pear in the other mamma, in the axillary gland, or in some other part of the body; but, even supposing I were perfectly certain that within a year the disease were again to show itself, should I not take that into account?

Let us next, therefore, consider the woman. And I think it is a very important thing for students to get into the habit of considering their patients. I am afraid that the tendency both of the surgeon and the students of surgery is to look at the physical condition of the part, forgetting a little the circumstances of the patient. I hope that is not the case with you; but it is important that it should every now and then be brought before you. Here is a woman who has comparatively suddenly become aware that she has cancer in the breast. I did not need to tell her that; she knew well enough, and that was why she came to me. She said, "I have got cancer in the breast". As you saw, she is of a nervous temperament, and she has a very disagreeable and painful feeling with regard to this scirrhus in the mamma. She has the horror of cancer upon her. Unlike many other diseases, cancer creates in the patient who is conscious that he or she has it a feeling of great depression. This patient wonders what will happen. We do not tell her what will happen, but we all know very well. A growth discovered three months ago suddenly puts on activity, which causes it to increase in size very much more than before. Within that time, probably, adhesion to the skin near the nipple has taken place, and that is the only part that is adherent. What will be the history of the case if I do not touch it? The adhesion to the skin will increase; a little red spot will show itself where the adhesion to the skin exists; within a short time, ulceration will take place, creating a loathsome discharge; the life of the patient will extend to two or three months, during which her whole existence, till death relieves her, will be most painful. That would probably be the history of the case. Well, if we be able to perform the operation in such a way as to enable her to recover from its effects, and if we be able to eradicate the disease, temporarily even, we will then have it in our power to say to the woman, You are free from cancer; your tumour is away; your disease is removed; it is in the hands of Providence when it may return; in the meantime, you are a healthy woman. Is it not worth while undergoing an operation which is rarely fatal, rarely dangerous, for the sake of being free from the condition I have described, restored for weeks, months, perhaps years, to a state of perfect health? I maintain that excision of the mamma ought to be performed; and for these reasons, which you may extend to others, I intend to operate upon that woman. I hope and believe the operation will be successful, and, when the wound is cicatrised, she will leave the hospital perfectly healthy for the time being. To show that this is no chimerical notion, I ask you to remember the operation you saw performed the first operation-day in this hospital, where you saw removed from a woman a large tumour somewhat of the same kind. She is not here now, because, two days ago, I gave her an admission here to the Convalescent Home at Dunoon, where she is at present enjoying herself; whereas, if the operation had not been performed, she would have been lying in bed, suffering from a loathsome discharge from a disease which would result in her death in a very short time; and I think that is a great deal gained.

In connection with this case, I here show you a remarkable specimen of colloid tumour, the second I have seen during my whole experience, which I removed the other day from a patient aged 70, who is now perfectly recovered.

The second patient I now present to you tells us that she is about 40 years of age, unmarried, and that, about three years ago, she got a blow on her right breast. A year after that, she became conscious of a small swelling on the breast, which has gradually enlarged till the present time. The whole mamma is converted into a firm hard tumour, which adheres to the pectoral muscle; the nipple is retracted, the skin nodulated and ulcerated, and the glands of the axilla enlarged and indurated. I need not tell you that, in such a case, no one would for a moment hesitate. To interfere surgically would not only hasten the fatal issue, but would bring opprobrium on surgery.

TESTIMONIAL.—On Friday, February 11th, the officers of the Sarn Mielltyrn Friendly Society and other friends met at the residence of R. H. Owen, L.K.C.P., of Bottwnog, to present him with a testimonial and address. The testimonial consisted of a handsome timepiece, a tea and coffee service, a pair of candlesticks, and chimney-piece ornaments. The timepiece had on it, engraved upon a silver plate, the following inscription. "Anrheg i Dr. Owen. Presented to Dr. R. Humphreys Owen, Plas Coch, Bottwnog, by the members of the Sarn Mielltyrn Friendly Society and other friends, in token of their feeling of respect and confidence in him as their professional adviser."

LECTURES ON PATHOLOGY.*

Delivered before the University of Cambridge.

By J. B. BRADBURY, M.D., F.R.C.P.,
Linacre Lecturer of Physic, and Physician to Addenbrooke's Hospital.

LECTURE I.

