patients, you should make one or more serious, careful, and prolonged examinations of the chest of one of your fellow-students in private, so as to familiarise your ear with the healthy laryngeal, tracheal, pulmonary, and cardiac sounds, and with the character of the vocal resonance, and of the cough, as heard in various parts of the chest. You should then listen in the same manner to the chest of a young boy of from five to eight years of age, and observe how clear and exaggerated the pulmonary sounds are. Then read the description of the healthy sounds, and the theory of their formation, in Barth and Roger—an excellent work, which has been translated into English by Dr Newbigging of this city.

jacent should be made the subject of special examination, until all the facts regarding the lesion be ascertained.

4. It is occasionally useful to tell the patient to cough, in which case we are enabled to judge, 1st, Of forced inspiration, as it precedes the cough; and, 2d, Of the resonance which the cough itself occasions.

Of the Sounds elicited by the Pulmonary Organs in health and in disease.—I am anxious to impress upon you, that the sounds which may be heard in the lungs are like nothing but themselves. Students are too apt to take up erroneous notions from reading on this subject, and, instead of listening to the sound actually produced, fatigue themselves in a vain endeavour to hear something like the crackling of salt, the rubbing of hair, foaming of beer, or other noises to which these sounds have been likened. Preconceived notions frequently oppose themselves to learning the truth, and have to be got rid of before the real state of matters can be ascertained. Hence the great importance of obtaining your first impressions of the sounds to be heard by auscultation, not from books or lectures, but from the living body itself.

If you listen through your stethoscope, placed over the larynx and trachea of a healthy man, you will hear two noises,—one accompanying the act of inspiration, and the other that of expiration. These are called the *laryngeal and tracheal sounds or murmurs.* If you next place your stethoscope a little to the right or left of the manubrium of the sternum, you will hear the same sounds diminished in intensity. These are the *bronchial sounds or murmurs.* If now you listen under and outside the nipple on the right side, or posteriorly over the inferior lobe of either lung, you will hear two very fine murmurs. That accompanying the inspiration is much more distinct than that accompanying the expiration. By some, on account of its excessive fineness, it is stated that there is no expiratory murmur in health; but this is incorrect. These sounds, then, are the *vesicular respiratory murmurs.* All these sounds become exaggerated during forced respiration, but in a state of health they never lose their soft character. Again, if you listen in the same places, whilst the individual speaks, you will hear a peculiar resonance of the voice, which has been called, in the first situation, *pectoriloquy;* in the second, *bronchophony;* while in the third, it is scarcely audible. A knowledge of these circumstances, and a capability of appreciating these sounds, are necessary preliminary steps to the right comprehension and detection of the murmurs which may be heard during disease.

I have to suppose, then, that you have made your ears familiar with these sounds, and that you are acquainted with the present state of theory regarding their formation. This last may be stated in very few words to be, that the respiratory murmurs are occasioned by the vibration of the tubes through which the air rushes, according to well known acoustic principles. Hence they are loudest in the trachea, finer in the large bronchi, and finest in their ultimate ramifications. The vocal resonance, on the other hand, originates in the larynx; and diminishes or increases,—1st, according to the distance of any point from

the source of the sound ; and 2d, according to the power which the textures have in propagating it.

If now you examine, in succession, any six of the cases in the wards which are labouring under well-marked pulmonary diseases, you will have no difficulty in recognising that all the sounds you hear may be classified into two divisions,—1st, alterations of the natural sounds ; 2d, new or abnormal sounds, never heard during health.

I. *Alterations of the Natural Sounds.*—All the sounds of which we have spoken, and which can be heard in the lungs during health, may, in certain diseased conditions, be increased, diminished, or absent ; their character or position may be changed ; and, with regard to the respiratory murmurs, they may present alterations in rhythm, or duration with respect to each other.

Alterations in Intensity.—Some persons have naturally louder respiratory murmurs than others ; if this occur uniformly in both sides, it is a healthy condition. Occasionally, however, the sounds are evidently stronger in one place, or on one side (*puerile respiration*), generally indicating increased action of the lung, supplementary to diminished action in some other part. In the same manner, there may be feeble respiration simply from diminished action, as in feeble or old persons ; but it may also be occasioned by pleurodynia, obstructions in the larynx, trachea, or bronchi,—pleurisy, or pulmonary emphysema, or exudations filling up a greater or less number of the air-cells and smaller tubes, as in pneumonia, phthisis, &c. Complete absence of respiration occurs when there is extensive pleuritic effusion or hydrothorax.

Alterations in Character.—The various respiratory murmurs may, in certain conditions of the lung, assume a peculiar harshness, which, to the ear of the practised auscultator, is a valuable sign, indicative of altered texture. Thus in incipient phthisis the vesicular murmur under the clavicle is often *rude* or *harsh*. In pneumonia the bronchial respiratory murmur presents a similar character. When ulceration exists, it becomes what is called *cavernous* (hoarse or blowing) ; and in certain cases of pneumothorax with pulmonary fistula, it assumes an *amphoric* character.

Alterations in Position.—It frequently happens that the sounds which are natural to certain parts of the chest, are heard distinctly where in health they are never detected. Thus, in pneumonia, *bronchial* or *tubular breathing*, as it is sometimes called, may be evident, where only a vesicular murmur ought to exist. This is often well marked with regard to the vocal resonance, as certain lesions, which occasion condensation or ulceration, will enable us to hear in parts where, under ordinary circumstances, no voice can be heard, either bronchophony or pectoriloquy.

Alterations in Rhythm.—In health, the inspiration is usually three times as long as the expiration. In certain diseased conditions this relation is altered, or even inverted. In incipient phthisis we often find the expiration unnaturally prolonged. In chronic bronchitis and emphysema it is three or four times longer than the inspiration.

II. *New or Abnormal Sounds.*—These are of three kinds; 1st, rubbing or friction noises; 2d, moist rattles; 3d, vibrating murmurs.

1. *Rubbing or Friction Noises* are caused in the pulmonary apparatus by some morbid change in the pleuræ, whereby, instead of sliding noiselessly on one another, they emit a rubbing sound. This may be so fine as to resemble the rustling of the softest silk, or so coarse as to sound like the creaking of a saddle, grating, rasping, &c.; and between these two extremes you may have every intermediate shade of friction noise. This variation in sound is dependent on the nature of the alteration which the pleuræ have undergone. If covered with a softened thin exudation, the murmur will be soft; if it be tougher and thicker, the sound will be louder; if hard, dense, and rough, it will assume a creaking, harsh, or grating character, &c. &c. These noises are heard in the various forms of pleurisy.

2. *Moist Rattles* are produced by bubbles of air traversing or breaking in, a somewhat viscous fluid. This may occur in the bronchi, when they contain liquid exudation, mucus, or pus, or in ulcers of various sizes. They may be so fine as to be scarcely audible (when they have been called *crepitating*), or so coarse as to resemble gurgling or splashing, when they have received the name of *cavernous*. Here again, between these two extremes, we may have every kind of gradation, to which auscultators have attached names, such as *mucous*, *submucous*, *subcrepitating*, &c. &c. With these names you need not trouble yourselves; all that it is important for you to recognise is, that the sound be *moist*, and you will easily recognise that the rattles are coarse or large, in proportion to the size of the tubes or ulcers in which they are produced. These rattles may be heard in pneumonia, phthisis pulmonalis, bronchitis, pulmonary apoplexy, &c. &c.

3. *Dry Vibrating Murmurs* arise when the air-tubes are obstructed, constricted, or lose their elasticity and become enlarged, whereby the vibrations into which they are thrown by the column of air, produce sounds or tones of an abnormal character. Hence murmurs may be occasioned of a fine squeaking (*sibilous murmur*), or of a hoarse snoring character (*sonorous murmur*), and between the two extremes, there may be all kinds of variations, to which ingenious people have applied names. These only cause confusion; all that is necessary, being to ascertain that the murmur is *dry*, and you will readily understand that the fineness or coarseness of the sound will depend on the calibre of the tube or cavity thrown into vibrations. They are usually heard in cases of bronchitis and emphysema. Occasionally they present a blowing character, as when ulcers are dry, which often occurs in phthisis.

The *vocal resonance*, besides undergoing the changes already noticed in intensity, character, and position, may give rise to abnormal sounds. Occasionally it presents a soft reverberating or trembling noise, like the bleating of a goat (œgophony). The value of this sign, as indicative of pleurisy, was much overrated by Laennec. At present it is little esteemed. Sometimes the resonance gives rise to a metallic noise, like dropping a shot into a large metallic basin, or the note produced by rubbing a wet finger round the edge of a tumbler or glass vessel. This is often best heard immediately after a cough, in cases of

pneumothorax, or large tubercular excavations of the lung. Œgophony is supposed to be produced, when a thin layer of serous fluid between the pleuræ is thrown into vibrations. The cause of metallic tinkling has created great discussion; but Drs Spittal and Skoda have shown that the existence of air in a cavity which is thrown into vibrations is the necessary condition.

Such, then, are the principal sounds which may be heard by auscultation of the pulmonary organs in health and during disease. Many writers have endeavoured to point out their diagnostic importance, and drawn up rules which have always appeared to me much too arbitrary. Indeed, in so far as the education of medical students is concerned, I have long been persuaded that the study of these rules has retarded their powers of diagnosis, and afterwards led to dangerous errors in practice. I know of no dogma, for instance, more mischievous than the one which asserts a crepitating (that is a fine moist) rattle to be pathognomonic of pneumonia, because it is just as common in phthisis, and is frequently heard in various other lesions of the pulmonary organs. Hence we should regard a crepitating rattle, not as indicative of this or that so-called disease, but simply of fluid in the smaller air-passages; increased resonance of the voice, as indicating hollow spaces with vibrating râles, or increased induration of the pulmonary textures, and not as diagnostic of phthisis, pneumonia, &c., and so on. I wish, then, strongly to impress upon you,—

1st, That the different sounds are only indicative of certain physical conditions of the lung, and in themselves bear no fixed relation to the so-called diseases of systematic writers.

2d, No single acoustic sign, or combination of signs, is invariably pathognomonic of any certain pathological state,—and conversely, there is no pathological state which is invariably accompanied by any series of physical signs.

3d, Auscultation is only *one* of the means whereby we can arrive at a just diagnosis, and should never be depended on alone.

Special Rules to be followed during Auscultation of the Circulatory Organs.—1. In listening to the sounds produced by the action of the heart and arteries, we should pay attention,—1st, to the impulse; 2d, the character and rhythm of the sounds; 3d, the place where they are heard loudest, and the direction in which they are propagated.

2. You should commence the examination by feeling for the spot where the apex of the heart beats against the walls of the chest, which will enable you to judge of the impulse. This ascertained, place your stethoscope immediately over it, and listen to the sounds. Then place the instrument above, and a little to the inside of, the nipple, near the margin of the sternum, and listen to the sounds there. In the one situation you will hear the first or systolic sound, in the other the second or diastolic sound loudest.

3. If anything different from the normal condition be discovered in either one or the other position, or in both, they should be again carefully examined, and by moving the stethoscope below and round the apex of the heart, or

above, in the course of the aortic arch or carotids, on the right and left side, &c. &c., it should be ascertained at what point, or over what space, the abnormal sounds are heard loudest, and whether they be or be not propagated in the course of the large vessels. Occasionally listening over the back and in the course of the descending aorta may be useful.

4. When, during the above examination, we discover a new source of impulse and of sound in one of the large vessels, this must be especially examined, the limits of such impulse and sound carefully ascertained,—whether they be or be not synchronous with those originating in the heart,—their direction, &c.

5. Under ordinary circumstances, the respiratory do not interfere with the detection of the cardiac sounds; but where the former are very loud and the latter indistinct, it is useful to direct the individual to hold his breath for a few moments. Sometimes the impulse and sounds of the heart are heard better by directing the patient to lean forward; they may also, if necessary, be exaggerated and rendered more distinct by directing him to walk up and down quickly, or make some exertion for a short time.

Of the Sounds elicited by the Circulatory Organs in Health and Disease.—On placing your ear over the cardiac region in a healthy person, you will feel a beating, and hear two sounds, which have been likened to the tic-tac of a watch, but to which they bear no resemblance. They may be imitated, however, very nearly, as pointed out by Dr Williams, by pronouncing in succession the syllables *lupp*, *dupp*. The first of these sounds, which is dull, deep, and more prolonged than the second, coincides with the shock of the apex of the heart against the thorax, and immediately precedes the radial pulse; it has its maximum intensity over the apex of the heart,—below and somewhat to the outside of the nipple. The second sound, which is sharper, shorter, and more superficial, has its maximum intensity nearly on a level with the third rib, and a little above and to the right of the nipple—near the left edge of the sternum. These sounds, therefore, in addition to the terms first and second, have also been called inferior and superior, long and short, dull and sharp, systolic and diastolic,—all which expressions, so far as giving a name is concerned, are synonymous.

The two sounds are repeated in couples, which, if we commence with the first one, follow each other with their intervening pauses, thus—1st, There is the long dull sound coinciding with the shock of the heart; 2d, There is a short pause; 3d, The short sharp sound, and 4th, A longer pause,—all which correspond with one pulsation. In figures, the duration of these sounds and pauses by some have been represented thus,—the first sound occupies a third, the short pause a sixth, the second sound a sixth, and the long pause a third. Others have divided the whole period into four parts; of which the two first are occupied by the first sound, the third by the second sound, and the fourth by the pause. The duration, as well as the loudness, of the sounds, however, are very variable even in health, and are influenced by the force and rapidity of the heart's action, individual peculiarity, and form of the thorax. Their extent also differs greatly. They are generally distinctly heard at the pre-

cordial region, and diminish in proportion as we withdraw the ear from it. They are less audible anteriorly on the right side, and still less so posteriorly on the left side. On the right side posteriorly they cannot be heard. Their tone also varies in different persons; but in health they are free from a harsh or blowing character.

Great diversity of opinion has existed regarding the causes of these sounds,—all of which you will of course have heard discussed before coming here. You must never forget, however, the cardiac actions which coincide with them; for our reasoning from any changes we may detect, will entirely depend upon our knowledge of these. We may consider, then, that there coincide with the first sound,—1st, The impulse, or striking of the apex against the thoracic walls; 2d, Contraction of the ventricles; 3d, Rushing of the blood through the aortic orifices; and 4th, Flapping together of the auriculo-ventricular valves. There coincide with the second sound,—1st, Rushing of the blood through the auriculo-ventricular valves; and 2d, Flapping together of the aortic valves. Contraction of the auricles immediately precedes that of the ventricles. The result of numerous pathological observations, and of many experiments, is, that in health the first sound is produced by the combined action of the auriculo-ventricular valves of the ventricles, and of the rushing of the blood, which sound is augmented in intensity by the impulsion of the heart's apex against the thorax; whereas the second sound is caused only by the flapping together of the sigmoid valves.

With the cardiac as with the respiratory sounds, the alterations which take place during the disease may be divided into,—1st, Modifications of the sounds heard in health; 2d, New or abnormal sounds.

I. *Modifications of the Healthy Sounds.*—These refer to the variations the healthy sounds present in their seat, intensity, extent, character, and rhythm.

Seat.—The sounds may be heard at their maximum intensity *lower* than at the points previously indicated, as in cases of dilated hypertrophy of the left ventricle, enlargement of the auricles, or of tumours at the base depressing the organ. They may be *higher*, owing to any kind of abdominal swelling pushing up the diaphragm. They may be more on *one side* or the other, in cases where the heart is pushed laterally by effusions of air or fluid in a pleural cavity. Various other circumstances may also modify their natural position, such as tumours in the anterior or posterior mediastinum, aneurisms of the large vessels, adhesions of the pericardium, deformity in the bones of the chest, &c. &c.

Intensity and Extent.—These are *diminished* in cases where the heart is atrophied or softened; when there is pericardial effusion, concentric hypertrophy of the left ventricle, or emphysema at the anterior border of the left lung. They are *increased* in cases of dilated hypertrophy, of nervous palpitations, and when neighbouring portions of the lung are indurated, especially in certain cases of pneumonia and phthisis pulmonalis.

Character.—The sounds become *clearer* or *duller* than usual, according as the walls of the heart are thinner or thicker. Occasionally they sound *muffled* in

cases of hypertrophy or softening of the muscular walls. Not unfrequently there is a certain degree of *roughness*, which is difficult to determine as being healthy or morbid. Occasionally it ushers in more decided changes; at others, continues for years without alteration.

Rhythm or Time.—I need not say that the frequency of the pulsations differs greatly in numerous affections altogether independent of any special disease in the heart. In certain cardiac affections, however, the beats are *intermittent*, in others *irregular*—that is, they succeed each other at unexpected intervals. The *number* of the sounds also varies. Sometimes only one can be distinguished, it being so prolonged as to mask the other. Occasionally three or even four sounds may be heard, depending either on reduplication in the action of the valves when diseased, or on want of synchronism between the two sides of the heart. Not unfrequently the increased and irregular movements of the organ, combined with the sounds, are of such a character as to receive the name of *tumultuous*.

II. *New or Abnormal Sounds.*—These are of two kinds: 1st, Friction murmurs; 2d, Blowing or vibrating murmurs. Dr Latham has called them *exocardial* and *endocardial*. I am in the habit of denominating them *pericardial* and *valvular*.

Pericardial or Friction Murmurs.—These murmurs are the same in character, and originate from the same causes, as the friction noises connected with the pulmonary organs. It is only necessary to observe, that occasionally they are so soft as closely to resemble blowing murmurs, from which they are only to be distinguished by their superficial character and limited extent.

Valvular or Vibrating Murmurs.—These murmurs vary greatly in character,—some being so soft as to resemble the passage of the gentlest wind; others are like the blowing or puff from the nozzle of a bellows (*bellows murmurs*); whilst others are harsher, resembling the noise produced by *grating, filing, sawing*, &c. They are all occasioned, however, by diseases interfering with the functions of the valves. Sometimes these do not close, and the blood consequently regurgitates through them; at others, whilst this is the case, they are constricted, indurated, roughened, and even calcareous,—whence the harsher sounds. They may be single or double, and have their origin either in the auriculo-ventricular or arterial valves, or in both at once,—the detection of which constitutes the diagnosis of the special diseases of the organ. Occasionally these sounds resemble *musical notes*, more or less resembling the cooing of a dove, singing or twittering of certain small birds, whistling, tinkling, &c. &c. These depend either upon excessive narrowing of the orifices, or upon any causes which induce vibrations of solids in the current of blood,—as, when there are perforations in the valves, irregularities of their margins, string-like or other shaped exudations on their surface, &c. &c.

