Diphtheria - P. 37 - 39
Phorthissa - P. 8 - 9
Anthrax P. 11 - 13

FIFTY YEARS OF MEDICAL PROGRESS
(1873–1922)

Frontispiece.

FIFTY YEARS OF MEDICAL PROGRESS

1873–1922

BY

H. DRINKWATER

M.D. EDIN., M.R.C.S. ENG., F.R.S.E.

WITH THIRTY-SEVEN ILLUSTRATIONS
ON THIRTY-FIVE PLATES

THE MACMILLAN COMPANY
NEW YORK
1924

PRINTED IN GREAT BRITAIN

PREFACE

The following pages contain a brief summary of the progress of medical science and practice during the last fifty years—1873 to 1922 inclusive. For the sake of easy reference the items are arranged in alphabetical order.

Every subject of the medical curriculum has been affected, and the sum total of the general advance has been so enormous that one cannot fail to be struck with amazement—or "bewilderment," as Osler would say—when one tries to realize it, and especially if it be compared with the history of medicine during any previous half-century. Without doubt, the last fifty years must be looked upon as the golden age of medical progress, not only because of the immense number of new facts discovered, but also because of their practical application. Many subjects that in 1873 were shrouded in what seemed to be impenetrable mystery have yielded up their secrets. Diseases (*e.g.*, Malaria and Yellow Fever) which have been widespread scourges have been partially, and in some places completely, eradicated; surgical operations that were definitely stated to be unjustifiable are now performed successfully every day in the great hospitals all over the world; parts of the body that were looked upon as "vestiges" of some former age are now known to be of vital importance, the net result being the relief and prevention of much suffering, the conferring of immunity to certain diseases, and an increase in the

"expectation of life" by several years. In 1873 very little was known regarding "germs" in relation to disease, and there were few physicians who believed that there was any etiological connection between them. Pasteur and Lister were almost alone in their opinion that fermentation and suppuration are due to the action of micro-organisms. They certainly had few followers in this or any other country. Lister was carrying out his great experiment in the wards of the Royal Infirmary at Edinburgh; he was Professor of Clinical Surgery in the University. The carbolic spray was used whenever an incision had to be made, for at this time the principal danger came, it was thought, from the air, which was believed to be laden with pathogenic particles. The operating theatre was septic in a high degree. It was exactly like the ordinary classrooms in the University, having plaster walls and wooden seats and desks. The instruments were never sterilized *after* an operation, but during the time of the operation they were placed in 1 to 40 carbolic solution. Asepsis, as we now understand it, had not then been thought of; apparently the word had not been coined.

It was Lister's experiment, and he made himself responsible for success or failure in each case; he dressed every case himself, whilst his house-surgeon, clerks, and dressers looked on. When one considers the means that are adopted to-day to ensure asepsis—the careful sterilization of instruments, the dressings, the operator's hands, and the patient's skin—Lister's success with the spray and carbolic gauze was truly remarkable. Those who worked under him saw him succeed where other skilful surgeons had failed. He practised antisepsis, not asepsis. Lister's principles of treatment are followed now by every operating surgeon throughout the world. Yet in 1873

his "following" was small; there was only one man in Edinburgh who was at all enthusiastic in employing antiseptic methods—namely, John Chiene, who later succeeded to the chair of surgery in the University. Lister's colleagues on the surgical staff—Joseph Bell (the original "Sherlock Holmes"), Annandale, P. H. Watson, and Professor Spence—were brilliant surgeons, but not one of them had a favourable word to say for Lister's method; indeed, *some* of them referred to it in sarcastic and sneering terms, and they looked upon Lister as a faddist. Lister's theory of the microbic origin of suppuration has been extended to many other diseases, including the whole of the zymotic class. A new science has arisen—Bacteriology—the term for which had not been introduced in 1873. The actual cause of many diseases can now be seen and studied under the microscope, thanks to the discovery of suitable methods of staining, and can be cultivated in nutrient media, the culture being used, when desirable, to reproduce the disease in certain of the lower animals. We now have a fair knowledge of the precise cause of such diseases as Tuberculosis, Plague, Diphtheria, Leprosy, Cholera, Gonorrhœa, Syphillis, Malaria, Yellow Fever, Hydrophobia, Typhoid, etc. New diseases have been identified, and new terms applied—*e.g.*, Vincent's Angina, Weil's Disease, Barlow's Disease, Anaphylaxis, Trypanosomiasis.

The Röntgen Rays are new to medicine. The knowledge of the Ductless Glands and Internal Secretions and the rôle of Vitamins has increased our power of dealing with many common ailments. Increased interest has been shown in the history of medicine. It is not to be wondered at that the curriculum has had to be increased by an extra year. Although the microscope was largely employed in histological work, it had not come into

general use in clinical medicine, and I never saw the instrument in the wards or Residents' rooms of the Edinburgh Infirmary.

I feel bound to enter a word of protest against men who have lost their didactic powers continuing to hold professorial posts in our medical schools. During my time at Edinburgh there were two of the professors who should have resigned some years previously, and whose "teaching" was a farce. The student, however, was compelled, by the regulations of the college, to attend the classes of these professors—an absolute waste of time! An excellent Bibliography of Medicine is contained in Garrison's "History of Medicine," a model of literary workmanship, from which I have obtained much information. The other standard works and periodicals referred to are too numerous to mention.

If readers will draw my attention to errors of omission or of commission I shall be very grateful.

I tender my most grateful thanks to all those confrères, both in this country and abroad, who have so readily sent me their portraits for publication; to Dr. Butt of Chester for the portrait of his brother-in-law, the late Dr. J. Everett Dutton; to Messrs. J. M. Dent and Co. for their courtesy in permitting the reproduction of Professor Bateson's photograph; and to Mr. Wickens of Bangor for permission to print the portrait of Dr. Griffith Evans.

I have received valuable help from Sir Robert Jones, Sir Henry Morris, Mr. Thurstan Holland, and Professor Robert Newstead. Mr. Honeyman, Librarian of the British Medical Association, and Mr. Home, Librarian of the Liverpool Medical Institution, have assisted in finding or verifying numerous dates; Messrs Siebe, Gorman and Co. have supplied illustrations of Mine Rescue apparatus; Dr. G. R. Murray and his publishers, Messrs. H. K. Lewis,

have granted permission to reproduce the illustrations of myxœdema (p. 144)—to all these I wish to express my obligation and sincere thanks.

The illustrations facing p. 100 are introduced by the courtesy of Sir Robert Jones, and that of "hour-glass contraction," p. 163, is from a radiograph by Mr. Thurstan Holland.

H. DRINKWATER.

WREXHAM,
October, 1923.

LIST OF ILLUSTRATIONS

FIFTY YEARS OF MEDICAL PROGRESS

Acetone and Acidosis.

1874.—Acetonæmia was discovered by Küssmaul.

1885.—Von Jaksch discovered small amounts of acetone in normal blood and urine. (It had been observed in 1851 in diabetes mellitus by Petter, Kaulich, and Betz.) It is detected in urine by the nitro-prusside test of Legal. Diacetic acid can be detected by the addition of perchloride of iron solution, but a much more delicate test is Rothera's, carried out as follows:

To an inch column of urine in a test-tube are added a couple of drops of a 10 per cent. solution of sodium nitro-prusside; then a few drops of liq. ammoniæ are poured gently on the top of the mixture. A dark plum-coloured ring forms at the junction of the liquids if diacetic acid be present.

Diacetic acid is often associated with the acetone, and sometimes β-oxybutyric acid is present. There is a close connection between " cyclical vomiting " in children and the presence of acetonuria and acetonæmia. The vomiting is readily cured by giving bicarbonate of soda and sugar, and restricting the amount of fat, especially butter, in the diet.

1883.—Naunyn and Stadelmann introduced the concept of diabetic coma as fatal acidosis.

1884.—Oscar Minkowski and Külz simultaneously discovered β-oxybutyric acid.

Actinomycosis.

Found chiefly in cattle and pigs.

1876.—Its parasitic nature was established by Bollinger; he named it *actinomyces*.

1877.—J. Israel described first case in the human subject.

Adiposis dolorosa.

1888.—First described by Dercum of the United States of America; hence it is also termed "Dercum's disease."

Amaurotic Family Idiocy (Tay-Sachs' Disease).

1880.—Warren Tay gave the first description of the symmetrical changes which occur in the eyes in this disease.

1887.—Sachs of New York named the disease, and gave the first complete description. The *Liverpool Med.-Chir. Jour.* for July, 1912, and the *Brit. Med. Jour.* for May 9, 1909, contain interesting articles about it, specially pointing out its hereditary tendency.

Ambulance, or First Aid.

1874.—Sir Thomas Longmore gave an address on the subject of the preliminary care necessary for accidental injuries at the Annual Assembly of the Order of St. John of Jerusalem in England. This was the starting-point of ambulance work in this country.

Friedrich von Esmarch, Professor in Kiel, had used, during the Franco-Prussian War, his "first aid," or triangular bandage.

1875.—He published his "First Aid to the Wounded," and

1882.—"First Aid in Accidents."

Amyotonia congenita.

1900.—Hermann Oppenheim of Berlin gave first description of the condition.

Anæmia, Pernicious.

1875.—William Pepper of Philadelphia described the changes in the bone-marrow.

Anæsthesia and Anæsthetics.

(The terms were introduced by Oliver Wendell Holmes, November 21, 1846, in a letter to Dr. T. G. Morton of Massachusetts, who introduced ether as an anæsthetic.)

This subject has made considerable strides since 1873. In 1873 general anæsthesia was produced almost exclusively by chloroform—at any rate, in Great Britain. During my curriculum at Edinburgh I only once saw ether administered, and it failed to "get the patient under," and chloroform had to be employed in its stead. Sometimes *nitrous oxide* was used. (This was introduced originally by Horace Wells in 1844, a dentist of Hartford, Conn.) It was principally employed in dentistry.

1897.—Sir F. W. Hewitt discussed the use of this gas in conjunction with *oxygen* supplied from a separate cylinder, so that they could be mixed and supplied to the patient in varying proportions as required. This mixture of "gas and oxygen" was considered safer than the pure nitrous oxide. It was also claimed that the anæsthesia could safely be maintained for a much longer time, and a dentist was allowed sufficient time to clear a mouth of numerous defective teeth at a single sitting. The procedure of administering the mixed gases has met with opposition, largely on theoretical grounds.

Local Anæsthesia.—The production of anæsthesia of a definite limited portion of the body without loss of con-

sciousness is one of the most notable advances of modern medicine.

1866.—The earliest attempt (in recent times) to produce local anæsthesia was made by Benjamin Ward Richardson, who employed the ether spray for the purpose. This, for obvious reasons, had a very limited use, and it is now rarely employed. For this purpose it has been superseded by *ethyl chloride*, which, when sprayed upon the skin, produces rapid freezing of the superficial structures, and is employed for simple incision and operations that can be completed in a few seconds. Benguë has introduced it under the name of Anistile.

1872.—Hughes Bennett of Edinburgh had shown that cocaine produces anæsthesia when applied to the mucous membranes, but the discovery did not lead to its employment in practice. Its introduction dates from the year

1877.—Clover's ether apparatus introduced.

1884.—Karl Köller of Vienna demonstrated the use of a solution of the alkaloid in ophthalmic surgery. He showed that it produced complete loss of sensation in the surface of the eyeball, and thus obviated the need for chloroform or other general anæsthetic. Köller's demonstration was given before the Ophthalmological Congress at Heidelberg, and in this way it soon became widely known. Cocaine was discovered in 1852 by Niemann in the leaves of *Erythroxylon coca*, but its properties were apparently not investigated. When its value in eye surgery became appreciated, so great and rapid was the demand for it that the price rose in a very short time to one guinea a grain.

1884.—Cocaine was used largely in rhinology and laryngology, and soon afterwards by hypodermic injection. It was found to produce local anæsthesia, but also that poisonous symptoms frequently occurred. This led

to a search for a less toxic local anæsthetic, and resulted in the discovery of *novocaine* by Alfred Einhorn, who produced it synthetically in 1905.

Several other closely related substances have also been prepared synthetically, having similar action.

1910.—Rendle Short says he has demonstrated* that opium, belladonna, aconite, cocaine, menthol, and carbolic acid are not absorbed through the unbroken skin, and are not anæsthetics when thus used. This is contrary to what has been believed for a long time past, the use of anodyne liniments being more or less universal. Moreover, one can readily demonstrate the almost instant relief of supra-orbital neuralgia by the application of a drop of camphor chloral applied to the unbroken surface.

Prolonged local anæsthesia can be effected by the following means: (1) Subcutaneous injection at the site of operation; (2) injection into or around the main trunk of the nerve at some distance from the operation area; (3) injection into the spinal canal.

(1) Hypodermic injection for any purpose was rarely employed in 1873. I never saw it used during the whole of my curriculum either in hospital or private practice.

When cocaine comes into contact with any nerve twig, it blocks the passage of the nerve current beyond the seat of injection.

1885.—James Leonard Corning of New York City noticed that when the circulation of blood is interrupted simultaneously with the injection of the cocaine solution, the action of the drug is augmented owing to its more prolonged local action, and, in consequence, much weaker solutions (*e.g.*, 0·25 to 0·3 per cent.) can then be used, with less risk of cocaine poisoning than when the stronger solutions are injected.

* "Newer Physiology in Medical and Surgical Practice.'

Novocaine has largely superseded cocaine for this purpose.

Braun added adrenalin to the solution.

1888.—Obherst injected cocaine near the terminal phalanx of the fingers and toes, and constricted the limb, using 0·5 to 1·0 per cent.

(2) **Nerve Trunks.**—There is scarcely a single large nerve trunk that cannot be reached by injection. Anæsthesia is produced in the whole area supplied by the sensory fibres of the nerve arising beyond the point of injection, which may be made into the sheath of the nerve (*e.g.*, the sciatic) or in its immediate neighbourhood.

1885.—Wm. Stewart Halsted of the Johns Hopkins University, Baltimore, injected solution of cocaine along the main trunk of the inferior dental nerve in the mouth. Thus he produced "conduction anæsthesia."

1898.—Harvey Cushing was the first to block the *large* nerve trunks.

1908.—G. W. Crile applied and extended the blocking principle to the cutaneous nerves (*vide* Anoci-association).

Infiltration Anæsthesia.—1894.—Reclus and C. L. Schleich injected a 1 per cent. solution in a complete circle around the area of operation, and applied it in resection of the ribs, herniotomy, etc. Schleich first sprays the skin with ether. His solution for injection has the following composition:

Cocaine hydrochloride	0·2
Sodium chloride	0·2
Morphia hydrochlor.	0·02
Distilled water	100·0

Sometimes even weaker solutions are used.

(3) **Spinal Anæsthesia.**—1885.—Introduced by James L. Corning, who was the first to employ it. He injected

cocaine solution into the lower part of the spinal canal, the needle being inserted between the spinous processes of the lower—generally the 3rd and 4th—lumbar vertebræ a very short distance from the mid-line. In this way is obtained anæsthesia of the lower limbs, as well as of the rectal and prostatic regions. He termed it "conduction anæsthesia," and he used a solution of from 2 to 3 per cent.

1899.—August Bier employed spinal anæsthesia largely in the operative treatment of hæmorrhoids. A few minutes after the injection the *sphincter ani* relaxes and the hæmorrhoids project externally. *Stovaine* (amylocaine hydrochloride), a cocaine derivative, has been used in place of cocaine for spinal anæsthesia. It is about half as toxic as cocaine, but is more apt to produce local irritation and inflammation.

1908. **Anoci-association** is the term employed by Crile to indicate the production of general + local anæsthesia. It is specially devised to prevent or reduce to a minimum the shock that is liable to occur after major operations. A general anæsthetic is administered, and in addition to this, local anæsthesia is produced in the whole area of operation by local injections, and complete "blocking" is effected, so that the general system is protected. Morphia $\frac{1}{6}$ to $\frac{1}{2}$ grain and scopolamine (hyoscine) $\frac{1}{200}$ grain are injected about half an hour before the operation (subcutaneously).

Whether used with or without local anæsthesia, it has been found advantageous to inject morphia and hyoscine before giving any general anæsthetic for an extensive operation. Cremer employed them in the second stage of labour for the immediate relief of pain, and to enable the patient subsequently to forget her sufferings.

1906-15.—Gauss of Freiburg and Kronig have popularized this procedure and standardized it. It produces

what they termed "Dämmerschlaf," or "twilight sleep." One injection of morphia is given, but the hyoscine is repeated as required until the child is born. The patient is not unconscious, but merely drowsy; she scarcely feels any pain, and afterwards is altogether oblivious of having suffered, and has no fear of a subsequent accouchement.

There is much diversity of opinion as to its effect on the child.

When *ether* is given by the "closed method," it is often found to produce an abundant secretion of saliva, even a dangerous amount. This can be prevented by giving a hypodermic dose of $\frac{1}{100}$ grain of atropine sulphate twenty minutes previously. It should be made a routine practice.

1880.—*Ethyl chloride* as a general anæsthetic was reported upon adversely by the Glasgow Committee of the British Medical Association, and its use was almost suspended until

1895, when it was restored to favour as a result of the observations of Carisen and Miesing, that when being used as a local anæsthetic it sometimes produced general anæsthesia, with loss of consciousness. Lotheissen also began to employ it regularly as a general anæsthetic. It is an extremely useful agent for the production of general anæsthesia of one to two minutes' duration. It allows just enough time for an expert operator to enucleate the tonsils and curette the adenoids at the same time. The patient "goes off" in a few seconds, and recovers rapidly. The operation can be done in the sitting position opposite a good light. It is advisable to keep the patient in the recumbent posture for about an hour afterwards. Ethyl chloride does not encourage hæmorrhage.

Looseley's two-way valve is an excellent apparatus. It is very important to get the patient to distend the bag by breathing into it before the ethyl chloride is turned on.

It is an excellent local anæsthetic used as a spray.

Delayed Chloroform Poisoning.—Chloroform has in several instances produced death during its administration. It has recently been shown to be due, at any rate sometimes, to interfering with the patient before anæsthesia is complete. It is of the utmost importance to keep the patient quiet, and not to move him at all during the early stages of the administration (*vide* p. 32).

Sometimes death has occurred some days after the anæsthetic has been used. It is generally preceded by uncontrollable vomiting. The same condition has been observed after ethyl chloride. It is now known to be due to acidosis (*q.v.*).

1894.—Pointed out by L. G. Guthrie (*vide Lancet*, 1894).

The urine should always be examined for acetone (diacetic acid) before giving chloroform or ethyl chloride, and if found to be present should receive the appropriate treatment. The net result of the modern practice and methods of producing anæsthesia is an increase in the use of local at the expense of general anæsthesia, with much saving of time and far less risk to the patient's life. I have used the term " anæsthesia " as applied to the action of certain substances on the skin. " Analgesia " would be the more correct term, because, though pain may not be felt from an incision, there is not generally complete absence of sensation.

1896.—Karl Binz published a work on the history of anæsthesia. He was appointed a professor at Bonn in 1868.

1910.—Sir F. Hewitt introduced his " artificial airway." Ether vapour is forced through it. It also serves as a gag and tongue depressor.

1914.—" Anæsthesia," by James T. Gwathmey, M.D. An exhaustive work.

Anaphylaxis.

This term was introduced by Richet in 1909 to indicate certain phenomena, mild or serious, that occasionally follow the injection of protein substances into the body of man and animals.

The mild symptoms are "serum sickness," urticaria, joint pains, etc. The serious ones are an intense swelling of the mucous membrane of the bronchi, leading to suffocation, and sometimes rapid death, which has occurred with regrettable frequency in recent years owing to the extensive employment of serums for various therapeutic uses. The urticaria and dyspeptic and asthmatic sequelæ following the use of certain foods in susceptible individuals are also looked upon by some physicians as due to anaphylaxis.

1798.—The phenomenon was first observed and remarked upon by Edward Jenner after variolous inoculations.

1838.—Magendie performed the first experiment. He showed that a *second* injection of egg albumen may cause death of rabbits which were tolerant to the first dose. He noticed it in numerous instances. Recently many experiments have been performed with a view to obviating this serious result.

1903.—Theobald Smith observed it particularly after the injection of the toxins of the diphtheria bacilli. This is what Ehrlich termed the "Theobald Smith phenomenon."

1907.—Besredka, who regarded it as one of shock, found that it could be prevented by giving a very small dose of the curative agent shortly before the full dose; also that patients can be made tolerant of foods for which they usually show an anaphylactic idiosyncrasy if they begin with very small quantities and gradually increase the amount.

It has been found recently that anaphylaxis is most likely to occur if an interval of more than twelve days is allowed to elapse before giving the second dose of antitoxin, and that the second injection may safely be given any time within twelve days of the first one.

What is to be done when a second injection is required after a considerable interval of weeks or months? Certain observations appear to show that this difficulty can be overcome. Horse serum has been given to dogs, and it has been noted that if it is mixed with nine times its volume of isotonic salt solution, no anaphylaxis occurs; or 1 gramme of sodium bicarbonate in 30 to 40 c.c. of water may be given intravenously fifteen minutes before the serum is injected; or the serum may be mixed with an equal volume of 5 per cent. solution of sodium hypophosphite with equally satisfactory results.

It is to be hoped that these observations will be confirmed by other experimenters.

Anatomy.—*Vide* Nervous System, Blood, Glands, etc.

Angioneurotic Œdema.

1882.—Described and named by Heinrich Quincke. It had been noted previously (in 1876) by John Laws Milton, who termed it "giant urticaria." The condition occurs in any part of the body, and consists in a local œdema due to paresis of vaso-motor origin, but its precise etiology is not yet known. It is apt to recur, and may prove suddenly fatal.

Anthrax.

The discovery and proof of its cause constitute one of the most important steps in the knowledge of the etiology of disease.

As an "internal" malady, it is known as woolsorter's disease.

1850.—Casimir J. Davaine discovered a bacillus in the blood of anthrax animals, and he expressed the opinion that it had some etiological association with the disease. He communicated his discovery to the Société de Biologie.

The *Bacillus anthracis* had previously (1849) been seen by Pollender and Brauell, but they had not published their observations until later. Davaine declared that the bodies seen by these observers in the blood of animals dying of anthrax were living; he called them bacteria.

In 1865 he showed that the virulence of the disease is in proportion to the number of bacteria present.

1871.—Klebs showed that the virus is something which is non-filterable, since the filtrate will not produce the disease.

1876-7.—Robert Koch worked out the life-history of the anthrax bacillus, and succeeded in cultivating it outside the body *in vitro*. He showed that the cultures will produce the disease when injected into susceptible animals experimented upon. These features constitute what is known as "Koch's postulates." *This was the first instance of the complete isolation of the living cause of a specific disease*, and has produced a profound influence on the investigation of other infectious diseases.

1877.—Pasteur carried the experiment a stage further by showing that the bacilli can produce the disease after the hundredth generation of cultivated germs. This proved that anthrax was not due to anything of a chemical or mechanical nature, which till then was the favourite theory; for a chemical substance, which is incapable of reproducing itself and multiplying, would be so diluted after 100 successive cultivations that any portion remaining in the last generation must be infinitely small and incapable of producing any discoverable effect.

Pasteur, in his work on wine and beer, had said in 1857, "Fermentation is due to organic life."

Koch published his observations in "Beitrage zur Biologie der Pflanzen," which was a botanical work; or, rather, his work was published by Cohn, the botanist, to whom he wrote, in April, 1876, to the effect that he had worked out the complete life-history and sporulation of the anthrax bacillus. Koch was then twenty-three years of age. About a week later, at Cohn's invitation, he gave a three days' demonstration of his culture methods and results at the Botanical Institute in Breslau, in the presence of Cohn, Weigert, Auerbach, Traube, Cohnheim, and others. Cohn declared that Koch's was the greatest bacteriological discovery yet made (Garrison).

The next step was to discover, if possible, some means of reducing the virulence of the bacilli.

1880 (June 17).—W. S. Greenfield of Edinburgh showed that the germ may be "attenuated"—*i.e.*, its virulence may be reduced—by culture in bovine aqueous humour. He thus laid the foundation for vaccination against this disease.

1883.—Vaccination against anthrax was definitely introduced by Pasteur. It is extensively employed in France, especially for sheep, immense numbers being saved by its means (*vide* "Life of Pasteur," by Valery Radot). So greatly has France benefited from Pasteur's work in this direction, that Huxley declared that the country had gained from it alone enough to pay the whole Prussian War indemnity. In Bradford the mortality from woolsorter's disease (=anthrax) was at the rate of nineteen out of twenty-three cases in 1879-80. Since then, as a result of prophylaxis, the death-rate has been reduced to about 2 per annum.