I PROPOSE in the ensuing course of Lectures on Pathology to omit all of an introductory nature, and shall not occupy your time, therefore, in defining theoretically or in a conventional sense disease† in the abstract, and shall pass over, likewise entirely, the large subject of the etiology of disease.

The shortness of the course renders it expedient that I should do this; and for these preliminary matters, if not already familiar with them, you can refer with equal advantage to the introductory chapters of any of our best works on pathology, and I shall thus be enabled to commence at once with what is capable of being communicated to you by description and demonstration combined, which I think is the most appropriate method that can be adopted in the delivery of lectures, to which your reading may furnish the supplementary matter.

It will, I think, be a further economy of our time, if, instead of giving you any preliminary statement of the arrangement or order which I propose to follow in treating of pathology, I at once state that I shall adopt, at least in great measure, both as the most convenient, and, as I believe, the most scientific, the same order as is followed in treating of physiology; and will ask you to take as a text-book, which may furnish you with a syllabus of the heads of our subject, any familiar work on physiology; I will mention Kirkes's *Manual*, as that at present is in most English students' hands, and as a good one. I propose to follow, for the present at least, the same arrangement of subjects as you will find in that work; and give as an appendix, as it were, to each chapter in the order in which it occurs, its pathological counterpart or commentary. For pathology is in truth but an extension of physiology, *i.e.*, physiology under the conditions of disease.

Omitting the introductory matter, the first chapter in that work is on the chemistry of the body. My first subject, then, shall be the pathological chemistry of the body.

I would invite you also, during the course, to come prepared in advance with a fresh acquaintance with the physiological function, of which I propose next in succession to give the pathological representation.

PATHOLOGICAL CHEMISTRY.—In commencing the exposition of the pathology of the human body by the consideration of the relation of its chemistry to the *genesis* of disease, it must be acknowledged that we shall not have the advantage of beginning with what is best understood.

But the chemical constitution and laws of the human organism form the first chapter, by the author treating of its physiology, whose work I have assumed to be your manual in the study of this science. I have chosen, therefore, the same as the commencement of our own subject, in conformity with the plan I have proposed of making, as far as possible, physiology our text, and treating pathology as an extension of its subject-matter; *physiology*, in fact, as presented under the conditions of disease.

In the first place, we may (but for a moment only) view the matter theoretically, and consider whether we may not perceive in some measure a reason why the distinctive character of *organic* chemistry should, under the influence of external pathogenic agencies, induce a liability to disease, and, it may be, entail the first step in its genesis.

As I have already stated that it is not my intention to enter upon the etiology of disease in general, I assume that we have admitted the operation of the predisposing and exciting causes of disease to be such as represented in the systematic works on pathology; and we have now to inquire only how far we are entitled to conclude that the peculiarities in the chemistry of organic life facilitate, if they do not even invite, this operation.

We observe in the inorganic world that the surfaces of most bodies

* I am anxious to acknowledge the very great obligation I am under to Dr. Bond, late Regius Professor of Physic, for the materials he has kindly and most liberally placed at my disposal in the preparation of these lectures, which are in great measure an expansion of a syllabus of lectures prepared by him for the use of students in the University.

† Disease in its totality is a "process" (Moxon); it cannot, therefore, be represented in a photograph taken at any one instant (Lectures on Analytical Pathology, *Medical Times and Gazette*, 1870).

are perpetually undergoing more or less of a disintegrating destructive process by oxidation when exposed to the atmospheric air. Oxidation plays a part likewise in the processes of organic life: a gentle and slow oxidation being necessary for the normal decomposition going on in the fabric of the body. This under the operation of morbid causes may be exchanged for a quick and consequently a destructive process, and constitute an essential element in many diseases.* But this is not exactly the point to which I would at present draw your attention, in speculating upon the probability that the distinctive character of organic chemistry may operate in favouring a predisposition to disease.

The physiologist tells you that the large number of atoms that form a molecule of the organic compound imparts an instability to the combination; and it would also appear, that the identical atoms constituting an organic molecule cannot retain their affinity indefinitely, but must be exchanged for the purpose of renewal of the requisite affinity; hence results the dependence of the organism on extrinsic stimuli to effect this renewal.