Auscultation of the large vessels.—On listening through the stethoscope placed over the arteries in the neighbourhood of the heart, we hear the same sounds

as are produced at the sigmoid valves, propagated along its course, but more indistinct as we remove the instrument from the base of the heart. Those which are more distant have only one sound, which is synchronous with their impulse and their dilatation. This sound is of a dull character, but in health always soft.

In the various conditions of disease we have a single or double bellows sound, or it may be harsh, grating, rasping, &c. In the first place, you must ascertain whether any of these sounds are propagated along the artery from the heart, which you will know by listening over its course from that organ, and observing whether they increase as you proceed towards it. If the sound have an independent origin, it may originate from disease of the internal surface of the artery, when it will be harsh in proportion to the roughness ; from stricture of, or pressure on the vessel, or from its dilatation. Generally speaking, the more dilated and superficially seated the vessel is, the sharper is the sound. Sometimes there is a double murmur in the course of a vessel, having an undoubted independent origin. This is most common in cases where there is an aneurismal pouch, into which the blood passes in and out through an opening narrower than the swelling itself. Occasionally one or both such murmurs may possess somewhat of a metallic ringing, or even musical character, when the margins of the opening are probably tense and thrown into peculiar vibrations.

I have already told you never to form a conclusion from auscultation alone. Even when combined with percussion, it is not safe to form a diagnosis without a knowledge of *all* the circumstances of the case. Hence, why I repudiate those rules which have been published in books, that have for their object the establishment of opinions from physical signs alone. At the same time, there can be no doubt that percussion and auscultation are absolutely essential to the proper investigation of maladies, although not more so than other modes of inquiry. I have, therefore, thought it best to give you a condensed resumé of the sounds which may be heard by auscultation of the lungs, heart, and large vessels, pointing out a few of the diseased states in which they may be sometimes (not always) heard, and especially indicating the physical conditions on which they are supposed to depend. Their true diagnostic value can only be learned by the careful examination of individual cases.

THE DIAGNOSIS OF CARDIAC DISEASES,—WITH THE ILLUSTRATIVE CASES WHICH OCCURRED IN THE CLINICAL WARDS DURING THE LATTER HALF OF THE SUMMER SESSION 1850.

From the middle of June to nearly the end of July, 1850, there has been an unusual number of cardiac diseases in the clinical wards, all of which we have studied at the bedside with great care. Indeed, most of the diseases to which this organ is liable, as well as their various complications, have been brought under your review,—so that it is scarcely possible to conceive a more instructive series of cases assembled together at one time than you have had the opportunity of examining. Before proceeding, however, to narrate and comment on these cases, allow me to remind you of some of the rules which the laborious researches of many able men have established for your guidance in the diagnosis of cardiac diseases. They are as follows :—

1. In health, the cardiac dulness on percussion measures two inches across, and the extent of dulness beyond this measurement indicates either the increased size of the organ, or the extent of pericardial effusion.

2. In health, the apex of the heart may be felt and seen to strike the chest between the fifth and sixth ribs, immediately below and a little to the outside of the left nipple. Any variations that may exist indicate the altered positions of the apex in disease.

3. A friction murmur indicates pericardial exudation.

4. A bellows murmur with the first sound, heard loudest over the apex, indicates mitral insufficiency.

5. A bellows murmur with the second sound, heard loudest at the base, indicates aortic insufficiency.

6. A murmur with the second sound, loudest at the apex, is very rare, but when present it indicates mitral obstruction, is almost always associated with insufficiency, and the murmur is double.

7. A murmur with the first sound, loudest at the base, and propagated in the direction of the large arteries, is more common. It may depend,—1st, on an altered condition of the blood, as in anæmia ; 2d, on dilatation or disease of the aorta itself ; and, 3dly, on stricture of the aortic orifice,—in which case it is almost always associated with insufficiency, and the murmur is double.

8. Hypertrophy of the heart may be independent of valvular disease, but this is very rare. In the vast majority of cases it is the left ventricle which is affected, in connection with mitral or aortic disease. In the former case the

hypertrophy is equal with rounding of the apex; in the latter there is dilated hypertrophy, with elongation of the apex.

Attention to these rules alone will, in the great majority of cases, enable you to arrive with precision at the nature of the lesion present. In cases in which there may be any doubt, you will derive further assistance from an observation of the concomitant symptoms, such as,—1st, the nature of the pulse at the wrist; 2d, the nature of the pulmonary or cerebral derangements. Thus, as a general rule, but one on which you must not place too much confidence, the pulse is soft or irregular in mitral disease, but hard, jerking, or regular in aortic disease. Again, it has been observed that cerebral symptoms are more common and urgent in aortic disease, and pulmonary symptoms more common and urgent in mitral disease.

I purposely say nothing of diseases of the right side of the heart, and of a few other rare disordered conditions of the organ,—1st, because they occur so seldom as scarcely to merit our attention; and, 2d, because I am convinced that an appreciation of the rules above given is the best method of enabling you to comprehend and easily detect any exceptional cases which may arise. In truth, however, we have seen in our examinations at the bedside that your difficulty is, not how to arrive at correct conclusions from such and such data, but how to arrive at the data themselves. You have to determine,—1st, by percussion, whether the heart be of its normal size or not; 2d, whether an abnormal murmur does or does not exist; 3d, if it be present, does it accompany the first or second sound of the heart; and 4thly, at what place and in what direction the murmur is heard loudest. These points ascertained, the conclusion flows from the rules previously given. But no instruction on my part, no reading or reflection on yours, will enable you to ascertain these facts for yourself. In short, nothing but percussing the cardiac region with your own hands, and carefully listening to the sounds with your own ears, can be of the slightest service, and the sooner you feel convinced of this truth the sooner are you likely to overcome these preliminary difficulties. Hence why the series of cases we have observed—most of which are now in the ward—are so valuable. You can at once convince yourselves of the accuracy of the facts ascertained to exist by others,—reflect on the probable correctness of the diagnosis formed at the bedside,—observe how, in the fatal cases, by following the rules given, the accuracy of that diagnosis has been confirmed by post-mortem examination,—watch the various complications,—and the effects of the treatment.

To give you confidence in the method of study now recommended, and the sufficiency of the rules I have given to enable you to arrive at correct conclusions, I shall, in the first place, direct your attention to two cases, in both of which we have seen that the lesions these rules indicated were proved to exist, by a post-mortem examination.

CASE I.[1]—*Dilatation of Ascending Portion of Aortic Arch—Incompetency of Aortic Valves—Dilated Hypertrophy of Left Ventricle.*

History.—William M'Ritchie, æt. 38, fireman on board a Newcastle steamer, entered the clinical ward, complaining of palpitation, dyspnœa, and cough, on the 4th of January 1850. At that time it was ascertained that the cardiac dulness was of unusual extent, and that a blowing murmur existed with the second sound at the base of the heart. He remained in the house under treatment until February 2d, when all the urgent symptoms having left him, he was dismissed. He was re-admitted on the 14th of March, the palpitation, cough, and dyspnœa having returned, together with anasarcous swelling of the abdomen and inferior extremities.

Cardiac Signs.—On percussion, the cardiac dulness measures four inches transversely. The apex beats between the sixth and seventh ribs external to the nipple. The carotid and subclavian arteries beat strongly. A loud and prolonged bellows murmur is heard with the second sound, loudest at the base of the heart, and propagated in the course of the large arteries. First sound is normal in character.

Concomitant Symptoms.—Respiration hurried; cough and dyspnœa urgent; respiratory sounds on inspiration harsh; expiration prolonged; face livid; pain and dizziness in the head; occasionally loss of vision; disturbed sleep; pulse 90, feeble; nausea and anorexia; abdomen considerably swollen from ascites; inferior extremities œdematous; legs cold.

Progress of the Case.—During April the symptoms continued with more or less intermission. In May he became liable to attacks of syncope, accompanied with angina and palpitations. In the beginning of June it was observed that the bellows murmur with the second sound assumed a rougher character over the arch of the aorta. He also complained of dysphagia and a pulsation in his throat, which obliged him to keep his head in a particular position. On the 14th he was seized with an unusually severe attack of angina and syncope, which in ten minutes was fatal.

Treatment.—The treatment consisted principally in the exhibition of a variety of expectorants and antispasmodics, of which a draught containing ten minims of chloroform, and a teaspoonful of Tr. Cardam. c. afforded him most relief. A few leeches were also applied occcasionally to the cardiac region.

Sectio Cadaveris, June 16th.—The pericardium contained three ounces of serous fluid. There was hypertrophy with dilatation of the left ventricle of the heart, in consequence of which the organ weighed 1 lb. 4 oz., and its transverse diameter measured five inches. The mitral valve was healthy. The aortic valves were considerably thickened and curled inwards. Immediately above them the aorta was unusually dilated, the diameter of its caliber being two and a-quarter inches. Water poured upon the aortic valves from above

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[1] Reported by Mr Hugh M. Balfour, clinical clerk.

passed through the orifice without apparently receiving any impediment. One inch below the origin of the left subclavian there was an aneurismal pouch, the size of a walnut, projecting half an inch from the general outline of the vessel. The arteria innominata, and the origin of the right carotid artery, were also somewhat dilated; and there was an aneurismal dilatation of the aorta opposite the superior mesenteric artery. The aorta, the coronary, and several of the larger arteries, were roughened internally by atheromatous deposits. The lungs were emphysematous anteriorly, and œdematous at their apices. Brain pale; slight subarachnoid effusion; cerebral arteries slightly atheromatous; other organs healthy.

CASE II.[1]—*Incompetency of Aortic Valves—Hypertrophy of Left Ventricle and Auricle—Obstruction and Incompetency of Mitral Valve.*

History.—Samuel Crawford, æt. 42, employed in chemical works, admitted June 10th. He has been subject to palpitation and dyspnœa, after any considerable exertion, for four or five years. Last February he had to leave off work on account of these symptoms, which subsided in a fortnight under medical treatment. Three days ago they once more returned. He has noticed, during the last four or five months, swelling of the feet, legs, and abdomen. He never had rheumatism or any other serious complaint.

Cardiac Signs.—The cardiac dulness measures three inches and a quarter transversely. The apex beats between the sixth and seventh ribs, two inches below and to the left of the nipple. The carotid and subclavian arteries beat strongly. Over the apex a bellows murmur is heard, with both sounds of the heart. Over the base there is a loud prolonged blowing murmur with the second sound, which is propagated in the course of the large vessels. The first sound heard at the base is unusually short and muffled.

Concomitant Symptoms.—The pulse is regular, strong, and jerking. He has cough and considerable dyspnœa. Percussion over the lungs is resonant, but, posteriorly and inferiorly, there are fine moist râles. He is liable to giddiness and a feeling of faintness on sudden exertion. Can only sleep in a half sitting posture, resting somewhat on his left side. Considerable œdema of the lower extremities.

Progress of the Case.—The cough and dyspnœa continued. On the 30th the urine became scanty and high coloured. On the 17th there was diarrhœa. Moist and dry râles were heard over a considerable portion of chest, and there was much cough and expectoration. On the 26th the urine was again abundant, but there was general fever, cough suppressed, and expectoration tinged with blood. Pulse 108, full, and hard. Crepitant and mucous râles were heard over the lower portion of the right side. On the 28th all œdema of the extremities had disappeared, but there was decided pneumonia on right side. Low delirium during the night. Died on the morning of the 29th.

Treatment.—At first ℥x. of blood were drawn from the arm with marked

[1] Reported by Mr David Christison, clinical clerk.

relief, and he took a mixture containing expectorants and diuretics, with tincture of digitalis. Local blood-letting, by means of leeches, was also practised from time to time. The scantiness of the urine and œdema gave way under the use of cream of tartar in ʒj. doses three times a-day. When the pneumonia came on, local blood-letting, and tartrate of antimony internally, were employed, but without success.

Sectio-Cadaveris, July 1st.—The pericardium contained four ounces of straw-coloured serum. The heart weighed twenty-three and a-half ounces. This increase in size was owing to hypertrophy of the walls of the left ventricle and auricle, and to dilatation of the right ventricle. The aortic valves were fringed with numerous warty vegetations. One of the valves was ruptured, and the ruptured edges were studded over with granules of recent exudation. In consequence of these lesions the valves allowed water to rush rapidly through, when poured on them from above. The septal leaf of the mitral valve was perforated in two places by orifices of sufficient size to admit a crow quill. These orifices were surrounded by vegetations, presenting a funnel-shaped prolongation on the internal surface of the valve, through which the orifice passes. There were several other vegetations on the opposite leaf of the valve and fringing its margin. One of the chordæ tendineæ was broken across at its valvular attachment, the ruptured or floating end being thickly covered with fibrinous vegetations. Aorta healthy. The lower, middle, and a portion of upper lobe of right lung dense, hepatised, presenting a reddish-gray colour, and yielding sanguineous pus on squeezing the cut surface.

Commentary.—Both the cases now detailed exhibit very strongly how the rules formerly mentioned, correctly applied, enable us to determine the nature of the cardiac lesion present,—for you will remember that, in both, the lesions named at the head of each case were confidently stated to exist, before the body was examined. In case I. "a bellows murmur was heard with the second sound, loudest at the base of the heart, and propagated in the course of the large arteries." Rule 5 tells us that this indicates aortic insufficiency, and on examination such was found to exist. As the case progressed, however, he complained of a pulsation in his throat and of dysphagia; and it is worthy of remark, that not only had an incipient aneurism formed in the arch of the aorta, which explained these symptoms, but that a tendency to the formation of aneurisms existed in other parts of the arterial system. In case II. the diagnosis, though more complicated, and therefore more difficult, was also determined on by paying attention to the same rules. "Over the apex a bellows murmur was heard with both sounds of the heart." Now rule 6 tells us that this indicates mitral obstruction with insufficiency, and a description of the lesion found affecting this valve after death, must convince us that whilst the vegetations prevented proper closure of the orifice, some of them must also have obstructed the flow of blood in its passage from the auricle to the ventricle. But there was also a bellows murmur with the second sound, heard loudest at the base; and this, as in case I., is a sign of aortic insufficiency. A careful determination of the cardiac signs, therefore, and an exact appreciation of the facts

in the first instance, led us, in accordance with the laws previously generalised, to a correct conclusion as to the nature of this complicated case.

Case III.[1]—*Incompetency of Mitral Valve.*

History.—Agnes Murray, æt. 41, admitted June 16th. About eighteen months ago she first experienced, without any obvious cause, palpitations and pains in the cardiac region, which have continued ever since. They became more violent after exertion, and were accompanied with dyspnœa. Latterly there has been an œdematous swelling of the legs, abdomen, and face. She has had four attacks of hæmoptysis, the first occurring eighteen months, and the last three months, ago.

Cardiac Signs.—The cardiac dulness measures two and a-quarter inches across. The apex of the heart beats under the sixth rib, below and a little outside the nipple. Over the apex there is heard a harsh bellows murmur, which diminishes in intensity towards the base and large vessels.

Concomitant Symptoms.—Pulse 80, weak. Great dyspnœa and palpitations on exertion, and occasional severe pain in the cardiac region. Resonance of lungs natural. Posteriorly, over right lung, loud sibilant murmurs are heard, both with inspiration and expiration. Expectoration abundant. No anasarca at present, or cerebral symptoms.

Progress of the Case.—This woman, under the action of small doses of digitalis, and cream of tartar, and the occasional application of a few leeches to the cardiac region, became gradually much better. The palpitations, dyspnœa, and bronchitis disappeared. She was dismissed greatly relieved July 16th.

Case IV.[2]—*Incompetency of Mitral Valve—Pulmonary Apoplexy.—Hydro-thorax.*

History.—Robert Ross, æt. 30, a lath-splitter, admitted June 28th. For some time past has occasionally experienced palpitation, and observed now and then slight swelling of the legs. He first became severely ill only seven weeks ago, when he was seized with repeated vomitings, which continued two days. He subsequently caught cold, to which he is very liable, and since then has been labouring under cough, dyspnœa, a feeling of tightness across the upper part of the abdomen, and general weakness.

Cardiac Signs.—Cardiac dulness cannot be distinctly defined. The apex beats feebly between the fifth and sixth ribs, two inches below the nipple. A bellows murmur is heard with the first sound over the apex, but much more distinctly three inches to the right of it, near the sternum. It is almost inaudible over the base. The second sound is normal.

Concomitant Symptoms.—Pulse 100, small and soft. Considerable dyspnœa and cough—sputa viscid and tinged with blood. No dulness on percussion over the lungs. Sibilant, mucous, and crepitating râles are heard very ge-

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[1] Reported by Mr Edmund S. Wason, clinical clerk.
[2] Reported by Mr David Christison, clinical clerk.

nerally over the inferior parts of chest, both anteriorly and posteriorly. No increase of vocal resonance. The general surface is slightly jaundiced. On careful percussion of the liver, its inferior border presents a prominence anteriorly the size of an egg, over the pylorus.

Progress of the Case.—Up to the 3d of July he experienced occasional vomiting. The inferior extremities became œdematous, and fluid accumulated in the abdomen. On percussion, the resonance over the right lung is diminished as high as the scapula; there is slight increase of the vocal resonance. On the 8th of July, the surface generally was anasarcous. From the 10th to the 15th, the dyspnœa greatly increased. He expectorated on various occasions mouthfuls of florid blood. Latterly, could only lie on the left side. The left side of the chest became completely dull on percussion, with absence of respiration. He was now removed from the infirmary by his friends.

Treatment.—Leeches to the epigastrium, with naptha and anodynes internally, checked the vomiting. The principal object of the treatment, however, was by means of diuretics, to increase the amount of urine, and thereby diminish the anasarca. Pills of leads and opium were also administered to check the hæmoptysis.