Antisepsis, Antiseptics, and Asepsis.

In 1873 antiseptic surgery was still in the experimental stage. Joseph Lister was then Professor of Clinical Surgery at Edinburgh, and one of the surgeons to the Royal Infirmary. Up to about this time putrefaction in wounds was thought to be due to the oxygen of the atmosphere, and the production of "laudable pus" had been a desideratum in treatment from the time of Galen in the second century until Lister's time.

Pasteur had recently demonstrated that the septic properties of the air were due to minute organisms floating in it (*vide* his researches on wines and beer). It occurred to Lister that wound sepsis might be due to the same cause, and that it might be prevented if the air was excluded by applying as a dressing some material capable of destroying the life of the floating particles.

This was his theory and his working hypothesis. He employed carbolic gauze and jaconet; in addition to this, the exposed part was bathed with 1 in 20 carbolic solution, and during the operation the whole area was enveloped in 1 to 40 carbolic supplied from a spray producer. The spray was always used at each subsequent dressing until the wound was healed.

This was the routine procedure in 1873, and had been commenced in 1867 when he was professor at Glasgow. In 1873 Lister had gained very few converts, and his colleagues at the Edinburgh Infirmary either sneered at what was looked upon as his fad, or treated it with silent contempt. I believe there was only *one* man who appeared at all enthusiastic on the subject; that was John Chiene, who followed Lister like a lap-dog. Chiene afterwards became Professor of Surgery in succession to Professor J. Spence.

1877.—Lister removed to London to take up the post

of Professor of Surgery at King's College; shortly afterwards he abandoned the spray, because he had come to the conviction that the germs floating in the atmosphere were little, if at all, pathogenic.

Many attempts have been made to replace carbolic acid by other less poisonous or less irritating chemicals.

1877.—Ernest V. Bergmann of Berlin introduced corrosive sublimate as a lotion.

1880.—Mosetig Moorhof introduced iodine, and in 1910 Waterhouse showed its penetrating action on the skin.

1878.—Koch wrote a work, "On Wound Infection," in which he strongly supported Lister's method of treatment, and which helped to make it known in German-speaking countries.

Two other standard books on this subject are Watson Cheyne's "Antiseptic Surgery," 1894, and McBurney's "Technic of Aseptic Surgery," 1900.

The conviction gradually gained ground that septic material is conveyed to wounds by the hands, instruments, and dressings, and surgeons endeavoured to guard against this by thoroughly sterilizing everything that is to come into contact with a wound, and also in obstetric practice.

This later development of antiseptics is now spoken of as *asepsis*. If all apparatus is thoroughly sterile, there is less need for the former free use of powerful germicides, which have a destructive action on living tissues as well as on germs; consequently, sterile water and sterile normal saline solution are largely used for cleansing purposes.

1886.—Von Bergmann introduced steam sterilization of dressings and instruments.

1890.—Halsted introduced rubber gloves, for it was found practically impossible to thoroughly sterilize the hands. Walter Moxon of Guy's was probably the first to use gloves in the post-mortem room.

The benefits of antiseptic surgery both to man and animals are incalculable, and a few statistics will serve to illustrate this point.

During the Franco-German War of 1870-71 there were rather more than 13,000 amputations recorded by the French, and of these over 10,000 proved fatal.

In the Munich State Hospital in 1874, 80 per cent. of all surgical cases developed hospital gangrene.

The mortality from amputations has now fallen to a very low percentage, and hospital gangrene is a very rare, almost an unknown sequela. At the City of London Hospital the mortality has fallen from 5 per cent. to 5 in 4,000 since the introduction of antiseptics.

At the maternity hospital in Paris the mortality has been as follows: From 1860-64, of 9,886 cases, 1,226 died (12 per cent.); 1870-80, the period of isolation from other cases, 2·32 per cent.; 1889-98, period of antiseptics, 0·67 per cent.; 1898-1908, period of asepsis, 0·29 per cent.

Before Lister's time surgeons were in dread of opening into the abdomen, into joints and cranium, because operations on these parts were specially liable to be followed by disastrous consequences as a result of septic infection. All this has been changed, and so far as septic infection is concerned these parts are operated upon with as little misgiving as other more accessible parts of the body. Dr. W. E. Fothergill has well expressed the benefits of antiseptic methods in the *British Medical Journal*, May 27, 1922, as follows: "When a woman is in good health, she can have a simple uterine or ovarian tumour removed with little more risk and with much less discomfort than that involved in having a baby."

Appendicitis.

In 1873 the condition now recognized under this term was called typhlitis and perityphlitis, and was thought

to have its origin in the cæcum or peritoneum. Very often the pathology was not recognized at all, and was styled "peritonitis."

1886.—Reginald H. Fitz of the United States of America first demonstrated the pathology of perforating inflammation of the vermiform appendix.

1887.—Treves advised removal of the appendix when quiescent. The mortality then is only 1 in 500, whereas during the inflammatory attack it is 1 in 5.

1889.—Charles McBurney published his "Operative Treatment in Cases of Disease of the Vermiform Appendix," and drew attention to tenderness at "McBurney's point" as an indication for operation. The ileo-cæcal valve is situated about 1 inch *below* McBurney's point.

It has been shown by several observers that the appendix is nearly always affected in gastric and duodenal ulcers, and initiates the latter condition through producing excess of hydrochloric acid in the stomach.

Arteriosclerosis.—*Vide* Bloodvessels.

Asthma.—*Vide* Protein Therapy.

Athetosis.

1873.—This phenomenon (a series of more or less spastic arrhythmical movements in a paralyzed limb, seen chiefly in the fingers and toes) was described by Dr. Wm. A. Hammond of America.

Auto-intoxication.

1887.—Bouchard first called attention to it.

Bacteriology.—*Vide* Germs.

This forms an entirely new branch of biological science. The word itself was not in use in 1873; indeed, it had not been coined. I cannot find who first used the term, but it seems to have been introduced in Germany. The *Athenæum* of August 30, 1884, says, "In Germany it has

become a separate study under the name of bacteriology." *Bacterium* was first used by Todd in the "Cyclopædia of Anatomy and Physiology" (1847-9), but *bacteria* was used by Felix Dujardin in his "Histoire Naturelle des Zoophytes" in 1841.

1882.—John Chiene started the first teaching laboratory (for disease germs) in the United Kingdom, and in 1913 a Chair of Bacteriology was founded in Edinburgh.

1887.—Dr. E. M. Crookshank was appointed to the Chair of Bacteriology at King's College, the first chair in this country. In 1886 he published "Practical Bacteriology."

1888.—Pasteur Institute founded.

Then the operating theatre had to receive attention. During my term at Edinburgh the operating theatre was of the then prevalent type—a series of rows of seats rising one above the other half surrounding the floor on which the operating table and accessories were placed. The surgeons seldom wore anything over their ordinary clothes; the hands were washed *after* an operation, but seldom before (except, of course, in the case of Lister and his assistants, who first dipped the hands into a 5 per cent. solution of carbolic, and then into a 2½ per cent.). Many of the onlooking students had come straight from the dissecting room. Except when Lister was operating, there was no attempt at sterilization, for it was not thought necessary—in fact, it apparently did not occur to the mind of the generality of surgeons.

Now most hospitals have theatres so constructed that they are easily capable of being rendered practically aseptic. One of the first model theatres was designed by W. J. Smyly, the Dublin surgeon. This had a glass screen between the patient and the onlookers. It was fitted up in the Dublin Hospital in 1895.

In 1892 Sir W. Macewen had refused to operate in the theatre of the Western Infirmary at Glasgow, because on Sundays it was used as a chapel. A new theatre was built for him.

Barlow's Disease (also called Scurvy, Rickets, and Infantile Scurvy).

1876.—First described by Sir Thomas Barlow, and again in 1882.

1878 (November).—Dr. Walter R. Cheadle published an account of three cases following rickets; he was the first to draw attention to this sequence.

Basedow's Disease.—*Vide* Thyroid (Goitre).

Beriberi.

A disease chiefly met with in Japan, the Malay States, and Mauritius. In the early years of the present century so prevalent was it in the Japanese Navy—about 25 per cent. of the whole strength—that the navy was reduced to a state of ineptitude (Osler).

It seems to have been demonstrated that beriberi is due to the consumption of polished rice as the chief article of diet. This was pointed out by E. B. Vedder in 1913.

Shortly afterwards Fraser and Stanton showed that it can be cured by adding to the diet the rice millings, which consist of the outer coverings of the grain, and which contain some vital substance known as vitamin B (*q.v.*).

Beriberi is therefore a "deficiency disease," akin to scurvy in this respect (*vide* Rendle Short, *op. cit.*).

Bladder (Urinary).

Ectopia.—1876.—Thiersch's operation.

1891.—This was modified by Billroth.

1885.—Trendelenburg narrowed the defective area by

dividing the sacro-iliac synchondroses, thus approximating the pubic bones.

1879.—Max Nitze introduced cystoscopy. This greatly facilitated the surgery of the bladder.

1889.—Matthew Berkley Hill established its use in this country and lectured on the subject.

Sir Henry Morris and M. E. H. Fenwick have written several important works on the bladder and urethra.

Vesical Calculus.—1878.—Henry Jacob Bigelow introduced litholapaxy or crushing and removal of the whole stone at one sitting, thus obviating a cutting operation (*e.g.*, lithotomy). In the same year Reginald Harrison performed Bigelow's operation in London. The mortality is much less than from lithotomy.

The suprapubic operation—an old procedure—was revised and established by Dr. Carson of Edinburgh and Petersen, a Danish surgeon, in 1880. He filled the bladder with fluid in order to raise it above the peritoneum, and thus avoid injuring it during the operation. He also distended the rectum with a rubber bag to raise it still higher.

Blastomycosis.

1896.—Described by Thomas C. Gilchrist.

Bloodvessels.

1896.—Murphy produced successful circular anastomosis of arteries.

1902.—A notable advance in the surgery of the arteries was made by Alexis Carrel of the Rockefeller Institute, a French surgeon.

1910.—He effected reunion of divided arteries by sutures. He found that the vitality of arteries can be prolonged for several days after removal from the body by keeping in cold storage.

1912.—He began to transplant them into the living body with success.

In 1880 C. S. Roy invented an ingenious instrument called the Oncometer for measuring the amount of blood flowing through the vessels of such organs as the kidney, and the Oncograph for recording the amount.

1903.—Bier introduced his method of producing artificial hyperæmia of the limbs for the cure of chronic inflammations.

Arteriosclerosis.—1909.—Henri Huchard wrote the chief work on this subject. He pointed out the clinical forms of the condition. Von Eiselsberg has observed its occurrence in myxœdema and after removal of the thyroid.

1902.—Aneurysmorrhaphy introduced by Rudolph Matas of U.S.A.

Blood, Coagulation of.

In 1873 the accepted theory (Schmidts') was that clotting was immediately due to the union of two substances: (*a*) fibrinoplastin derived from the blood-corpuscles, and (*b*) fibrinogen from the tissues.

1875.—Olaf Hammarsten showed that this is not so, but that the actual clot is formed by the splitting up of fibrinogen into fibrin and another substance.

1883.—Wooldridge devoted considerable attention to the chemistry of coagulation. As far as can be made out, what apparently occurs is as follows: Fibrin (clot) comes from fibrinogen after having been acted upon by fibrin ferment, now called thrombin. This consists of prothrombin (a zymogen) + calcium, which are made to combine by the action of thrombokinase derived from disintegrated cells. Normally the blood does not clot in the vessels, because (partly) the liver produces an antithrombin.

1891.—Wright first pointed out the rôle of calcium salt in coagulation.

Hæmophilia, found in "bleeders," has been ascribed on the one hand to a want of contractility in the blood-vessels, and on the other to a diminished coagulability of the blood; the former view is now abandoned. It is now held that there is a deficiency in the prothrombin content of the blood, so that it yields thrombin much too slowly (Addis, 1910).

1909.—Sir A. E. Wright has found that coagulation may be delayed to as long as 80 or 90 minutes. Adrenalin and calcium salts have proved most useful as drugs. Horse serum (as diphtheria antitoxin) has been found useful, but in a severe case transfusion is the only efficient procedure (Rendle Short).

Ehrlich classified the leucocytes according to their granular contents.

Blood-Pressure.

The estimation of this is now much more practised than formerly.

1878.—"Method Graphique de la Circulation du Sang," by E. J. Marey.

1883.—Dr. R. E. Dudgeon of London published a book on the sphygmograph.

1883.—Von Basch introduced the aneroid.

1890.—Roy and Adami introduced the armlet; they expanded it with water. Riva-Rocci employed air for the purpose.

1906.—Messrs. Down Brothers introduced the unspillable mercury trap.

1896.—Scipione Riva-Rocci of Turin introduced his sphygmomanometer. It is the instrument most frequently employed.

JULES BORDET.

P. 23.

1893-4.—Sir James Mackenzie introduced the graphic method of taking simultaneous records of the arterial and venous pulse as a clinical means of showing the condition of the heart. The instrument is called the Polygraph. The venous pulse is taken in the jugular. This method does not show, nor is it meant to show, the actual blood-pressure.

Chemistry of the Blood.—1878 (December 13).—Sir Wm. Gowers introduced his hæmoglobinometer.

1901.—It was improved by Haldane and later by Thoma-Zeiss.

1903.—Wright published his method of estimating the "opsonic index" as a means of measuring the efficient amount of protective substances in the blood.

1897.—The Belgian physician Bordet discovered bacterial hæmolysis, and in 1901 it was used by Uhlenhuth as a test for blood-stains.

Much work has been done on the leucocytes or white blood-corpuscles, and their relative proportions in various anæmias and diseases of the lymphatic and chylopoietic systems, and in their staining properties, but much further observation is required.

Bone.—*Vide* Fractures.

Botulism.

A disease, generally fatal, caused by the *Bacillus botulinus*, discovered by Van Emengem (Belgium) in 1896. First observed a few years ago in Germany, due to eating infected sausages (botulus=a sausage). The first symptom is diplopia, then rapidly followed by paralysis of muscles of tongue and of deglutition, but no diarrhœa and little vomiting.

In mid-August, 1922, eight people partook of meat sandwiches in Scotland; they all died within a few days.

This was its first appearance in this country. The bacillus is destroyed by boiling. It also infects vegetables.

Brain.

Notable advances have been made in the knowledge of the anatomy, physiology, pathology, and surgery of the brain, and largely by British observers. The finer anatomy of the brain, together with that of the rest of the nervous system, was advanced by the epoch-making researches of Golgi in 1879 and 1883, and in the same direction by Ramon-y-Cajal in 1903 (*vide* Nervous Systems). These observers used a new method of staining the cells and their prolongations, and rendered possible the clear differentiation of the layers of the cortex by Bodmann in 1906 (*vide* Leonard Hill's "Further Researches in Physiology," 1909).

Bodmann divides the cortical layers, particularly those of the precentral gyrus, as follows (beginning at the surface):

1. Zonal layer without cells.
2. Molecular and small pyramidal cells.
3. Medium and small pyramidal cells.
4. Internal granular layer.
5. Deep pyramidal cells (large cells).
6. Polymorphous cells.

The prefrontal region is late in reaching maturity. The deepest layer (6) is the first to be differentiated in lamination. The layer of large pyramidal cells is the last to appear; its development becomes greater as we ascend the animal scale, being better developed in rodents than in insectivora, better in ungulates and carnivora than in rodents, and still better in the primates. It appears to be directly related to educability. It is the only cell layer which varies measurably in normal brains. It is un-

developed in imbeciles and idiots. It varies in depth according to the mental power of the individual.

Investigation of the functions of the brain has clearly demonstrated that they are numerous, and are distributed in different parts. The cerebrum is not—functionally, at any rate—a single organ acting as a unit. The liver acts as a single organ, but not so the brain. It subserves *sensations* of very diverse kinds; it produces *muscular contraction;* it *thinks.*

The experimental foundation of our knowledge of the functions of the cerebral cortex was laid by Fritsch and Hitzig, who demonstrated in 1870 that electrical excitation of certain parts of the surface in the living animal produces definite muscular actions, accurately repeated in response to like stimuli, whilst other parts were apparently non-excitable.

1878-90.—The work of these observers was confirmed in its main features and largely extended by David Ferrier. It was shown that the chief motor area is in the Rolandic region. The temporal region, and especially the island of Reil, is associated with hearing. In a recent case Harvey Cushing stimulated the temporal region of a man who was conscious, and the patient declared that he heard a buzzing noise. The auditory word centre occupies the posterior part of the second left temporal convolution.

The visual word centre is in the left angular gyrus.

Broca's Speech Centre.—Paul Broca observed that in some cases of aphasia there was a lesion of the third (inferior) frontal convolution on the left side, and he was led to regard this region as associated with the production of speech. There is a good deal of doubt on this point, for numerous cases have now been observed in which aphasia was not associated with any discoverable lesion of Broca's area (Marie and Manakow). This may be true,

yet it is also true that the nerve centres which do control the muscles concerned in the production of articulate speech are situated in the immediate neighbourhood of Broca's centre. Some of the motor areas have been thought to be associated with sensations as well as motion, and have been therefore termed " kinæsthetic " (Charlton Bastian).

For some time the cortex on each side of the fissure of Rolando was regarded as motor in function; this was the opinion in 1873 and later. The present view is that the convolution immediately in front of the fissure is purely motor, whilst the one behind is purely sensory. This, at any rate, is the opinion of Sherrington. In the Rolandic area the upper parts bordering on the longitudinal mid-line fissure are the centres for the leg and trunk; on passing outwards and downwards we come to the centres for the arm, forearm, hand, face, eyes, and tongue. The centres for sensation appear to be placed on the other side of the Rolandic fissure, immediately opposite the corresponding centres for motion, the motor centres in front of the sulcus, in the ascending frontal gyrus, and the sensory centres behind the sulcus in the ascending parietal convolution. The Rolandic area, therefore, is intimately associated with cutaneous sensation and action of the voluntary muscles. In the phylogenetic development of man it is believed there was a time or stage when the Rolandic area did not exist—it had not been evolved—nor, indeed, any other part of the cortex cerebri, and yet there was sensation as well as control of the muscular system. These functions were performed by the optic thalamus and corpus striatum.

The optic thalamus, in one evolutionary stage, was the sensory cortex. The primitive sensations—touch, heat, cold, pain—those immediately associated with the en-

SIR VICTOR HORSLEY.

vironment and the mechanism of self-defence, are still intimately connected with the optic thalamus. It is believed that it gives emotional colour to sensations—*e.g.*, pleasure and pain.

The precise function of the more highly developed and later-evolved centres is the interpretation of sensations received by the lower centres: the cortex enables us to judge of the quality of a surface, the weight and size of an object; it subserves the psychic functions. The instinctive functions of the cerebrum are apparently associated with the lower polymorphic layer of the cortex.

There is good ground for the opinion that the whole of the frontal lobes are efferent in function, and the rest of the cerebral hemispheres afferent or receptive.

Language is connected with the four centres for sight, hearing, writing, and speech.

Aphasia.—According to Marie, the lesion which produces aphasia is limited to the regions of the visual and auditory word centres near the lenticular nucleus. He asserts that some impairment of the intellect is always present at the same time. There may be aphasia with an intact Broca's convolution.

The Surgery of the Brain has made great strides.

1886.—Victor Horsley removed a slice of brain for the relief of epilepsy following an old injury to the head; he excised the cortex to a depth of 2 centimetres. The fits ceased, and the mental condition of the patient improved.

He removed a tumour from the cerebrum.

1884-8.—Horsley and Schäfer carried out certain experiments on cerebral localization which advanced the scope of cerebral surgery.

1884.—Practical surgery of the brain dates from November 25, 1884, when a case of tumour was operated

upon by Dr. Hughes Bennett and Mr. Godlee, an account of which they published on December 12, 1885.

1888.—Macewen described a case operated on by himself in June, 1883.

1887-94.—Beevor and Horsley continued them. These experiments in the main confirmed Ferrier's results.

1892.—Frank Hartley of the U.S.A. divided the second and third divisions of the fifth nerve within the cranium for facial neuralgia.

The Gasserian ganglion has been removed by several surgeons.

1917.—Sherrington and Leyton have observed that "there is a remarkable degree of recovery in a few days" from paralysis following excision of parts of the motor area. The giant pyramidal or Betz cells in the ascending frontal convolution are the only cells to undergo chromatolysis when the pyramidal tracts are destroyed in the spinal cord.

Harvey Cushing has shown that where there is increased intracranial pressure there is a limitation of the field of vision for blue which may amount to actual blue-blindness. Sir F. Mott* quite recently has shown that in nerve shock and in dementia præcox there is a characteristic change (degeneration or actual disintegration) of the cells of certain cerebral centres.

Hydrocephalus.—1881.—Wernicke suggested opening into and drainage of the lateral ventricles. This has been done by Keen, Broca, and Mayo Robson. Broca's case improved. Harvey Cushing has tried lumbar drainage.

Calcium.

In 1873 nothing was known of the special rôle of calcium in the body beyond the part played in the formation of bone, and its relative deficiency in rickets and

* "The Genetic Origin of Dementia Præcox," 1922.

SIR HENRY MORRIS.

osteomalacia. It is now believed that its metabolism is under the control of the parathyroids. It plays an essential part in blood-clotting. As a drug it is extremely useful in chilblains and urticaria, also in erythema nodosum, and sometimes in hæmorrhage. Other features are still *sub judice*, but some authors assert that it is useful in transient or functional albuminuria, tetany, and the menopause. Where it fails to give relief it is probably due to imperfect absorption, and in such cases magnesium salts will sometimes have the desired effect. The best preparation is the lactate or lacto-phosphate.

Calculus.—*Vide* Kidney, Bladder, Gall Bladder.

Cancer.

Sir Henry Morris, Bart., in his Bradshaw Lecture (*Lancet*, December 12, 1903), gives a résumé of the work on cancer up to date.

1886.—Rappin isolated a diplococcus from epithelioma and sarcoma.

1901.—Schueller described certain "protozoa."

1903.—Ludwig Feinborg described an animal parasite, *Histosporidium carcinomatosum*.

1890.—W. Russell suggested the yeast fungus—blastomycetes. No one has been able to confirm the above theories as to the cause of malignant growths.

1894.—Moran succeeded in transmitting cancer from one animal to another of the same species.

1903.—Jensen and Borrel of the Pasteur Institute in Paris have successfully inoculated white mice.

It has been established that the structure of the primary growth depends upon "the type of epithelial cell which is normal to the part affected," and that secondary growths resemble the primary one and are the result of migration (Morris).

1877.—Cohnheim propounded his theory of "embryonic inclusion" of portions of the germinal layers, which for a time remain quiescent, and are later stimulated to active growth by local irritation or other exciting cause.

1874.—A similar theory was propounded by Durante (Rome), but he thought the adult tissue may revert to an embryonic type.

Portions of embryonic tissue have been demonstrated in many parts of the body, especially the kidneys, liver, and genital organs, the very places where there is a special tendency to the development of malignant disease. The pathological aspect bears some resemblance to the sudden activity of certain organs at puberty.

1895.—Marchand showed that *deciduoma malignum* is cancerous.

Carriers.

Certain mysterious and unexpected outbreaks of infectious disease and poisoning from eating infected food have been explained as traceable to individuals who, whilst apparently healthy and well, contained the germs in an active condition, and dispersed them so as to affect other people. It has been demonstrated that typhoid bacilli may exist in large numbers in the urine of typhoid patients many weeks after convalescence; it is thus easily understood how such a convalescent professional cook may spread the disease.

A person who, whilst apparently well and healthy, possesses disease germs that he is capable of passing on to a second individual, and so transmitting the disease, is technically called a "carrier," and this term has now this specific meaning. Cerebro-spinal fever and diphtheria may be carried about in this manner.

1913.—Poliomyelitis carriers studied by Howard Osgood and C. Schlatter.

1922.—Legislation in U.S.A. and South Africa restricting cooks who may be "carriers."

Cell, The.—*Vide* Embryology.

Chemistry of Drugs.—*Vide* Drugs.

Chemistry of the Body.—*Vide* Metabolism.

1877.—Max Jaffé discovered indican.