Any failure or imperfection then arising from physical causes in the operation of these stimuli may, it is conceivable, convert this inherent instability into actual disorder, and thus derange or modify the process of molecular exchange, and thus establish disease. Again, the capability of interstitial renewal does not continue equally perfect at all ages; hence results the difference in the texture of parts at different epochs of life, and consequently their natural degeneration and decay. Under these altered, though still natural conditions, the organic chemistry, inherently unstable, we may readily conceive is maintained with greater difficulty and more imperfectly, and thus there is entailed a diminished resistance to deteriorating influences, producing a liability to death, even from slight causes. May not also, I think it may reasonably be asked, this inherent instability in some measure explain the agency of foreign or toxic substances introduced into the system; for, if the natural incidental elements (as they are called, *vide* Kirkes), in such small quantities, can impart a peculiarity to the different tissues, it is conceivable that the introduction of (incidental) abnormal proximate principles in equally small quantities, may rapidly cause as characteristic a change in them, and one destructive of their functional powers.†

Destructive agents act only on the external surfaces of inorganic bodies; but, by means of the circulation of the blood, analogous agents are brought into contact with every internal surface, interpenetrating the texture of all organs almost simultaneously, and hence may rapidly cause the deprivation or death of the whole organism. The occasional fearfully sudden destruction consequent on the introduction of morbid poisons, as of certain fevers, into the system, seems explicable on this ground. But, I admit, these are mere speculative conjectures on the relations which may exist between the peculiarities of organic chemistry and the genesis and nature of disease, and I hasten to the exposition of what is more within the province of facts, and will proceed to the description and demonstration of the actual products of abnormal chemistry that occur within the body.

Inorganic Formations (*syn.*, *unorganised new growths*, Rokitsansky).—The ultimate constituents of the body in disease are identical with those existing in it, whether as ordinary or as incidental elements, in health. So far, the chemistry of the body remains the same under the conditions of disease as in a state of health.

But many of the constituents which normally exist only in determinate organic connection with other constituents, or in a state of solution within the tissues of the body or in its secretions, by some alteration of vital conditions, or from some mechanical change—*e.g.*, as from the obstruction of a canal—are removed from this organic connection, or are no longer held in solution. Hence arise inorganic or unorganised formations within the body; and thus mineral or other bodies, ordinarily in a state of solution, become solid, either in a crystalline or amorphous form; while some may still remain in the fluid state or in solution as long as they are retained within the body, and only become solidified on removal from it, as is the case with most urinary sediments.

Many, again, of these formations, unorganised themselves, are still identical with some of the constituents of the living tissues, but, though retained within the organism, are no longer subject to nutritive changes, but obey chemical laws as ordinary inorganic substances do, and thus are properly considered as foreign to the structure of the

body, and included in the same category with other organic formations; such are, *e.g.*, collections of fat (*lipoma*) or fatty deposits (*atheroma*), which are as far removed from physiological agencies as calcareous concretions.

I proceed to enumerate the principal of these substances which may exist within the organism without being amenable to its vital (physiological) changes.

1. **Protein Compounds or Proteids** (fibrin, albumen, globulin, etc.) Many of the products of exudation—the fibrinous, including their corpuscular elements (of which I shall hereafter have to speak)—if they are not absorbed, may remain and yet not undergo any development into tissue. They are then subjected to physical influences and chemical changes only, become more or less desiccated, and, though inclosed within the cavities of the body, yet continue to exist there as unorganised formations, *e.g.*, the ancient layers of pleuritic exudations, neither converted into areolar tissue, nor having undergone any ulterior chemical change.

The concentric layers of aneurysmal coagula, and some of the so-called fibrinous deposits on the valves of the heart, are other instances of protein unorganised formations. Albuminous unorganised formations are sometimes found as concretions in the peritoneal cavity.