Commentary.—The two last cases contrast very strongly with the two first. In both, the bellows murmur was heard only with the first sound, loud over the apex, diminishing towards the base; and Rule 4, tells us that this indicates mitral incompetency. The concomitant symptoms fully bear out this diagnosis. The pulse was weak,—the pulmonary organs were those disturbed, while the cerebral functions were unaffected. In case III., there was bronchitis, which diminished under appropriate treatment. In case IV., bronchitis also existed, but it was much more general, and mingled with a certain degree of pneumonia on the right side. Extravasation of blood into the pulmonary tissue of both lungs had most probably also taken place, as indicated by the hæmoptysis; and, latterly, the general dropsy which prevailed affected the thoracic cavities, causing hydrothorax on the left side. The man was evidently in a dying condition when his friends insisted on his removal; and I was rather surprised to hear that he lingered a fortnight before death took place. No examination could be obtained.

Case V.[1]—*Mitral Incompetency—Hypertrophy of Left Ventricle—Attack of Acute Rheumatism, followed by Aortic Incompetency.*

History.—John Conolly, æt. 49, a joiner, admitted June 22d, 1850. He has for some years past been subject to pain in, and swelling of, the joints. Eighteen months ago he was suddenly seized with pain in the cardiac region, unaccompanied by dyspnœa, but followed by severe cough. He has been copiously bled, and undergone a lengthened treatment.

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[1] Reported by Mr Charles Murchison, clinical clerk.

Cardiac Signs.—The cardiac dulness measures $2\frac{3}{4}$ inches across. The apex beats in a hollow between the xyphoid cartilage and the cartilage of the seventh left rib. Heart's impulse strong. A bellows murmur can be heard with the first sound, synchronous with the cardiac impulse. It is loudest at the apex, and diminishes in intensity towards the base.

Concomitant Symptoms.—Pulse 74, full and strong. No cough, but considerable dyspnœa on making the slightest exertion. Percussion and ascultation indicate slight pulmonary emphysema anteriorly, but no bronchitis. Slight tinnitus-aurium, and dimness of vision occasionally. There is a patch of *psoriasis figurata*, an inch and a-half in diameter, on the right cheek and side of the nose.

Progress of the Case.—July 1st, he was attacked with severe articular rheumatism in the hip, knee, and wrist joints, which had entirely disappeared under appropriate treatment on the 9th. On the 14th he had diarrhœa, accompanied by considerable discharge of blood per anum. This continued in smaller quantities from time to time. On the 22d, a careful examination exhibited a change in the cardiac signs. The impulse over the apex was more prolonged, with a deep murmur and jog. The bellows murmur synchronous with the impulse was no longer audible, but one can be heard alternating with it at the base,—that is, with the second sound. Great pulsation of the carotid, subclavian, and humeral arteries was seen and felt, and a loud puffing murmur, synchronous with their dilatation, could be heard over them. His general health, however, was greatly improved, the local and other symptoms having disappeared; and he left the house, at his own desire, July 24th.

Treatment.—At first he took digitalis for six days, with a view of diminishing the cardiac impulse and pain. It was then suspended on account of the nausea and weakness it apparently occasioned. The rheumatic fever and arthritis were combated by salines, diaphoretics, and venesection to the extent of ʒxij. Afterwards the local pains rapidly yielded to small blisters placed over each affected joint. The diarrhœa and discharge of blood were checked by pills of lead and opium.

Commentary.—This man, after frequent attacks of rheumatism, entered the Infirmary, labouring under hypertrophy, with incompetency of the mitral valve. At the time there was no bronchitis, but he had previously suffered from severe cough and pulmonary derangement. Whilst in the house one of his acute rheumatic attacks came on. Many of the joints were swollen and exceedingly painful; but this affection yielded to one general bleeding, tartar emetic internally, and blisters locally, in eight days. The effect of this attack was to give rise to acute endocarditis, which, instead of affecting the auriculo-ventricular orifice formerly diseased, fixed itself upon the aortic valves. The lesion, however, must have been slight—probably limited to a few small vegetations upon the margins of the valve—because the murmur was soft in character, and the incompetency not of such amount as to occasion either cerebral or other functional symptoms. The pulsation in the large vessels, however, was greatly augmented, and there is every reason to fear, that should the

incompetency continue (as is most probable) the aorta and cavity of the left ventricle will both become dilated.

CASE VI.[1]—*Mitral Incompetency—Hypertrophy of Left Ventricle—Aortic Incompetency and Obstruction.*

History.—Edward Monro, æt. 41, a painter, admitted June 24, 1850. Two years ago, without any assignable cause, he was suddenly seized with angina, consisting of severe pain in the middle of the sternum, often running down the left arm, accompanied by violent palpitations. Since then the paroxysms have been increasing both in frequency and intensity.

Cardiac Signs.—The cardiac dulness below the nipple measures $3\frac{1}{4}$ inches transversely. The apex of the heart cannot be felt to beat at any particular spot. Heart's action is regular. A distinct bellows murmur can be heard accompanying both the first and second cardiac sounds, which are equally loud at the apex and at the base. Both are heard loudest to the right of sternum, opposite the second, third, and fourth costal cartilages. A loud blowing murmur is heard over the carotid arteries.

Concomitant Symptoms.—Pulse 74, regular. Has a slight cough, with expectoration. Lungs resonant on percussion, and on auscultation the inspiratory murmurs are louder and rougher than natural, and the expiration is slightly prolonged. He has frequently expectorated small quantities of dark-coloured blood. There is great dyspnœa on making the slightest exertion, and he has occasional severe attacks of angina. There is considerable dyspepsia. Slight dimness of vision, and muscæ volitantes, but otherwise no cerebral symptoms.

Progress of the Case.—The attacks of angina returned four and five times a-day. They occasioned great agony, profuse perspiration, and increased action of the heart, during which the murmurs were heard louder. There was also occasional nausea and tendency to vomit. On the 8th of July he fainted, being unconscious for five minutes. At this time the murmur with the first sound assumed a whining character, heard loudest at the apex. There was a double bellows murmur heard distinct from this, at the base. July 11.—There was cough and expectoration. A fine moist râle could be heard over the lower half of left chest, both anteriorly and posteriorly. No dulness on percussion, or increased vocal resonance. July 15.—He has now only one attack of angina in the day, which is also much less severe. The cough and expectoration are diminished. A mucous râle still perceptible in left lung inferiorly. A whining murmur with the first sound is still heard at the apex, and a double bellows murmur at the base, propagated in the course of the great vessels. He left the house at his own desire.

Treatment.—The attacks of angina were at first treated with anodyne and antispasmodic draughts, containing M. v. of chloroform for a dose. Afterwards they were greatly relieved by taking carminatives, such as three drops of each

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[1] Reported by Mr Charles Murchison, clinical clerk.

of the oils of aniseed and cajiput dropped on sugar. Latterly they greatly diminished after ℥vj. of blood were drawn from the cardiac region by cupping. The bronchitis was treated with anodynes and expectorants.

Commentary.—When this man entered the Infirmary it was very difficult to determine at what point the two bellows murmurs were heard loudest. Repeated and careful examination failed to discover whether one or both were referable to the apex or to the base; and in consequence we could not, according to the rules given, determine whether the disease was aortic, mitral, or both. This was probably owing to the circumstance of the abnormal murmurs originating in two places, and being, at the same time, so similar in tone, that the diffusion of sound was pretty equal over the whole cardiac region. But as the case progressed the murmurs underwent such modifications as left us in no doubt. The murmur with the first sound over the apex assumed a whining tone, so that it was easily separated from the double bellows murmur which still remained loud at the base. The former, according to the rules given, must have depended on mitral incompetency; whilst the latter, for the same reason, must have been owing both to incompetency and obstruction of the aortic orifice. The man laboured under slight pulmonary, as well as cerebral, symptoms. His chief complaint, however, was the angina, the attacks of which were in him very severe, causing the most excruciating agony, and bathing the whole surface with sweat. This, in its turn, seemed to be connected with a state of dyspepsia which existed. Whenever gas accumulated in the stomach, so as to distend that organ and press the heart upwards, the attacks were most severe. The carminatives gave relief by causing discharge of this gas. After local bleeding, and an improvement in his general health, but more especially in the dyspeptic symptoms, the angina diminished in intensity.

The two last cases recorded exhibit how important it is carefully to examine the cardiac signs from time to time as the case progresses, and to watch the modifications they undergo. Where doubt and difficulty prevail, it is only in this way they can be removed. Under such circumstances, never state an opinion at all, and continue to watch until the signs become permanent and unequivocal. This advice you will find to be even more useful in private than in hospital practice, for reasons which I shall allude to hereafter. But not only are frequent examinations useful in clearing up different points in diagnosis, but they reveal to the pathologist the changes which take place in the affected parts. Of this the following case affords us an instructive example.

CASE VII.[1]—*Incompetency of the Aortic Valves—Dilated Hypertrophy of Left Ventricle—Pneumonia—Pulmonary Apoplexy.*

History.—William Caird, æt. 29, labourer, admitted May 30. Five months ago he first noticed that he became unusually breathless, and had palpitations after exertion. He continued to work until two months ago, when, being

[1] Reported by Mr David Christison, clinical clerk.

engaged in lifting heavy stones, he was suddenly seized with pain in the cardiac region, violent cough, and hæmoptysis. He entered the Glasgow Infirmary, from which he was discharged, much relieved, in a fortnight. Since then he has been subject to giddiness, dyspnœa, and palpitation, with occasional hæmoptysis.

Cardiac Signs.—Cardiac dulness extends $3\frac{3}{4}$ inches transversely. The apex beats between the sixth and seventh ribs, three inches below, and a little to the left of the nipple. A bellows murmur is heard with the second sound, loudest at the base, and propagated in the course of the large vessels. The first sound is normal.

Concomitant Symptoms.—Pulse 92, strong and regular. He feels a shooting pain in the cardiac region, extending to the epigastrium. There is great dyspnœa, and palpitation on exertion. Slight cough, and fine moist râle in the chest, heard inferiorly and posteriorly. Occasional giddiness.

Progress of the Case.—The pain in the cardiac region and epigastrium was the chief source of complaint during the progress of the case. The dyspnœa and palpitations were from time to time distressing. There was occasional vomiting. On the 12th of July, it was observed that the bellows murmur assumed a whining character, and on the 15th it was distinctly musical, like the chirping of a small bird. On the 17th, the heart's action was tumultuous, and vomiting was very distressing. On the 23d there was considerable hæmoptysis, mouthfuls of blood being evacuated. On the 24th, there was dulness on percussion over the inferior portion of chest, and distinct crepitation, with increased vocal resonance, could be heard. The cardiac dulness was determined, on careful percussion, to measure five inches transversely. The vomiting and hæmoptysis defied all remedies. The pulse was 100, soft. He gradually became weaker. The urine was scanty, and œdema of the legs appeared. Latterly there was muttering delirium at night. Died on the 29th.

Treatment.—At first he experienced relief, from the cardiac and epigastric pains, after small local bleedings by means of leeches and cupping. Blisters were also applied. All kinds of remedies were tried to check the vomiting, but with little effect. Antispasmodics were employed to relieve the dyspnœa; and latterly, as the pulse became weak, wine and stimulants were freely administered.

Sectio-Cadaveris, July 30th.—Heart much enlarged, weighing 25 ounces, owing almost entirely to hypertrophy with dilatation of the left ventricle. When water was poured upon the aortic valves from above it passed rapidly through the orifice. The aortic valves were thickened throughout and shortened. The curled-in and dense margins were one-tenth of an inch thick. Two of the valves were united at their neighbouring surfaces, so as to form one, the only vestige of a septum between them being a hardened nodule at the base of the enlarged valve. On the edge of the smaller valve was a warty excrescence, the size of a coffee-bean, soft in consistence, composed of recent exudation, and infiltrated with blood, so as to present a purple colour. There was red hepatisation of the posterior and inferior portion of both lungs, and there was considerable apoplectic extravasation in the substance and the neighbourhood of the diseased

portions of the lung. The bronchi were filled with frothy mucus. The liver presented the nutmeg appearance, being in the first stage of cirrhosis. Other organs healthy.

Commentary.—We had very little difficulty in determining, from the cardiac signs in this case, that, according to the rules laid down, there was incompetency of the aortic valves, with dilated hypertrophy of the left ventricle. The bellows murmur, which was at first soft, gradually changed its character as the case progressed, without altering its position. It became whining, and then chirping, constituting what is called a musical murmur. It is generally found in such cases that a solid body projects into the current of the blood as it flows through the valve, so as to be thrown into vibrations; and it was interesting to discover, on the examination of the body, that the vegetation described exactly fulfilled these conditions. From its softness also there is every reason to suppose it was of recent formation, originating probably about the time the musical murmur was first observed. From the great induration of the aortic valves, there can be very little doubt that they had been affected for a long time, at least many months; but it becomes a question, whether the adhesion and formation of one valve out of two might not have been caused by a rupture of one or both valves, two months previously, at the time he was lifting heavy stones, and was suddenly seized with cardiac pain and other symptoms. It is worthy of observation, also, that, although he had cerebral symptoms, the lungs were greatly affected, the bronchitis latterly passing into pneumonia and pulmonary apoplexy.

CASE VIII.[1]—*Mitral Incompetency—Hypertrophy of left Ventricle—Dilatation and Disease of Arch of Aorta—Aortic Incompetency.*

History.—Hugh Devine, æt. 40, labourer, admitted July 17. Dates his illness from a severe strain of the back, eighteen months ago, but is not sure when he first noticed dyspnœa and palpitation, which have prevented him from working for the last eight months. Never had rheumatism or hæmoptysis.

Cardiac Signs.—Cardiac dulness measures $2\frac{3}{4}$ inches transversely. The apex beats between the fifth and sixth ribs, two inches below, and a little to the right of, the nipple. A bellows murmur with the first sound is heard at the apex, decreasing towards the base. A bellows murmur of a rougher character is also heard with the first sound at the base, which is prolonged in the course of the large vessels. The second sound is normal. There is distinct pulsation under the clavicles, but none above the sternum.

Concomitant Symptoms.—Pulse 104, regular, full, and jerking. No cough or pulmonary symptoms, with the exception of dyspnœa on exertion. Has frequent pain in the upper part of the head and across the temples, and occasional dimness of vision. The thyroid gland is somewhat enlarged.

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[1] Reported by Mr David Christison, clinical clerk.

Progress of the Case.—Since his residence in the infirmary the symptoms are greatly ameliorated. The dyspnœa, palpitation, and cephalalgia, have nearly disappeared. The cardiac signs, however, have undergone considerable change. On the 16th of August it is reported that there is still a bellows murmur with the first sound, heard loud at the apex. An inch above, and to the inside of the nipple, a loud, harsh, grating murmur is heard with the first sound, and followed by a soft bellows murmur with the second. In the course of the aorta there is unusual impulse, and coinciding with it there is a bellows murmur, which is propagated along the carotids. He was dismissed Septr. 12th.

Commentary.—You will remember that we examined this man with great care, and found cardiac signs which are not often associated together. For instance, a distinct bellows murmur, loud over the apex and diminishing towards the base, which, according to the rules given, we ascribed to mitral incompetency. Over the aortic valves, however, and extending along the arch of the aorta, there was also a bellows murmur of a rougher character, and also occurring with the first sound. Now Rule 7 tells us that this may depend on three circumstances,—"1st, On an altered condition of the blood, as in anæmia; 2d, On dilatation or disease of the aorta itself; and, 3d, On stricture of the aortic orifice, in which case it is almost always associated with insufficiency, and the murmur is double." It is clear that the first and third propositions would not apply, and I therefore came to the conclusion that in addition to mitral regurgitation, the aorta was dilated and diseased, the former indicated by the increased impulse, and the latter by the roughened murmur. Latterly, when dismissed, the roughened murmur over the aorta assumed a rasping character, and a soft bellows murmur was also heard with the second sound,—so that the dilated and diseased aorta was at that time probably associated with aortic incompetency.

CASE IX.[1]—*Incompetency of Aortic Valves—Hypertrophy of Left Ventricle—Aneurism of the Arch of the Aorta.*

History.—Charles Watt, æt. 31, groom, admitted June 19. During the last eight months has frequently had occasion to lift heavy weights, and has occasionally felt slight pain in the epigastrium. This suddenly became very violent on the 8th of June; and the next day, on walking, he experienced violent dyspnœa. On the 11th he was cupped, with considerable relief. Has been aware of a pulsation in the neck for two years, but never suffered any inconvenience from it. No dysphagia.

Cardiac and Aortic Signs.—The cardiac dulness extends three inches transversely. The apex beats with great force between the fifth and sixth ribs, two inches below, and a little to the left of, the nipple. A bellows murmur is heard with the second sound, loudest at the base. The first sound is normal. In the right side of neck, immediately above the sternum and clavicle, there is a pul-

[1] Reported by Mr David Christison, clinical clerk.

sating tumour the size of a hen's egg, extending laterally two inches. It communicates a strong impulse, and a peculiar thrill, to the hand placed on it, and over it there may be heard a loud hoarse bellows murmur, synchronous with the impulse of the heart, and this murmur may be heard at the back, extending down the course of the aorta.

Concomitant Symptoms.—Pulse 74, regular, hard, and jerking, alternating with the impulse at the apex, stronger in the right than the left wrist. Pain in the epigastrium, and dyspnœa on exertion. No other pulmonary symptoms. Frequent pain in the left temple, extending down that side of the nose. Giddiness on rising suddenly. Frequent muscæ volitantes.

Progress of the Case.—Continued to have pain in the epigastrium, and dyspnœa at intervals. He was treated by occasional small topical bleedings and blisters, and latterly small doses of aconite. The physical signs underwent no change, but the distressing concomitant symptoms nearly disappeared, and he felt so well that he was dismissed, at his own desire, July 15.

Commentary.—In this case aortic incompetency was proved to exist by the same sign as we have seen to accompany it in the other cases. The visible swelling, diffuse pulsation, and bellows murmur, synchronous with the dilatation of the vessel, could leave little doubt that an aneurism of the aorta existed. It became a question, however, whether the innominata was or was not involved; and I am inclined to consider not, from a variety of circumstances, but more especially—1st, because the pulse at the right wrist was stronger than at the left; 2d, because the pain in the head and face was on the left, and not on the right side; and, 3d, because the bellows murmur over the tumour was superficial, anterior, and propagated down the back in the course of the aorta. In addition it could be argued that there was neither dysphagia nor dyspnœa, while the respiratory murmurs were equally loud in both lungs. Now aneurisms of the transverse arch of the aorta press against the most convex part of the trachea, which is least liable to compression, whilst the œsophagus at this point is well protected. Hence the seat of the aneurism explains why deglutition and respiration were not interfered with.