1885.—Jaksch discovered acetonuria and diaceturia.

1883.—Kjeldahl introduced the test for nitrogen in organic substances. Gowland Hopkins showed how to test for urea in 1892.

The most important work on physiological chemistry has been done by Hoppe-Seyler and Emil Fischer.

Hoppe-Seyler published an important textbook in 1877-81. He introduced the term "proteid" as applied to what was previously called albumen or albuminous substance. We now generally write "protein."

1882.—Albrecht Kossel wrote an important work on the chemistry of the cell and its nucleus.

1893.—He discovered nucleinic acid. He also discovered adenin, thymin, thymic acid, histin, and agmatin.

The principal textbook in English in the early days was the "Handbook to the Physiological Laboratory," by Burdon-Sanderson and his collaborators.

Chloroform.—*Vide* Anæsthesia (*vide* p. 9).

Chloroform may produce death during its administration or after an interval of several hours following its employment—what is called "delayed chloroform poisoning."

For many years it was held that death during its administration as an anæsthetic was due to reflex stopping of the heart through vagus stimulation (inhibition); it was observed that it was most likely to occur during light anæsthesia, and it was therefore advised that the

anæsthesia should be deep enough to stop all cutaneous reflexes reaching the vagi.

1912-13.—Goodman Levy made a careful study of the whole subject, and came to some important conclusions. The main point for which he contends is that chloroform acts directly as a poison to the heart muscle and causes it to fibrillate. Levy performed his experiments on cats, and found the effect was the same after section of the vagi.

As, however, special danger seems to be associated with light anæsthesia, especially during the cutting of nerves, there is apparently a reflex element. It is important to give the anæsthetic *continuously* even during struggling. " Whiffs " are especially dangerous. Also, all lifting and moving of the patient should be avoided before anæsthesia is complete, and the head of the patient should be kept low. When the breathing or ventricular contraction has stopped, artificial respiration must be resorted to quickly. The heart must be compressed by forcing the hand below the costal border, and, if necessary, atropine should be injected into the heart muscle. Some advise the intracardiac injection of adrenalin. If these drugs are not at hand, simple puncture of the ventricular wall may have the desired effect. Adrenalin given before the anæsthetic seems to be especially liable to produce auricular fibrillation.

Delayed Chloroform Poisoning.—Sometimes some hours after an operation in which chloroform has been used as the anæsthetic the patient suffers from distressing, and maybe incessant, vomiting, drowsiness and prostration. This is an after-effect of the chloroform. It is especially liable to occur where there is acidosis present before the operation. Sometimes the smell of acetone can be detected in the patient's breath. Precisely the same thing occurs in regard to ethyl chloride, particularly

in children. The urine should always be tested for acetone before the administration of chloroform or ethyl chloride —a few days beforehand, if possible—and if acetone is present, sugar and alkalies should be given in increased amount, and the intake of fat, especially butter, should be reduced to a minimum, or even entirely cut off from the diet. When a general anæsthetic is to be given, especially to a young child, there should not be too long an interval between the last meal and the operation.

1874.—Acetonæmia discovered by Kussmaul.

Cholera.

1883 (February 2).—Robert Koch discovered the vibrio, the *materies morbi* of cholera, and in 1884 discovered that it is transmitted by drinking-water, by food, and by clothing.

1892.—Waldemar M. W. Haffkine, a Russian Jew scientist, lectured in London on "Anticholera Inoculation," and in

1893, at Lord Dufferin's suggestion, Haffkine went to India to introduce his inoculation method in the cholera-stricken districts. He effected a great reduction in the mortality. His work in India was begun in April, 1893, and an account published in the *British Medical Journal* in December, 1895.

Leonard Rogers has reported benefit from the intravenous injections of normal saline + calcium and potassium.

Cocaine.—*Vide* Anæsthesia.

Collective Investigation of Disease.

About 1880 Frederick H. A. Mahomed urged it, and was chiefly instrumental in starting it here and elsewhere.

Circulation of the Blood.—*Vide* Blood-Pressure.

Cyclical Vomiting.

This condition has long been observed in children, but its pathology has been a mystery until the discovery of acidosis and acetonuria (*vide* Acetone).

1906.—Naunyn introduced the term "acidosis."

Dengue.

Charles F. Craig with Major Percy M. Ashburn, working in the Philippines, showed that it is due to a filterable virus transmitted by the mosquito *Culex fatigans*.

Development.—*Vide* Embryology.

Diabetes.

Much has been learned since 1873 about diabetes, but much yet remains unknown.

1874.—A very important fact was discovered by Kussmaul; he showed that in diabetic coma there is a great excess of acetone in the blood, and he applied the term "acetonæmia" to this condition, which Naunyn later (1906) called "acidosis."

In 1883 Stadelmann, and in 1884 Minkowski and others, discussed the relation between beta-oxybutyric acid and diabetic coma, and Minkowski showed that it is present in excess in the urine. It was isolated first by Eduard Külz in 1884-7.

1886.—Joseph von Mering produced diabetes by administering phlorizin, and in

1889.—Mering and Minkowski showed that diabetes is one result of excision of the pancreas. It is thought that in the healthy body the pancreas has an inhibitory action on the excessive production of sugar by the liver.

The pituitary gland has some connection with sugar tolerance (*vide* Pituitary Gland).

In the last quarter of the nineteenth century it was a common practice in cases of diabetes to cut off all starchy

and sugary substances from the diet as completely as possible. This is now thought to be a mistake, for the body absolutely demands a certain amount of sugar; it is required for muscular action.

1906.—Lusk showed that sugar may be produced in diabetic subjects from protein foodstuffs.

1922.—Banting and Best, in Toronto, showed that the pancreas produces in its islands of Langerhans an anti-diabetic hormone, which Schäfer has named *insulin*. J. B. Collip isolated it from alcoholic extracts, and made a preparation suitable for injection subcutaneously. Insulin diminishes the blood-sugar, improves the nutritive condition, and increases resistance towards infection.

Diathermy.

1913.—Treatment by this means was begun at Bartholomew's by Drs. E. P. Cumberbatch and C. A. Robinson, with marked success.

Diet.—*Vide* Digestion, Metabolism, Vitamins.

Digestion.—*Vide* Metabolism, Vitamins, Internal Secretions.

1875.—Karl A. Ewald employed intubation of the stomach for examination of its contents.

1885.—" Test breakfast " devised by Ewald.

1876.—Trypsin isolated by Kühne, which he had discovered in 1874. Pawlow and his pupils have done much important work on the physiology of gastric secretion.

1894.—Chischin with Pawlow (or Pavloff) found that when psychic stimuli are cut off (the experimental animal not being allowed to see or smell food, nor to detect any indication of its approaching administration) the amount of gastric juice varies with the kind of food; it is freely secreted when meats and peptone are introduced into the

stomach, but the secretion is negative for others which would produce a flow under psychic impression.

1899.—Enterokinase was discovered by Pavloff; it is said to activate the pancreas.

1897.—" The Work of the Digestive Glands," published by Pawlow (Pavloff).

It is the most important work on the stomach and its secretion since that of Beaumont.

1902.—W. M. Bayliss and E. H. Starling announced their discovery of " secretin." It is produced by the mucous membrane of the small intestine, under the influence of the acid of the gastric juice; secretin exists in the mucous membrane in the form of secretinogen. The secretin is absorbed by the veins, carried in the blood-stream to the pancreas, and causes a flow of pancreatic juice. This was the first instance of the recognition of what is called a *hormone*, or chemical messenger, from one organ to another. The secretion of pancreatic juice is thus seen to be not, as was previously thought, a reflex action, but due to the direct action of the secretin contained in the perfusing blood. It is a beautiful demonstration of the dependence of one organ upon the action of another and (physiologically) distant organ. It also shows that reflex action has not the monopoly hitherto attributed to it.

1904.—R. H. Chittenden, who studied some time in Pawlow's laboratory, by numerous experiments showed that much less protein is necessary than had been thought (see his " Physiological Economy in Nutrition ").

Hydrochloric Acid of Gastric Juice.—When the juice is first secreted, the hydrochloric acid amounts to 5 per cent., but it is soon partly neutralized by the food, and later the alkaline intestinal and pancreatic juices, some of which are regurgitated into the stomach, so that the per-

centage is reduced to 2 or 1 per cent., the latter being the optimum. The hydrochloric acid is not influenced by diet.

Hydrochloric is in excess when gastric and duodenal ulcer exists; also in appendicitis and in pyrosis. Hunger pain, coming on two hours or so after meals and relieved by food and alkalies, is due to hydrochloric acid.

Congenital Stenosis of the Pylorus.—This condition has received a good deal of attention in recent years. A tumour in the pyloric region is generally palpable. Operation is necessary.

Colon.—This has been asserted by Metchnikoff to be not only useless, but positively harmful, by fostering fermentations and bacterial growth, with consequent absorption and auto-infection. It has been excised by Lane and Treves without the patient's digestion suffering. Keith has written on the subject.

Sterilized Milk.—**1886.**—Introduced by Soxhlet for children in America (*vide* Vitamins).

Nutrient Enemata.—Meat juices, "nutrient suppositories," and peptonized milk are valueless, because they are not absorbed.

1913.—Rendle Short thinks that the only enemata which possess nutritive value are those which contain milk that has been pancreatized for twenty-four hours; the protein is then converted into amido-acids, which are readily absorbed. Some dextrose should be added. He carried out a series of experiments on this subject with Bywater.

1911.—Abderhalden, the Swiss chemist, has succeeded in feeding dogs on amido-acids; he has shown that tryptophan is essential, and glycocol is not, also that glycerine and fatty acids can replace fats in the diet.

Diphtheria.—*Vide* Immunity.

1883.—Edwin Klebs discovered the bacillus. It was also observed by Frederick Löffler in

1884, and Löffler showed that it is the cause of the disease; hence it is called the Klebs-Löffler bacillus. Löffler was the first to cultivate it, to find it in the throats of healthy people, and to introduce the methylene blue stain.

1888-9.—Roux and Yersin showed that the filtrates of a Klebs-Löffler culture will produce the symptoms characteristic of the disease, and that the symptoms are, in fact, due to this filterable virus. They were pupils of Pasteur, and their work was the result of Pasteur's previous observation that a clear filtrate of the specific organism of chicken cholera will reproduce this avian disease.

1889.—Emil von Behring, whilst working in Koch's Institute, demonstrated that the serum of animals immunized against attenuated diphtheria toxins can be used as a preventive, and also as a curative agent, when inoculated against diphtheria in other animals. This serum produces a specific neutralization of the disease. It is, in fact, an *antitoxin.*

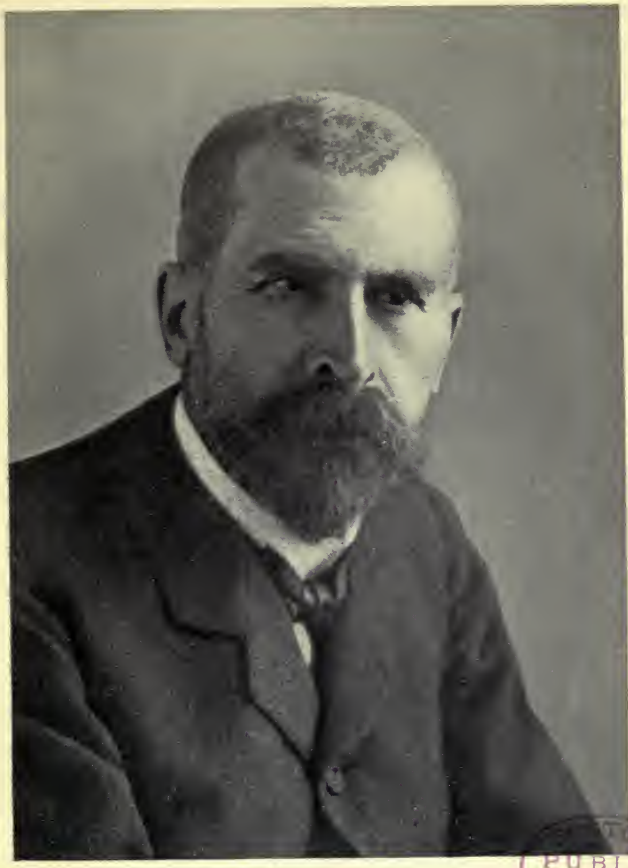
1894.—Behring began to prepare this antitoxin on a large scale. It was soon acknowledged to be a specific remedy for diphtheria, especially if administered in the early stage of the attack.

It has since been shown, over and over again, that the remedy is less and less effective with each day that elapses between the onset of the disease and the administration of the antitoxin.

This led to the discovery and employment of other antitoxins (tetanus, typhoid).

It is calculated that diphtheria antitoxin has been the means of saving 10,000 lives per annum in France alone. During the last two years it has been given in much larger doses than formerly.

1891-2.—W. H. Welch and Flexner, and independently



DR ÉMILE ROUX.

P. 28.

Behring, demonstrated the pathological changes produced by the experimental injection of the toxins of diphtheria. This is used in guinea-pigs for diagnostic purposes in doubtful cases occurring in the human subject.

Test of Susceptibility.—1913.—Shick of New York published in the *Münchener Medizinische Wochenschrift* an account of his test for susceptibility to, or immunity from, diphtheria. This test has been largely used in Bristol (England), and in 1921 Dr. Monckton Copeman, M.D., F.R.S., of Bristol wrote a special report of the subject (issued by the Ministry of Health), with a valuable introduction by G. S. Buchanan. By the use of this test, which consists in injection of diphtheria toxin-antitoxin *intra*-dermally, it is shown that a very large percentage of children after about six months old are susceptible. It shows whether a " carrier " is infective or not.

In England Dr. O'Brien of the Wellcome Research Laboratories has prepared the toxin. It is recommended to inject $\frac{1}{50}$ of the lethal dose for the guinea-pig dissolved in 0·2 c.c. normal saline. The kind of reaction following the injection indicates whether the patient is immune or not.

Drugs.

Very many new drugs have been introduced, and a really serious attempt has set in to found a scientific therapeusis.

In 1884-92 Lauder Brunton and Cash investigated the relation between chemical constitution and physiological action of drugs, as suggested by the work of Crum Brown and T. R. Fraser in 1867. Many new drugs are the result of synthetic experiments, and are closely related substances. The great bulk of the new drugs have an anæsthetic, anodyne, and febrifuge or hypnotic action. Amongst the anæsthetics we have :

Cocaine (*vide* Anæsthesia).

Eucaine : discovered by Gaetano Vinci whilst working under Liebreich in Berlin in 1896. In 1896 it was introduced into medical practice by Merling, and its use in ophthalmic practice investigated by Berger; it is similar to cocaine.

Novocaine: 1905, obtained by Einhorn. It is much less toxic than cocaine, is soluble in water, and may be boiled; 7 grains may be injected. There are numerous drugs very similar to cocaine in composition and physiological action.

Amongst hypnotics there are:

Trional and tetronal: prepared and introduced by Eugen Baumann and Alfred Kast in 1888.

Heroin: 1898, by Dreser.

Sulphonal: 1884, discovered by Baumann; 1888, introduced by Kast.

Veronal: 1904, by Emil Fischer and von Mering. It had been made synthetically by Fischer in 1902, and he also prepared proponal in 1905.

Among other drugs we find:

Salicylic acid : isolated by Kolbe in 1876.

1875.—Sodium salicylate first prepared synthetically by Kolbe.

1878.—Saccharine discovered by Falberg.

1879.—Homatropine discovered by Landenberg.

Antipyrin (phenazonum): in 1884, prepared by Ludwig Knorr, and introduced by Filehne the same year.

Salol: an intestinal antiseptic introduced by Nencki in 1886.

Acetanilide: by A. Cahn and P. P. Hepp in 1886.

Methylacetanilide or "exalgin."

Eserin (physostigmin): used in glaucoma by Ludwig Laqueur in 1876.

Aspirin (acetyl-salicylic acid).

Diuretin (theobromine-sodio-salicylate).

Hexamin (hexamethyline or "urotropine"): its use was discovered by Samuel J. Crowe of Johns Hopkins University in 1909.

Ichthyol: 1881, named by Rudolph Schroeter of Hamburg. He started the Ichthyol Company near Seefeld in the Tyrol. 1886, introduced into medicine by Unna.

Strophanthus: 1885, by Thomas Fraser.

Resorcin: 1886, introduced by Unna.

Suprarenal extract: 1894-5, introduced by G. Oliver and E. A. Schafer.

Adrenalin: 1901, by Takamine.

Salvarsan ("606"): 1909, by Ehrlich.

Luminal: a veronal derivative, introduced by the Germans. First reference in English is in *Lancet*, 1913, ii., p. 1180. It has been found useful in Epilepsy.

Emetin: its amœbicidal action was discovered by Edward Vedder, 1910-11. In 1912 definitely introduced for the treatment of amœbic dysentery by Leonard Rogers.

Two important new methods of administration are ionization, suggested by Edison in 1890, and introduced by Stephan Leduc in 1900; and the introduction within the body of metals in a colloidal form by Créde in 1901.

Synthesis of Drugs.—The most important work in this connection has been done by Emil Fischer in Berlin. He has prepared veronal, proponal, caffein, xanthin, and theobromin artificially.

The study of *antagonism of drugs* has not yet received the attention it merits, but a start has been made by McKendrick and others, who showed in 1875 that chloral antagonizes the action of strychnine, and that morphia is opposed to Calabar bean in its action.

For preparation of thyroid, etc., *vide* Glands.

1887.—" A Textbook of Pharmacology, Therapeutics, and Materia Medica," by T. L. Brunton.

1911.—" The British Pharmaceutical Codex."

Ductless Glands.—*Vide* Glands.

Dysentery.

Two distinct causes have been discovered which were not recognized in 1873.

1875.—Lösch found amœbæ abundant in the discharges in certain cases. Koch and Kartulis in Egypt differentiated between amœbic and the other form of dysentery.

1891.—The term " amœbic dysentery " was introduced by W. J. Councilman and H. A. Lafleur of Johns Hopkins Hospital.

1897.—Shiga discovered the bacillus that causes " bacillary dysentery." The amœbic type is endemic. the bacillary is an epidemic disease.

1903.—Schaudinn termed the "amœba" *Entamœba histolytica.*

1910.—Specific action of emetin in cases of amœbic dysentery was shown by E. B. Vedder of New York City, and in 1912 Sir Leonard Rogers in India established its use.

Magnesium sulphate and sodium sulphate, which are useless in amœbic dysentery, have been shown to be the most useful drugs in the bacillary or epidemic form of the disorder.

Ear.—*Vide* Mastoid.

Menière's Disease.—In 1906 Robert Bárány of Vienna published the results of his experiments on this disease, by which he claims to diagnose between vertigo due to cerebellar or ear disease.

By injecting hot or cold water into the ear he produces nystagmus, and the type of nystagmus shows whether the

lesion is of central (cerebellar) or peripheral (vestibular) origin.

1878-82.—" Diseases of the Ear," by A. Politzer; English translation, 1882.

1907-13.—" History of Otology," by Politzer.

Embryology.

Both human and comparative embryology have seen great and numerous advances during the last quarter of the nineteenth century particularly, and an immense amount of work has been done on the ovum and other cells, and on the developing embryo.

Cytology.—1876.—Van Beneden discovered the centrosome.

1880.—Walter Flemming described karyokinesis, a complicated process occurring during cell division, and in 1882 discovered that the chromosomes of the nucleus divide into two during the process.

1893.—Brauer made an important observation on the centrosome in *Ascaris megalocephala* (the thread-worm of the horse). He detected it in the resting nucleus, and found that sometimes it undergoes division therein.

Fertilization.—1875.—Butschli showed that the polar bodies are split off from the nucleus.

1875.—Oscar Hertwig proved that the spermatozoon enters the ovum, and that in fertilization there occurs a union of the male and female pronuclei.

1883.—Edward van Beneden discovered that of the associated male and female pronuclei in the fertilized egg, each contains half as many chromosomes as the normal body cells in the same species.

1887-90.—Theodar Boveri made an elaborate study of the multiplication of the fertilized ovum of *Ascaris megalocephala* (of the horse), and showed that the chromosomes differ in number in the cells according to their

ultimate destination as "germ cells" or "body cells." At the first division of the ovum into two cells, he found that one becomes the future germ cells, the other one gives origin to the body cells. He named the "centrosome" discovered by van Beneden.

1902.—Clarence Edwin Clung stated that the accessory chromosome is the determinant of sex; the ovum which receives it from the spermatozoon becomes a female, the ovum which does not receive it becomes a male. The accessory chromosome was first observed by Henking and Montgomery in certain spermatozoa.

Development of the Embryo.—1880-8.—The human embryo studied from carefully selected specimens was fully described for the first time by Wilhelm His.

The human embryo, during the course of its development, passes through certain stages, and possesses certain structures that are of a more or less temporary character, but which correspond to or "represent" corresponding permanent structures in some of the lower animals. Certain anatomists contend that such a course of development is only explicable on the assumption of man's descent from lower vertebrates and invertebrates, and that these temporary structures are a surviving record of types from which he has descended, and, in fact, that his ontogeny is a recapitulation of his phylogeny. This is known as the "recapitulation theory." The most powerful advocate of the theory is Ernst Haeckel (*vide* his "Riddle of the Universe" and "The Evolution of Man").

In 1884 Haeckel propounded his "gastræa theory"—viz., that the two-layered "gastrula" (seen in an early stage of the development of all the vertebrates and the higher invertebrates) is the analogue of the hypothetic ancestral form of all multicellular animals. Du Bois

Reymond has opposed this theory, but many eminent zoologists agree with Haeckel.

1872.—Haeckel gave the first sketch of his gastræa theory in his monograph on sponges.

Much light has been thrown on the origin and function of certain organs and structures—*e.g.*, suprarenal bodies, pituitary gland, etc.—by the study of comparative embryology.

1886.—W. His demonstrated embryologically that the axis cylinder process is an outgrowth from the nerve cell.

1908.—Gaskell maintained that the central canal of the spinal cord, and its continuation in the ventricles of the brain, formed originally the lumen of the primitive gut, the "neurenteric canal."

Experimental Embryology.—It is only during the period under consideration that embryology has entered on the experimental stage. Some extremely interesting facts have been observed. The founder of experimental embryology was Wilhelm Roux of Halle, a pupil of Virchow and Haeckel. In 1888 he published an account of his experiment of killing one of the initial blastomeres with a hot needle, and thereby producing a typical half-embryo.

He also noted that the whirling of the developing ovum in a machine does not alter the normal course of development.

1899.—Loeb (of U.S.A.) produced free-swimming larvæ of sea-urchins by treating the unfertilized egg with certain chemicals (strong saline solution).

1889.—Boveri produced an adult sea-urchin by fertilizing a non-nucleated portion of egg, but found that material characteristics were lacking in the resulting offspring. Other workers on the subject are Pflüger, Driesch, and T. H. Morgan.

From the results of recent experiments Hans Driesch has

formulated the theory that protoplasm is equally potential in every part, and therefore its energy cannot be purely mechanical, physical, or chemical, as any part of a mere machine cannot do the work of the whole mechanism.

Some of the principal publications on embryology are:

1880-1.—"Comparative Embryology," by Francis M. Balfour, which Garrison says is "a book of almost priceless value."

1910-12.—"Manual of Human Embryology," by Franz Kerbel, the best modern work.

1892.—"Human Embryology," by Charles S. Mimot of Harvard; also his

1903.—"Laboratory Textbook of Embryology," and

1908.—"Age, Growth, and Death."

Encephalitis Lethargica.

1917 (April 10).—First case reported by Economo in Vienna in *Wien. Med. Woch.*

1918 (April).—Dr. Hall in Sheffield and Dr. Wm. Harris in London reported the first cases in this country.

1918.—Netter of Paris reported some cases, and gave the name to the disease: "Encéphalite lethargique épidémique." The history of the disease is given in "Encéphalite Lethargique," by Prof. Achard (Paris).

Endocrine System.—*Vide* Glands.

Epilepsy, Jacksonian.

1875.—Described by Hughlings Jackson and named after him, although it had been described by Richard Bright in 1836.

Erythromelalgia.

1872 and 1878.—Described by S. Weir Mitchell of Philadelphia, and which he first termed "red neuralgia."

Ether, Intravenous injection of.

1909.—Introduced by Burkhardt. 7·5 per cent.

in normal saline should be introduced continuously. Apparatus for injection by F. S. Rood.