2. **Fatty Substances**—The different fatty substances, which are normal constituents of various structures and even of some fluids (blood, bile, lymph) of the body, may likewise occur as precipitates, or segregated from the organism though existing within it, *e.g.*

Cholesterin ($\text{C}_{26}\text{H}_{44}\text{O}$) + H_2O , or *biliary fat*, regarded by some

chemists as a monatomic alcohol) is thus met with in extremely thin rhombic tables, angles 80 to 100 degs. It occurs often in large quantities, *e.g.*, in gall-stones, encysted tumours, in the atheroma of arteries; also in the ulterior metamorphosis of protein formations, the exsudates, etc. It is found in tubercular concretions, and occasionally in disorganised eyes, floating in detached scales in the vitreous fluid. According to Dr. Austin Flint, cholesterin accumulates in the blood in some cases of organic hepatic disease, and gives rise to symptoms of blood-poisoning, a condition which he has designated *chole-terremia*. Cholesterin is insoluble in water, acids, and alkalies; but is soluble in ether, chloroform, and boiling alcohol; solutions of soap and fatty oils take up a part of it. Sulphuric acid turns it to a dark brown reddish colour (from red to violet, according to the degree of concentration of the acid, Lebert), whilst the simultaneous action of sulphuric acid and iodine causes a fine blue colour. Cholesterin separates from the blood largely during old age, and is stated to increase in quantity in the blood from the fortieth to the fiftieth year, producing probably the increased separation (Vogel).

Margarin* and Margoric Acid.—Margarin and margoric acid undoubtedly crystallise under certain conditions (*lipoma*) during life, and may easily be obtained artificially, simply by the cooling of the fluids which contain the margarin in a state of solution (Wedl). Crystals of margoric acid form microscopic needles, usually in stellar or tuft-like groups; insoluble in water and in acid, but readily soluble in ether and hot alcohol. The margoric acid is in the living body held mostly in solution by olein (Vogel). Margoric acid is also met with in combination with alkalies, forming margarates. Margarate of lime is met with in some concretions, *e.g.*, gall-stones. Crystals of margoric acid are most commonly found in gangrenous parts.

Olein occurs as fat-globules (insoluble in water and in acids, but soluble readily in ether and hot alcohol, and after prolonged ebullition in potash), free, or in cells; in exsudates, in medullary carcinoma, and in gangrenous parts.

3. **Uric Acid** ($\text{C}_5\text{H}_4\text{N}_4\text{O}_6$) and **Urates**.—Frequently as the crystals of uric acid are met with as a sediment in the urine, it has been doubted whether "they ever exist ready-formed in perfectly fresh urine"; but, as the constituent of the most common of all urinary calculi, this acid has a prominent place among the unorganised formations that occur in the body. The primary form of the crystals† is the *rhombic prism*, which frequently appears cut down to a tablet, whose principal surfaces are rhombs. Not unfrequently the crystals are united in masses with the form of rosettes—colourless when pure, but often reddish; insoluble in alcohol and ether, nearly so in water, and only dissolved slowly in caustic potash (Vogel). They are dissolved by concentrated

* The late Dr. Fencé Jones regarded inflammation as a disease of peroxidation; and gout, diabetes, oxaluria, etc., as diseases of suboxidation (*Lectures on some of the Applications of Chemistry to Pathology and Therapeutics*; Lond., 1867).

† Dr. MacLagan's theory of fever is in accordance with this view. The phenomena of fever are explicable on the supposition that microzymes are introduced into the system, and feed upon its albumen, etc. (*vide* BRITISH MEDICAL JOURNAL, 1873, vol. ii, p. 397).

* Margarin is now regarded as a mixture of tripalmitin and tristearin; and margoric acid as a mixture of equal parts of palmitic and stearic acids.

$$\text{Tripalmitin} = \left(\text{C}_5\text{H}_5 \begin{Bmatrix} \text{O. C}_{16}\text{H}_{31}\text{O} \\ \text{O. C}_{16}\text{H}_{31}\text{O} \\ \text{O. C}_{16}\text{H}_{31}\text{O} \end{Bmatrix} \right)$$

$$\text{Tristearin} = \left(\text{C}_5\text{H}_5 \begin{Bmatrix} \text{O. C}_{18}\text{H}_{35}\text{O} \\ \text{O. C}_{18}\text{H}_{35}\text{O} \\ \text{O. C}_{18}\text{H}_{35}\text{O} \end{Bmatrix} \right)$$

† See an interesting paper by Dr. Ord in the *St. Thomas's Hospital Reports* for 1870, entitled "Experiments relating to the Forms assumed by Uric Acid".

sulphuric acid. When uric acid is treated with nitric acid evaporated to dryness over a water bath, and the residue slightly moistened with ammonia, there is formed murexide or diammonic purpurate, which presents a beautiful purple colour. Dr. Garrod has obtained crystals of uric acid from the blood of gouty persons. Of urinary calculi, generally, I shall hereafter have to speak.