Case X.[1]—*Pericarditis and Endocarditis—Hydropericardium.*

History.—Barney Kilpatrick, æt. 25, a miner, admitted July 8th. Nine weeks ago he was suddenly seized with dyspnœa and a feeling of weight or dull pain in the cardiac region. A fortnight since, this pain became much more acute, and has continued up to the time of admission. For five years he has been much exposed to wet and changes of temperature, but never had rheumatism.

Cardiac Signs.—Cardiac dulness measures three and a-quarter inches transversely, and is limited above by the margin of the third rib. Apex beats between the fifth and sixth ribs, two inches below, and considerably to the right of, the nipple. All over the dull region a double friction sound is heard, resem-

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[1] Reported by Mr David Christison, clinical clerk.

bling a roughened bellows murmur, but superficial. Beyond the region of the dulness these murmurs suddenly cease. Action of the heart regular.

Concomitant Symptoms.—Pulse 96, regular, small, and feeble, stronger on the right than on the left side. The slightest movement induces pain, extending from the cardiac region down the left arm to the fingers; great dyspnœa; no cough or other pulmonary symptoms; no fever; no cerebral symptoms or tendency to syncope.

Treatment, and Progress of the Case.—Twelve leeches were ordered to be applied to the cardiac region, and a calomel and opium pill to be taken every six hours. On the 11th, the friction murmurs were much louder at the base than at the apex. The pulse 108; feeble on left side; on the right side it had a double impulse, a pretty strong beat being followed by a weaker one. ℥vj. of blood to be drawn from the cardiac region by cupping, and a pill to be taken every four hours. On the 13th the breath had a mercurial fetor. Pulse stronger; less dyspnœa; friction murmurs more faint; pain in arm diminished. On the 14th, pulse full; slight fever; six leeches to be applied to the cardiac region; morphia draught at night. On the 15th, friction murmur only heard at the base; anorexia; can take no food; omit calomel and opium pills. 16th, Friction murmurs have disappeared, but there is a soft bellows murmur with the second sound, heard at the base. 18th.—Had an attack of severe dyspnœa and syncope; pulse 100, regular, but feeble; ℥iv. of wine; cardiac dulness increased. 19th.—Orthopnœa; pulse weak and fluttering; a quivering pulsation felt in the cardiac region; faintness; œdema of feet and legs. Stimulants to be freely administered. Died early in the morning of the 30th.

Examination of the body was not allowed.

Commentary.—This was a well characterised case of pericarditis. At first the endocardial murmur was masked by the friction sounds, but as these disappeared, its existence became apparent. It was observed, that as the mercury affected the system, the friction murmur diminished; but there is every reason to believe that this was not so much owing to absorption of the exudation, as to increase in the amount of serous effusion. To the combined effects of pressure on the heart from liquid without, and incapability of performing its function from incompetency of the aortic valve, the fatal event must be attributed.

In the short commentary I have appended to each case, I have dwelt principally on points of diagnosis, which are those that present the chief difficulties to you in the study of these diseases. I must guard you, however, from the idea, that the group of cases we have reviewed, gives a fair notion of cardiac disorders as you will meet with them in private practice. No doubt their study will enable you, by the way of exclusion, to determine those functional derangements of the organ which are more frequently met with among individuals moving in the better ranks of life. To these, as well as to a variety of important considerations connected with the etiology and treatment of heart disease, I must direct your attention on some future occasion.

THE MICROSCOPE AS A MEANS OF DIAGNOSIS.

There are still a few teachers who consider the microscope as useless in the investigation of disease. I believe, on the contrary, that our acquaintance with the ultimate structure of the human body, in its healthy and diseased conditions, is now so advanced, and good microscopes are so common and cheap, as to warrant their introduction among the instruments of the medical practitioner. You must not suppose that an additional method of gaining information implies abandonment of those, the utility of which has stood the test of experience. Men must learn the every-day use of their senses; must know how to feel, hear, and see, in the same manner as they did before instruments were invented. We don't see the stars less clearly with our naked sight, because the telescope is necessary for an astronomer. Neither should a physician observe the symptoms of a disease less accurately because he examines the chest with a stethoscope, or a surgeon be less dexterous with the knife, because it is only by means of the microscope he can determine with exactitude the nature of a tumour. But it is unnecessary to enter into a lengthened argument to prove that the science and art of medicine are greatly indebted, in modern times, to the invention and proper application of ingenious instruments. The following examples will serve to convince you that the microscope is one of these:—

Example 1.—Some years ago I was summoned to see a Dispensary patient labouring under bronchitis, who was spitting florid blood. On examining the sputum with a microscope, I found that the coloured blood corpuscles were those of a bird. On my telling her she had mixed a bird's blood with the expectoration, her astonishment was unbounded, and she confessed that she had done so for the purpose of imposition.

Example 2.—A gentleman, for some years, had laboured under a variety of anomalous symptoms, referable to the head and digestive systems, under which he had become greatly reduced. He had consulted many practitioners, and visited innumerable watering places, in a vain search after health. On examining the urine with a microscope, I found it crowded with spermatozoa. He evidently laboured under spermatorrhœa, a disease which had never been suspected, but which was readily cured on the employment of an appropriate treatment.

Example 3.—A boy was brought to me with an eruption on the scalp, which was of so indefinite a character that its nature could not be determined. He had lately been elected to occupy a vacancy in one of our charitable educational establishments, and the question to decide was, whether the disease was or was not contagious. On examining the scab with a microscope, I readily discovered the *Achorion Schoenleini*, or fungus constituting true favus ; and as this has been experimentally proved to be inoculable, I had no hesitation in preventing his admission to the school.

Example 4.—A child was supposed to be affected with worms, because it passed in abundance yellowish shreds, which, to the naked eye, closely resembled ascarides. All kinds of vermifuge remedies had been tried in vain. On examining the shreds with a microscope, I found them to consist of the undigested spiral vessels of plants ; and they ceased to appear when the vegetable broth used as food was abandoned.

Example 5.—I was called to see an infant, a month old, which was in a state of considerable emaciation, with constant diarrhœa. The mother, however, maintained that her milk was abundant, and that it was taken in sufficient quantity. On being examined with a microscope, it was found to contain numerous compound granular bodies, and comparatively few milk globules. In short, it presented, in an exaggerated degree, all the characters of colostrum, and this thirty days after delivery. It was evident then that the *quality* of the milk was in fault, an opinion which was confirmed by the recovery of the infant, when a healthy nurse was procured.

Example 6.—An individual was supposed to be labouring under dysentery, from the frequent passage of yellowish pulpy masses in the stools, accompanied with tormina and other symptoms. On examining these masses with the microscope, I found them to consist of undigested potato skins. On inquiry, it was ascertained that this person eat the skins with the potatoes. On causing these to be removed before dinner, the alarming appearance ceased, and the other symptoms also disappeared.

Example 7.—An eminent surgeon, in London, was treating a case, of what he considered to be pharyngeal abscess. Before opening it, however, he scraped off a little of the matter on its surface with his nail, and took it to Mr Quekett, who told me that, on examining it with a microscope, he found it to contain numerous cancer cells. The tumour was allowed to progress uninterruptedly ; and on the death of the individual, some months afterwards, the bones at the base of the cranium were found to be enlarged, from a cancerous growth.

Examples of this kind could be readily multiplied. No doubt, mistakes will be made with this instrument in the hands of inexperienced persons, in the same manner as the use of the stethoscope, or of a knife, may lead to a false

conclusion, or to an accident. But this, so far from being an argument opposed to their employment, only proves the necessity of becoming more skilful in their use. Certainly there is none which requires more expert management in itself, or more caution in drawing conclusions from its employment, than the microscope.

Description of the Microscope.

It is not my intention to enter upon a description of the optical principles on which microscopes are constructed, although you will find a knowledge of these very useful. I shall suppose that you are desirous of obtaining an instrument that will answer all the purposes of the anatomist and physiologist, as well as afford you every possible assistance in the way of diagnosis as medical men. For this purpose, you should learn to distinguish what is necessary from what is unnecessary, in order that you may procure the former in as convenient a form, and at as moderate a cost, as possible.

A microscope may be divided into mechanical and optical parts. The former determine its general form and appearance. Of the numerous models which have been invented, the one here figured, exactly one-fourth its real size, appears to me the most useful for all the purposes of the physiologist and medical practitioner. The body consists of a telescope tube, eight inches in

Fig. 44.

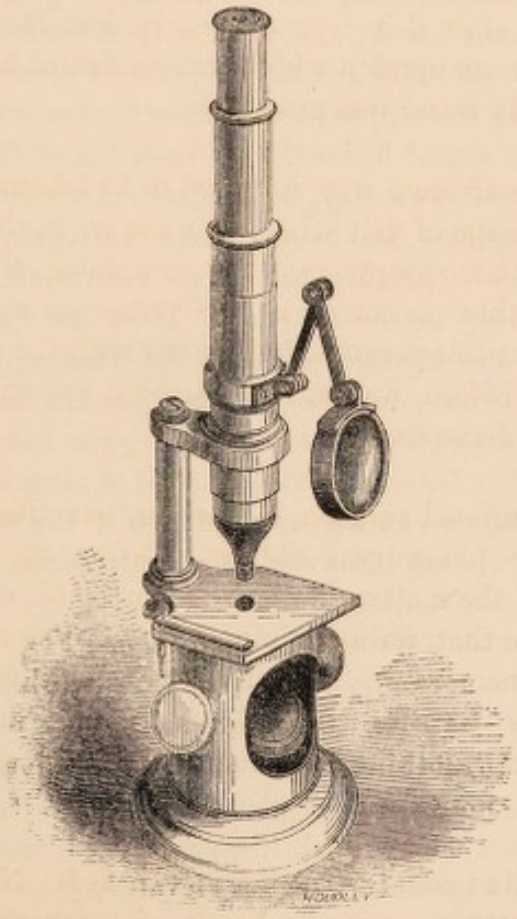


Fig. 44.—Oberhaeuser's latest model, made at my suggestion for medical men.

length, held by a split tube, three inches long. It may be elevated and depressed with great readiness by a cork-screw movement, communicated to it by the hand, and this constitutes the coarse adjustment. It is attached to a cross bar and pillar, at the lower portion of which last, very conveniently placed for the hand of the observer, is the fine adjustment. The stage is three inches broad, and two and a-half inches deep, strong and solid, with a circular diaphragm below it. The base of the instrument is heavily loaded with lead to give it the necessary steadiness.

This form of microscope possesses all the mechanical qualities required in such an instrument. These are,—1st, Steadiness; 2d, Easy power of adjustment; 3d, Facility for observation and demonstration; and 4th, Portability.

1. *Steadiness.*—It must be evident that if the stage of the microscope possesses any sensible vibration, minute objects, when magnified highly, so far from being stationary, may be thrown altogether out of the field of view. Nothing contributes more to the comfort of an observer than this quality of a microscope, and great pains have been taken to produce it. In the large London instruments this end has been admirably attained, but at so much cost and increase of bulk as to render it almost useless. In the small model I have recommended, all the steadiness required is present in the most convenient form.

2. *Power of Easy Adjustment.*—It is a matter of great importance to those who use the instrument much, and work with it for hours together, that the adjustments should work easily and rapidly, and be placed in convenient situations. Nothing can be more commodious than the manner in which these ends are arrived at in the model figured. By insertion of the body of the instrument within a split tube, you may, by a spiral movement, elevate and depress it with the greatest rapidity, and even remove it altogether if necessary. The necessity of continually turning the large screws affixed to most microscopes, becomes fatiguing in the extreme. Then the fine adjustment, placed conveniently behind the microscope, near the hand which rests on the table, is in the very best position; whereas, in some London instruments, it is placed on the top of the pillar, so that you must raise your hand and arm every time it is touched. In other London instruments, it is placed in front of the body, so that you must stretch out the arm and twist the wrist to get at it. No one could work long with so inconvenient a contrivance.

3. *Facility for Observation and Demonstration.*—For facility of observation and demonstration it is necessary that the instrument should be of a convenient height, and that the stage on which the objects are placed should be easily accessible. Here, again, nothing can be more commodious than the microscope I have recommended, for, when it is placed on a table, its height is almost on a level with the eye, and we can look through it for hours without the slightest fatigue. On the other hand, the stage is elevated, just so much as enables the two hands, resting on their external edges, to manipulate with facility all kinds of objects placed upon it. The large London instruments are so high, as to

render it necessary to stand up to see through them. To obviate this disadvantage, a movement is given to the body, by which it can be depressed to any angle. But this movement renders the stage oblique, and removes it to a distance, where it becomes very inconvenient to manipulate on its surface. To obviate this difficulty, the stage itself has been rendered moveable in various ways by different screws, so that in this way complexity has been added to complexity, until a mass of brass work and screws is accumulated, to the advantage of the optician, but to the perplexity and fatigue of the observer. But by no contrivance is it possible to avoid the aching arms which such a position of the stage invariably produces in those who work with such a cumbrous machine for any length of time.

4. *Portability.*—This is a property which should by no means be overlooked in instruments that are intended more for utility than ornament. A medical man is often called upon to verify facts in various places; at his own house, at an hospital, at the bed-side of his patient, or at a private post-mortem examination. It is under such circumstances that the value of portability is recognised. The large London instruments require an equipage or a porter to transport them from place to place; even the putting them in and out of the large boxes or cabinets that are built around them, is a matter of labour. In short, notwithstanding the splendour of the screws, the glittering of the brass, and the fine workmanship, there can be little doubt that, on the whole, they are very clumsy affairs.

There are many occasions on which a medical man may find it useful to carry a microscope with him, especially in the case of post-mortem examinations. Many attempts have been made to construct a pocket-microscope; and

Fig. 45.

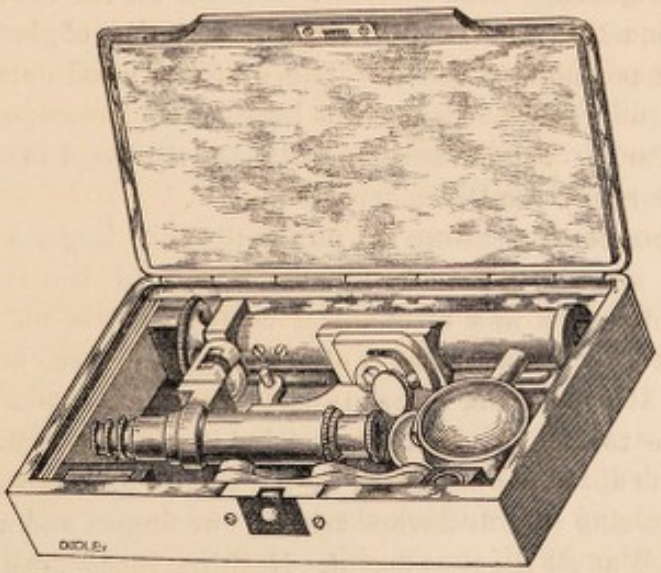


Fig. 45.—Gruby's compound pocket microscope, exactly one-half the real size.

for the purposes above alluded to, I myself planned one some years ago, which with its case, resembled a small pocket telescope. Dr Gruby of Paris, however, has planned the most ingenious instrument of this kind, which possesses most of the properties we have enumerated, and will be found very use-

Fig. 46.

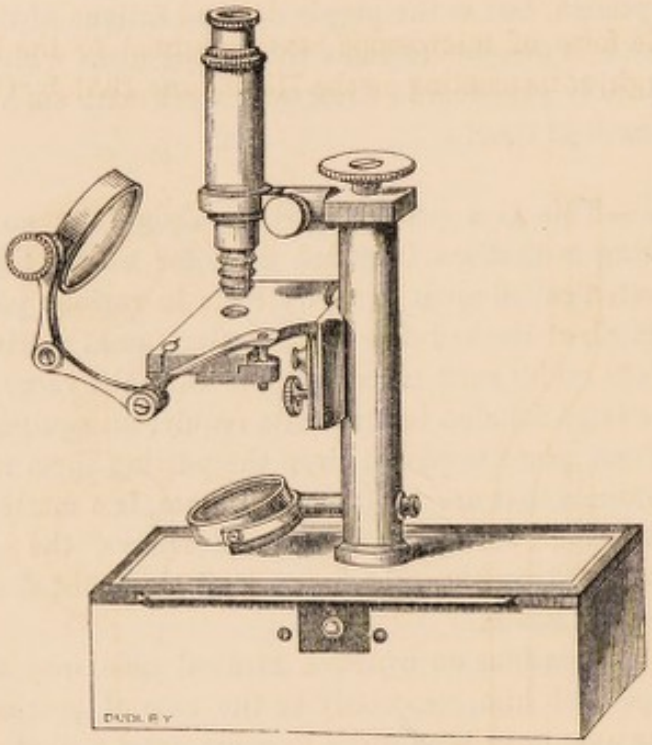


Fig. 46.—The same microscope mounted, ready for use.