Eugenics.

This means the production of sound offspring from sound stock. The movement was initiated by Sir Francis Galton, who was one of the first to study heredity by the experimental method; he published his main conclusions in "Hereditary Genius" and "The Human Faculty." In 1904 he founded the Eugenic Laboratory in London, and with Karl Pearson and Professor Weldon in 1901 started the publication *Biometrica* for the recording of observations on genetics and eugenics.

Much attention has been paid to the physical, intellectual, and moral standard of the population, both individually and from the racial point of view; and there has arisen a very prevalent opinion that the standard is below what it ought to be and what it might be. Statistics show that the inferior classes (the "unfit," the feeble-minded, the criminal type) tend to increase, and very often do multiply at a greater rate—*i.e.*, they have larger families—than the better types of the population. The feeble-minded are reproducing their type much too abundantly; a large measure of help is given towards the maintenance of the offspring of poor stock, both from private and public funds. It is asserted that the better stock are unduly taxed and handicapped for the alleviation and sustenance of the poorer. The unemployed individual is far too often unemployable.

It is the aim of eugenists to change all this, to make the race better physically, mentally, and morally; and they maintain that the laws of heredity (*q.v.*) point out, with unmistakable clearness, the means that are to be adopted to this end. Various measures have been proposed, but so far none has met with unanimous acceptance. One

of the most drastic is sterilization of the unfit; another is segregation in colonies (*vide* Ovary).

Exophthalmic Goitre.—*Vide* Thyroid.

Eyes and Vision.

1873.—Ferdinand Cuignet introduced retinoscopy.

1874.—Silas Weir Mitchell was the first to draw attention to the connection between eye strain (especially from astigmatism) and headache and other neurotic symptoms.

1879.—Wm. Thomson published observations on the same condition.

1877.—Visual purple (rhodopsin) was discovered by Willy Kühne of Heidelberg.

1883.—Koch discovered that Egyptian conjunctivitis is due to a bacillus called Koch-Weeks' bacillus, because of its identity with the bacillus discovered by John E. Weeks as the cause of "pink-eye," in 1886.

1884.—Carl S. F. Crédé, Prof. in Leipzig, introduced his method of preventing ophthalmia neonatorum. He instils a 2 per cent. solution of argenti nitras into the palpebral fissure and over the eyeball immediately the child is born, for the purpose of killing any gonococci that may be present, and which have been demonstrated to be the cause of this serious inflammation of the eye, sometimes resulting in blindness.

1884.—Dr. Mules described his operation (evisceration).

The most notable recent work on ocular dioptrics has been done by Allvar Gullstrand of Upsala in Sweden, of which the following may be mentioned:

1908.—Dioptrics of the crystalline lens, showing the intracapsular mechanism.

1906.—The real optic image.

1889.—Method of estimating corneal astigmatism by a single observation.

1907.—Showed that the yellow colour of the macula is a post-morten change.

1912.—Devised reflexless stationary ophthalmoscope, which excludes all light not belonging to the ophthalmoscope, and gives a better and larger image.

1907.—Night-blindness. Large pedigree of this condition was published by Ed. Nettleship. This condition and amaurotic family idiocy (*q.v.*) are hereditary.

Filariasis.

Due to the *Filaria sanguinis hominis* discovered by Timothy Lewis in 1872.

1876.—Sir Patrick Manson, whilst in China, studied the relation of the mosquito to filaria. He discovered, by keeping up continuous observation by means of assistants working day and night, that the filariæ are only found in the blood (of man) at night, and not during the day. He showed also that the mosquito sucks in the filaria in an immature form from carriers' blood, and that it undergoes development to maturity in the body of the mosquito.

Dr. Low of the London School of Tropical Medicine showed that the developed filariæ pass into the proboscis of the mosquito, from which it is introduced into the body of its human host when he is bitten by the insect.

These discoveries were of paramount importance, and showed for the first time that disease organisms can be conveyed from man to man by an intermediary (*vide* Malaria).

Finsen Rays.

1893.—Introduced by Niels Ryberg Finsen and employed in phototherapy.

1896.—Finsen Institute opened in Copenhagen with

Finsen as director (*British Medical Journal*, September 30, 1899).

Food.—*Vide* Digestion, Vitamins, Metabolism.

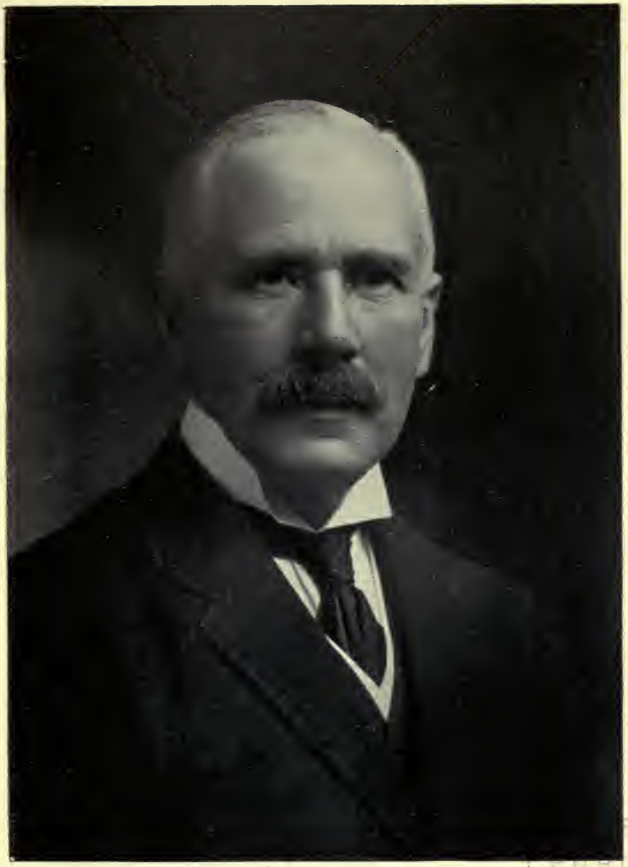
Fractures.

Diagnosis has been greatly aided by the employment of X rays, and it has been shown by this means that accurate apposition, even where there is not the least amount of visible or palpable deformity, is scarcely ever obtained by splints and bandages alone as a final result of treatment.

1892 and 1895.—To remedy this defect, or rather to prevent it, Sir Arbuthnot Lane introduced the method of securing the accurate apposition of the broken ends immediately after the injury, by means of metal plates and screws (of course, under strict antiseptic precautions), and obtained excellent results. Sometimes screws alone are used.

Bone Grafts for filling of gaps left by fracture or otherwise have been used in numerous instances by Murphy in America and by Sir Wm. MacEwen in this country. One fact has been definitely established—viz., that the graft must be autogenous, otherwise it is not likely to live. The lower jaw and large parts of the long bones have been renewed.

1911.—MacEwen published his book, "The Growth of Bone." Apparently he has established the fact that the periosteum does not (as hitherto stated) form bone, but rather serves to keep bone formation within proper bounds. Bone is formed only from the osteoblasts distributed throughout the bone, and particularly at the articular ends. In the young the bone of the shaft is formed at the epiphysis only—*i.e.*, it increases in length only in this region. New bone, when the entire thickness



SIR W. ARBUTHNOT LANE.

P. 50.

of the shaft is missing, is formed by extension from the ends into the gap. If the periosteum be destroyed, the osteoblasts may invade the surrounding muscles and fasciæ. This is more likely to occur if the parts are manipulated too soon after the injury. The brachialis anticus is the most frequently affected, and the condition has become more frequent since massage and early passive movement came into vogue, because these procedures disturb and distribute the osteoblasts. Passive movement and massage should not be commenced earlier than a fortnight after the fracture occurred.

Compound Fractures and compound comminuted fractures have been most successfully treated by continuous irrigation, by the Carrel-Dakin method, and many cases that would have been immediately amputated before the Great War have made excellent recoveries with useful limbs.

Ununited Fractures.—1903.—A. Bier employed an elastic bandage above the seat of fracture to produce passive hyperæmia and stimulation of the osteogenetic activity of the fractured ends and reunion.

1876.—Hugh Owen Thomas of Liverpool employed passive hyperæmia for the same purpose. Thyroid extract given internally has been found to stimulate the growth of new bone at the seat of fracture; and iodide of potassium, by stimulating the patient's thyroid gland, has also been found of service.

Gall Bladder.

Cholecystotomy.—1878.—Performed by Marion Sims. This was the second time the operation had been performed, the first having been done by Dr. Bobbs of Indianapolis in 1867. Sims's description of the details laid the foundation for the successful performance of this operation.

Cholecystectomy.—1882.—Proposed by Langenbüch, and since performed by him several times.

Cholecystenterostomy.—1882 (November 21).—First performed by Winiwarter in a case of permanent occlusion of the common bile duct.

Gas Gangrene.

Numerous cases of this occurred during the late war. It is produced by the introduction in a wound of the *Bacillus aerogenes capsulatus*, discovered by Welch in 1892.

Germs.

As the cause of disease *vide* Anthrax, Glanders, Rinderpest.

In 1873 there was little interest shown in germs, and the "germ theory" was regarded with doubt and looked upon more as a fad or curiosity than as something deserving serious attention from physicians. So long ago as 1546 Fracastori, in his work, "De Contagionibus," gave a clear statement of contagion and infection. He defined contagion as "an infection passing from one individual to another, the infection or virus being the same in both individuals." This approaches very near to Koch's "postulates," and only needs the word "living" introduced to make it conform to modern opinion. Moreover, he states that infection occurs in three ways: (1) By contact; (2) through an intermediate agent (*e.g.*, garments, "fomites," which term he introduced); (3) through the air. These still hold good. A hundred years later the great Sydenham expressed his opinion that smallpox is not contagious; it is a disease (he said) which had to be passed through for the purpose of renovating the blood (!). Yet Gilbertus Angelicus had stated that smallpox is contagious. The question would have remained

Photo : John Wickens, Bangor.

GRIFFITH EVANS.

unsettled till the present day except for the fact that Carl Weigert had succeeded in 1871 in staining bacteria, and in 1874 introduced his aniline dye stains, thus enabling observers to make discoveries which have thrown such a flood of light on the etiology of infectious diseases. In 1877 Pasteur, by his work on anthrax, proved the truth of the germ theory of the cause of infectious disease. The following are the principal discoveries during the last fifty years:

1873.—Relapsing fever: the spirillum was discovered by Otto Obermeier.

1878.—H. Vandyke Carter of the Indian Medical Service was the first to find the spirillum in relapsing fever patients in India, and later showed it is identical with the famine fever of India (*vide* Relapsing Fever).

1874.—Leprosy: bacillus discovered by Armauer Hansen of Bergen.

1875.—Dysentery: amœbæ discovered by Lösch (*vide* 1897).

1876.—Anthrax: life-history of bacillus demonstrated by Koch (*vide* Anthrax).

1877.—Malignant œdema: by Pasteur and Joubert. This was the first "anaerobe" discovered.

1879.—Puerperal and surgical infections: by Pasteur and Koch, continued by Gaffky in 1881 and by Welch in 1892.

1879.—Gonorrhœa: coccus by Albert Neisser.

1880.—*Trypanosoma Evansi:* by G. Evans in "surra." This was the first pathogenic trypanosome discovered.

1880.—Furunculus: Pasteur discovered *Staphylococcus pyogenes*. In the same year he also discovered streptococcus in puerperal septicæmia, and certain germs in pneumonia in January, 1881.

1880.—Typhoid: by Carl J. Eberth.

1880.—Pneumonia: diplococcus (Fraenkel's pneumococcus) discovered by George Miller Sternberg in September in the saliva. It was termed the "coccus of sputum septicæmia."

1884.—More fully described by Albert Fraenkel, and named after him.

1883.—Carl Friedländer discovered the pneumo-bacillus, which is sometimes present in lobar pneumonia. The pneumococcus is now regarded as the sole cause of the disease.

1882.—Glanders: by Löffler.

1882.—Tuberculosis: by Koch.

1883.—Erysipelas: by F. Fehleisen.

1883.—Cholera (Asiatic): comma vibrio by Koch.

1884.—Cholera nostras: D. Finkler and J. Prior discovered a bacillus known by their names.

1884.—Tetanus: by Nicolaier.

1886.—*Bacillus coli:* by T. Escherich.

1887.—Malta fever: Sir David Bruce found the germ in the goats which supply the milk to the inhabitants, and also in the milk itself. Almost every native suffers from the disease. In 1906 the goats were to a large extent banished from the island, and the disease soon abated. In 1917 the goats were again abundant, and the disease was rampant.

1887.—Cerebro-spinal meningitis, or "spotted fever": the meningococcus was discovered by Weichselbaum.

1888.—Gaertner isolated a bacillus from the diseased meat and body of a cow. It is very like the typhoid bacillus.

1889.—Texas fever: by Theobald Smith.

1892.—Influenza: by Pfeiffer.

1894.—Bubonic plague: by Kitasato and Yersin.

1897.—Dysentery: bacillary or epidemic form by the Japanese observer, Shiga.

Photo: J. Russell & Sons, London.

SIR DAVID BRUCE.

1893.—Paratyphoid and paracolon bacilli discovered.

1896.—Botulism: *Bacillus botulinus* by Van Emengem. The disease made its first recorded appearance in this country in August, 1922, when eight people, staying at an hotel in Scotland, died from eating infected food.

1898.—Foot and mouth disease of cattle: Löffler obtained the virus from the vesicles. The germ has not yet been seen, owing to its extremely minute size, which allows it to pass through the filter. This was the first observation of a "filterable virus," and since then other viruses, believed to be living germs, are found to be filterable; in all, eighteen diseases are known to be caused by this kind of germ.

1900.—Kala-azar, or dum-dum fever: Leishmann found the protozoon chiefly in the spleen.

1905.—Syphilis: the treponema or spirochæte was discovered by F. Schaudinn.

1905.—Yaws: Castellani discovered the *Treponema pertenue*, which is the cause of the disease, and which bears a close resemblance to that of syphilis, both in appearance and in its response to salvarsan.

1906.—Whooping-cough: by Bordet and Gengou. In 1887 Afanassjeff found a bacillus in the sputum. In 1893 Cohn and Neumann found a diplococcus; in 1897 Henry Koplik of New York confirmed Afanassjeff's observation.

The bibliography of bacteriology is immense, and I shall only refer to the following: "Bacteria and their Products," by G. Sims Woodhead; "Bacteria in Relation to Disease," by various authors, edited by Watson Cheyne; "Practical Bacteriology," by Muir and Ritchie.

Glanders.—*Vide* Germs.

Glands.

For ductless glands, *vide* Thyroid, Pituitary, etc.

Salivary Glands.—1878-9.—John N. Langley published observations on the changes in glands occurring during digestion.

1883.—Heidenhain published his observations, which quite revolutionized ideas as to glandular activity, not of the salivary only, but also of other similar glands—viz., those which pour out their secretion intermittently. He described the changes seen in the gland cells according to their action for the time being. During the resting stage the special products of the cells are elaborated from the blood, and stored in a granular or solid form in the interior of the cell. When the secretion is required for immediate use, the intracellular secretion is poured out into the lumen of the gland duct in a liquid form, and the cells become more or less collapsed. Pepsin, found in the gastric juice during digestion in the stomach, accumulates in the cells of the peptic glands in the resting stage in the form of pepsinogen.

In 1885 Langley wrote on paralytic secretion.

1886.—Langley wrote on pepsinogen and pepsin.

1876.—Kühne discovered and named trypsin.

Mammary Gland.—The secretion of milk is believed to be due to some hormone received from the fœtus or ovary. When one of the Siamese twins (women) gave birth to a child, both had milk in the breasts. Starling and Lane-Clayton have found that injection of extract of fœtal animals into a non-pregnant female of the same species produces hypertrophy of the mammary glands and a flow of milk. Lactation may continue after double ovariotomy.

Rendle Short states that "the only drug which increases the flow of milk is pituitary extract," and that neither belladonna nor pilocarpine, contrary to what has been generally believed, has any special action on the mammary

glands. The antiscorbutic element (vitamin) present in mother's milk is not synthesized in her own body, but has to be ingested with her food.

Glenard's Disease (or Enteroptosis).

1885.—Described by Franz Glenard.

Goitre.—*Vide* Thyroid.

Gonads.—*Vide* Ovary, Testis.

Gonorrhœa.

1879.—Neisser discovered the micro-organism—the "gonococcus." Gonorrhœal infection of the eye of the new-born has caused many cases of permanent total blindness, resulting from the intense inflammation of the surface of the eyeballs (conjunctivitis and keratitis), with subsequent opacity.

1884.—Franz Crédé introduced his preventive treatment of this terrible calamity; it consists in the application to the conjuctivæ of a few drops of a 2 per cent. solution of argenti nitras immediately after birth.

The prostate has been found to harbour the cocci (and pus), and to keep up the discharge and infectivity. Massage of the prostate by digital pressure from within the rectum is a useful procedure in such cases. Lavage of the urethra with solution of potassium permanganate seems to have been the most successful mode of treatment in the acute stages. It has been extensively employed in the Army, and can be administered by the patient himself (or herself).

Gonorrhœa causes disease of distant parts, complications or sequelæ, the most important of which are:

Arthritis, which may, and often does, lead to ankylosis.

Endocarditis. About 1895 J. W. Lazear first succeeded

in isolating the gonococcus in pure culture from a case of ulcerative endocarditis. It has since been found by other observers.

Sterility in women from pyosalpingitis. Preventive measures have lately been advised, especially during the war. Most reliance has been placed upon the use of a solution of perchloride of mercury.

E. P. Cumberbatch has recently shown that the gonococcus is killed by a temperature a little above 100° F. in cultivations. He has treated at St. Bartholomew's Hospital gonococcal infections by diathermy.

Injection of antityphoid serum (T.A.B.) has been recently employed in cases of gonorrhœa and gonorrhœal arthritis; introduced by Cecil.

1908.—"System of Syphilis," by D'Arcy Power and Murphy.

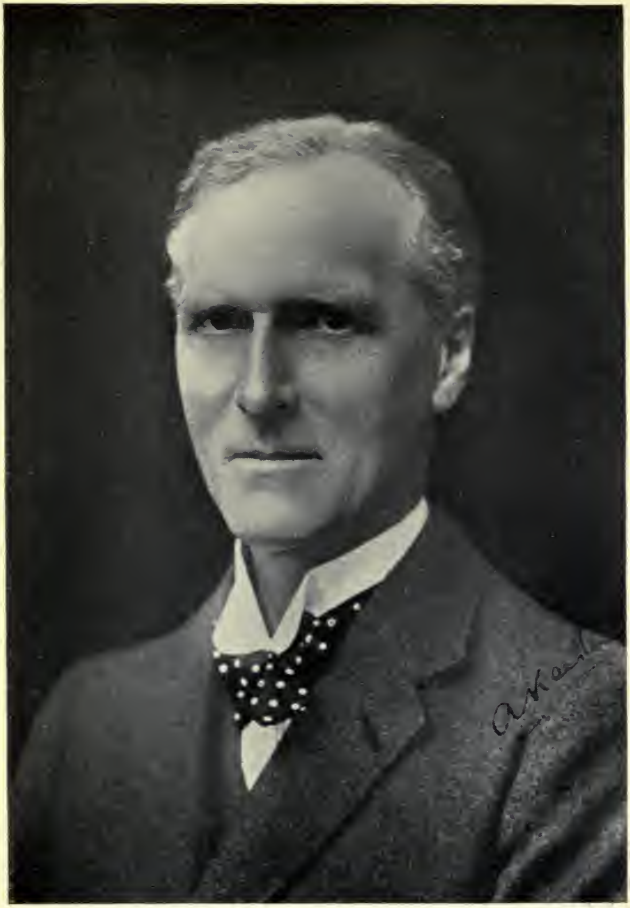
1918.—"The Diagnosis and Treatment of Venereal Diseases in General Practice," by L. W. Harrison, D.S.O., is perhaps the most authoritative recent publication. Harrison recommends vaccine therapy.

Graves' Disease.—*Vide* Thyroid.

Hæmophilia.—*Vide* Blood, Coagulation of.

Hæmorrhage.

1873.—Esmarch introduced his elastic "hæmostatic bandage" for the control of hæmorrhage during operations on the limbs (in place of the old tourniquet), and, later, a rubber tube tourniquet, now much employed on account of the ease with which it can be manipulated. It has been calculated that recovery may take place after a loss equal to about 40 per cent. of the total volume of blood in the body, if large quantities of fluid are taken by the mouth, and normal (warm) saline solution intro-



SIR ARTHUR KEITH.

duced per rectum. During recovery from hæmorrhage the red marrow encroaches upon the yellow marrow of the long bones, and reticulated red cells which are readily stained with cresyl blue appear in the blood.

Pituitary extract, which contracts the unstriped muscle of the bloodvessels, is found useful in controlling continued hæmorrhage from small vessels (*vide* Calcium).

Hay Fever.

1873.—Blackley showed that it is due, at any rate in the majority of cases, to the irritative action of pollen on the nasal mucous membrane. This was the initiation of many subsequent observations on the pathology of closely related conditions (*vide* Nose, Reflexes).

1886.—"Hay Fever, Asthma, and Allied Affections," by F. H. Bosworth. He says that in 1881 Dr. Daly of Pittsburg first drew attention to the coexistence of some local structural or functional disease of the nose or naso-pharynx.

Bosworth does not admit Bigelow's theory of the erectile nature of the inferior turbinated body.

Heart.

The heart has received much attention, and several interesting and important discoveries have been recorded in its anatomy, physiology, pathology, and therapeutics. In 1873, and for several years later, the great object in view was to decide whether or not a murmur or bruit was present, and if one was heard a bad prognosis was given. There may have been a few specialists of whom this was not true, but it certainly was true as regards the general practitioner, and is still true to a considerable extent. Instruments of precision were scarcely known, and still less employed.

1874.—It was discovered that the heart muscle cannot be tetanized, and that its contraction is "all or none" (Kronecker).

1881.—Gaskell showed that the innervation of the heart is the same in cold- and warm-blooded animals, that the vagus weakens as well as slows it, but that the heart's contraction is due to the power inherent in the heart muscle itself. The motor influences from the nerve ganglia in the sinus venosus influence the rate and force of the heart beat, but do not *originate* its movements, which are due to the automatic, rhythmic, contractile power of the heart muscle itself, and to the peristaltic contraction wave which proceeds from the sinus venosus to the bulbus arteriosus, and from muscle fibre to muscle fibre. He demonstrated rhythmic action in small isolated portions of the heart which contain no nerve fibres, and showed that the wave may be reversed in direction after applying the second Stannius ligature.

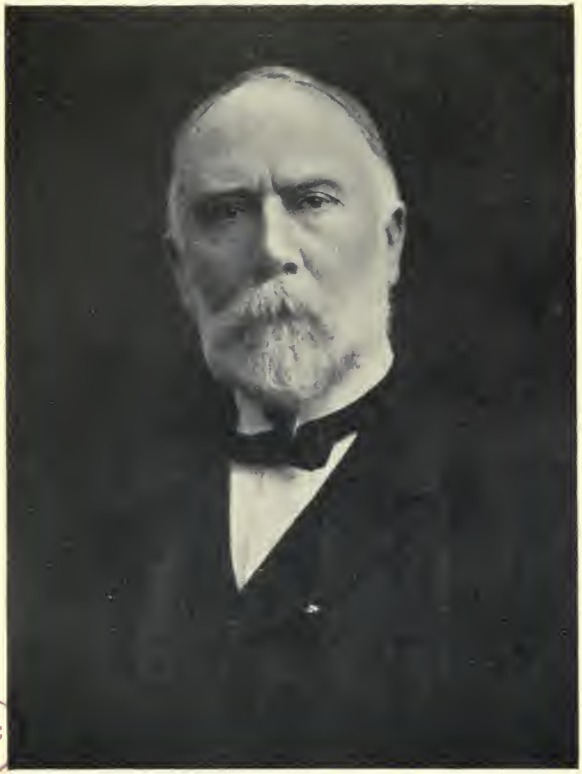
He introduced the term "heart block." He produced it experimentally in 1895. It occurs when the auriculo-ventricular bundle is destroyed (or diseased), causing the ventricle to beat at its own rate, which is much slower than that of the auricle, from which the contractive impulse is normally received.

1880.—Sydney Ringer showed that not only the heart of the frog, but also the mammalian heart, can be kept beating for a long time in a mixture of chloride of sodium, potassium, and calcium.