Urate of Ammonia (probably a deposit of mixed urates of ammonia, soda, potash, and lime, and now termed "amorphous urates") is the most familiar of all the urinary deposits, occurring variously coloured, and in a finely granular form. It is sometimes found deposited in the structure of the kidney. The precipitate, slightly soluble in cold water, dissolves readily on the application of heat;* acids decompose it, precipitating the uric acid in the form of rhombic tablets.

Urate of Soda is one of the most remarkable among the unorganised substances that exist in a separated condition from the human body, as it forms the constituent of the so-called, or rather mis-called, *chalk-stones* in gout, or spread over the articular surfaces and on the tendons in this disease. Urate of soda from gouty concretions appears under the microscope as long delicate needles, arranged in bundles or stars, or lying separately (Roberts). Urate of soda occurs also, as I have just stated, mixed with the urate of ammonia, as a sediment in the urine. Here it consists usually of minute granules, which are unequally aggregated together in different parts of the field of the microscope. Urate of soda is sometimes *spontaneously* deposited from the urine as hedgehog crystals, especially in children during fugitive febrile attacks.

4. *Salts of Lime*.—These are the *phosphate* and *carbonate* of lime, which occur in the calcareous transformation and so-called ossifications (calcifications) of natural tissues, and in the cretification of the adventitious products of disease (as conversions of fibrinous exudations, tubercles, pus, etc.), and the *oxalate* of lime in the urine in crystals, and as a calculeous concretion of the same.

(a) *Carbonate of Lime* (CaCO_3) occurs almost always in an amorphous state, and usually combined with the phosphate ($\text{Ca}_3(\text{PO}_4)_2$). It is soluble in acids with effervescence. Precipitates of calcic carbonate occur in almost every fluid of the body (Vogel), but rarely as urinary deposits in man (Wedl). It is said to occur occasionally in the urine in globular spheres and cornucopia-like crystals (Bird, Hassall).

(b) *Phosphate of Lime* ($\text{Ca}_3(\text{PO}_4)_2$) occurs in pathological deposits, usually in the amorphous form. It is a frequent ingredient in urinary sediments, where it sometimes, though rarely, assumes a stellar form. Calcic phosphate forms a common ingredient in nearly every animal fluid (viz., blood, urine, gastric juice, saliva, semen, milk, and juices of organs, Frey). It is normally held in solution by an acid, or it forms soluble compounds with certain organic compounds, as gelatin, etc.) Calcic phosphate, when treated with hydrochloric acid, dissolves without bubbles, and is thus distinguished from the carbonate. It is distinguished from the urates by the non-appearance of uric acid (Wedl).

(c) *Oxalate of Lime* ($\text{CaC}_2\text{O}_4 + 3\text{aq}$) is usually found in the urine in the form of obtuse square octohedral crystals, which are sometimes remarkably minute. It is sometimes found in nodular concretions in the pelvis of the kidney between the mamillary processes. The urine of hypochondriacal and other nervous persons especially was thought, by Prout and Golding Bird, to contain oxalates in excess. Oxaluria may result from eating rhubarb too plentifully. Dr. Beale thinks that crystals of oxalate of lime form the nuclei of most urinary calculi. The octohedral crystals are insoluble in water, alcohol, ether, and acetic acid, but soluble in hydrochloric acid. Oxalate of lime, also, occurs in the urine as dumb-bell crystals, which were supposed by Dr. Golding Bird to be formed of oxalurate of lime. They are, however, probably identical in composition with the octohedra. "The precipitation of oxalate of lime as dumb-bells depends upon some physical condition which interferes with the ordinary crystallisation. Very frequently urine depositing dumb-bells contains little masses of viscid mucus; and it seems probable that a certain viscosity of the urine is essential to this globular precipitation" (Roberts). As I have previously remarked, the form of uric acid crystals also, according to Dr. Ord, depends on certain physical conditions of the urine.