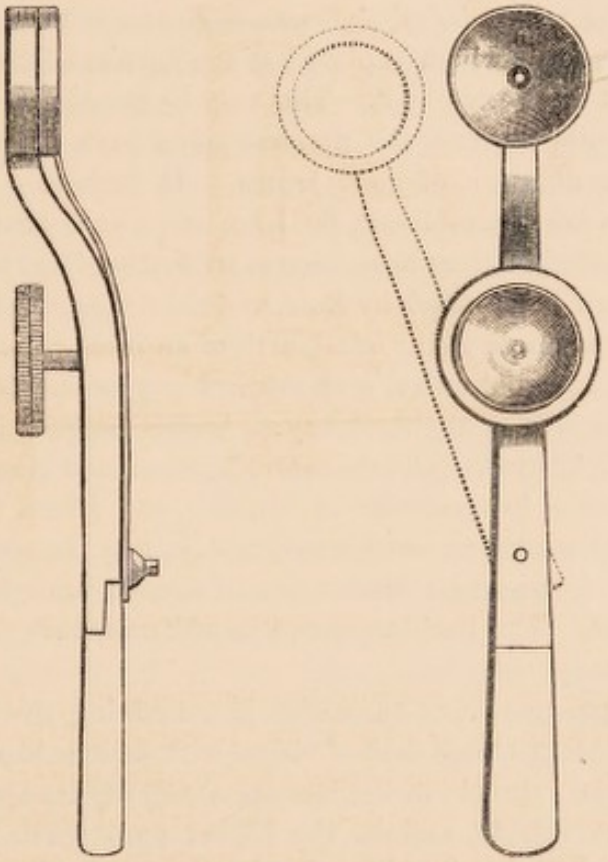
ful for those accustomed to microscopic manipulation. It is contained in a case, the size of an ordinary snuff-box, and possesses all the conveniences of the larger instruments, with various lenses, a micrometer, slips of glass, needle, knife, and forceps, in that small compass. The prefixed wood-cuts, exactly one-half the real size, will give an idea of this ingenious microscope, manufactured by Brunner of Paris. For a more minute description, I must refer you to the "Monthly Journal" for December 1846.

There is a general feeling among the public that the larger a microscope is, the more it must magnify; but I need not tell you this is error. A very imposing mass of brasswork and mechanical complexity, is no guarantee that you will see objects better, or, what is of more consequence, become good observers. On the contrary, the more unwieldy the instrument, the less disposed will you be to use it. Besides, the habitual employment of artificial methods of moving about the object, as by the screws of a moveable stage, will prevent your acquiring that dexterous use of your fingers and accuracy of manipulation which is at all times so useful. Nothing, indeed, can be more amusing than to see a man twisting his screws, pushing his heavy awkward stage about, and laboriously wasting time to find a minute object which another

can do in a moment, and without fatigue, by the simple use of his fingers. But perhaps you will consider the weightiest objection to the large instruments is the expense they necessitate,—the cost being necessarily in proportion to the amount of brass and mechanical labour employed upon them. If, then, you have to choose between a complex model and a simple one, I strongly advise you, as a matter of real economy, to choose the latter. Indeed the former, to a practical histologist, is worthless.

A very simple form of microscope was presented to the Physiological Society of Edinburgh, at its meeting on the 7th of June, 1851, by Dr W. T. Gairdner

Fig. 47. Fig. 48.



Gairdner's Simple Clinical Microscope.—Fig. 47, a lateral view of the instrument. Fig. 48, a front view, showing in outline the posterior glass separated and turned aside.

(Figs. 47 and 48). It consists of a Wollaston's doublet, so small that the focal distance is about the $\frac{1}{15}$th of an inch, and the magnifying power from 150 to 250 diameters linear. This lens is fixed in a round plano-concave disc of brass, attached to a small handle of brass. On the plane side is a ring of silver, in which a thin piece of glass is fitted, also supported by a handle of brass. The two handles are united together by means of a fine screw, so that exact focal distance is attained. A drop of fluid placed on the *outside* of this glass, either covered or not with another glass, then applied to the eye, and directed towards the light, will enable us to distinguish blood, pus, epithelial, or other corpuscles, various forms of crystals, &c., sufficient, *to experienced eyes*, for the

purposes of diagnosis. By shading the lens externally with the finger, all the effects of a diaphragm can be produced. It must not be supposed that this instrument will ever supersede the necessity of studying histology by means of a larger one; but, to him who is already familiar with minute objects, it will prove a valuable acquisition at the bedside. It is made by Bryson, optician, Princes Street.

We have next to speak of the optical parts of microscopes, which are certainly much more important than the mechanical ones,—everything depending upon obtaining a clear and distinct image of the object examined. Under this head we may describe the objective, the eye-piece, and methods of illumination.

1. *The Objective, or series of Achromatic Lenses*, is that part of the optical portion of a microscope which is placed at the bottom of the tube or body, and is near the object to be examined. This may be considered the most important part of the instrument, and the greatest pains have been taken by all opticians in the manufacture of good lenses. It is here I consider that the London opticians are pre-eminent, for I am not aware that in any part of the world such perfect objectives have been manufactured as the eighth of an inch by Smith, the twelfth of an inch by Ross, and the sixteenth of an inch by Powell. But when we come down to the one-fourth of an inch, which is by far the most useful objective for anatomical and medical purposes, the superiority of the London opticians is very slight, if any. At this magnifying power the compound lenses of C. Chevalier, Oberhaeuser, Brunner, and Nachet of Paris, Schiek and Pistor of Berlin, Frauenhofer of Munich, and Ploesl of Vienna, may be employed with the greatest confidence, and it may be said that by far the largest number of important discoveries in science have been made through their employment. The Parisian lenses, in addition, have one great advantage, namely, their cheapness.

The London opticians have succeeded in combining the lenses of their objectives, so as to obtain a large field of vision, with as little loss of light as possible. These qualities are valuable in the lower magnifying lenses during the examination of opaque objects, and in the higher ones when observing transparent objects by transmitted light. But in the lenses of medium power, such as the one-fourth of an inch, the amount of light is so great as to be almost a defect. Notwithstanding careful management of the mirror and diaphragm, the field of vision is often dazzling, and always presents a glare most detrimental to the eyes of the observer. I cannot employ Ross's fourth of an inch for fifteen minutes without feeling intense headach, and I know of more than one excellent observer in whom the sight has so much suffered from this cause as to incapacitate them from continuing their researches. In the same manner, the lenses of Brunner and Nachet give rise to a yellow light highly disagreeable; while those of Oberhaeuser, Schiek and Pistor, and Frauenhofer (with Amici's and Ploesl's I am not familiar), present a pale blue light, most pleasant to work with, and which may be gazed at for hours without fatiguing the eye.

For the above reasons, as well as from considerable experience in the use of many kinds of microscopes by different manufacturers, I am satisfied that the best lens you can employ for ordinary purposes is Oberhaeuser's No. 7, which corresponds to what is called in England the quarter of an inch. For low powers you may have Oberhaeuser's No. 3, or the one inch lens of the London opticians. For all the wants of the medical man these will be sufficient. The anatomist may occasionally require a higher lens, as during the examination of the ultimate fibrillæ of muscle, when the eighth, twelfth, or sixteenth of an inch of the London opticians may be procured. All these lenses may be attached to the model we have recommended by means of a brass screw made on purpose.

2. *The Eye-Piece.*—This is that portion of the optical apparatus which is placed at the upper end of the tube or body, and is near the eye of the observer. While the objective magnifies the object itself, the eye-piece only magnifies the image transmitted from below. Hence, as a source of magnifying power, it is inferior to the lens ; and when this possesses any defects, these are enlarged by the eye-piece. Two eye-pieces are all that is necessary with the model I have recommended, and those of Oberhaeuser, called Nos. 3 and 4, are the most useful for the medical man.

3. *Methods of Illumination.*—There are few things of more importance to the practical histologist than the mode of illumination. This is accomplished, —1st, by transmitted light ; 2d, by reflected light ; and, 3d, by achromatic light.

Transmitted light is obtained by means of a mirror placed below the object, which, to be seen, must therefore be transparent. In large microscopes mirrors are provided with universal joints, so that they may easily be directed in any direction. Below the stage every microscope should possess a diaphragm pierced with several sized holes, whereby the amount of light furnished by the mirror may be moderated. It is also useful in the examination of many objects that the light should be directed upon them sideways ; this may be done by the diaphragm, or by the mirror, and, in the small model formerly figured, is admirably attained by simply turning the whole microscope. The best light for microscopic purposes is that obtained by catching the rays which are reflected from a white cloud. The conjoined use of the mirror and diaphragm can only be learned from actual experience.

Reflected light is employed in the examination of opaque objects, and the lenses of low power, manufactured by the principal London opticians, enable us to do so without assistance. Occasionally, however, the light of the sun is useful ; and when this cannot be obtained, the rays of a lamp or gas light, concentrated by a bull's-eye lens, may be employed. Hence every microscope should be possessed of such a lens, and it is most convenient to have it attached to the body of the instrument by a moveable ring, and stem with two joints, as in the model figured.

Achromatic light is only serviceable in the examination of very deli-

cate objects, with high powers. The apparatus necessary for obtaining it is occasionally useful in ascertaining the ultimate structure of muscle, or the nature of the markings on minute scales or fossils, but is useless for the purposes of the medical man. In the same way I know of no benefit to be obtained by a polarising apparatus.

In addition to the mechanical and optical parts constituting the microscope itself, the box which contains it should possess a convenient place for holding a few slips of glass, a pair of small forceps, a knife, and two needles firmly set in handles. A micrometer to measure objects with is also necessary to those who are making observations with a view to their exact description. No other accessories are necessary.

An excellent microscope of the model previously figured, by Oberhaeuser, with two objectives (Nos. 3 and 7), two eye-pieces (Nos. 3 and 4), a neat box with all the accessories necessary (with the exception of a micrometer, which had better be English), may be obtained in Paris for the sum of about 150 francs (L.6), and will cost in Edinburgh, after payment of carriage and duty, about seven guineas. Nachet and Brunner's instruments are much cheaper, as are the smaller models of Oberhaeuser. Either of them, for all the purposes of the medical man, is amply sufficient.

Test Objects.—The defining power of a microscope is generally tested by examining with it a transparent object, having certain fine markings, which can only be rendered clearly visible when the glasses are good. In all such cases it is of course necessary to be familiar with the structure of the test-object in the first instance. If you are not confident on this point, it is better to trust to the judgment of a friend, whose knowledge of histology is ascertained, or place your dependence entirely on a respectable optician. One of the best test-objects for a quarter of an inch lens is a drop of saliva from the mouth. For, if the microscope shows with clearness the epithelial scales, the structure of the salivary globules, their nuclei, and contained molecules, you may be satisfied that the instrument will exhibit all the facts with which, as medical men, you have to do.—(See Fig. 50.)

Mensuration and Demonstration.

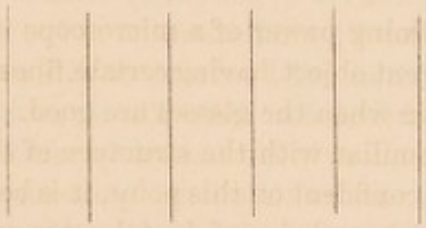
Having then obtained a good instrument, and tested its qualities in the manner described, you should next determine the number of diameters linear the various combinations of glasses magnify. This you may do for yourself with the aid of a micrometer, a pair of compasses, and a measure.

A micrometer is a piece of glass on which lines are ruled at the distance of $\frac{1}{100}$th or $\frac{1}{1000}$th of an inch. This must be placed under the instrument, when the lines and the distances between them will of course be magnified by the combination of glasses employed, like any other object. Taking a pair of compasses in one hand, we separate the points, and place them on the stage (always on a level with the micrometer magnified). Now, looking through the instru-

ment with one eye, we regard the points of the compasses with the other, and mark off by the naked sight, say the $\frac{1}{100}$th of an inch, as magnified by the instrument. Though difficult at first, a little practice enables us to do this with the greatest accuracy. The result is, that if the distance magnified and so marked off ($\frac{1}{100}$th of an inch) is equal to three inches, the instrument magnifies 300 times linear; if two inches, 200 times; and so on.

To measure the size of objects, they may be placed directly on the micrometer; but as this is at all times inconvenient, whilst the object and micrometer, from their not being in the same place, cannot, under high powers, both be brought into focus at once, it is better to use an eye-micrometer. Many ingenious inventions of this kind are to be procured. The most simple is a ruled micrometer placed in the focus of the upper glass of the eye-piece. With this we observe how many divisions of the eye-micrometer correspond with one of those magnified by the microscope, always making our observation in the centre of the field, where the aberration of sphericity is least. On the latter being removed and replaced by an object, it becomes a matter of mere calculation to determine its size. Thus, supposing each of the upper spaces in Fig. 49 to represent the $\frac{1}{1000}$th of an inch magnified 250 dia-

Fig. 49.



Spaces equal to 1-1000th of an inch magnified 250 diameters linear.

Five ruled spaces in an eye-micrometer, corresponding to one of those above, and each consequently equal to the 1-5000th of an inch.

meters linear, and five of the lower spaces, as seen in an eye-micrometer, to correspond with one of these, it follows that each of these latter must measure the thickness of an object so magnified equal to $\frac{1}{5000}$th of an inch. Oberhaeuser has made beautifully ruled eye-micrometers, for the model recommended, which those who wish to make measurements would do well to procure.

If it be not in your power to estimate the magnifying power for yourself, the optician will give you a table, setting forth the various degrees of enlargement possessed by the lenses, and different eye-pieces, with the tube up or

down. This table should always be referred to during the description of objects, and the amount of magnifying power invariably stated.

The art of demonstrating under the microscope is only to be acquired by long practice, and, like everything requiring practical skill, cannot be learnt from books or systematic lectures. I can only, therefore, give you very general directions on this head.

All that is necessary in examining fluid substances, is to place a drop in the centre of a slip of glass, and letting a smaller and thinner piece of glass fall gently upon it, so as to exclude air bubbles, place it upon the stage under the objective. In this way the fluid substance will be diffused equally over a flat surface, and evaporation prevented, which would dim the objective. The illumination must now be carefully arranged, and the focus obtained, first by means of the coarse, and then by means of the fine, adjustment. It will save much time, in examining structures, to employ always, at one sitting, the same slips of glass, as it is easier to clean these with a towel, after dipping them in water, than to be perpetually shifting the coarse adjustment.

The action of water, acetic acid, and other re-agents on the particles contained in the fluid, may be observed by adding them to another drop before covering with the upper glass ; or when this is done, a drop of the re-agent may be placed at the edge of the upper glass, when it will be diffused through the fluid under examination by imbibition.

The mode of demonstrating solid substances will vary according as they are soft or hard, cellular or fibrous, &c. &c. The structure of a soft tissue such as the kidney, skin, cartilage, &c., is determined by making very minute, thin, and transparent slices of it in various directions, by means of a sharp knife or razor. These sections should be laid upon a slip of glass, then covered over, and slightly pressed flat, by means of an upper one. The addition of a drop of water renders the parts more clear, and facilitates the examination, although it should never be forgotten that most cell-structures are thereby enlarged or altered in shape from endosmosis. Acid and other re-agents may be applied in like manner. The double bladed knife of Valentin will enable you to obtain large, thin, and equable sections of such tissues, and permit you to see the manner in which the various elements they contain are arranged with regard to each other. Harder tissues, such as wood, horn, indurated cuticle, &c., may be examined by small thin sections, made in the same way. Very dense tissues such as bone, teeth, shell, &c., require to be cut into thin sections, and afterwards ground down to the necessary thinness. Preparations of this kind are now manufactured on a large scale, and may be obtained at a trifling cost. A cellular parenchymatous structure, such as the liver, may be examined by crushing a minute portion between two glasses. If it be membranous, as the cuticle of plants, epithelial layers, &c., the membrane should be carefully laid flat upon the lower glass, and covered with an upper one. A fibrous structure, such as the areolar, elastic, muscular, and nervous tissues, must be separated by means of needles, and then spread out into a thin layer before examination, with or without water, &c.

The commencing observer should not be discouraged by the difficulties he will have to encounter in dissecting and displaying many tissues. He must remember that the figures he sees published in books are generally either fortunate or very carefully prepared specimens. Practice will soon enable him to obtain the necessary dexterity, and to convince himself of the importance of this mode of inquiry. He should early learn to draw the various objects he sees, before and after the action of re-agents, not only because such copies constitute the best notes he can keep, but because drawing necessitates a more careful and accurate examination of the objects themselves. A note-book and pencil for the purpose should be the invariable accompaniments of every microscope.

How to Observe with a Microscope.

The art of observation is at all times difficult, but is especially so with a microscope, which presents us with forms and structures concerning which we had no previous idea. Rigid and exact observation, therefore, should be methodically cultivated from the first, in order to avoid those errors into which the tyro, when using a microscope, is particularly liable to fall. Thus you should carefully examine the physical properties of the particles and ultimate structures you may see, and not hastily conclude, that you have under observation so-called pus, tubercle, or cancer-corpuscles, because they were obtained from what was, *a priori*, believed to be pus, tubercle, or cancer. Nothing has been more clearly demonstrated by the progress of histology, than the fact, that the naked sight has confounded different structures together, from a similarity of external appearance, and that the greatest caution is required at all times, but especially by learners, in forming opinions as to the nature of different tissues.

The physical characters which distinguish microscopic objects consist of,—1st, shape; 2d, colour; 3d, edge or border; 4th, size; 5th, transparency; 6th, surface; 7th, contents; and, 8th, effects of re-agents. These we may notice in succession.

1. *Shape.*—Accurate observation of the shape of bodies is very necessary, as many of these are distinguished by this physical property. Thus the human blood globules, presenting a biconcave round disk, are in this respect different from the oval corpuscles of the camelidæ, of birds, reptiles, and fishes. The distinction between round and globular is very necessary to be attended to. Human blood corpuscles are round and flat, but they become globular on the addition of water. Minute structures seen under the microscope may also be likened to the shape of well known objects, such as that of a pear, balloon, kidney, heart, &c. &c.

2. *Colour.*—The colour of structures varies greatly, and often differs, under the microscope, from what was previously conceived regarding them. Thus the coloured corpuscles of the blood, though commonly called red, are,

in point of fact, yellow. Many objects present different colours, according to the mode of illumination,—that is, as the light is reflected from, or transmitted through their substance, as in the case of certain scales of insects, feathers of birds, &c. Colour is often produced, modified, or lost, by re-agents, as when iodine comes in contact with starch corpuscles, when nitric acid is added to the granules of chlorophyle, or chlorine water affects the pigment cells of the choroid, and so on.

3. *Edge or Border.*—The edge or border may present peculiarities which are worthy of notice. Thus it may be dark and abrupt on the field of the microscope, or so fine as to be scarcely visible. It may be smooth, irregular, serrated, beaded, &c. &c.