1893.—W. His, jun., discovered the auriculo-ventricular bundle, and

1907.—Arthur Keith and Flack discovered the sino-auricular node. This is now called "the pacemaker of the heart."

1893.—Gaskell showed that chloroform lowers blood-



SIR JAMES MACKENZIE.

pressure by acting directly on the heart, and not on the vaso-motor centre.

1893-4.—Sir James Mackenzie greatly advanced our knowledge of the pathology of the heart by raising the question, "How much work can the heart do that is under examination?" and showing how to answer it.

Dr. Thomas Lewis pursued the same theme. There have resulted from their labours a new standard, and definite tests are applied to show approximately the heart's capacity for work, the effect of a definite effort—*e.g.*, raising the whole body by stepping on to a chair twenty times, observing its effect on the rate of the pulse and the respiratory distress, and then observing these phenomena after two minutes' rest. This is called the "effort syndrome." It gives a good idea of the heart's recuperative power, and is regarded as much more important than the mere detection of a murmur. A systolic apical bruit is now considered of no pathological importance in the absence of other signs of cardiac disease—*e.g.*, aortic involvement, hypertrophy, recent acute rheumatism.

Auricular Fibrillation.—This is a condition that has only been understood (so far as it is yet understood) since the introduction of instruments of precision for registering the heart's action, especially of the auricles. The term was first used by Dr. Thomas Lewis.

1910.—Dr. James Mackenzie found digitalis by far the most useful drug for fibrillation; its action is effective and prompt, restoring the normal rhythm. Digitalis (digitoxin) must be given in full doses until the desired effect is produced.

Erlanger of the Johns Hopkins University has shown that the rhythm of the heart can be altered by compression of the auriculo-ventricular bundle, so as to produce a gradually increasing degree of heart block.

In 1903 William Einthoven of Leyden invented the string galvanometer, and shortly afterwards Thomas Lewis used this in his electrocardiograph.

Syncope.—Where this is profound the injection of adrenalin into the ventricular wall has been found very efficacious, causing the heart to recommence beating after complete cessation. Some prefer atropine. Manual compression has also been employed.

Angina Pectoris.—1920.—Walter Vernon has shown very clearly that in many cases—perhaps the majority—angina pectoris is a gastric reflex. Disease of the coronary arteries is not always or generally present.

Valvular Disease—Etiology.—Just as disease of the valves may be produced by the etiological factor of acute rheumatism, so also it undoubtedly arises from other poisons, especially the gonococcus, and there is good ground for associating it with pyorrhœa from dental caries.

Heredity.—*Vide* Embryology, Eugenics.

An enormous amount of work has been done on this subject, and a voluminous literature published during the last four decades. The tremendous impetus caused by Darwin's "Origin of Species by Means of Natural Selection" gradually effected the conversion of the biologist to the truth of the Darwinian theory, but some recent observations have tended to modify the theory to some extent.

1901.—Hugo de Vries propounded his "mutation theory," according to which there sometimes occurs a jump in the evolution of some member or members of a species—a kind of "sport"—and the modification, becoming fixed, gives origin to a new species.

By far the most important work on heredity since the "Origin of Species" was done by Gregor Mendel, an Austrian monk, who published in

WILLIAM BATESON, F.R.S.

1865 his "Versuche über Pflanzen Hybriden." This important work remained quite unknown to the scientific world until the year

1900, when it was rediscovered, and its results confirmed independently, by De Vries, Correns, and Tschermak. They made it known on the Continent, and in

1902 Professor W. Bateson of Cambridge issued an English translation. Mendel's experiments consisted in producing cross-fertilization between two individuals showing contrasting characters, such as tallness and dwarfness in peas, coloured and colourless flowers, etc. If these contrasted characters be represented by a and b respectively, then he obtained the following result: $(a+b)^2=a^2+2ab+b^2$. This has been found to hold true of a great number of contrasted characters, or, as they are termed, "allelomorphic pairs," not only in plants, but also in animals and in man. This is now termed "Mendelian inheritance." Of the contrasted characters, one is termed "dominant," the other "recessive."

In man, several anatomical and other congenital characteristics have been found to be inherited in accordance with the Mendelian law or ratio, some being dominant and others recessive—*e.g.*, eye colour : brachydactyly : nyctalopia : feeble-mindedness.

Bateson and Punnett have propounded what is known as the "presence and absence theory" as an explanation of the Mendelian ratios. Sir Francis Galton began the study of heredity experimentally; he studied the inheritance of colour-spots in Bassett hounds, and came to the conclusion that the Lamarckian theory of the inheritance of acquired characters is not true.

1889.—In "Natural Inheritance" Galton propounded the law of "filial regression" and the law of "ancestral

inheritance." He founded the science of eugenics, and introduced the term.

1901.—*Biometrica*, founded by Galton, Karl Pearson, and Weldon.

1885.—A. Weismann published his celebrated "Memoirs," in which he explained inheritance by the theory that the germ plasm is directly continuous from parent to offspring, the character of the offspring being dependent upon the factors present in the germ plasm from which it has grown. On this theory, "acquired characters" (such as are due to environment) cannot be inherited. This theory has commanded a good deal of support, but several competent biologists are strongly opposed to it.

Polydactylism shows certain hereditary features, but the condition does not "breed true."

Anthropology.—*Homo rhodesiensis*, found about 300 miles north of the Zambesi in 1921, and described by Prof. Elliot Smith, is said to be older than the Neanderthal skull, and to have a capacity of only two-thirds that of the modern European.

Books on Mendelism by Bateson, Punnett, Darbyshire, and several American authors. "The Jukes," 1877, by Dugdale, gives an account of this family, in which criminal and other undesirable characters are markedly inherited. The same thing is illustrated by "The Hill Folk" and "The Nam Family," both of which give extensive pedigrees (Eugenics Record Office Memoirs, Nos. 1 and 2, 1912).

Hernia.

1880-5.—Professor John Wood developed the "radical cure." He introduced kangaroo tendon.

Bassini split the external oblique aponeurosis over the canal in order to facilitate access to the highest part of the

sac. Mitchell Banks and Macewen were careful to protect this aponeurosis.

1887.—Macewen introduced his radical operation for oblique inguinal hernia.

1903.—Halsted introduced a modification.

Hip Joint, Arthritis of.

Sometimes this is mistaken for, and called, sciatica. Patrick has introduced a diagnostic test. In arthritis it is found impossible (without great pain) to rotate the hip fully outwards with the ankle (of affected side) crossed over the opposite knee. He calls this the "fabere" sign (*f*lexion-*ab*duction-*e*xternal *r*otation). The man cannot sit in the tailor's posture. In sciatica the thigh can be rotated outwards to the normal extent.

Congenital Dislocation of Hip Joints.—In 1895 Adolf Lorenz introduced his bloodless method of reduction, consisting in rupturing the taut muscles with blows of the ulnar edge of the palm, and then fixation in plaster in fully abducted position. "The percentage with adequate treatment of complete recoveries is very great, and one is able to do away with the marked lordosis and ugly 'wobbling'" (Sir Robert Jones in letter to author, October 4, 1922).

History of Medicine.

There has been considerable interest manifested in this subject during recent years. Large and scholarly works showing laborious research have been written on medicine and surgery and other branches.

1875-82.—A good start was made by Haeser's "Lehrbuch der Geschichte der Medicin und der epidemischen Krankheiten," which brought the history of medicine and of epidemic diseases up to date. The most interesting

and readable books on the general history of medicine are the following:

1889.—By Theodor Puschmann.

1889.—By Johann H. Baas, translated into English in 1910 by Dr. H. E. Handerson.

1906.—By Max Neuberger of Vienna, translated by Ernest Playfair in 1910.

1913.—By F. H. Garrison, third edition, 1921. By far the most interesting work on the subject. It is illustrated with numerous portraits, etc.

1905.—Sir T. C. Allbutt, "The Historical Relations of Medicine and Surgery to the End of the Sixteenth Century."

1909.—Sir T. C. Allbutt, "Greek Medicine in Rome."

1883.*—"Geographical and Historical Pathology," by Hirsch.

1880-95.—"Index Catalogue of the Surgeon-General's Office, Washington." "The most exhaustive piece of medical bibliography ever undertaken" (Garrison).

1894.—"The Medical Profession," by Edward T. Withington (London). A very readable book, and comprehensive.

1895.—"History of Surgery," by John S. Billings in "Dennis's System of Surgery." "The best history of surgery in English" (Garrison).

1898.—"Geschichte der Chirurgie" till the end of the Renaissance period, a very exhaustive work, by Ernest Julius Gurlt.

1897 —Dr. Franz Spaet published in German a translation (F. Bauermeister, Glasgow) of a manuscript recently found by Mr. F. G. Kenyon, of the British Museum, amongst some papyri from Egypt. It seems to have been a student's notebook containing notes of lectures

* W. Syd. Soc. Transl.: First German edition, 1864.

by a Greek professor. It contains extracts from a treatise by Menon, a disciple of Aristotle, and expresses the medical doctrines of Aristotle, though not compiled by him. It gives the names of Greek physicians unknown hitherto. The author of this manuscript is now called *Anonymus Londinensis*. Aristotle here shows that Hippocrates had a highly speculative as well as a practical side. His speculations are the same as those contained in some of his books that have been considered spurious, one of which is that all diseases are caused by the pneuma or wind acting in various ways on the organs.

1901.—Michael Foster's charming "Lectures on the History of Physiology."

1902.—W. Stirling's "Some Apostles of Physiology."

1902-5.—Rudolf Herzog of Tübingen discovered the remains of the Asclepieion at Cos, and Dr. Caton of Liverpool has reconstructed the plan of these ancient temples of medicine.

1909.—"Malaria and Greek History," by W. H. S. Jones. Here he argues that the loss by Greece of its ancient supremacy was due to the ravages of malaria.

1909.—Prof. Karl Sudhoff's "Greek Papyri of the Alexandrian Period" and, 1908, "Early Anatomical Illustration."

1913.—"The Midwifery Forceps: Historical Sketch," by K. R. Drinkwater.

For history of syphilis, *vide* Syphilis.

Dealing with British Medicine:

1903.—J. F. Payne's "Anglo-Saxon Medicine."

1908.—Norman Moore's "History of the Study of Medicine in the British Isles."

1886.—John F. South's "A History of the Craft of Surgery." Edited by D'Arcy Power.

1886.—Sir Ch. A. Cameron's "History of the Royal College of Surgeons of Ireland."

1894.—Charles Creighton's "History of Epidemics in Great Britain."

1895.—The *British Medical Journal* gives "History of the Medical Institutions of London."

Dealing with Medical Biography may be mentioned:

1912.—Howard A. Kelly's "Cyclopædia of American Medical Biography," with numerous portraits.

1878.—Munk's "Roll of Royal College of Physicians of London" (second edition).

1882.—"The Chamberlens and the Midwifery Forceps," by Aveling.

1897.—D'Arcy Power's "Life of Harvey," and, 1910, "Arderne."

1899.—M. Foster s "Claude Bernard."

1897.—H. Laing Gordon's "Life of Sir James Y. Simpson."

1899.—"Life of Helmholtz," by McKendrick.

1900.—"Sydenham," by F. Payne.

1909.—Sinclair's "Life of Semmelweis."

1900.—V. Radot's "Life of Pasteur." English translation, 1911.

1916.—"The Modern Descendants of Dr. Peter Chamberlen," by H. Drinkwater.

Several of the last-named works, though primarily biographical, are historical from the medical point of view, and therefore contain a good deal of information on contemporary medical opinion and practice.

In 1877 the manuscript of Harvey's lectures on the heart was rediscovered in the British Museum.

In 1905 the Institut für Geschichte der Medicin at Leipzig was founded by Karl Sudhoff.

Photo: J. Russell & Sons, London.

SIR D'ARCY POWER.

Julius Pagel of Berlin has edited the writings of Mondeville, 1892, and Mesuë, 1893.

In 1897 the first medical history chair in this country was founded in Edinburgh University, and Dr. John D. Comrie was appointed lecturer in 1898.

Hookworm Disease.

1890.—Arthur Looss showed that the larva enters the skin.

1903.—Ashford discovered it in Porto Rico.

1892.—Charles W. Stiles showed that the disease, as seen in America, is due to *Uncinaria americana*. Stiles and Ashford devised prophylaxis. During Ashford's campaign in Porto Rico 300,000 inhabitants were treated, with 90 per cent. reduction in mortality.

In 1921 Hall, a veterinary surgeon of Washington, suggested carbon tetrachloride for treatment. His plan has been adopted in Fiji, and found to be very efficacious.

Hormones.—*Vide* Glands.

These are substances produced in various organs of the body for the purpose of acting upon some other distant organ or series of organs to stimulate them to their own special form of activity. So far as is at present known, the hormones are *chiefly* produced by the endocrine glands—*e.g.* suprarenal, pituitary; the intestinal mucous membrane produces a hormone which "activates" the pancreas.

Hospitals.—*Vide* Tuberculosis.

The hospitals of to-day are very different to those of fifty years ago. At that time they consisted of blocks of two or three stories of small dingy rooms, with narrow dark passages. They were often very dirty and dusty, and situated in densely crowded areas. In many cases, alas! they were veritable death-traps, where

the mortality after major operations and accouchements was much higher than in private houses. All this has undergone a great change, and our chief hospitals of to-day are models of scientific construction, and the results of treatment are correspondingly better.

Many new general and special hospitals have been opened. In 1889 a great advance in hospital construction was exemplified by the Johns Hopkins Hospital opened in that year. It was planned by John S. Billings on the pavilion principle. He also planned the Peter Bent Brigham Hospital on similar lines, opened in 1913. These mark a great advance on the many-storied buildings.

The old hospital wards had papered or painted walls; the walls of the newest hospitals are lined with glazed tiles, and so are the corridors. There are few acute angles to collect dust.

The operating theatre has undergone transformation—good lighting, copious supply of hot and cold water, "aseptic walls."

Smyly in Dublin introduced a glass screen to separate the students and other onlookers from the operating area. Aseptic overalls, face masks, gloved hands, and strict antisepsis and asepsis are all new.

Hydrophobia.—*Vide* Brain, Rabies.

Hygiene.—*Vide* Sanitation.

Hypnotics.—*Vide* Drugs.

Hypnotism.—*Vide* Psychology.

Hypodermic Injection.

The syringe was introduced by Francis Rynd in 1845, and Ch. G. Pravaz in 1851.

1878.—Tablet triburates were invented and introduced by Robert M. Fuller of Philadelphia.

1890.—Guido Baccelli employed quinine injections in malarial fever, and in 1894 corrosive sublimate in syphilis.

1901.—Benno Crédé employed colloidal metals.

1900.—Robert Gersuny, an Austrian surgeon, introduced solid paraffin for certain deformities, especially of the nose. It was melted by heat, and injected whilst still warm enough to flow through the syringe. In some cases the result was good, but sometimes serious danger to the eye resulted. I have seen blindness follow the injection.

Hysteria.

No one has illuminated this subject so much as Jean-Martin Charcot between 1879 and 1885. He studied the sensory, motor, and psychic phenomena.

1877.—S. Weir Mitchell announced his special treatment in "Fat and Blood."

Ichthyol.—*Vide* Drugs.

Immunity.—*Vide* Diphtheria, Blood, Germs.

Immunity is that condition of the body which results from an attack of fever or other disease which renders it more or less *in*susceptible to a subsequent attack. This condition may persist for a long time, as after smallpox, typhus, and, generally, scarlet fever and pneumonia. Sometimes immunity is conferred for a very short time only, as after influenza. Sometimes there is no immunity conferred, but rather the opposite condition—an increased susceptibility, as in the case of asthma and a common cold. Various theories have been propounded to explain the mechanism of immunity, as those of Ehrlich, Metchnikoff, and Bordet; but as these are so discordant, and nothing is really definitely known on the subject, I shall not discuss or outline them. The fact of prime importance is that in certain cases immunity can be produced

artificially, and this without doubt constitutes one of the most notable and remarkable discoveries in modern medicine, and is a triumph of the experimental method.

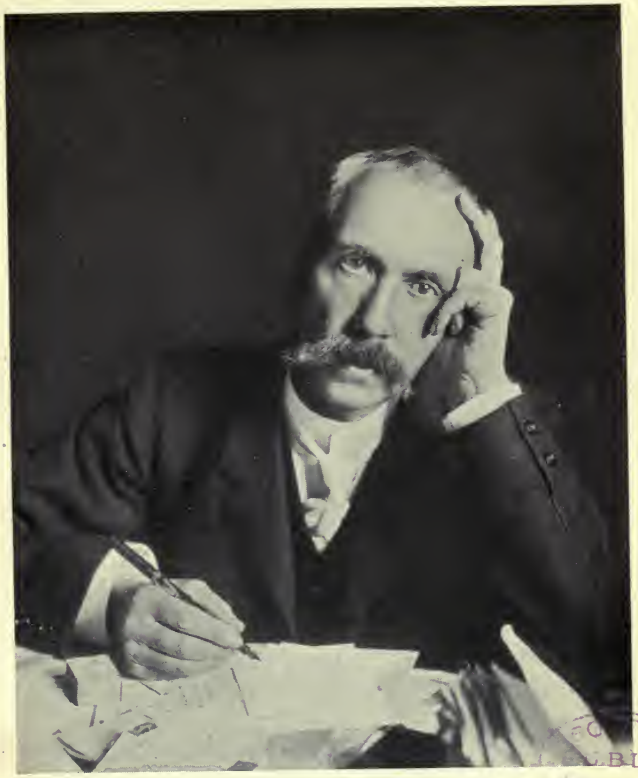
1886.—Theobald Smith performed the first experiments in immunization, and showed, with D. E. Salmon, that immunity from hog cholera can be conferred by injecting the filtrate of the specific organisms into susceptible animals.

1888 (November 5).—The fundamental experiment was performed by Charles Richet, a French physician (*vide* the *British Medical Journal* for September 18, 1897). Mons. Chauveau, he says, showed in 1887 that Algerian sheep, unlike French sheep, are refractory to anthrax. He "framed the hypothesis that the cause of the immunity of the Algerian sheep . . . depended upon chemical substances contained in the blood, and that in consequence we might hope to confer immunity on French sheep by transfusing into them the blood of the Algerian sheep." He experimented with Héricourt "on the dog and rabbit, first by intraperitoneal transfusion (for perfusion into the veins rapidly causes death); in this way . . . rabbits transfused with the blood of the normal dog survived the inoculation of the microbe of *Streptococcus pyosepticus* for four or five days; and rabbits transfused with the blood of a dog vaccinated against the microbe did not die, and were, in fact, hardly ill at all." He adds: "This experiment . . . seems to me the very basis of serum therapeutics." It shows that the blood of animals which are refractory to certain microbes contains substances which counteract the effects of the microbe.

1889.—Emil Behring discovered antitoxin (diphtheria).

1893.—Emil Behring first used it in the human subject.

1882.—Metchnikoff discovered phagocytosis, and propounded his theory of intracellular digestion, by which



CHARLES RICHET

means the bacteria are dissolved and produce some antitoxic substance. In 1895 he showed that bacteriolysis (Pfeiffer's phenomenon) can occur *in vitro*. His work contributed largely to the foundation of vaccinotherapy.

1885.—Ehrlich announced his "side-chain theory."

1888.—George H. F. Nuttall of San Francisco showed the bactericidal powers of *blood-serum;* confirmed in 1889 by Hans Buchner.

1894.—He (Nuttall) showed that different kinds of blood can be identified by the "precipitin" test (*vide* Blood).

1896.—Bacterial agglutinations discovered by Max Gruber.

1894.—Bacteriolysis discovered by Richard Pfeiffer.

1898.—Bacterial hæmolysis by Bordet.

1875.—L. Landois discovered that animal serum will hæmolyze human blood.

1892.—Maragliano discovered that the sera of normal donors will hæmolyze alien blood. This was confirmed by Landsteiner (1901) and by Eisenberg (1901).

This has revolutionized the whole subject of blood-transfusion. As R. Short says, in speaking of transfusion for hæmophilia, "It will not do to use animal blood, because bloods of different species are mutually destructive." Individuals may be divided into four groups as regards their blood.

1900-1.—Bordet and Gengou discovered fixation of "complement."

1890.—Behring and Kitasato, working at immunity in Koch's laboratory, made the following statement: "Our researches on diphtheria and tetanus have led us to the question of immunity and cure of these two diseases, and we succeeded in curing infected animals, so that they have become incapable of contracting diphtheria and tetanus."

Roux and Yersin were working at the same subject at the same time, and announced the same results in 1894.

Susceptibility to Foreign Proteins.—1880.—Schmidt-Mülheim began to inject with peptone. This has been extensively employed by Dr. Auld of London and others in the treatment of spasmodic asthma with considerable success. Various respiratory and gastro-intestinal troubles are now regarded as reflex manifestations of susceptibility to certain articles of food and foreign substances, and the susceptibility can be detected in numerous instances by applying these substances to minute abrasions of the skin, whereby a more or less definite reaction is elicited. If the reaction indicative of idiosyncrasy or special susceptibility appears, it is to be followed either by abstention from the offending article of diet, or the avoidance of it if foreign (*e.g.*, horse-hair, etc.); or, if it is considered a desirable article of food (*e.g.*, eggs, lettuce, etc.), then a very small quantity may be injected subcutaneously, or given by the mouth, and the dose gradually increased until tolerance is established. The whole subject is now being carefully studied, and it is likely that definite facts of practical utility will be announced.

Infantile Paralysis.—*Vide* Orthopædics.

Infantile Scurvy.—*Vide* Barlow's Disease.

Infantilism.

Infantilism may be due to a temporary delay in development or a permanent arrest. Its exact pathology is not fully understood, but there seem to be several contributory factors. In some cases it is a manifestation of congenital syphilis; in others it is due to some endocrine abnormality, especially hypopituitarism.

Ateliosis is the term often used, whilst *progeria* is applied

when there is a marked tendency to presenility, giving the appearance of an old man to a youth in his teens. In some cases there is sexual delay until about the time of puberty, which itself may be postponed. This is known as the Lorain type. In others the sexual organs are permanently abortive. "Fröhlich's syndrome" is the combination of adiposity with skeletal and sexual infantilism. It is also called *dystrophia adiposo-genitalis*.

Hastings Gilford of Reading has made a particular study of infantilism, and has written on progeria (1897) and ateliosis (1902).

Internal Secretions.

The term was introduced by Claude Bernard more than fifty years ago in connection with the glycogenic function of the liver. In 1873 practically nothing further was known on the subject. Then in 1889 Mering and Minkowski produced diabetes by excision of the pancreas.

See the various ductless glands—pancreas, etc.

Intestinal Peristalsis.

1896.—Franklin P. Mall showed that it occurs in a definite direction—viz., towards the rectum—and that after section food accumulates above the point of section.

1899.—Bayliss and Starling showed that it is a reflex through the intrinsic ganglia.

1902.—W. B. Cannon observed peristaltic movement by means of X rays. Since then it has been carefully studied by expert radiographers for diagnostic purposes, especially in connection with gastric and duodenal disorders, a bismuth meal being administered beforehand, and its progress watched by the X-ray shadow.

1912-13.—Roger Glénard showed that the rabbit's gut still performs peristaltic movement after removal from the body if perfused with Locke's fluid.

1920.—If for any reason the contents of the ileum or jejunum are unable to pass along, dangerous toxins rapidly accumulate (Rendle Short). This occurs if a 6-inch loop of dog's intestine is isolated and closed at both ends, and the continuity of the rest of the gut restored, so that there is no "obstruction." This throws light on the modern view that many disorders are due to intestinal sepsis (*vide* Metchnikoff s work).

Intestines.—*Vide* Surgery for Anastomosis.

For the flora, *vide* Germs.

1885.—"Anatomy of the Intestinal Canal and Peritoneum in Man," by F. Treves.

1899.—"Intestinal Obstruction," by F. Treves.

Iodine.—*Vide* Antiseptics.

Ionotherapy.

1890.—Suggested by Edison.

1900.—Introduced by Stéphane Leduc of Nantes.

Joints.—*Vide* Surgery.

Kala-Azar.

1900.—Leishman discovered a protozoon in the dead body.

1903.—C. Donovan obtained the same by splenic puncture during life. It is now called the Leishman-Donovan body.

Kernig's Sign.

In cerebro-spinal meningitis. Described by him in 1884.

Kidney.