5. *Ammonio-magnesian Phosphate* ($\text{MgNH}_4\text{PO}_4 + 6\text{aq}$) occurs in crystals, the fundamental figure of which is the rhombic vertical prism, the common form being like a sarcophagus lid. The crystals are very readily soluble in dilute acetic acid. They are, according to Vogel, "amongst the most common that are met with in the microscopical examination of the human body", which is accounted for by the circumstance, that the phosphate of magnesia exists in almost all the fluids of

the body, and, when it comes into contact with ammonia, which is readily generated in the organism, it unites with it and produces crystals of this, the triple phosphate. The formation of crystals of phosphate of magnesium and ammonium accompanies the process of decomposition in the animal organism, but occurs only in alkaline or neutral sanies (Rindfleisch). This salt, also, forms a crystalline pellicle on the surface of the motions in typhoid fever (Wedl). Besides occurring as a crystalline urinary deposit in alkaline urine, this salt constitutes also one of the well-known urinary calculi. Dr. W. Roberts says, "In the immense majority of cases, the deposition of this salt is only an incident due to the loss of the acid reaction of the urine, and especially of ammoniacal decomposition of the urine."

Cystine, Xanthine, Leucine, and Tyrosine, must be omitted from our consideration from their rarity and the want of time.

6. *Pigmental Formations (pigments).*

(a) The colouring matter of the blood (the hæmatin) furnishes more than one of these, in various forms of crystals, e.g., hæmatoidin, which differs from hæmatin in containing no iron. It is found in old apoplectic cysts, and in otherwise retained extravasated blood. It crystallises in fiery red rhombic prisms, and also in acicular crystals (Robin), which are soluble in chloroform, sulphide of carbon, and absolute ether, but not in absolute alcohol, water, ammonia, solution of soda, or dilute acetic acid.

(b) *Bile-Pigment*.—"Never, or only in very rare cases, is the biliary pigment deposited in a solid form. Virchow detected crystalline deposits of bilifulvin in the epithelium of the gall-bladder" (Rindfleisch).

(c) *The Colouring Matter of the Urine (uroerythrin)*, or urohæmatin. Little is known of this pigment.

(d) *Melanin*.—As a pathological product, melanin, or something nearly allied to it, is frequently met with in great abundance in different organs, tumours, etc. It is a substance remarkable for its insolubility and unchangeableness. It is not soluble in water, alcohol, ether, dilute mineral acids, or concentrated acetic acid. It is dissolved, after some considerable time, in warm potash solutions (Frey).

Such are the principal known substances, which, separated from the organism that generated them, exist within it as unorganised formations. I have spoken of them at present principally in their relations simply as chemical substances; it remains for me to say something more of the conditions under which some of them occur, and their state of aggregation, and the localities in which they are presented.

THE TREATMENT OF STRICTURE OF THE URETHRA.*

By F. N. OTIS, M.D.,

Clinical Professor of Genito-Urinary Diseases, College of Physicians and Surgeons, New York.

MR. CHAIRMAN AND GENTLEMEN,—The urethra may be described as an appendage of the urinary bladder and of the vesiculæ seminales; its office, in connection with the vesiculæ seminales, being simply to convey the spermatic fluid, and, in its connection with the urinary bladder, to convey the urine from that reservoir to a proper and convenient distance. It is provided with no especial organic structure, except that which is required for the complete performance of its office as a common carrier. To facilitate the passage of the urine, a propelling power of no insignificant character is furnished by the muscular structures of the bladder, aided by those of the abdominal parietes and the diaphragm. As the urinary fluid is an excretion, irritating in its nature, its immediate and complete discharge from the urethra becomes a necessity; hence this canal is furnished throughout its entire length with a resilient muscular surrounding, which, in its normal condition, effects this purpose with certainty and completeness. In order, therefore, that the fluids which find their exit from the body by the urethra, shall pass through it with the least possible friction, the chief mechanical necessity in its formation is complete freedom from obstruction. Any obstruction, therefore, from any cause—congenital or acquired—must, of necessity, be considered an interference, to a greater or a less degree, with the functional perfection of the genito-urinary apparatus. Constrictions of the urethral canal, from various causes, and at various points, are known to occur, and vary from slight interference with its muscular surroundings to virtual obliteration of the canal.

* "As no other urinary deposit disappears with simple heat, this circumstance offers an easy means of recognition" (Roberts *On Urinary and Renal Diseases*, 2nd edition, p. 68).

* A demonstration given at the Annual Meeting of the British Medical Association in Edinburgh, August 1875.