4. *Size.*—The size of the minute bodies, fibres, or tubes which are found in the various textures of animals, can only be determined with exactitude by actual measurement, in the manner formerly described. It will be observed, for the most part, that these minute structures vary in diameter, so that when their medium size cannot be determined, the variations in size from the smaller to the larger should be stated. Human blood-globules in a state of health have a pretty general medium size, and these may consequently be taken as a standard with advantage, and bodies may be described as being two, three, or more times larger than this structure.

5. *Transparency.*—This physical property varies greatly in the ultimate elements of numerous textures. Some corpuscles are quite diaphanous, others are more or less opaque. The opacity may depend upon corrugation or irregularities on the external surface, or upon contents of different kinds. Some bodies are so opaque as to prevent the transmission of the rays of light, when they look black by transmitted light, although they be white, seen by reflected light. Others, such as fatty particles and oil globules, refract the rays of light strongly, and present a peculiar luminous appearance.

6. *Surface.*—Many textures, especially laminated ones, present a different structure on the surface from that which exists below. If, then, in the demonstration, these have not been separated, the focal point must be changed by means of the fine adjustment. In this way the capillaries in the web of the frog's foot may be seen to be covered with an epidermic layer, and the cuticle of certain minute fungi or infusoria to possess peculiar markings. Not unfrequently the fracture of such structures enables us, on examining the broken edge, to distinguish the difference in structure between the surface and the deeper tissues of the tissue under examination.

7. *Contents.*—The contents of those structures which consist of envelopes, as cells, or of various kinds of tubes, are very important. These may consist of included cells or nuclei, granules of different kinds, pigment matter, or crystals. Occasionally their contents present definite moving currents, as in the

cells of some vegetables, or trembling rotatory molecular movements, as in the ordinary globules of saliva in the mouth.

8. *Effects of Re-agents.*—These are most important in determining the structure and chemical composition of numerous tissues. Indeed, in the same manner that the anatomist with his knife separates the various layers of a texture he is examining, so the histologist, by the use of re-agents, determines the exact nature and composition of the minute bodies that fall under his inspection. Thus water generally causes cell formations to swell out from endosmose, whilst syrup, gum water and concentrated saline solutions, cause them to collapse from endosmosis. Acetic acid possesses the valuable property of dissolving coagulated albumen, and, in consequence, renders the whole class of albuminous tissues more transparent. Thus, it operates on cell walls, causing them either to dissolve or become so thin as to display their contents more clearly. Æther, on the other hand, and the alkalies, operate on the fatty compounds, causing their solution and disappearance. The mineral acids dissolve most of the mineral constituents that are met with, so that in this way we are enabled to tell with tolerable certainty, at all events, the group of chemical compounds to which any particular structure may be referred.

Any farther instruction I could give you, with regard to the microscope as a means of diagnosis, could only consist of a description of the different tissues in their healthy and diseased conditions. With this view, it is necessary to become acquainted with the structure both of plants and animals, first in their healthy and then in their diseased conditions. This constitutes, as you are aware, a distinct portion of my systematic lectures on the institutes of medicine,—a necessary preliminary branch of education to that of clinical medicine. The subject is also taught *practically* in this university during the summer months; and certainly there are few studies where, owing to the sources of error inherent in the best microscopes, the manual dexterity required, and the difficulties to be overcome, a teacher is more necessary. A phenomenon, which may have puzzled a solitary observer for months, concerning which, even at the termination of that time, he may have arrived at an erroneous conclusion, is, when properly explained, at once understood. Hence why histology has made such progress in Germany, where practical courses of lectures have been given upon it for many years, and where, in consequence, the young anatomist commences his career with a knowledge which would have astonished the older observers. The researches of Remak on the nerves, of Emmert, of the younger Burdach, and some of the greatest discoveries made in anatomy and physiology, have constituted the subject of the theses published by these observers, on taking their degree of doctor in medicine. Several of our own graduates have recently distinguished themselves in a like manner; and it is satisfactory to know that there is an extensive field for original research open to our alumni, the cultivation of which will actually bind them more closely and intimately with their practical studies.

In conclusion, let me repeat what I have formerly published and frequently

stated, namely, that you should regard the microscope only as a means to an end ; that in itself it is nothing, and can no more confer the power of observing, reflecting, or of advancing knowledge, than a stethoscope can *per se* enable a physician to discover a disease, or a cutting instrument give the judgment and skill necessary for performing a great operation. We should learn to distinguish between the mechanical means necessary for arriving at truths, and those powers of observation and mental processes which enable us to recognise, compare, and arrange the truths themselves. In short, rather endeavour to observe carefully and reason correctly on the facts presented to you, than waste your time in altering the fashion and improving the physical properties of the means by which facts are ascertained. At the same time, these are absolutely necessary, and perhaps no kind of knowledge has been so much advanced in modern times by the introduction of instruments and physical means of investigation, as that of medicine. These enable the practitioner to extend the limits to which otherwise his senses would be limited, and I claim for the microscope a place beside that of the stethoscope, pleximeter, speculum, probe, &c. I do not say employ one to the exclusion of the other, but be equally dexterous in the use of all. Do not endeavour to gain a miserable reputation as a microscopist, or as a stethoscopist; but by the appropriate application of *every* instrument and means of research, seek to arrive at the most exact diagnosis and knowledge of disease, so as to earn for yourselves the title of enlightened medical practitioners.

PRINCIPAL APPLICATIONS OF THE MICROSCOPE TO DIAGNOSIS.

A perfect application of the microscope, for the purposes of diagnosis, can only be arrived at by obtaining, in the first instance, a complete knowledge of the tissues of plants and animals, both in their healthy and diseased conditions. The medical practitioner may be called upon to distinguish, not only the various structures which enter into every species of food, every kind of animal texture and fluid, and every form of morbid product, but he will frequently have to judge of these when more or less disintegrated, changed, or otherwise affected, by the processes of mastication, digestion, expectoration, ulceration, putrefaction, maceration, &c. &c. In this place, however, I propose merely calling your attention to those points which are more likely to fall under your notice at the bedside. No doubt, the practical applications of the microscope are daily extending, and whilst there are many points which may be said to be scarcely investigated, those which have been most so require to be further extended. At the same time, a careful and persevering investigation of the morphological elements found in the various excreta of the body, as modified by different diseases, or by constitution and diet, cannot but prove of great importance in the present state of practical medicine. Hence, besides shortly discussing what is known, I shall especially indicate what are those subjects which may be elucidated by such of you whose previous histological observations qualify them for the task.

The Saliva.

The readiest way of examining the saliva is to collect a drop of that fluid at the extremity of the tongue, and let it fall on the centre of a slip of glass. It should be allowed to remain quiescent for a minute or so, until most of the bubbles of air have collected in a mass on the surface. This should then be gently scraped off or placed aside with a needle, and the subjacent fluid covered with a thin glass. There will now be observed, with a magnifying power of 250 diameters linear—1st, The salivary corpuscles ; 2d, Epithelial scales of the mouth ; 3d, molecules and granules.

1. *The salivary corpuscles* are colourless spherical bodies, with smooth margins, varying in size from the $\frac{1}{3000}$th to the $\frac{1}{1800}$th of an inch in diameter. They contain a round nucleus, varying in size, but generally occupying a third of the cell; and between this nucleus and the cell wall are numerous mole-

cules and granules, which communicate to the entire corpuscle a finely molecular aspect. The addition of water causes these bodies to swell out and enlarge from endosmosis; while acetic acid somewhat dissolves the cell wall, and it becomes more transparent; while the nucleus appears more distinct as a single, double, or tripartate body. Both water and acetic acid also produce coagulation of the albuminous matter contained in the fluid of the saliva, which assumes the form of molecular fibres, in which the corpuscles and epithelial scales become entangled, and present to the naked eye a white film.

Fig. 50.

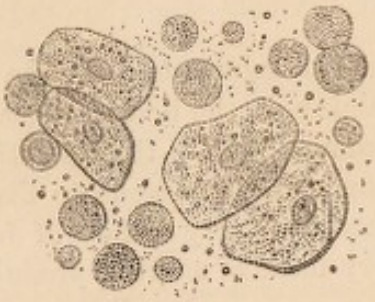


Fig. 50.—Salivary corpuscles, epithelial scales with molecules and granules, as seen in a drop of saliva.

2. *The epithelial scales* found in the saliva are derived from the mouth, and consist of flat plates, variously shaped, but generally presenting an oblong or squarish form, more or less curled up at the sides. Not unfrequently these have five or six sides, and are assembled together in groups, with their edges adherent. In size they vary from the $\frac{1}{800}$th to the $\frac{1}{500}$th of an inch in length. Embedded in their substance is a round or oval nucleus, together with numerous molecules and granules. Water produces no change in these bodies; but acetic acid renders the scale more transparent, and the nucleus to appear more distinct, with a darker edge.

3. Associated with the salivary corpuscles and epithelial scales are several *molecules and granules*, which vary in number in different people, and at various times of the day.

There may also be occasionally found in the saliva various foreign substances derived from the food,—such as granular debris of different kinds, starch globules or vegetable cells, muscular fasciculi, portions of areolar tissue, tendon, or spiral filaments, &c.,—derived from pieces of texture which have adhered to the teeth during mastication.

The saliva may present various alterations, dependent on disease of the mucous membranes of the mouth and tongue. This, when ulcerated, causes an increase in the molecular and granular matter. Many of the epithelial scales also lose their transparent character and become opaque, from an augmentation of granular matter in their substance. Not unfrequently, under such circumstances, they give rise to confervoid growths, which mainly spring up in the debris collected in the mouth, either on the surface of ulcers, in the

sordes which collect on the teeth, gums, and tongue, of individuals labouring under fever, or even in the inspissated mucus of persons who sleep for a considerable time with the mouth open. In infants, the tongue and cavity of the mouth are not unfrequently covered with a yellowish flocculent matter, constituting the disease named *mugnet* by the French, in which sporules and confervoid filaments, in a high state of development, may be detected in considerable numbers.

Fig. 51. Fig. 52.

Fig. 51.—Minute confervoid filaments springing from an altered epithelial scale, scraped from the surface of a cancroid ulcer of the tongue.
Fig. 52.—Confervoid filaments and sporules, in the exudation on the mouth and gums, constituting *Mugnet* in infants.

In epithelial cancroid of the tongue, the epithelial scales exhibit a great tendency to split up and form fibres, and may frequently be found on the surface of the ulcer presenting the form here figured.

Fig. 53.

Fig. 53.—Fringe-like epithelium, from the surface of an ulcer on the tongue.

Occasionally they exhibit a tendency to form concentric circles, an appearance very common in the substance of the morbid growth, but also occasion-

ally seen in the nodules, which are from time to time separated, and found in the saliva.

Fig. 54.

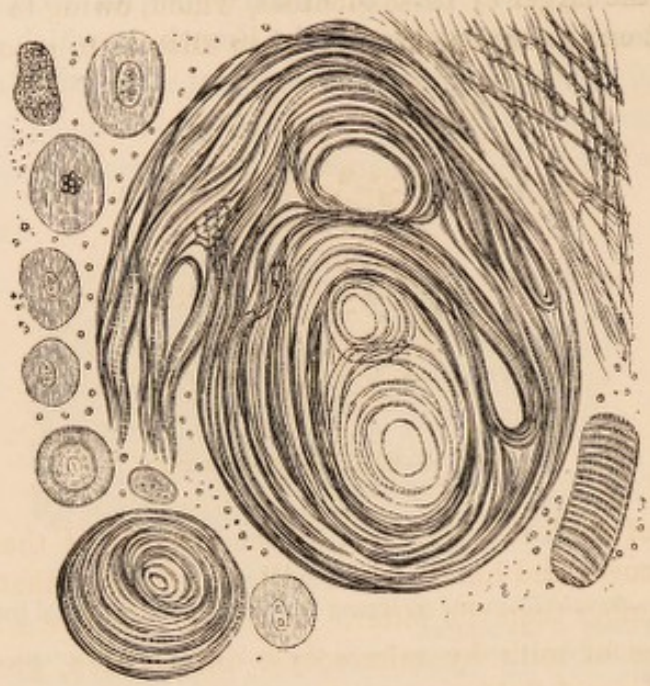


Fig. 54.—Concentric laminæ of condensed epithelial scales, with epithelial cells and fragments of muscular fasciculi, from a cancroid ulcer of the tongue.

An histological examination of the saliva, of the fur and load of the tongue, in the great majority of diseases, is still a desideratum.

Milk.

On examining a drop of milk,[1] we observe a number of bodies rolling in a clear fluid. These bodies, in healthy milk, are perfectly spherical, with dark margins, smooth and abrupt on the field of the microscope, with a clear transparent centre, which strongly reflects light. In size they vary from a point scarcely measurable, up to, in different specimens, the $\frac{1}{4000}$th or $\frac{1}{3000}$th of an inch in diameter. In excess of ether they are dissolved or disappear; but if this re-agent be in small quantity, exosmosis takes place, and the field of the microscope is covered with loose globules of oil, of various forms. Water causes the milk globules to swell out, but very slightly. Acetic acid coagulates the caseous fluid in which they swim, and causes the globules to be aggregated together in masses. Several of the globules also exhibit, under the action of this re-agent, a certain flaccidity, and nearly run into one another under pressure.

These globules consist of an albuminous delicate envelope, enclosing a drop

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[1] The mode of examining all fluids is the same, and is described p. 196; it need not be repeated.

of oil or butter. The membrane keeps them separate, so long as it is intact; but, dissolved by means of acetic acid, or ruptured by heat or mechanical violence (as in the churn), the butter is readily separated and collected. Cream is composed of the larger of these globules, which, owing to their light specific gravity, float on the surface of milk when allowed to repose.

Fig. 55.

Fig. 55.—Globules of cow's milk.

The richness of milk is determined by the quantity of these globules. An examination of cow's and human milk will at once show that the former contains a larger number than the latter. In all efforts, however, to determine the relative value of milk by microscopic examination, great care must be taken that the drop of fluid examined should be of the same bulk, that the same upper glass should be used in every case, and that it should be applied and pressed down with the same force. It is very difficult at all times strictly to fulfil these conditions, so that not only is great skill in manipulation required, but considerable experience, and an intimate acquaintance with milk as seen under the microscope, necessary, before any confidence can be placed in this mode of testing the quality of different specimens of the fluid. At the same time, the difference in the amount of oily constituents between the milk of the cow, ass, and human female, may in this way be easily determined.

In the same manner the various adulterations of milk are at once determined. Water, of course, separates the globules more and more from each other according to its amount. Flour will exhibit the large starch corpuscles, which are changed blue by the action of iodine. Chalk shows numerous irregular mineral particles, which are soluble in the mineral acids; and broken-down brain will be distinguished by large oil globules, mingled with fragments of fine nerve-tubes. Milk, when acid, exhibits the same character that it does under the action of acetic acid.

Healthy and fresh milk is indicated by a certain uniformity in the size of the globules; by their rolling freely over each other, and not collecting together in masses. When the latter circumstance occurs, it is a sign of acidity.

The milk first secreted after parturition is called the colostrum. It is yellow in colour, and may be seen under the microscope to contain globules more variable in size, mingled with a greater or less number of compound granular bodies. These latter ought to disappear in the human female on the third or fourth day after parturition, but occasionally they remain, when the milk must

be considered as unhealthy. In some cases I have seen them abundant so late as six weeks after the birth of the infant.

Fig. 56.

Fig. 56.—Colostrum of the human female, containing milk globules greatly varying in size, with compound granular corpuscles.

On some occasions, milk may be mixed with pus and blood, which are readily detected by the characters distinctive of each. Dr Peddie has pointed out that milk can be squeezed from the mamma during the early months of pregnancy. Under such circumstances, it constitutes a most important sign of the pregnant state, especially of a first pregnancy; for although the secretion at this time has seldom the external appearance of milk, but is serous-looking, and often very viscid and syrupy, when examined with the microscope the characteristic milk globules will at once appear. See his valuable paper, "Monthly Journal," August, 1848.

The Blood.

On examining a drop of blood drawn from the extremity of the finger by pricking it, there will be seen a multitude of yellow, round, bi-concave discs, rolling in the field of the microscope, which soon exhibit a tendency to turn upon their edge, and arrange themselves in rolls, like rouleaux of coins. These rouleaux, by crossing one another, dispose themselves in a kind of net-work, between which may be seen a few colourless spherical corpuscles, having a molecular surface, and a few granules. The coloured blood-corpuscles vary in size from the $\frac{1}{5000}$th to the $\frac{1}{3000}$th of an inch in diameter, their average size being about the $\frac{1}{4000}$th of an inch. Owing to their bi-concave form, they present a bright external rim with a central shadowed spot, or a bright centre

Fig. 57.

Fig. 57.—Blood-corpuscles, drawn from the extremity of the finger. On the left of the figure they are isolated, some flat and on edge, some having a dark and others a light centre, according to the focal point in which they are viewed. On the right of the figure several rolls have formed. Two colourless corpuscles and a few granules are also visible.

and a dark edge, according to the focal point in which they are viewed. If the blood be exposed to the air a little time before examination, or if it be obtained by venesection, the edges of the corpuscles may often be observed to have lost their smooth outline, and to have become irregular, notched, serrated,

Fig. 58.

Fig. 58.—Blood-corpuscles altered in shape from exosmosis.

beaded, &c. Long maceration in serum, or other circumstances, frequently cause them to diminish in bulk half their natural size, and present a perfectly spherical coloured body. On the addition of water, the blood discs become spherical, and lose their colour. On adding syrup, they become flaccid and irregular. Strong acetic acid dissolves them rapidly, and very weak acetic acid does so slowly, or diminishes their bulk by one-half.

The colourless corpuscles of the blood are spherical in form, and vary in size from the $\frac{1}{2500}$th to the $\frac{1}{2000}$th of an inch in diameter. Their surface presents a molecular or dotted appearance, which almost disappears on the addition of water, when they swell out by endosmosis. Acetic acid renders the external cell wall very transparent, and brings the nucleus into view, consisting of one, two, or three round granules.

The examination of the blood by the microscope enables us to determine certain pathological conditions of that fluid, which, though few in number, are by no means unimportant. We have seen that, in a healthy condition, the blood possesses very few colourless corpuscles; but there is a certain state, which I have called "Leucocythemia," in which they are very numerous, generally associated with enlargement of the spleen or of the lymphatic gland, or of both. The blood then presents the characters represented in the accompanying figures.