In 1873 nephrectomy—excision of the kidney—was coming into vogue, the first case having been reported by

Gustav Simon in 1869. His second case died of sepsis, as also did that of Paul von Brun of Tübingen, operated on in 1878. These untoward results put the operation out of favour until antiseptic methods made it practicable. Garrison says that E. B. Walcott of New York was the first to excise the kidney in 1861.

Nephrolithotomy.—**1880** (February 11).—Sir Henry Morris performed the first successful operation of removal of a renal calculus. The stone was reached through the renal parenchyma. This was the starting-point of renal conservative surgery. He also performed fixation of **floating kidney** with good results. This operation was first performed by Hahn of Berlin in April, 1881. The French term this operation "nephropexy," or "nephrorrhaphy." Both these operations have been frequently performed in recent years.

Renal Tumour.—**1884.**—P. Gravitz showed that it frequently arises from suprarenal tissues.

1892.—Brown-Sequard asserted that the kidney produces an internal secretion.

1901.—G. M. Edebohls of U.S.A. introduced decapsulation for chronic Bright's disease and for puerperal eclampsia.

1901.—"Surgical Diseases of the Kidney and Ureter," by Henry Morris.

Albumosuria.—**1848.**—Discovered by Bence-Jones. Bradshaw's test (*vide* Urine).

Transplantation of kidney from one animal to another has been performed successfully by Carrel, of the Rockefeller Institute. So skilfully has this operator performed the experiment that in one instance urine was observed to flow down the ureter before the completion of the operation. It does not seem to have been so far performed in the human subject.

Urine.—In 1873 the urine was examined for specific gravity, reaction, albumen, sugar and casts, and rarely further than this.

1877.—Max Jaffé discovered indicanuria.

1880.—Heidenhain contended that urine is a secretion, in opposition to Ludwig's filtration theory.

1882.—Ehrlich introduced the diazo-reaction for the diagnosis of typhoid fever. Diazobenzene sulphonic acid+ammonia give a deep red colour to the urine of typhoid cases. It is not so reliable as Widal's test (1896).

1885.—Rudolf v. Jaksch wrote on acetonuria and diaceturia.

1893.—F. G. Hopkins introduced his method of estimating uric acid.

1895.—Ernst Salkowski wrote on pentosuria.

1910.—Rowntree and Geraghty introduced the phenolphthalein test for renal disease.

Oxalates, which are usually formed from the food, especially vegetables, were shown by Miss Helen Baldwin to come in certain cases from the bacterial decomposition of carbohydrates. They are not formed on a milk diet.

Salicyl sulphonic acid has been introduced as a delicate test for proteins. Earliest reference found is in *Roch, Pharm. Centralb.*, 1889, vol. xxx., p. 549.

Acidosis.—The presence of acetone in excess in the blood is now found to be frequently associated with, and to be the cause of, cyclical vomiting (*vide* Acetone).

Knee (Genu valgum).—Macween's operation, introduced about 1882, has superseded all others.

Koplic's Spots.—*Vide* Measles.

Laboratories.

These have greatly increased in numbers since 1873, when they were limited to the department of chemistry.

They are now established in connection with most departments.

1882.—John Chiene started in Edinburgh the first teaching laboratory for bacteriology.

Larynx.

1885-8.—Intubation perfected by Joseph P. O'Dwyer of Cleveland, Ohio. This was intended to replace tracheotomy, but it has not come into general favour, though spoken highly of by those who practise it.

Cancer of Larynx.—1873.—Billroth did excision on a woman; she lived a few months afterwards.

1879.—Krishaber recognized two classes—namely, "intrinsic" and "extrinsic" cancer. It is an important distinction from an operative point of view. Most cases are intrinsic, and a large percentage of these are curable. The intrinsic are "those that begin in the vocal cords, ventricles, ventricular bands, or interarytenoid space."

The "extrinsic" are those that begin elsewhere; *vide* article on laryngo-fissure by St. Clair-Thomson of King's College in the *British Medical Journal* for February 17, 1912.

1880-4.—Morell Mackenzie's work, "Manual of Diseases of the Throat and Nose," gave great impetus to the study of the subject.

Leprosy.

1873.—It was declared not to be infectious, but hereditary. Some time afterwards the Board of Trade ordered the stoppage of segregation of lepers.

1874.—Hansen of Bergen, where the disease is endemic, discovered the germ (*Bacillus leprœ*), and refuted the hereditary theory. He showed that the bacilli are discharged from the mouth and nose of the patient in coughing.

1922.—In the *British Medical Journal*, June 24, Sir Leonard Rogers gave the history of the spread of leprosy in India and Egypt from the year 1400 B.C.

Litholapaxy.—*Vide* Bladder, Calculus.

Lumbar Puncture.

1895.—Heinrich Quincke introduced it for diagnostic purposes (*vide* Anæsthetics).

Malaria.

The recent story of the medical aspects of this disease forms one of the most brilliant chapters in the whole of medical history. Old theories have been completely revolutionized or destroyed, and the disease can now be traced through all its stages. It is found to be one of those diseases for the production of which two quite distinct hosts are necessary. As the name implies, it was once regarded as due to the breathing of bad air, especially the air of marshy districts, such as the country immediately to the south of Rome, known as the Roman Campagna, where the disease has been prevalent for centuries. Thanks to the scientific researches of Laveran, Sir Patrick Manson, and Sir Ronald Ross, and the practical demonstration of Drs. Sambon and Low, some districts that were hotbeds of malaria have now been completely freed from it and rendered salubrious, and other localities are rapidly being improved. No one dreamed of such a thing fifty years ago. The starting-point in this important work was made on November 6.

1880.—Alphonse Laveran, a medical officer in the service of the French Government, discovered in Algiers a flagellate organism in the blood of malarial patients, and expressed the opinion that it was the malarial parasite. His discovery was much discussed at the time, and it remained barren for several years.

Photo: Maull & Fox, London.

SIR RONALD ROSS.

R. Newstead, del.

MALARIA MOSQUITO (*Anopheles*), SHOWN THE NATURAL SIZE IN THE UPPER FIGURE.

Note the characteristic, almost vertical, attitude of the body of the insect. The wings are speckled, and the terminal segment of the hind leg is white.

ETTORE MARCHIAFAVA.

1884.—Marchiafava observed amœboid movements of the parasite inside the red blood-corpuscles.

1885-6.—Camillo Golgi showed that there is a difference between the parasite of tertian and that of quartan ague.

1885.—He also observed that the paroxysms of ague coincide with sporulation of the parasite. This was later confirmed by Osler.

1889.—Marchiafava and Celli showed that the parasite of pernicious fever in Rome, in summer and autumn, differs from the other two, and can be differentiated at an early stage of the attack.

1891.—Marchiafava and Bignami showed that the bad types are all either quotidian or tertian.

1890.—Golgi worked out the schizogony of the sexual phase. So far observation was confined to the parasite in man; then in

1894.—Manson made a brilliant suggestion—viz., that the first stage of the organism outside the human body might be passed in the mosquito. He was convinced that some blood-sucking insect acted as intermediary, as the plasmodium was confined to the red blood-corpuscles, and therefore could not leave the body unaided. He was then in London, and financial considerations prevented him going to a malarial district to test the truth of his theory. He was led to this opinion about the rôle of the mosquito in consequence of his work on filariasis (*q.v.*). Manson suggested that Ronald Ross should undertake the investigation.

1895.—Ross went to India for this purpose. His first observations were on birds and mosquitoes. He traced the parasite from bird to insect, and then from the mosquito back to birds.

1897.—Ross made the epoch-making discovery of the way the parasite gets into the blood of man. He traced

its development in the stomach of the mosquito, from thence to its salivary glands and proboscis, from which it enters the human body when the insect bites. He infected a mosquito with human malarial blood, and then, after the lapse of the requisite time, allowed the insect to bite unaffected patients, and saw the disease follow in due course. He showed that the special mosquito is a species of Anopheles.

1897-8.—MacCallum and Opie demonstrated sexual conjugation in the flagellate forms.

1899.—Grassi, Bignami, and Bastianelli showed that the human parasites develop only in the genus Anopheles.

Ross was the first to undertake antimalarial work.

Celli was instrumental in organizing sanitary improvements in the Roman Campagna for the suppression of malaria.

The essential thing is the prevention of the breeding of mosquitoes by not affording them suitable breeding-places, such as small collections of stagnant water where larvæ are developed, as in the case of the common gnat.

One specially useful measure is to pour oil (paraffin) on to the surface of patches of water that cannot be perfectly drained. Old cans must not collect water; tubs should be covered. These measures were specially insisted upon by Sir R. Ross.

1907.—C. F. Craig demonstrated intracapsular conjugation as a cause of latency and relapse.

1912.—Baas cultivated the plasmodium *in vitro*. A specially important experiment was undertaken in 1900 by Drs. Sambon and Low of the London School of Tropical Medicine. They were sent by the Colonial Office to the Roman Campagna, where they lived for some time at the height of the malarial season. At nights they protected themselves from mosquitoes by means of wire-gauze nets.

They escaped the disease, and remained perfectly healthy, whilst the people of the surrounding districts were heavily affected. They sent infected insects to London. These were allowed to bite Manson's son and a laboratory assistant, and both contracted the disease. This was an absolute demonstration that the disease is transmitted by the mosquito, and also that marsh air is not the cause. (It also upsets the theory of Beauperthuy as applied to yellow fever—viz., that the *poison* was decomposed water —though it was introduced by a mosquito, the Stegomyia.)

1883.—Hirsch, in his "History," says (vol. i., N.S.Soc., p. 286): "All that we know of the production of malaria forces us to assume that it stands in a close connection with the process of decomposition of organic matter, especially vegetable matter."

1899 (April 22).—The Liverpool School of Tropical Medicine was opened (*vide* "Tropical Medicine"). Teaching commenced in May.

1899 (October 3).—London School of Tropical Medicine officially opened; teaching commenced in October.

1903.—Diploma in Tropical Hygiene established by Cambridge University.

Literature of malaria:

1891.—Laveran's "Paludism."

1894.—Another important work is that by Julius Mannaberg, M.D., of Vienna, entitled "The Malarial Parasites" (New Syd. Soc.). It has coloured plates.

"Malarial Parasites," etc., by Marchiafava and Bignami.

1909.—Sir Rupert Boyce of the Liverpool University has written a charming account of malaria in his "Mosquitoes or Man." Here he says that 50,000 workmen died of yellow fever and malaria in the Panama Isthmus in the time of Mons. de Lesseps, the engineer of the

Panama Canal, but more still had died during the last three years. Forty-one per cent. of European troops suffer from it in India, where it affects all races; 4,919,591 deaths occurred in India in 1900 from "fever," and most were cases of malaria.

Marmite.—*Vide* Vitamins.

Massage.—*Vide* Orthopædics.

Mastoid.—*Vide* Ear.

1873.—Hermann Schwartze and Adolph Eysell devised the mastoid operation for middle-ear disease by chiselling.

1877.—Von Bezold gave first clear description of mastoiditis.

1890.—Ludwig Stacke excised the ossicles.

1906.—Heath described his mastoid operation (*Lancet*, August 11).

Measles.

1898.—Henry Koplik of New York described certain spots seen on the inside of the cheek during the stage of onset. They are now called "Koplik's spots." The disease is produced by what is believed to be a filterable germ not yet discovered.

Mendelism.—*Vide* Heredity.

Mental Deficiency.—*Vide* Psychology.

Mental Disease (Insanity).

Here there has not been much advance.

1874.—Karl Kahlbaum wrote on and introduced the term "katatonia."

1901.—Emil Kraepelin made a new classification and introduced the concepts "Dementia præcox" and "Manic depressive insanity."

1910.—Paul Eugen Bleuler elaborated the same subjects.

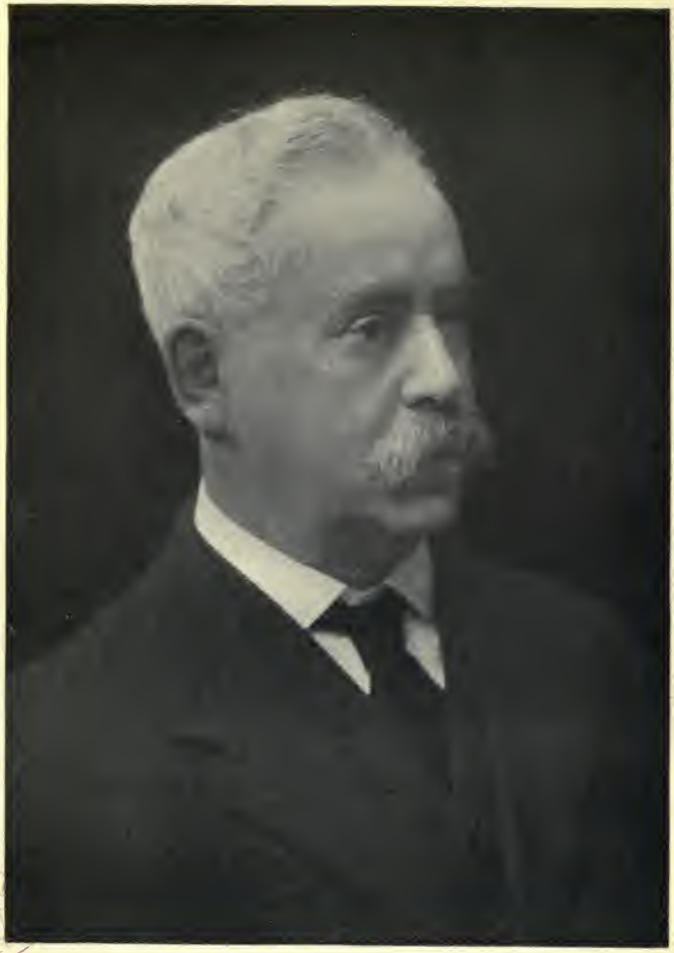


Photo: J Russell & Sons, London.

SIR FREDERICK MOTT.

P. 85.

1905.—Mercier wrote on criminal responsibility of the insane.

1900.—F. W. Mott has carried out a long series of observations on the histological changes in the cerebrum, especially in dementia præcox, and has studied its relation to the gonadal glands.

1903.—Pierre Janet wrote on "psychasthenia."

The most interesting and lucid writer on insanity in this country was Charles Mercier.

Metabolism.—*Vide* Digestion.

This subject has been carefully studied by many expert investigators, and much valuable knowledge has been gained.

1876.—The first work of importance after 1873 was an elaborate study of proteolysis by Kühne. He followed the changes effected in proteins in the stomach by the action of pepsin+hydrochloric, and in the intestines by the action of the "trypsin" (of the pancreatic juice), which he named.

1878.—E. Pflüger contended that animal heat is due to oxidation within the tissues; he replaced the frog's blood with normal saline solution, and found that the respiratory exchange was the same as whilst the animal was alive.

Paul Bert showed that a muscle produces heat after removal from the body. These observations upset the earlier belief that animal heat had its source in the lungs, and the subsequent one that it was generated entirely in the blood. But in 1889 Berthelot showed that one-seventh of the total heat production *is* generated in the lungs by the union there of oxygen with hæmoglobin.

1881.—Voit distinguished between "tissue proteids" and "circulating proteids." He held that the latter—viz., those derived immediately from the absorption of

the products of digestion—are directly metabolized for the production of heat. On the other hand, Liebig, Bernard, and Pflüger maintained that these circulating proteids must first be changed into tissue proteids—that they must enter into the actual structure of the cells—before they can be oxidized.

In the same year Pettenkofer and Voit worked out the "balance of nutrition" (*vide* Hermann's "Physiology").

1882.—Horbaczewski synthesized uric acid *in vitro*.

1889.—He showed that it is derived from nuclein.

1895.—Emil Fischer maintained that uric acid and the xanthin bases have a common "purin" nucleus.

1887.—Eck, a Russian physiologist, devised the "Eck fistula" between the portal vein and the inferior vena cava, and ligatured the portal vein on its hepatic side; then, by ligaturing the hepatic artery, the liver was shut out from the circulation, and its effect on metabolism could be studied.

1883.—Rubner showed that the metabolic change is in proportion to the surface area of the body.

1891.—He expressed metabolism in terms of heat, using the animal body as a calorimeter.

1904.—Chittenden showed experimentally that the amount of protein required is much less than the Voit estimate.

It has been shown that in a child one year old the relative metabolism is 50 per cent. greater than in the adult, and is at its maximum from two to six years, after which it steadily falls.

Calcium.—*Vide* Parathyroids.

Its metabolism has been found to be more or less under the control of the parathyroids, which are associated with the production of tetany. Calcium salts are necessary for the production of blood-clot and the formation of casein.

Metalarsalgia.

1876.—Described by Thomas G. Morton.

Midwifery.—*Vide* Pregnancy.

Milroy's Disease.

1892.—Described by W. F. Milroy of the United States. The outstanding feature is a persistent œdema of the leg.

Morvan's Disease.—*Vide* Syringomyelia.

Muscle and Work.—*Vide* Nervous System: Metabolism.

The work of muscles has been carefully studied by Angelo Mosso of Turin. He introduced the ergograph for this purpose in 1890. He showed that the sense of fatigue is due to toxin products of muscular action accumulating in the muscle. The injection of the blood of a fatigued animal gives rise to fatigue in the recipient.

The nerve cells become exhausted, and cause a sense of fatigue before the muscle becomes incapable of further work.

1893.—Chauveau showed that the CO_2 output during action is five times that during rest. This subject was investigated by Adolf Fick in 1882.

Atrophic changes in the muscles are as a rule consequent on degeneration of some part of the cerebro-spinal axis, and especially of disease of the anterior horn cells of the spinal cord, but there appear to be cases in which the disease is primarily and essentially dependent on some pathological change in the muscles themselves. The term "dystrophy" is now applied to such a condition.

1891.—Muscular dystrophies were described and classified by Erb. The principal dystrophies described since 1873 are as follows:

1876.—Myotonia or Thomsen's disease, described by Julius Thomsen.

1878.—Myasthenia gravis described by Erb.

1900.—Amyotonia congenita, described by Herman Oppenheim.

1884.—Erb's juvenile type. There is a marked hereditary element in all these.

Mycetoma.

1874.—Described by H. V. Carter. He showed its mycotic nature.

Myxœdema.—*Vide* Thyroid.

Nervous System.—*Vide* Brain, Muscle.

Among the notable advances in medical science during recent times, those of the nervous system occupy a prominent place. This applies specially to histology, symptomatology and pathology. The work of the Berlin and Paris schools is particularly conspicuous in this respect, though the English have made several important contributions. Advances have been made possible chiefly through improved methods of staining, and the study of paths of degeneration in the central nervous system. Anatomy has advanced very materially.

1873.—Golgi introduced his method of staining by nitrate of silver. This shows up the gross structure of the nerve cells, and for the first time revealed the complex branching "dendrites" as distinct from the axis cylinder, together with "collaterals."

1903.—Ramon y Cajal says that the dendrites are the receiving filaments, whilst the axis-cylinder process is the transmitting efferent filament, which ends in ramifications that come into close relationship with the dendrites of other nerve cells, but are not directly continuous with them.

1879.—Golgi published his "Un nuovo processo di technica microscopica."

1878.—Golgi discovered certain corpuscular bodies in

tendons, and showed that a nerve fibre splits up into several filaments within them, and that Pacinian bodies in the tendons also receive a nerve filament. It is probable that these are the receiving apparatus for reflex phenomena.

1876.—Flechsig traced the course of the pyramidal tracts from the cerebral motor centre through the crusta of the crus cerebri, pons, and medulla oblongata, to the lateral column of the opposite side of the spinal cord. He also showed that the decussation in the anterior pyramids of the medulla varies a good deal; sometimes it is almost complete, some few of the fibres continuing down the median border of the anterior column of the same side—*i.e.*, they are not crossed. Occasionally this "direct" pyramidal tract is larger than the "crossed" tract.

1882.—This was confirmed by Charcot on clinical grounds.

1876.—Flechsig observed that at birth the medullated nerve fibres are absent in the greater part of the central nervous system, and that the pyramidal tracts are not then formed. Any disease present at or immediately after birth, therefore, is not due to degeneration of these tracts.

1877.—Charcot considered that these tracts exercise normally an inhibitory influence on the cells of the anterior cornua. Hence, when they are absent (or degenerate), there is a special tendency to spasm and contracture of muscle, and exaggeration of the spinal reflexes.

1880.—Gowers described the tract known by his name; it is situated on the outer margin of the anterior column (*vide* his "Diagnosis of Diseases of the Spinal Cord").

1882.—Weigert introduced his acid fuchsin stain.

1886.—He proved that the axis cylinder is a process of the nerve cell, and that the nerve cell develops from

the columnar epiblast cell by the thrusting out of pseudopodia.

1886.—Gaskell showed that there are two kinds of nerve fibres in the spinal cord differing in their diameter; some are "large" and others "small."

1891.—Waldeyer showed that the axis cylinder is efferent; the dendrons afferent. He founded the "neuron" theory.

1893.—Langley discovered the pilo-motor nerves.

Regeneration of Nerves.—Nerve cells, when once destroyed, are apparently not re-formed, but new fibres may grow out from the nerve cell, as when first formed. Originally they grow out from the cells of the brain or spinal cord, and are not formed *in situ* (His, Mott, Halliburton).

1910.—R. G. Harrison demonstrated the amœboid outgrowth of the nerve fibres from the cell in extra-vital cultures.

Physiology.—Advances in physiology have in many instances been due to the use of the staining methods of Golgi. Old ideas have had to be modified. This is specially true as regards the function of various parts of the cerebro-spinal axis. The motor paths have been traced from the Rolandic area of the cerebral hemisphere through the anterior part of the posterior segment of the internal capsule, the middle part of the crusta, and through the pons and medulla, where they cross more or less completely to the opposite side in the anterior pyramids, and reach the postero-lateral internal part of the spinal cord.

Some fibres start from the cells of the red nucleus in the corpus quadrigeminum and descend the cord under the name of rubro-spinal tract, which is situated immediately in front of the crossed pyramidal tract. The rubro-

spinal tract is supposed to contain the fibres which control massive elemental movements. The pyramidal tracts are believed to control the finer movements that have been acquired during the evolution of the species, and the development of the individual, and are not fully formed till some time after birth.

There is good ground for believing that the crossed pyramidal tract has a bilateral association (Charcot).

Sensations.—It has been definitely proved that an afferent fibre does not convey every kind of sensation, but that there are different fibres proceeding to the cord, and different paths in the cord itself for epicritic, protopathic, and for deep (muscle and bone) sensation. Sensation of *heat:* these fibres cross in the cord a few segments above the point of entry.

1896.—Pain fibres pass at once to the opposite side, according to Max von Frey. Kinesthetic, joint, and tactile fibres remain uncrossed in the cord. In 1873 we were told that all sensory fibres cross over to the opposite side of the spinal cord immediately.

Reflexes.—These were practically never mentioned in 1873. They have been much studied since then, and are found to be an important aid to diagnosis and prognosis.

1875.—Westphal made important observations on the knee-jerk, or patellar tendon reflex. Much discussion has taken place as to the nature of this phenomenon. At first it was regarded as an ordinary reflex, the stimulus affecting the afferent nerve—the spinal cord—and the efferent (motor) nerve successively, forming a reflex arc. It was afterwards decided that the muscle response occurred too soon for it to be a pure reflex phenomenon, and the contraction of the muscle was said to be due to the inherent irritability of the muscle itself. This seems

to be true, but at the same time it is quite clear that the reflex arc must be intact. If the sensory or motor nerves or the cells in the spinal cord are not acting, the reflex cannot be elicited. The knee-jerk and other reflexes are exaggerated when there is an interruption between the cortical cells of the cerebrum and the spinal cord. It would appear that the cerebral centres exercise an inhibitory influence upon the cells of the anterior cornu. When there is a block in any part of the cerebro-spinal motor neuron, the cornual cells exercise unrestrained action, and the reflexes are exaggerated. This is especially evident in cases of spastic paresis of whatever kind—whether from non-development of the pyramidal tracts or degeneration of the same.

1875.—Erb studied the reflexes about the same time as Westphal, and he introduced the term "tendon reflex."

The knee-jerk is sometimes called the "sign of Westphal"; he showed that the thigh muscles must be in a state of tone, and that they should be *slightly* on the stretch when an attempt is made to elicit their reflex contraction.