Fig. 59.

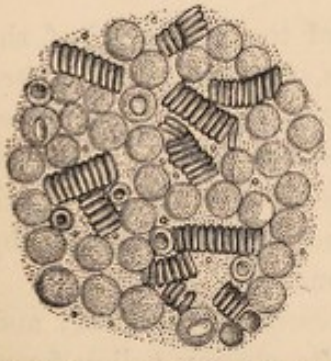

Fig. 60.

Fig. 61.

Fig. 59.—Appearance of a drop of blood, in Leucocythemia, magnified 250 diameters.
Fig. 60.—The same, after the addition of acetic acid.
Fig. 61.—A drop of the same blood, treated with acetic acid 24 hours after being taken from the arm by venesection.—*See Memoir on Leucocythemia.*

In several diseases the blood presents unusual spissitude, depending on excess of fibrine. In this condition the coloured blood-corpuscles easily lose under pressure their rounded margin, and assume a caudate or flask-like shape. They do not present their usual tendency to accumulate in rolls, but aggregate themselves together in irregular masses, as represented Fig 62.

Fig. 62.

Fig. 62.—Blood-corpuscles altered in form, and aggregated together, in thickened blood.

In certain internal hemorrhages the blood-corpuscles break down, or become partially dissolved, when the external envelope is seen very transparent, the shadowed spot disappears, and there is found in their interior one or more granules. The liquor sanguinis also contains an unusual number of granules. The same change is occasionally observable in the blood extravasated below the skin in scurvy or purpura hemorrhagica.

Fig. 63.

Fig. 63.—Altered blood-corpuscles in the fluid of an hæmatocele.

It has been affirmed, that the colour and number of the corpuscles of the blood undergo a change in plethora, fever, jaundice, dropsies, cholera, &c., but exact observations are wanted to confirm the statement. I have never been able to satisfy myself that any such changes were observable in these diseases by means of the microscope. In chlorosis the number of the blood-globules is undoubtedly diminished; but this is more readily determined by the size of the clot, than by microscopic demonstration.

Occasionally the serum of the blood presents a lactescent appearance; and, on being allowed to remain at rest some hours, a white creamy pelicle forms on the surface. This consists of very minute particles of oil, which resemble the smaller molecules found in milk.

Pus.

A description and representation of pus were formerly given (pp. 14 and 15, Fig. 4). It may be well, however, to recall the principal facts presented by this important fluid to your recollection here. Normal or good pus, when examined under a microscope, is found to consist of numerous corpuscles, floating in a clear fluid, the *liquor puris*. The corpuscles are globular in form, having a smooth margin, and finely granular surface. They vary in size from the $\frac{1}{1300}$th to the $\frac{1}{1000}$th of an inch in diameter. There may be generally observed in some of them a round or oval nucleus, which is very distinct on the addition of water, when also the entire corpuscle becomes distended from endosmosis, and its granular surface is more or less diminished. On the addition of strong acetic acid the cell-wall is dissolved, and the nuclei liberated in the form of two, three, four, or rarely five, granules—each having a central shadowed spot. If, however, the re-agent be weak, the cell-wall is only rendered very transparent and diaphanous, through which the divided nucleus is very visible.

Fig. 64.

Fig. 65.

Fig. 64.—Pus corpuscles, as seen in healthy pus.
Fig. 65.—The same, after the addition of acetic acid.

Occasionally these bodies are seen surrounded by another fine membrane, as noticed p. 15, and figured Fig. 4, *a*. At other times they are not perfectly globular, presenting a more or less irregular margin, and associated with numerous molecules and granules. This occurs in what is called scrofulous pus, and various kinds of unhealthy discharges, from wounds and granulating sur-

Fig. 66.

Fig. 66.—Irregular-shaped pus corpuscles, in scrofulous pus.

faces. In gangrenous and ichorous sores, a few of these irregular pus corpuscles are associated, not only with a multitude of molecules and granules, but with transformed and broken-down blood globules, the debris of the involved tissues, &c. &c.

Sputum.

A microscopic examination of the sputum demands a most extensive knowledge of both animal and vegetable structure. I have found in it,—1st, All the tissues which enter into the composition of the lung, such as filamentous tissue, young and old epithelial cells, blood-corpuscles, &c. 2d, Mucus from the œsophagus, fauces, or mouth. 3d, Morbid growths, such as pus, pyoid, and granular cells ; tubercle corpuscles, granules, and amorphous molecular matter; pigmentary deposits of various forms, and parasitic vegetations, which are occasionally found in the lining membrane of tubercular cavities. 4th, All the elements that enter into the composition of the food, whether animal or vegetable, which hang about the mouth or teeth, and which are often mingled with the sputum, such as pieces of bone or cartilage, muscular fasciculi, portions of esculent vegetables, as turnips, carrots, cabbages, &c. ; or of grain, as barley, tapioca, sago, &c. ; or of bread and cakes ; or of fruit, as grapes, apples, oranges, &c. All these substances render a microscopic examination of expectorated matters anything but easy to the student.

After considerable experience in the examination of sputum, I think myself warranted in saying, that a knowledge of its minute structural composition is, with few exceptions, of little use in a clinical point of view. The diagnosis of pulmonary diseases is capable of being so accurately determined by percussion and auscultation, that the microscope is, in this respect, of secondary importance.

To examine sputum it should be thrown into water, when, on account of the air it contains, it will generally float on the surface. It should be then teased, or broken up with a rod, when the various elements and particles it contains will gradually disengage themselves, and may be separated from the mass without difficulty. Nothing is more common, on examining portions of sputum with a microscope, than to observe various aggregations of molecular and granular matter, which present the various appearances here figured.

Fig. 67. Fig. 68. Fig. 69. Fig 70. Fig. 71. Fig. 72.

Fig. 67.—Mass, consisting of minute molecules, frequently seen in disintegrated tubercle.
Fig. 68.—Mass, composed of molecules and oily granules, varying in size.
Fig. 69.—Mass, in which the granules are more or less aggregated together.
Fig. 70.—Mass, in which the granules are pretty equal in size, and separated.
Fig. 71.—Mass, in which the particles present the debris of a fibrous structure, as occurs on an ulcerated surface.
Fig. 72.—Mass, composed of molecular black pigment.

Sputum frequently presents a fibrillated appearance, which is common to all mucous discharges. This is caused by the deposition in viscid mucus of molecules, which assume a linear arrangement. This deposition is increased

by the addition of water and acetic acid, so that they consist of albumen. These fine molecular fibres (see Figs. 75, 87) must be separated from the areolar and elastic tissue of the lung, which is not unfrequently found in sputum, indicating ulceration or sloughing of the pulmonary texture. Shroeder van der Kolk has lately stated, that these fragments may be found in the sputum before the physical signs of ulceration of the lung are well characterised.

Fig. 73.

Fig. 73.—Fragment of areolar and elastic tissue of the lung, found in phthisical sputum.

This fact I have never been able to confirm, as in every case in which they have occurred to me, the physical signs of the disease have been well marked. At the same time it is very possible that in doubtful cases, especially where, from chronic pleurisy or pneumonia, there is dulness on percussion, whilst other physical signs are more or less obscure, the presence of these fragments will confirm a previous suspicion of existing phthisis.

In acute pneumonia, the sputum frequently contains fibrinous casts of the minute bronchi, which present a branched mould of the tubes. These casts may be readily separated in water, as previously described; and when examined with the microscope, are found to consist of molecular fibres, in which pyoid and pus corpuscles are infiltrated, as represented Figs. 68 and 69.

The inspissated sputum, so commonly expectorated in the morning, is derived from the fauces. It often presents a dirty-green or brownish colour, passing into black. When examined with a microscope, it may be seen to consist of epithelial cells, more or less compressed together, and varying in size from the $\frac{1}{2000}$th to the $\frac{1}{800}$th of an inch in diameter. The smaller ones are round, and closely resemble pus corpuscles; the larger ones are round or

Fig. 74.

Fig. 75.

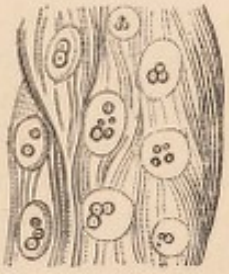

Fig. 74.—Epithelial cells, embedded in mucus, expectorated from the fauces. Some are seen to contain black pigment; others resemble pus corpuscles.

Fig. 75.—Another portion of expectorated mucus from the fauces, acted on by acetic acid, showing fibrillation and the changes in the young cells.

oval, with a distinct nucleus. In the dark-coloured portions of this sputum, the cells contain numerous granules and molecules, several of which are black and quite opaque. This black matter consists of carbon, and is unaffected by re-agents. The addition of acetic acid causes coagulation of the mucus in which these cells are embedded, and whilst it causes little change in the older ones, dissolves, or renders transparent, the walls of such as are young, displaying a round or oval nucleus, as seen in the figure.

In the black phthisis of colliers the sputum is ink-black, and more or less tenacious. On examination with a microscope, the cells are seen to be loaded with carbonaceous pigment.

Fig. 76.

Fig. 76.—Cells loaded with carbonaceous pigment in the sputum of the collier.

Several of these cells are perfectly opaque, whilst others are almost colourless; and between the two extremes there is every kind of gradation as to intensity of blackness. This black pigment is unaffected by the strongest re-agents, nitro-muriatic acid, chlorine, and even the blow-pipe, failing to decompose it. It is, therefore, pure carbon, and differs from the pigment contained in cells of similar appearance in melanotic tumours (Fig. 17), as in these latter the re-agents just mentioned at once destroy the colour.

Vomited Matters.

The matters rendered by vomiting have not been made so frequent an object of microscopical observation as is necessary, with a view to diagnosis. In organic diseases of the organ, nothing has been ascertained on this head. In other cases, it almost always happens, that the matters rendered consist,—1st, Of the food and drink, in various stages of decomposition and disintegration; 2d, Of alterations in the epithelial lining membrane of the stomach, œsophagus or pharynx, mingled with more or less mucus; 3d, Of certain new formations, which are produced in the fluids of the stomach.

1. It would constitute a very interesting series of observations, to determine, with the aid of the microscope, the structural changes which various articles of food undergo during the process of digestion in the stomach. This has not yet been done with accuracy, although there can be little doubt that compound tissues become disintegrated in the inverse order to that in which they are produced—that is to say, fibres become separated, embedded cells become loose, and, when aggregated together their cohesion is destroyed. The cell-walls then

dissolve, the nucleus still resisting the solvent process for some time; but at length the whole is resolved into a molecular and granular mass, which, in its turn, becomes fluid. Such, however, is the different soluble properties of various edible substances, that, in a time sufficient for the perfect solution of some, others are scarcely affected. It may readily be conceived, that the transitions which these substances undergo, may occasionally render their detection difficult; and such is really the case. Starch corpuscles, for instance, break down into rounded granules or molecules, and are very liable to puzzle an inexperienced observer. Tincture of iodine, from its peculiar re-action on these bodies, will always enable us to recognise them.

Fig 77.

Fig. 77.—Appearance of starch corpuscles after partial digestion in the stomach.

2. The various epithelial cells which line the passages leading to the stomach, as well as the structures peculiar to that organ itself, may be found in the vomited matters,—of course mingled with the debris of edible substances. They also may have undergone various changes in appearance, from endosmosis, or even partial digestion. In cholera, the vomited matter consists principally of such altered epithelial cells or scales, many of which are derived from the fauces or œsophagus.

Fig. 78.

Fig. 79.

Fig. 78.—Structures observed in certain rice-water vomitings from a cholera patient,—showing bodies which consist of the half-digested uredo in bread.

Fig. 79.—Another flake in the rice-water vomiting of a cholera patient, showing, *a*, large epithelial cells; *b*, milk globules, and coagulated caseine; *c*, torulæ; and *d*, half-digested epithelial scales, with liberated nuclei, more or less broken down.

3. The new formations which may be produced in the stomach are principally vegetable fungi—such as various kinds of torulæ (see Fig. 79 *c*), and espe-

cially one first discovered in vomited matters by Goodsir, and which he has called, on that account, Sarcina Ventriculi.

Fig. 80.

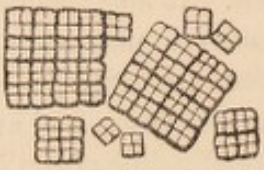

Fig. 80.—Sarcina Ventriculi.

It consists of square particles, which apparently increase by fissiparous division in regular order, so that they present square bundles of four, sixteen, or a multiple of these. Although at first supposed to be peculiar to the stomach, I have frequently found them in the fæces ; and in one case, which occurred to Dr Mackay of this city, in the urine. They were also found by Virchow, in an abscess of the lung.

In addition to the bodies alluded to, occasionally observed in vomited matters, they may contain various morbid products, such as blood, pus, and cancer cells, colouring matter of the bile, &c.

Fæces.

The same difficulty attends the examination of the fæces as of the sputum ; for there may be found in it,—1st, All the parts which enter into the composition of the walls of the alimentary canal ; 2d, All kinds of morbid products ; and, 3d, All the elements which enter into the composition of food. The only difference is, that these last are generally more broken down or disintegrated.

Under certain circumstances, the diagnostic value attached to the examination of the fæces is greater than that of the sputum, or of vomited matters. For instance, when pus or blood globules are detected, we may infer that the more perfect these are, the nearer to the anus did they originate. In examples 4 and 6, I have shown how the detection of certain vegetable structures, used as food, were serviceable in diagnosis ; but this subject merits more extensive researches than have hitherto been paid to it.

In typhus, and other putrid fevers, the stools contain masses of large crystals of phosphates or carbonates. In dysentery they are loaded with pus and blood ; and the former may also be detected on the surface of fæcal masses when the intestine is ulcerated. There may also be occasionally observed, numerous torulæ, and occasionally sarcinæ. In cholera the white stools consist of mucus, in which the debris of epithelial cells are entangled ; and as the nuclei of these cells resist disintegration for a long time, these round or oval bodies generally exist in considerable numbers. (Fig. 81.)

In a disease very common in Edinburgh, especially in women, in which flakes of membranous matter are thrown off from the bowels in large quantities, these present a very similar appearance to the cholera flakes just noticed.

Fig. 81.

Fig. 81.—Structure of flakes in a rice-water stool, from a cholera patient.

Among the indigestible articles connected with the food, it was observed, in the autumn of 1849, that curious-shaped bodies were detectable, both in the vomited matters and stools of cholera patients. These were supposed to be parasitic formations connected with the cause of cholera, but were pointed out by Mr Busk to be the uredo-segitum, occasionally found in bread.

Fig. 82.

Fig. 82.—Portions of the uredo in bread, still further digested and disintegrated than is observable in the vomited matters. Some torulæ are also present.

On one occasion, a dispensary patient brought to me a membranous mass, which had been evacuated by the bowels. It resembled a piece of boiled fine leather, of a greenish-yellow colour, and fibrous structure. On microscopic examination, it was found to be made up of an inextricable mesh-work of confervoid growths, consisting of long tubes, with joints, and a few oval sporules,—the former having a great tendency to break across.

Fig. 83. Fig 84.

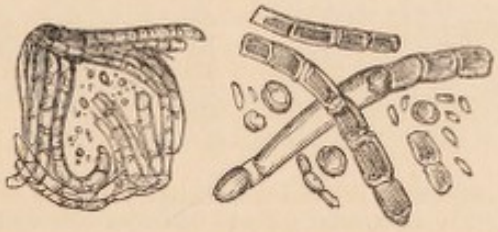

Fig. 83.—Structures of confervoid mass passed from the bowels.
Fig. 84.—The same, magnified 500 diameters linear, showing their vegetable nature.

Uterine and Vaginal Discharges.

The diagnostic indications to be derived from the microscopic examination of these discharges, has not been much investigated ; but there are few subjects which hold out the promise of more useful results to the medical practitioner. It can only be prosecuted by the obstetric histologist, who, on collecting the secretions poured out from the os uteri, or on the vaginal walls, by means of the speculum, should observe their structural peculiarities when quite fresh.

The menstrual discharge will be found to consist of young epithelial cells, old epithelial scales, and blood globules, the number of which last will be greater or less according to the intensity of the colour. A leucorrhœal discharge always consists of epithelial cells, which may be more or less loaded with fat, combined with numerous young epithelial cells (round or oval), and pus corpuscles.

Fig. 85.

Fig. 85.—Corpuscles seen in a chronic leucorrhœal discharge, consisting of, 1st, Large epithelial scales, from the vagina and cervix uteri. On the left of the figure some of these may be observed to have undergone the fatty degeneration. 2d, Numerous pus corpuscles; and, 3d, blood globules, the external edges of which are more or less dentated from exosmosis.

The white gelatinous discharge, so frequently seen with the speculum to be derived from the os uteri, consists of gelatinous mucus, in which round or oval young epithelial cells are mingled. The mucus is copiously deposited in a molecular form, on the addition of acetic acid or water, whilst the walls of the latter are rendered transparent, and an oval granular nucleus made apparent.

Fig. 86. Fig. 87.

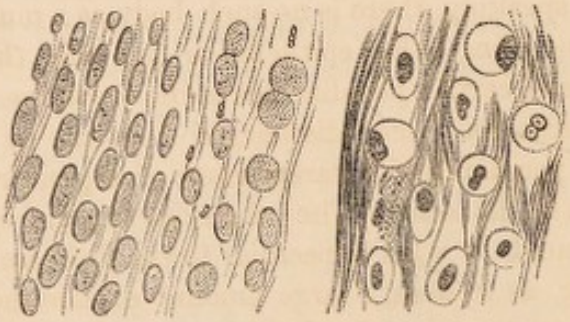

Fig. 86.—Structure of gelatinous mucus from the os uteri.
Fig. 87.—The same, after the addition of ascetic acid.

Not unfrequently leucorrhœal and other discharges contain groups of blood-globules, the shapes of which are almost always more or less altered by endosmosis, on account of the viscid fluid mingled with them.—(See Fig. 85). Indeed, the variations observable in these discharges is dependent for the most part on the excess of one or more of the elements just mentioned, namely, epithelial cells or scales, pus or blood corpuscles, and gelatinous mucus.

In addition to the fluid discharges poured out from the uterus and vagina, there are a variety of morbid growths connected with these organs, the diagnosis of which may be materially facilitated by microscopic examination. The separation of fibrous, epithelial, and cancerous tumours and ulcers, belong to

this category, which must be conducted on the general principles referable to the diagnosis of morbid growths in general.[1] By the kindness of Dr Simpson, I have had abundant opportunities of satisfying myself of the importance o this mode of proceeding, in cases where the substance, mucous surface, or cervix of the uterus, has been more or less involved.

Mucus.

In all fluids secreted from a mucous membrane, many of which have been noticed, there may be found a gelatinous material, which has long been called mucus. It may vary in colour from a milk-white to a yellowish brown or even black tint, these variations being dependent on the cell structures or pigment it contains. By some it has been supposed that there are certain cell formations peculiar to mucus, which have been called "mucus corpuscles," but it has always appeared to me that the various bodies found in this secretion are either different forms of epithelium on the one hand, or pus cells on the other. Thus the round epithelial cells found in mucous crypts, or the bodies constituting permanent epithelium, when newly formed; before they have had time to flatten out, and perhaps more or less affected by endosmosis, are represented, Figs. 74 and 86. These are the mucous corpuscles of some writers. Again, when exudation is poured out on a mucous surface, and is mingled in greater or less quantity with the gelatinous secretion, it presents a marked tendency to be transformed into pus corpuscles, and hence why all irritations of mucous surfaces are usually accompanied by purulent discharges. The pus corpuscles, under such circumstances, present all the characters formerly noticed as peculiar to these bodies. (See Figs. 65 and 75.)

Hence, properly speaking, there is no such body as a mucous corpuscle, the cells found in mucus being either epithelial or pus cells, the number of which present, communicates certain peculiarities to the discharge. Thus, as we have seen, the white gelatinous mucus discharged from the os uteri contains the former, whilst the peculiar fluid characteristic of a gonorrhœa or catarrh, in either sex, abounds in the latter. The gelatinous substance, however, in which these bodies are found, is what is peculiar to the fluid secreted from mucous surfaces, containing, as it does, a large amount of albumen, possessing a remarkable tendency to coagulate in the form of molecular fibres. When recent, these are few in number, but on the addition of water or acetic acid they are precipitated in such numbers as to entangle the cell formations, and present a semi-opaque membraneous structure. (Figs. 75, 81, and 87.)

The more healthy a mucous secretion, the more it abounds in this viscous albuminous matter, and the less are its cell elements. On the other hand, when altered by disease, the cell elements increase, and the viscosity diminishes.

Dropsical Fluids.

The fluids obtained by puncture of dropsical swellings, may in some cases, when examined microscopically, present peculiarities worthy of notice. Thus

[1] See Cancerous and Cancroid Growths, &c.

in the serum collected within the tunica vaginalis testis, numerous spermatozoa may be found, constituting what has been called spermatocele. How these

Fig. 88.

Fig. 88.—Spermatozoa as observed in the fluid of spermatocele.

bodies find their way into this fluid is unknown, as no direct communication with the substance of the testicle has ever been seen ; neither does their occurrence seem to interfere in any way with the successful treatment of this kind of dropsy, by injections, as practised in hydrocele.

In the fluid of ascites, when removed from the body, there may usually be observed a few epithelial scales from the serous layer of the abdomen, which are more abundant in some cases than in others. Occasionally blood and pus corpuscles may be detected in greater or less quantity.

In ovarian dropsy, various products may be found in the evacuated fluid, according to the nature of the contents of the cyst. Pus and blood corpuscles are common elements, but more commonly epithelial cells and scales, which occasionally accumulate in the cysts of ovarian tumours. At other times, masses

Fig. 89. Fig. 90. Fig. 91.

Fig. 89.—Cells in fluid, removed from an ovarian dropsy.
Fig. 90.—The same, after the addition of acetic acid.
Fig. 91.—Group of similar cells, many-sided from compression.

of gelatinous or colloid matter are evacuated, which may present various appearances, according to the time it has been secreted. Occasionally it exhibits a faintly fibrous structure, the large meshes of which are filled with trans-

parent jelly, in which round or oval corpuscles, isolated or in groups, may be seen as represented in Fig. 93. Occasionally this substance is more or less

Fig. 92. Fig. 93.

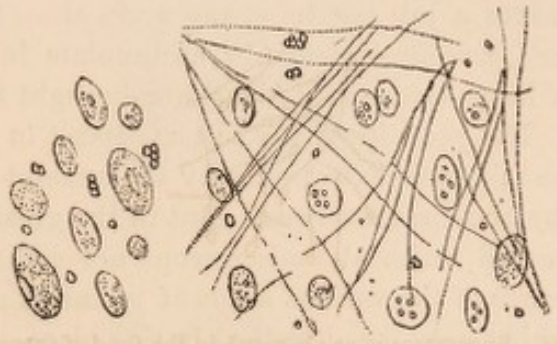

Fig. 92.—Group of oval corpuscles in the gelatinous matter of ovarian dropsy.
Fig. 93.—Round and oval corpuscles, with fibres in another gelatinous mass.

opaque, and, on examination, will be found to consist sometimes of fatty granules, either alone or combined with the flat characteristic crystals of cholesterine.

Fig. 94. Fig. 95.

Fig. 94.—Fatty granules occasionally found in colloid masses, taken from an ovarian tumour.
Fig. 95.—Fatty granules, and compound granular cells, with crystals of cholesterine, frequently found in similar masses.

In the examination of dropsical fluids, also, there can be little doubt that further research will lead to very important results in diagnosis.

Urine.

Healthy human urine examined with a microscope, when recently passed, is absolutely structureless. Allowed to repose for twelve hours, there is no precipitate—occasionally, however, a slight cloudy deposition may be observed, in which may be discovered a few epithelial scales from the bladder, a slight sediment of granular urate ammonia, or a few crystals of triple phosphate. In

certain derangements of the constitution, however, various substances are found in the urine which, in a diagnostic point of view, are highly important, and which we shall shortly notice in succession.

To examine the deposits found in urine, this fluid should be poured, in the first instance, into a tall glass jar; then decant the clear liquid, and put the lower turbid portion into a tall test tube, and again allow the deposit to form. In this manner the structural elements accumulate in the smallest possible compass, and a large number of them are brought into the field of the microscope at once. The *quantity* of any salt or deposit in the urine can never be ascertained by the microscope, but only by the amount of sediment visible, or more accurately by chemical analysis. But in the great majority of cases, the appearances observed under the miscroscope are sufficient in themselves to distinguish the *nature* of the various kinds of sediment met with, and these consequently are all that need be described in this place.

Uric Acid.—Uric acid crystals are almost always coloured, but the tint varies from a light fawn to a deep orange red. The general colour is yellow. They present a great variety of forms, the most common being rhomboidal. The lozenge-shaped and square crystals, which are more rarely met with,

Fig. 96. Fig. 97.

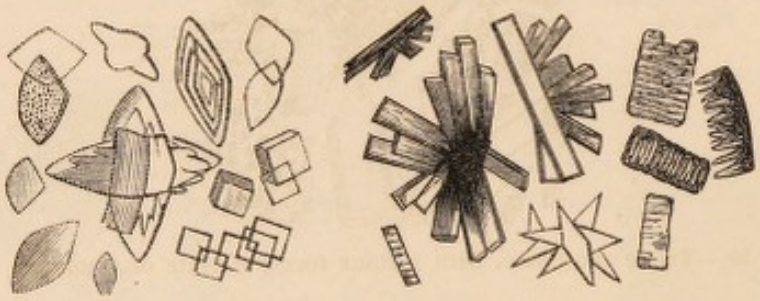

Fig. 96.—Lozenge-shaped and rhomboidal crystals of uric acid.
Fig. 97.—Aggregated and flat striated crystals of uric acid.

isolated and in groups, are represented, Fig. 96. Not unfrequently they present adhering masses or flat scales with transverse or longitudinal markings, as seen, Fig. 97. Occasionally they assume the form of truncated rounded columns, as represented, with other structures, Fig. 102.

Urate of Ammonia most commonly assumes a molecular and granular form, occurring in irregular aggregated amorphous masses. This may be separated from a similar looking deposit of phosphate of lime by the action of dilute muriatic acid, which immediately dissolves the last-named salt, but acts slowly on urate of ammonia, setting free the uric acid. Sometimes, however, it occurs in spherical bodies of a bister brown colour, varying in size from the $\frac{1}{5000}$th to the $\frac{1}{2000}$th of an inch in diameter. The latter size rarely occurs. Occasionally they assume a stellate form, from needle-like or spicular prolongations coming off from the spherical body. I have seen both these forms associated, and the former so curiously aggregated together as to assume the ap-

pearance of an organic membrane, for which by some it was mistaken, until it was observed to dissolve under the action of dilute nitric acid.

Fig. 98.

Fig. 98.—Urate of ammonia, in a granular membranous form, and in rounded masses, with spicula.

Triple Phosphate or Ammonia-Phosphate of Magnesia.—These crystals are the most common met with in urine, and are generally well defined, presenting the form of triangular prisms, sometimes truncated, at others having terminal facets. If an excess of ammonia exist, or be added artificially, they present a star-like or foliaceous appearance, which, however, is seldom seen at the bedside.

Most of the forms of urate of ammonia are represented in the following figure, associated with the triple phosphate.

Fig. 99.

Fig. 99.—Triple phosphate, with various forms of urate of ammonia.

Oxalate of Lime most commonly appears in the form of octohedra, varying in size, the smaller aggregating together in masses. Once seen, these bodies are readily recognized. (Fig. 100.) Very rarely they present the form of dumb bells, or an oval body, the central transparent portion of which presents a dumb bell shape, while the shadowed dark portion fills up the concavities.

Fig. 100.

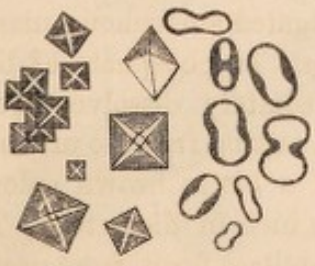

Fig. 100.—Octohedral and dumb-bell-shaped crystals of oxalate of lime.

Cystine presents flat hexagonal plates, presenting on their surface marks of

similar irregular crystals. Occasionally the centre is opaque, with radiations more or less numerous, passing towards the circumference.

Fig. 101.

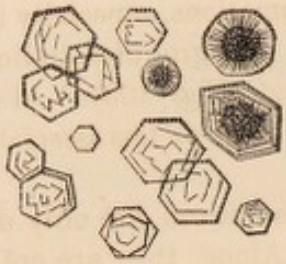

Fig. 101.—Flat crystals of cystine.

In addition to the various salts found in the urine, there may occasionally be found different organic products, such as blood and pus corpuscles, spermatozoa, vegetable fungi, exudation casts of the tubes, or epithelial scales from the bladder, or mucous passages. Frequently one or more of these are found together, as in the following figure :—

Fig. 102.

Fig. 102.—Bodies observed in the urine of a scarlatina patient, 24 hours after being passed. *a*, Desquamated fragment of uriniferous tube. *b*, Exudation casts of uriniferous tubes. *c*, Amorphous urate of ammonia. *d*, Columnar crystals of uric acid. *e*, Blood corpuscles. *f*, Pus corpuscles. *g*, Torulæ and vegetable fungi, which had been formed since the urine was excreted.

Spermatozoa are occasionally found in the urine, but must not be considered as of any importance, unless accompanied by the peculiar symptoms of spermatorrhœa. (See Fig. 88). Very rarely casts of the tubes, principally composed of oily granules, may be seen, or epithelial cells, more or less loaded with similar granules, several of which also float loose in the urine, as in the following figure :—

Fig. 103.

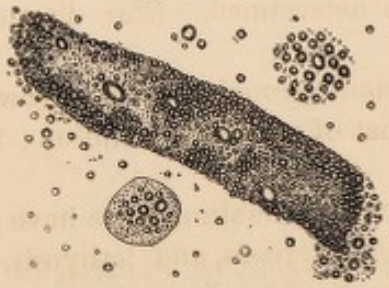

Fig. 103.—Cast of a uriniferous tube, principally composed of oil granules, with fatty epithelial cell and free oil granules, in urine of Bright's disease.

Although these casts of the tubes were at one time confounded together, they may now be separated into at least two distinct kinds, namely,—1st, Fibrinous or exudation casts (Fig. 12, *b*), which are most commonly found in the urine at critical periods of acute inflammations, especially in scarlatina, small-pox, pneumonia, &c. 2d, Casts, with oily granules, indicative of chronic disease, and especially of Bright's disease. (Fig. 103). At the same time, it should be understood that they may be more or less associated together, and that the rule is not invariable.

All the various appearances noticed, are only diagnostic when accompanied by concomitant symptoms. Alone, they are not to be depended on; but, in combination with the history, and accompanying phenomena, are capable of affording the greatest assistance in the detection of disease.

Skin.

An examination of the various products thrown out upon the skin in the different forms of eruption, ulcer, and morbid growth, may in many cases be of high diagnostic value. Thus, in healthy and granulating sores, we have previously seen (p. 16) that, whilst the surface is covered with normal pus corpuscles, the granulations themselves present fibre cells in all stages of development. (Fig. 7.) We have also, when speaking of pus, alluded to the changes it may undergo in scrofulous and unhealthy sores. Here we may allude to the characters presented by the exudations and accumulations on the skin—1st, in cutaneous eruptions; 2d, in epithelial growths.

1st. *Cutaneous Eruptions.*—In the vesicular and pustular diseases there may be observed below the epidermis all the stages of pus formation, commencing in exudation of the liquor sanguinis, gradual deposition of molecular and granular matter, and formation around them of cell walls. The eruption produced artificially by tartar emetic ointment offers the best opportunity of examining the gradual formation of these bodies under the microscope. Pus taken from all kinds of eruptions and sores presents the same characters, there being no difference between the pus in impetigo and that in variola. When a scab is formed, as in eczema or impetigo—a small portion of it broken down, mixed with water and examined under the microscope, presents an amorphous collection of granules, oil globules, and epithelial scales. We have previously described and illustrated the peculiar structure of the favus crusts—(Figs. 35, 36, 41)—from which the diagnosis of this disorder, from all other kinds of skin eruption, may be at once determined. (For diagnosis of skin-diseases, see p. 50.)

2d. *Epithelial or Epidermic Growths.*—These growths on the skin may assume three forms,—1st, That of squamous eruption; 2d, That of tumour; 3d, That of ulcer.

1. The squamous eruptions of the skin, as we have seen (p. 19), are three in number,—namely, psoriasis, pityriasis, and icthyosis. The dry incrustations which form on the surface in these diseases, essentially consist of epidermic scales more or less aggregated together. They are very loose in pityriasis,

and occasionally mingled with debris of vegetable confervæ, similar to what grows on the mucous membrane of the mouth. (Fig. 52.) The scales are more aggregated together in psoriasis, and greatly condensed in icthyosis; occasionally in the latter disease presenting the hardness and structure of horn.

2. The epidermic tumours of the skin assume the form of corns, callosities, condylomatous warts, and what has been called veruca Achrocordon. They all consist, in like manner, of epidermic scales more or less condensed together; in the latter growth they surround a canal furnished with blood vessels. Sometimes they entirely assume a regular form, their interior being more or less hard, fibrous, and vascular,—in short, a prolongation of the epidermis. At other times they soften on their summits, and assume the structural peculiarities of the ulcer next to be noticed.

3. The epidermic or epithelial ulcer is very common on the under lip, commencing in the form of a small induration or wart, but rapidly softening in the centre, assumes a cup-shaped depression, with indurated margins, which extend in a circular form more or less over the cheek and chin. An examination of the softened matter sometimes exhibits epithelial cells, mingled with fibre or fibro-plastic cells, as in Fig. 104.

Fig. 104. Fig. 105. Fig. 106.

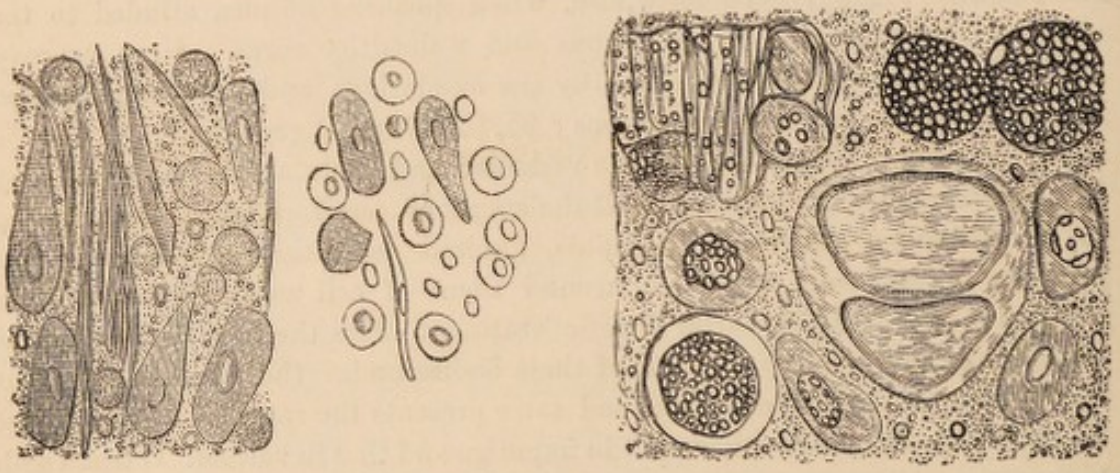

Fig. 104.—Epithelial and fibre cells, from the surface of an ulcer of the lip.
Fig. 105.—The same after the addition of acetic acid.
Fig. 106.—Altered epithelial cells, from the surface of another labial ulcer.

At other times the cells are enlarged, flattened out, and more or less loaded with fat molecules and granules. (Fig. 106.) These growths, though generally denominated cancer, are at once distinguished by a microscopic examination, as may be ascertained by comparing the above figures with groups of cancer cells represented, Figs. 13, 14, 15, 16. The so-called chimney-sweep's cancer of the scrotum is essentially a similar formation, but for more minute descriptions, and for numerous illustrations of these growths, I must refer you to my work on Cancerous and Cancroid Growths.