The knee-jerk is lost when there is a block in any part of the reflex arc—*e.g.*, in locomotor ataxia, where there is disease of the afferent fibres in the spinal cord, especially in the posterior columns; in anterior poliomyelitis, where the nerve cells of the anterior horns of the cord are degenerate. Babinski's plantar reflex—extension of the hallux with flexion of the other toes—is found when there is disease of the pyramidal tract.

Ankle clonus is present with spastic phenomena in disease of the lateral columns.

The chin phenomenon or masseter reflex, the biceps jerk, the Triceps and the Achilles tendon jerk are all important signs. In addition to the above, there are

WILHELM HEINRICH ERB.

certain skin reflexes that have to be noted, especially the epigastric, abdominal, and cremasteric.

1893.—Sherrington described "reciprocal innervation."

1890.—H. P. Bowditch showed that nerve fibres are unfatigueable. He paralyzed the motor nerve endings in muscle. This ultimately led to local anæsthesia.

1894-1912.—Pawlow showed the influence of *sensory* nerves on gastric secretion.

Pathology.—1878.—Erb described myasthenia gravis, and said it is of bulbar origin.

1873.—A. Kussmaul gave the first description of progressive bulbar paralysis.

1881.—Medin discovered the epidemic nature of poliomyelitis.

1891.—Marie insisted upon infection as the cause of poliomyelitis. Charcot in his lectures on the diseases of the nervous system greatly extended our knowledge of its pathology, especially of the "system diseases"—viz., those limited to definite nerve tracts. In 1886, with P. Marie, he described progressive peroneal paresis, which was also described in the same year independently by Dr. Tooth.

He described the arthropathy peculiar to tabes, sometimes called "Charcot's joints."

1877.—Charcot described hysterical paralysis, hysterical contracture, and hystero-epilepsy.

1874.—He showed that progressive muscular atrophy is due to degeneration of the anterior horns of the cord.

1884.—Kernig described his special sign in cerebro-spinal meningitis.

1910.—Flexner produced anterior poliomyelitis experimentally.

1876.—Fournier strongly insisted upon syphilis being

the cause of tabes, and immediately afterwards his views were supported by Erb and other neurologists. Duchenne had expressed the same opinion in 1856.

General paralysis of the insane is also due to syphilis.

1880.—Brissaud gave the best account of the degeneration of the pyramidal tract in the spinal cord.

1875.—Erb described spasmodic spinal paraplegia.

1876.—Charcot named it spasmodic tabes dorsalis.

1875.—Charcot declared that secondary degeneration only occurs when the lesion involves the anterior two-thirds of the internal capsule.

1874.—Erb introduced term "spastic gait."

This is the condition described by Seguin of New York in 1873 as "tetanoid paraplegia."

1882.—Quincke described angio-neurotic œdema.

1888.—Paul Blocq described astasia abasia.

1895.—Quincke introduced lumbar puncture. This he first employed for diagnostic purposes in cases of meningitis, parasyphilis, etc. It was afterwards employed for the relief of intracranial pressure.

Later it was employed for the production of anæsthesia, especially for pelvic and crural operations.

Salvarsanized serum has been injected for general paralysis of the insane.

There have been notable advances in the *surgery of the brain, spinal cord, and nerves.*

1887.—Gowers and Horsley operated on the spinal cord. A tumour of the cord was removed by them.

Horsley and MacEwen have removed tumours of the brain.

1890.—Wm. Rose removed the Gasserian ganglion. Tumours of the pituitary body have been operated on by several surgeons.

The posterior roots of the spinal nerves have been

divided for the relief of pain in the gastric crises of tabes, and in inoperable cancer. Divided nerves have been reunited by grafting and by end-to-end union, the latter method being the most satisfactory.

On the medical side, one of the most notable advances has been the rest cure, introduced in 1875 by Silas Weir Mitchell. His method is described in his "Fat and Blood." It is specially valuable in nervous disorders—*e.g.*, neurasthenia and hysteria.

The war has been responsible for the production or aggravation of many cases of functional disorders, such as "shell shock," neurasthenia, psychasthenia, anxiety neurosis, and hysteria. Mention should be made of the experiments of Jacques Loeb, the American biologist. He contends that instinctive actions are due to chemical and physical processes. In 1889 he published his theory of "tropisms," which deals with this subject.

Nose and Nasal Cavities.

1875.—H. J. Bigelow discovered the erectile nature of the inferior turbinated body, and described it in his paper, "Turbinated Corpora Cavernosa," read before the Boston Medical Society. A copy of this paper was sent to Zuckerkandl in Vienna, and Zuckerkandl made it public as a piece of his own original work, and without reference to Bigelow.

The structure becomes congested—sometimes sufficiently to cause complete obstruction to the passage of inspired air—in common nasal catarrh. Several such attacks are usually followed by more or less permanent hypertrophy, a condition which is satisfactorily treated by the electric cautery or fused chromic acid applied by means of a silver probe, after the mucous membrane has been rendered anæsthetic by means of a 20 per cent. solution of cocaine.

1882.—Special attention was drawn to deflections of the nasal septum by Ephraim Ingals of the U.S.A. He practised partial excision. *Submucous resection* has been satisfactorily performed by some nasal specialists, particularly by Robert Krieg in 1889, and Gustav Killian of Freiburg in 1904. Krieg left only one layer of muco-perichondrium and muco-periosteum; in the modern operation both layers are left. Ballenger of Chicago introduced useful instruments.

1887.—Edward Woakes greatly advanced the pathology and treatment of nasal polypi.

1885.—Löwenberg explained the pathology and treatment of ozæna.

1881.—Hebra gave first description of rhinophyma.

Nursing.

In 1873 "Sairey Gamp" still performed the work of the nurse in too many instances. A great change has taken place since then. Various nursing institutions have been started for the training of nurses in all branches of the art—medical, surgical, maternity, mental, fever, and poor-law—to the great advantage of the patient. Certification of the nurse is now practically essential, and is in some cases enforced by Act of Parliament. This applies particularly to midwives, who not only must be trained, but registered, and whose work and outfit are subject to inspection by the Medical Officer of Health.

Nystagmus.

This has been very common in miners and colliers, and has been attributed to working (*a*) in insufficient light, and (*b*) in a constrained position, many miners having to lie on one side whilst working with the pick on the face of the coal. Owing to improved lighting of the mines

and shorter hours of work, this affection has largely decreased in frequency. During recent years it has been carefully studied as a pathological symptom—*e.g.*, in Friedreich's disease. It occurs sometimes in association with disease of the cerebellum and the labyrinth.

1906.—Bárány of Vienna made a thorough investigation of nystagmus and its artificial production. He showed that in the normal individual, if hot water is poured into, say, the right ear, the eyes slowly turn to the left, and then are quickly jerked to the right, and that cold produces the contrary movements. This test can be applied in cases where it is doubtful whether the labyrinth or the cerebellum is at fault.

If the movements can be reversed by injecting first hot and then cold water, the labyrinth, he declares, cannot be at fault. In otitis media, with deafness and vertigo, if injection causes no nystagmus, there is destruction, more or less complete, of the labyrinth. It is a prominent sign in most cases of Friedreich's ataxia, described by him in 1863-76.

Obesity.

In addition to common causes such as heredity, excess of food and drink, and want of sufficient exercise, the condition is now known to be associated with certain pathological conditions, especially deficiency of the pituitary gland (*q.v.*). It is also a marked feature of Dercum's disease, described by him in 1892.

Obstetrics.—*Vide* Pregnancy.

Occupational Diseases.

A great deal has been done to improve the conditions under which employés work, both in this and other countries. Ventilation, lighting, conditions as to moisture

and drainage, have all received attention, with a corresponding improvement in the health of the work-people.

1878-91.—The Government appoint inspectors and surgeons in connection with the Factory Act.

1892.—John T. Arlidge of Stoke-on-Trent published the first important work on the subject, entitled "Hygiene, Diseases, and Mortality of Occupations." It exerted great influence in the regulation of factories and workshops.

1902.—Sir Thomas Oliver published his work on "Dangerous Trades." He has specially investigated lead poisoning.

1912.—Leonard Hill investigated caisson disease.

1912.—Work on industrial fatigue by Joseph Goldmark.

Explosions in mines have been studied, not only in connection with fire-damp, but also the amount of dust, and the ventilation has been greatly improved. Special "rescue" apparatus has been introduced, in the use of which miners receive training at rescue stations.

Opsonic Index.—*Vide* Immunity.

Organotherapy.—*Vide* Thyroid and Myxœdema, Pituitary, etc.

1874.—Lauder Brunton gave raw muscle extract to a diabetic patient on the chance that it might contain some glycolytic enzyme. He thought it was the first instance of the use of solid organs for such a purpose. It is interesting to note that the old Norsemen of about the eleventh and twelfth centuries, and still later, had a custom which was allied to organotherapy. When two warriors engaged in mortal combat, as the result, generally, of some family feud, the victor, after his antagonist was killed, opened the chest and took out the heart and ate it. This was in order to strengthen still further his own courage by obtain-

ing also that of his opponent, for they believed that courage was a quality which had its seat in the heart. Moreover, in Ancient Greece and throughout Europe in the Middle Ages a crude, unscientific—a sort of homœopathic—organotherapy existed.

Orthopædics.

This branch of surgery originally dealt only with deformities and physical abnormalities as met with in children, but is now extended to the treatment of such conditions at any period of life, and not only with the means of cure, but also the prevention of deformities. Thanks largely to the genius and labours of Hugh Owen Thomas of Liverpool, orthopædic surgery has developed into a special branch, requiring the use of specialized apparatus and special training of the men who practise it. So many procedures have been devised in recent years that space will not allow me to give more than a brief summary. Not only have new operations been introduced and old ones improved, but we now see numerous instances of the correction of deformity and restoration of function, which fifty years ago would either have been left alone or treated by some mutilating operation. We see great improvement produced by means of manipulation and apparatus, without resort to any cutting procedure. Recovery is facilitated by placing the patient in a healthy environment, and particularly by residence in an open-air hospital (*vide* Hospitals). This is particularly true of tuberculous or rachitic subjects. Orthopædics deals with bones (deformity, fracture), joints (dislocation, limitation of movement), nerves (compression, division), muscles (paralysis, contracture), ligaments, and cicatrices.

(1) **Bones** (*Deformity*).—**1877.**—Sayre of New Jersey introduced the plaster of Paris jacket and head sling for Pott's disease of the spine.

1890.—Bradford and Lovett in America began to treat scoliosis by suspension with plaster jacket and head sling.

Sir Robert Jones and Lovett employ forcible correction in extreme cases. Jones has treated many cases of bowed legs in children by fracturing with the osteoclast, and then applying suitable splints.

Deformity from *mal-union* is treated by excision of wedge-shaped portion of bone from near the seat of fracture.

Fracture.—The most striking innovation in treatment has been the introduction of metal plates and screws for the immediate fixation of simple fractures that cannot otherwise be brought into good alignment. It is essentially a preventive measure.

1892.—This was begun by Sir Arbuthnot Lane.

Elbow.—Jones emphasizes the importance of keeping the elbow fully flexed.

In compound comminuted fractures the loose fragments are to be retained. Here the Carrel-Dakin treatment of continuous irrigation has given remarkably good results. In one army area during the Great War the mortality from compound fractures was 80 per cent. in 1916. Later on these cases were treated immediately with Thomas's splints, and the mortality soon fell to 30 per cent.

Shortening.—" Of 500 fractures of the femur at one time in our orthopædic hospitals, the average shortening was less than ½ inch " (Sir R. Jones in letter to author).

Bone Grafting.—For this procedure we are indebted to Sir Wm. Macewen, who demonstrated its practicability in his experiments with the humerus.

1912.—Albee of America used bone grafts for fixation of the spine. He obtained the graft from the tibia.

1915.—Hibbs modified the procedure by splitting the spinous processes of the vertebræ and turning them down so as to become fixed to one another.

GAP IN ULNA BEFORE OPERATION.

THE SAME CASE AFTER BONE-GRAFTING.

P. 100.

It has been clearly demonstrated that the graft must be autogenous, and that, when possible, the periosteum and endosteum should be included in the graft. If this cannot be done, small fragments of fresh bone should be scattered along the site of the gap that is to be filled.

1892.—Julius Wolff described what is known as "Wolff's law," governing the pathological transformation of bone. Robert Jones states it thus: "Every change in the formation and function of bones, or of their function alone, is followed by certain definite changes in the internal architecture, and equally definite alterations in their external conformation in accordance with mathematical laws." Hence the functional use of a grafted bone should be permitted as soon as practicable.

(2) Joints—*Excision* is now rarely performed. Their conservative treatment was inaugurated by H. O. Thomas, and was put in practice by him.

Ankylosis is sometimes treated by osteotomy.

Pseudarthrosis.—The making of a false joint. This has been done at the hip in cases of arthritis deformans. Jones performed the operation in 1902 with a good result.

Cheilectomy.—Removal of bony excrescences from around a joint; was introduced by De Courcy Wheeler and Sampson Handley (1913).

Arthrodesis is performed when a joint is painful and only partially ankylosed. The aim is to produce a sound, complete ankylosis. It was introduced by Albert in 1878.

1890.—Hoffa introduced his manipulation procedure for reduction of congenital dislocation of the hip. In Jones and Lovett's method, "reduction occupies only a few seconds in young children" (Lorenz's method, *vide* Hip).

Pseudo-coxalgia, or *Coxa Plana*, often called Legg's disease, was first described by him in America in 1910.

Original descriptions were also given by Calvé in France and Perthes in Germany in 1913. Up to the present it has only been met with in the hip joint, and chiefly in boys from three to twelve years old. It is not due to tuberculosis. It can be definitely diagnosed by X rays.

Coxa Vara has frequently been corrected by the removal of a wedge from the upper part of the femur.

Hallux Valgus.—In the early stage, osteotomy of the first metatarsal with tenotomy of the extensor proprius pollicis is indicated.

In the later stage, when there are bony excrescences, the operative procedure found most beneficial has been resection of part of the head of the metatarsal bone, with interposition of bursal flap as a covering to the raw end of the bone. The extensor tendon is to be divided in all cases. There must be free dorsiflexion, correction of the valgoid deformity, and preservation of the main part of the head of the bone, so as to support the weight in walking.

Hammer Toe.—"The operation found most uniformly satisfactory is a wedge-shaped excision, removing the articular cartilage on both sides of the joint so as definitely to ankylose the joint in extension."*

1906.—Ernest A. Codman described subacromial bursitis as a common cause of pain and limitation of movement of the shoulder.

Metatarsalgia (*q.v.*)—1897.—Robert Jones came to the conclusion that Morton's explanation of the pain is not correct in every case. Jones thinks that it is due to pressure on the nerves in the sole of the foot between the bones and the ground, and not, as Morton stated, between the heads of the metatarsals.

* Robert Jones in "Notes on Some Points in Military Orthopædics," 1916, p. 53.

(3) **Muscles.**—Two important principles were definitely established by H. O. Thomas. First that overstretched muscles soon become paralyzed, and secondly that paralyzed muscles ought to be kept relaxed, or they will have little chance of recovery.

Infantile Paralysis (*vide* Poliomyelitis)—**1910-13.**—Simon Flexner of the Rockefeller Institute has elucidated its etiology and pathology. It has been clearly demonstrated to be an infectious communicable disease, due to some micro-organism that primarily attacks the central nervous system, and particularly the motor cells, so that there results a poliomyelitis or a polio-encephalitis, or a combination of the two, and the muscles supplied by the affected motor cells become paralytic, those of the lower extremity being most frequently affected.

In the early stage the case should be treated by complete rest of muscles, nerves, and spine. Afterwards it may be necessary to wear some form of splint or perform tenotomy.

In many cases tendon transplantation, as first practised by Nicoladoni, or subcutaneous tenoplasty (Bier) is necessary. It is in this department that orthopædic surgery has achieved some of its most brilliant results. Any operative interference is for the purpose of restoring muscular balance. Great ingenuity has been displayed in devising mechanical contrivances to support the weakened muscles.

The transplanted tendon must be that of an acting muscle, and it is to be transplanted into the tendon of a muscle which is paralyzed through injury to its nerve supply. About 1899 Tilanus of Amsterdam introduced *tenodesis*, by which is meant the fixing of a paralyzed tendon with its blood-supply into bone, to take the place of a lax or ruptured ligament, and was originally used for flail foot.

Experiments have been tried with silk to take the place of tendons.

The hamstring muscles have been transplanted into the patella for weakness of extensors of the leg (R. Jones's operation); for eversion and inversion of the foot, transplantation of peronei or tibialis anticus; for spastic pronation of forearm, transplantation of pronator radii teres into extensor carpi radialis longior and brevior (Jones); for wrist-drop, transplantation of flexor carpi radialis and flexor carpi ulnaris into extensors of the same name.

Median Nerve Paralysis.—The outer tendons of the flexor profundus muscle should be inserted into the inner tendons, and the flexor sublimis attached to the flexor carpi ulnaris; the extensor carpi radialis longior into the flexor longus pollicis.

(4) **Nerve Suture** has been advanced as a result of experience in the Great War. It has been found that if a nerve is merely concussed or compressed, and has undergone Wallerian degeneration, it will soon recover. If complete division has occurred, restoration of function may be brought about by suturing the ends to one another; and Robert Jones states that "it is probable that no interval between wound and operation is too long to preclude possible recovery after suture" (*British Medical Journal*, November 8, 1919).

When the gap is considerable, end-to-end suture can frequently be attained by posturing the joints or by transposing the nerve. By bringing the musculo-spinal nerve to the *inner* side of the humerus, 1½ inches may be gained. The ulnar nerve may be transposed to the front of the elbow. When even this plan will not succeed, a two-stage operation should be attempted. First, the bulbs of the injured nerve are pulled as near together as possible by means of silk ligatures and posturing, and

SIR ROBERT JONES.

P. 104.

the wound closed. Gradual traction is then applied to the nerve by extension or other movement of the limb for a few weeks. At the second operation it will be found that the ends of the nerve can usually be brought together (Jones, *loc. cit.*).

Nerve Grafting has for the most part proved a failure.

Spastic Paraplegia.—This has been treated by excision of the adductor muscles and plastic elongation of the tendo Achillis.

(5) **Scars.**—The deformity produced by contraction can be usually avoided by placing the limb during healing of the wound in a position opposite to that of the contractile force. If the axilla is the seat of the wound, the upper arm must be abducted; if the front of the elbow, the forearm must be extended, and so on.

1889.—Croft introduced his flap operation for cicatricial deformity after burns.

The following works may be consulted:

1875.—"Diseases of the Hip, Knee, and Ankle Joints," by H. O. Thomas.

1887.—"Fractures of the Spine and Upper Limbs," by H. O. Thomas.

1890.—"Operation for Congenital Dislocation of the Hip," by Albert Hoffa.

1892.—Work by Julius Wolff.

1895.—"Bloodless Surgery of Hip," by A. Lorenz.

1912.—"A Textbook of Orthopædic Surgery," by A. H. Tubby.

1914.—"The Operative Treatment of Fractures" (second edition), by Sir A. Lane.

1915.—"Bone-Graft Surgery," by F. H. Albee.

1916.—"Notes on Some Points in Military Orthopædics," by Sir R. Jones.

1923.—" Orthopædic Surgery," by Sir Robert Jones and R. W. Lovett.

Lectureships have been started at Liverpool, St. Thomas's, and King's College, London.

Osteo-arthropathy (Hypertrophic Pulmonary).

1890.—Described by P. Marie.

Osteomalacia.

1879.—Lawson Tait excised the normal ovary, with the appendages (which he said were not normal).

1877.—Alfred Hegar did the same. These were on the lines laid down by C. Battey (August 27, 1872) for the relief of painful menstruation and neuroses.

It was afterwards found that this operation arrested osteomalacia without removing the already produced deformity. Subcutaneous injection of adrenalin has proved beneficial.

Ostitis deformans (Paget's Disease).

1876.—Described by Sir James Paget.

Ovaries.—*Vide* Pregnancy.

There is some evidence, not yet very definite, of the production by the ovary of an internal secretion; one would anticipate this, knowing that the testes produce an internal secretion. They are under some sort of control from the pituitary, thyroid, and adrenals. Excess of adrenal secretion or tumour of the cortex produces an appearance of masculine features in the female. Thyroid and pituitary feeding may hasten the onset of puberty when delayed. Defective thyroid secretion causes in some instances amenorrhœa (*vide* Osteomalacia).

1911.—Dr. J. H. Nattrass of Melbourne transplanted the ovaries into the anterior abdominal wall. This was done in a delicate tuberculous young woman, at the same

time that Cæsarean section was performed, with a view to preventing further conception. The case was reported in the *Medical Journal of Australia*, January 16, 1915, when the woman was still alive and in improved health.

Ovum.—*Vide* Pregnancy.

Pancreas.—*Vide* Glands.

1889.—Hæmorrhagic pancreatitis, as a cause of death, was first observed by F. W. Draper of Boston, U.S.A. and its pathology was elucidated by Reg. H. Fitz in the same year. Pawlow demonstrated that the secretory fibres for the pancreas are in the vagus nerve.

1895.—Dolinsky found that the introduction of acids into the duodenum causes a flow of pancreatic juice, and it is inferred that this effect is normally produced by the HCl of the gastric juice.

1902.—Its method of action was elucidated by Bayliss and Starling, who discovered that when an acid enters the duodenum it excites the mucous membrane to the production of a "hormone" (messenger), which they termed "secretin." This is absorbed by the portal system of veins, and passes in the blood-stream to the pancreas (and elsewhere); on arrival at the pancreas it causes the formation of the pancreatic enzymes trypsin, amylopsin, and steapsin from their "pro"-condition. The pancreas produces an internal secretion which controls carbohydrate metabolism in the whole body, and especially in the liver—*i.e.*, it controls sugar formation. Also it produces a ferment which takes a direct part in protein metabolism of the tissue cells, and in the defensive reactions in these cells and in the blood-stream.

Ablation produces immediately severe diabetes from loss of control over the liver.

1922.—J. J. R. Macleod of Toronto University describes the isolation of a pancreatic hormone obtained from the pancreatic islands of Langerhans, which he and his collaborators—C. H. Best and Banting—have termed "insulin." They have used this in the treatment of diabetes, first in animals and then in the human subject, and they claim that it controls the disease; in fact, that it is an antidiabetic hormone. This substance has been further purified by Dr. J. B. Collip, by acting on mature ox pancreas with alcohol to destroy the trypsin.

Parasites.

1893.—Smith and Kilburne showed that they can be transmitted by arthropoda.

Parathyroids.—*Vide* Thyroid.

Paratyphoid.—*Vide* Typhoid.

Pathology.—*Vide* Nerve, Brain, etc.

This received very special attention in Vienna, under the influence of the "New Vienna School." The great aim of the Vienna physicians appeared to be to arrive at a correct diagnosis, whilst therapeusis was relegated to a subordinate position. In 1873 there were very few Chairs of Pathology in Great Britain; Edinburgh had had a special pathological department for several years, but in Glasgow pathology and physiology were in 1873 taught by one professor.

1893.—A separate chair was founded in Glasgow, chiefly due to the influence of Dr. Joseph Coats.

Pellagra.

In 1873 this disease was confined to the countries bordering the Mediterranean.

1908.—It appeared in America, and up to 1913 about 3,000 cases had occurred there.

1912.—First case reported in England, in London, in a boy aged eight years.

1910.—Dr. Lewis W. Sambon attributed it to the agency (extra-human host) of certain small flies (the Simuliidæ), whose larvæ are found attached to stones and plants in rapidly-flowing streams. Previously it was supposed to be due to diseased maize. A lesion has been found in the spinal cord consisting of sclerosis in parts of the posterior and lateral columns.

Phthisis.—*Vide* Tuberculosis.

Physiology (Practical).

This subject was only taught in a few schools in 1873, and there were no textbooks on the subject.

1880.—Burdon-Sanderson's "Practical Exercises in Physiology" was the first work on the subject in any country.

Pineal Gland.—*Vide* Glands.

In 1873 this gland was looked upon as a vestige. Embryologists assert that it represents the central eye of a remote ancestor. It apparently is associated, through its internal secretion, with mental and physical growth, and its overgrowth (tumour) has been found in individuals showing precocity, increased stature, premature sexual characters, hypertrichosis, and mental vigour.

Pituitary Gland.

1873.—Nothing was known as to its function—in fact, it was regarded as quite a useless vestige of a structure, probably active in some early stage of phylogenetic evolution.

1912.—The rôle of the pituitary body has been elucidated chiefly by Harvey Cushing, who wrote an

exhaustive work on it in 1912, dealing with its anatomy, physiology, pathology, and surgery, entitled "The Pituitary and its Disorders."

1919.—Blair Bell has written an excellent account of the same subject.

Anatomically, the gland consists of two parts, called respectively the anterior and the posterior or infundibular portion. Some recognize a middle portion. Removal of the pituitary produces tremors, slow pulse and respiration, sudden fall of temperature, and death. The anterior lobe is concerned in bodily growth; when hypertrophied, it produces overgrowth of the body, but the precise result varies according to whether it occurs in childhood and adolescence, or in adults. If it occurs in the earlier periods of life, before the skeleton is fully developed, it produces gigantism; if it occurs in adult life it produces acromegaly. Pituitary deficiency produces obesity, low temperature, sexual inactivity, and skeletal undergrowth. The function of the posterior lobe (infundibulum) is to produce contraction of the arterioles, increased heart beat, contraction of the muscular walls of the stomach and intestine, and it stimulates the flow of milk and of the urine. Its administration has been found useful in intestinal and uterine inertia, and in simple amenorrhœa. Blair Bell gives it in climacteric flushing, with calcii lactas. Jonathan Hutchinson has given it for lipomatous distrophy. Cushing has several times removed tumours of the pituitary. There is some little-understood relation between the pituitary, thyroid, and adrenals.

The chief dates are as follows:

1886.—Pierre Marie showed the relationship between acromegaly, gigantism, and the pituitary, and that the two diseases are due to some lesion of this gland.

Photo: J. E Purdy & Co., Boston.

HARVEY CUSHING.

P. 110.

1895.—Schäfer and Oliver showed that injection of pituitary extract (whole gland) raises the blood-pressure.

1898.—Howell showed that this function resides in the infundibular portion.

1899.—Schäfer and Vincent showed that it contains also a depressor substance.

1901.—Fröhlich described a pituitary tumour associated with obesity and sexual infantilism=Fröhlich's syndrome.

1908.—Nicholas Paulesco of Bucharest showed that removal of the anterior part is fatal, but removal of posterior part negative. This has been confirmed by Cushing and Blair Bell.

1911.—Cushing described "dyspituitarism."

1908-13.—He showed that the anterior part is concerned in normal growth and sexual development, and that the posterior part is associated with carbohydrate metabolism. After partial removal in young animals they remain of the infantile type, and secondary sexual characters do not appear; whilst, if the animal be mature, they become obese and the genitals atrophy. There results also increased sugar tolerance. More than 150 grams (which is the maximum amount tolerated by man without the production of glycosuria) may be given without glycosuria resulting. There seems to be an internal secretion which turns glycogen into sugar, and it is controlled by the sympathetic, for stimulation of the cervical sympathetic in the dog and rabbit produces glycosuria.

1907.—Schloffer performed the first successful excision of the hypophysial part for tumour. He operated through the sphenoid,

Development.—The anterior and middle portions are outgrowths from the posterior pharyngeal wall, whilst the posterior or infundibular portion is developed from the brain, and remains with a persistent stalk.

Plague.

This is one of the most fatal of all infectious diseases. It occurs specially in India and China, but appears now and then in various other countries. There was a small epidemic in Glasgow in 1900. The mortality is usually from 80 to 90 per cent., the pneumonic form being more fatal than the bubonic.

1895.—Yersin of Paris went to Hong Kong to study the disease. He discovered the cause to be a bacillus —the *Bacillus pestis*. He prepared a serum (horse), which he employed in the treatment of the disease. He came to the conclusion that his serum cures and also confers immunity.

1896 (June 26).—He gave his first injection to a mission student at Canton, and it effected a cure in less than two days. Shortly afterwards two other students were cured by the same means. He next treated twenty-six cases, of whom two died—a mortality of 7·6 per cent. in place of the usual 80 per cent. or more.

1897.—W. M. Haffkine studied plague in Bombay. Haffkine introduced a vaccine.

1908 (January 8).—The *British Medical Journal* published the report of Haffkine and Surgeon-Major Lyons of the I.M. Service of the epidemic which broke out in Lower Damaun in Portuguese territory. In a population of 8,000 there were occurring eighty deaths per day; 2,189 deaths from plague were registered, and there may have been others. Then 2,297 people were inoculated with the vaccine; of 6,033 unvaccinated 1,482 died, of 2,297 vaccinated 36 died. Thus it would appear that after treatment by Haffkine's vaccine there is now only one death where previously there would have been fourteen.

Pleurisy.

1900.—Washbourne declared that, in the absence of pneumonia, it is tubercular.

Pneumonia.—*Vide* Germs.

1897, or thereabouts, antipneumococcic serum was first prepared by Washbourne.

Poliomyelitis.—*Vide* Orthopædics.

The essential feature of this disease is an inflammatory affection of the cells of the anterior horn of the spinal cord, with subsequent degeneration, and with atrophy and loss of power in the muscles which derive their motor nerve supply from the implicated region of the cord.

Until 1909 nothing definite was known as to its etiology, and it was not suspected of being due to infection. For many years it had been endemic in Europe, but in 1907 it developed a new activity in Norway and Sweden, and has since spread around the globe.

1909.—Landsteiner and Popper announced that they had succeeded in transmitting it to monkeys.

1909 (a little later).—Flexner and Lewis, by employing intracerebral injections, were able to transmit it indefinitely from one monkey to another. They showed that the virus will pass through a Berkefeld filter. "The degree of infectivity is almost fabulous," says one writer. $\frac{1}{1000}$ c.c. of a $2\frac{1}{2}$ per cent. suspension of spinal cord tissue of monkey produces infection and disease in another monkey. Another instance of extreme virulence occurs in chicken plague, where the blood, after being diluted with water 1,000 million times, is still active.

Mode of Spread of Infection.—The germs are present in the mucous membrane of the nose, throat, stomach, and intestines, as well as in the central nervous system. Dip a camel-hair pencil in the broken-up tissue of the

spinal cord and paint the mucous membrane of a monkey's nose with it, and the disease is developed. The germs pass from the lining membrane of the nose along the olfactory nerve to the central nervous system. This was asserted by Flexner in 1912. It may be conveyed by "carriers."

1910-13.—Flexner declared it to be an infectious disease.

Treatment.—The only drug that appears to exert a beneficial action is urotropine. It is apparently the only drug which has been shown to pass into the cerebro-spinal fluid when taken by the mouth or subcutaneously.

Pregnancy.—*Vide* Uterus.

Signs of.—1884.—Reinl first described what has since been called "Hegar's sign"; about the sixth week from the commencement of pregnancy there occurs a softening of the lower uterine segment between the firm fundus and lower part of cervix. It is detected by bimanual examination.

1886.—James R. Chadwick of U.S.A. laid stress upon the discoloration of the vulva as an early sign. It is called "Chadwick's sign."

1899.—Von Braune said the earliest sign is the presence of a longitudinal furrow on the anterior or posterior surface of the uterus, due to a change of consistence of the uterine wall at the part to which the ovum has attached itself.

1913.—Abderhalden described his "ferment test." Some fresh placenta is treated with the patient's serum; if she is pregnant, peptones are formed by digestion.

The Ovum (Impregnated).—1898.—Hyrtl described the only human ovum so far found in transit through the Fallopian tube five days after the menses.

1899.—Peters described a fertile ovum, the earliest that has been found in the uterine cavity. He has published

a description of its histological features in "Uber die Einbettung des Menschlichen Eies." He considered it three days old. The "decidua reflexa" is not formed, as hitherto stated, by the upgrowth of the uterine membrane around the ovum, but by the sinking of the ovum into the decidua. This is probably the explanation of Braune's sign.

1908.—Drs. Boyce and Teacher of Glasgow published an elaborate work on the ovum.

Ovarian Pregnancy.—1897.—First description was given by B. J. Kouwer.

The Cervix.—A great deal has been written about the part played by the cervix during parturition.

1872.—Braune described a projecting ring of uterine tissue about 10 to 11 centimetres above the margin of the dilated external os; this, he declared, is the internal os, and that all below it belongs to the cervix. Others since then contend that only the lower half, or less, of this "lower uterine segment" belongs to the cervix, and is fibrous in structure, whereas the upper part is muscular. The differentiation between the two uterine segments occurs during labour, the upper part being active, the lower passive.

1875.—Bandl pointed out that the seat of rupture is nearly always below Braune's ring.

1883 (January 17).—Lawson Tait did the first operation for ruptured tubal pregnancy, and in 1886 published his epoch-making "Lectures."

Cæsarean Section.—1876.—Edouardo Porro introduced his operation in which, after Cæsarean section, the adnexa and body of the uterus are removed.

1882.—Sänger revolutionized the procedure by using uterine sutures and closing the upper end of the stump, instead of suturing it to the lower angle of the abdominal wound.

Cæsarean section saves the life of the infant in many cases in which it had been the practice of resorting to craniotomy.

1882.—The first operation in England was performed by Clement Godson.

1880.—Bischoff removed the whole uterus after Cæsarean section.

1893.—Gigli introduced pubiotomy.

Forceps.—1877.—E. S. Tarnier invented the axis-traction instruments. The term "axis traction" was introduced by Sir A. R. Simpson of Edinburgh.

1882.—"The Chamberlen's and the Midwifery Forceps," published by J. H. Aveling, M.D.

For "Twilight Sleep," *vide* Anæsthetics.

Prostate—*Vide* Surgery.

Protein Therapy.

This is intimately associated with anaphylaxis.

1917.—Professor P. Nolf of Liège introduced peptone injections in the treatment of hæmophilia, purpura, hæmoglobinuria, and severe septicæmia after gunshot wounds, particularly where there is streptococcic infection. In the last condition it is given intravenously; in the other conditions intramuscularly. The peptone must be pure and free from odour, and in the case of intravenous use must be injected slowly—not more than 5 c.c. per minute; 10 c.c. of a 10 per cent. solution is the total amount injected. Untoward symptoms are: acceleration of the pulse, cyanosis, and headache; if they are observed, the injection must be stopped. The peptone may be dissolved in 150 c.c. of normal saline. The injection is best given in the morning on alternate days. Adrenalin is useful in peptone shock. Dr. A. G. Auld has largely employed peptone injections in spasmodic asthma with

good results. Cecil has used typhoid vaccine in rheumatic fever and articular rheumatism, and especially for gonorrhœal arthritis.

Protozoa.

These are found in malaria, amœbic dysentery, kala-azar, and trypanosomiasis.

Psittacosis.

1892.—A small epidemic occurred in France, due to infection from parrots imported into the affected district. They were brought from Buenos Ayres. Of forty-two cases, fourteen deaths occurred. Nocard obtained a bacillus from the bone-marrow of one of the parrots very like Gärtner's bacillus.

Psychology.

A great deal of interest has been manifested in this subject from a physiological, pathological, and curative aspect, and real advance can be recorded.

Psychological laboratories have been established in several teaching centres—*e.g.*, at Harvard (1880) under Wm. James, at Cambridge under Professor Myers, and both these teachers have written special textbooks.

1876-89.—" L'Uomo dilinquente," by Cesare Lombroso, Professor of Psychiatry at Turin, had a stimulating effect on the study of insanity, and the administration of prisons and asylums. He maintained that there is a distinct criminal type. In a later work—" The Man of Genius " —he argues that some kind of mental defect is nearly always associated with great ability.

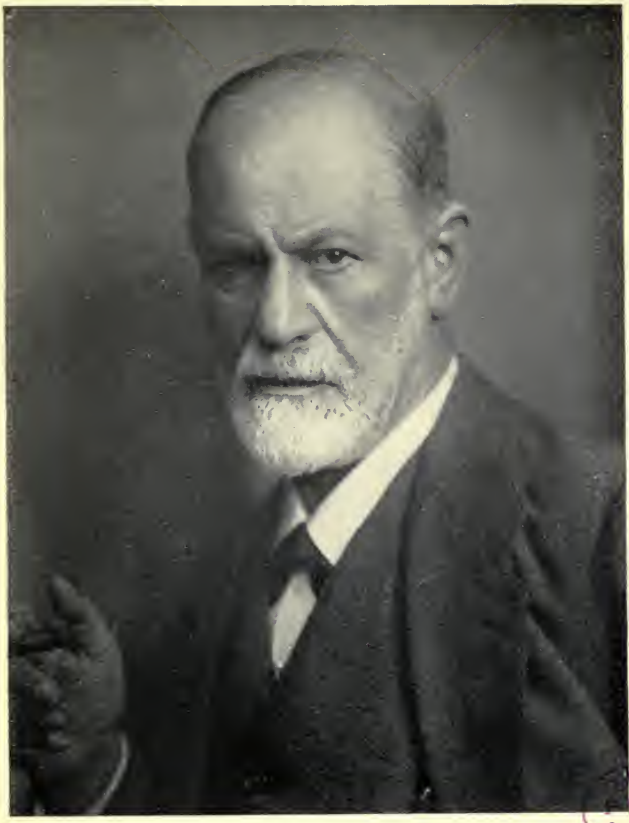
Whatever be the opinion of the result of the teaching given in the " psychology " courses as to its practical value, there is very little doubt in the minds of those who have given attention to two features of psychological work that they mark a real advance. I refer to the method

of teaching young children, especially those more or less feeble-minded, introduced by Dr. Maria Montessori of Rome. This method is the natural method; it trains the mental powers by cultivating the special senses—sight, hearing, touch. Montessori's first pupils were all suffering from mental deficiency, and in due time they were presented at the formal examination in school work, taking the same examination as the normal children. The remarkable success of her method was strikingly demonstrated by the fact that these defective children obtained higher marks than the normal children (*vide* "The Montessori Method, 1912").

The other subject is the "measurement of intelligence," introduced by the French psychologist, Alfred Binet.

1914.—Binet's tests published in England. This work was brought out in collaboration with Dr. Simon, and the method is now called the "Binet-Simon method." It consists in applying certain sensory and intelligence tests that have been standardized. The original Binet-Simon tests have been somewhat modified by the teachers of the Stamford University in America; these are called the "Stamford revision" tests, and are certainly more accurate for American and British children than those originally introduced by Binet.

It is possible in a very large percentage of cases to measure the individual's intelligence almost as accurately as his height and weight can be measured. It enables one quickly and accurately to sort out the children in school, to distinguish the dull and backward ones, as well as the brighter children; and one can tell whether "backwardness" in school work is due to lack of opportunity merely, or, on the other hand, if it is the result of native (inborn) lack of brain power. The tests have practically nothing to do with tuition.



SIGMUND FREUD.

P. 119.

This is undoubtedly the greatest advance in psychology that has occurred since the discovery that the brain is intimately associated with the performance of mental operations.

1914.—Dr. A. F. Tredgold published an important work on mental deficiency, in which he gives special attention to physical stigmata that are often found associated with it.

On the pathological side we have the quite modern development of *psycho-analysis* and *psycho-therapy*, about which the leading authorities entertain very diverse opinions.

The modern apostle of psycho-analysis is Freud of Freiberg, professor in Vienna.

1910.—" On Hysteria," by Freud. He maintains that hysteria is a psychic trauma from nervous shock, of sexual origin in the first instance, and that the exact cause can be ascertained by suitable psycho-analysis whilst the patient is in a state of hypnotism or semi-hypnotism.

1913.—Translation of Freud's " Interpretation of Dreams." Dreams, he says, are practically always connected with some very recent event. His work has been continued by C. G. Jung.

1896.—Kraepelin introduced the concept and term " dementia præcox."

1913.—Abderhalden introduced a ferment reaction for the diagnosis of dementia præcox.

1919-22.—Sir F. W. Mott has shown that in dementia præcox there is a primary atrophy of the reproductive organs in both sexes, and that it is an inherent congenital defect, and not due to chronic disease in other parts of the body, for it is absent in General Paralysis (*vide British Medical Journal*, March 25, 1922, p. 465).

1917.—Binet's test introduced into the recruiting system in America by Robert M. Yerkes.

Public Health.—*Vide* Sanitation.

Purpura.—*Vide* Protein Therapy.

1874.—Ed. H. Henoch described a form known by his name.

Pylorus, Resection of.

Its practicability was shown by experiments on animals.

1879.—Péan performed the earliest resection.

1880.—Rydygier did the second. Both patients died.

1881 (January).—The first successful operation was performed by Billroth.

1897.—Dr. Schlatter (Zurich) removed the whole stomach for cancer.

Rabies (Hydrophobia).

1881.—Pasteur performed his first experiments on animals.

1885.—His account published and his first case in the human subject treated in Paris. The patient was Joseph Meister from Alsace.

1888.—Pasteur Institute opened; it was founded by public subscription. The mortality before 1885 varied from 15 to 40 per cent.

During the first thirty years that Pasteur's treatment has been employed, which consists in inoculation with a solution of infected spinal cord, 32,817 cases have been treated in Paris, with a total mortality of 92=0·28 per cent., and yet antivivisectors declare that animal experiments have never led to any real advance in medical practice !

1903.—Negri discovered "Negri bodies" in cells of central nervous system.

1913.—Noguchi cultivated them.

Radiography.—*Vide* X Rays.

Radium.

1898.—Madame and Pierre Curie isolated radium; it had shortly before been discovered by Madame Curie.

1906.—The Radium Institute was founded.

It is employed in the treatment of neoplasms, but its use is very limited owing to its great cost.

Rectum, Prolapse of.

From about 1889 ventrifixation has been done by a few surgeons. The part sutured has been the meso-rectum or meso-sigmoid, attaching it to the abdominal wall just above the left Poupart's ligament. Treves recommends excision for severe cases (vide *Lancet*, March 1, 1890).

1891.—Paul Kraske performed proctectomy by excision of a large part of the sacrum. Treves had done it in 1885 for cancer.

Reflexes.—*Vide* Nervous System.

Relapsing Fever.—*Vide* Germs.

The carriers are certain ticks (*Ornithodorus mombata*) which infest animals. This was worked out by J. Everett Dutton of the Liverpool School of Tropical Medicine, who himself died of the disease in West Africa in 1905.

Respiration.—*Vide* Blood, Metabolism.

Artificial.—1881.—Howard's method introduced.

1892.—Laborde's.

1904.—Sir E. A. Schäfer introduced his method with the patient in the prone position.* Leonard

* *Med.-Chir. Soc. Journ.*, vol. lxxxvii, p. 609, and described in his Harvey Lectures, 1907-8.

Hill has carried out a long series of observations and experiments on the effects of rarefied and compressed air on respiration. He has shown that respiratory distress in a rarefied atmosphere is due to want of oxygen simply. After increased pressure, danger arises from a too sudden decompression liberating the extra nitrogen dissolved in the blood, and which then forms bubbles of gas that block the capillaries. He found also that exposed frog's muscle will stand a pressure of 300 atmospheres without losing excitability (*British Medical Journal*, February 17, 1912).

Mine Rescue Apparatus.—In 1873 the "self-contained apparatus" in use would allow the wearer to exist in a poison atmosphere for a few minutes only, and it did not permit him to do any real work; it is altogether unsuitable for exploration after an explosion in a mine. It contained compressed air.

H. A. Fleuss, an Englishman, introduced the breathing of pure undiluted oxygen, and used caustic soda to absorb the expired carbon dioxide (CO_2).

1880.—Fleuss invented his self-contained apparatus suitable for use in an irrespirable atmosphere. It was first put to practical use after an explosion at the Nethersal Colliery (1880), and next at Seaham (1881). On the latter occasion he also used for the first time his portable lime lamp that would burn under water.

The breathing bag was carried on the front of the chest; the oxygen under a pressure of 16 atmospheres was contained in a cylinder on the back.

Professor J. S. Haldane suggested that men should use small animals, such as mice or birds, for localizing zones of poison gas.

The animal air-tester consists of an aluminium air-tight box with a mica window through which the animal can be

THE PRESENT TYPE OF "PROTO" RESCUE APPARATUS.

(*Courtesy of Messrs. Siebe, Gorman & Co., London.*)

P. 122.

observed. It has also a hinged door. When testing, the door is opened to admit the surrounding atmosphere. If CO (carbon dioxide) be present, the animal soon succumbs, but is speedily revived by closing the door and turning on the oxygen from a small cylinder forming part of the apparatus.

1886.—British Oxygen Company founded.

1896.—The pneumatophor introduced into Germany and Austria. The following year its adoption in mines was made compulsory in Austria.

1898.—Helmet type of face fitting introduced by Johann Mayer.

1900.—The Giersberg apparatus introduced. It showed several improvements. The oxygen supply was regulated by the hand.

About 1900 Garforth erected a testing gallery at Altofts, near Normanton in Yorkshire, in which the precise conditions found underground after an explosion were reproduced on the surface. This was the first of the kind in any country. Tests of various forms of apparatus demonstrated that they were only efficient for fifteen to twenty minutes if the men were exerting themselves to any considerable degree. The men suffered from headache, vomiting, quick pulse, etc.

1901.—The supply of some form of breathing apparatus was made compulsory in Germany.

1901.—An improved Giersberg apparatus introduced on the Continent, embodying many of Garforth's suggestions—*e.g.*, two cylinders of oxygen, automatic supply of oxygen through a reducing valve, pressure gauge.

1904.—Interest in the original Fleuss apparatus was revived by Mr. R. H. Davies of Siebe, Gorman and Co., London. The Fleuss apparatus was shown to be superior to all the foreign makes, and it was brought up to date.

It was made lighter and more comfortable, and an emergency by-pass was fitted to the oxygen supply. It was introduced in 1906 under the name of the "Proto" apparatus. The one in use now is this apparatus with some further improvements.

1906.—Bamberger and Bock of Vienna invented the pneumatogen apparatus, and it was introduced into England in 1909. In this the oxygen is generated in the apparatus from peroxides of sodium and potassium. In theory it was apparently ideal, but in practice it turned out a failure, owing chiefly to the heat produced by the chemical action making the respired air too hot. The best apparatus for supplying oxygen to the asphyxiated is known as the "Novita." Rescue work was introduced into the Army in France, and men were specially trained to the use of apparatus in 1915.

Rheumatoid Arthritis (Arthritis deformans).

Professor Petrie found a skeleton in the cemetery at Deshabeh which he estimates at 5,500 years old. It is described by Dr. Page May in the *British Medical Journal* for December 14, 1917, p. 1631. Many of the bones show well-marked evidence of the disease, thus showing that it is of very ancient date.

Thyroid gland gives a certain amount of relief in early cases. An autogenous vaccine should be used.

Rhinoscopy.

This is a subject I never heard referred to whilst at Edinburgh up to 1877. It was not employed by any University teacher there, so that it must have been little used elsewhere. This is remarkable, as the authoritative work of Czermak on this subject had been translated into English and published in 1861.

Rhinoscopy has revealed morbid conditions which were

scarcely suspected, or at any rate not accurately diagnosed, before—*e.g.*, hypertrophic rhinitis, deflection of septum, empyæma of ethmoidal and sphenoidal cells—and it is also an essential help in the local treatment of these conditions. Morell Mackenzie and Lennox Browne were pioneers in this country.

Rickets.—*Vide* Vitamins.

Rinderpest.

1896.—Sir George Turner, M.O.H. for Cape Colony, studied this disease with Koch, who went out at the request of the British Government.

Turner prepared a curative and preventive serum, which had beneficial effects, but only for about six weeks.

Later Wilhelm Kolbe assisted Turner. They devised a new method known by their names. Over 14,000 animals were treated, and the disease was stamped out within a year.

1901.—It recurred, and Kitchener asked for Turner's help. A station was opened at Pretoria, and the disease was again stamped out in less than twelve months.

Rocky Mountain Spotted Fever.

1900.—H. T. Ricketts discovered that it is transmitted by the wood-tick—*Dermacentor occidentalis.*

Sanatoria.

Open-air treatment, combined with rest, had been advocated in England and elsewhere, and a few institutions had been started for carrying out the treatment before 1873, but it is only since then that the method has been utilized on an extensive scale. Sanatoria (or sanitaria) have been established for the treatment, primarily, of pulmonary tuberculosis.

1876.—Peter Dettweiler founded one at Falkenstein in the Taunus; he introduced portable receptacles for

sputum. Since then they have been started all over the world.

A good percentage of patients treated in these institutions have been benefited; some have been practically cured, but the high hopes at first entertained have not been realized. The method has, however, been of immense service in educating patients to the value of fresh air and the precautions necessary to avoid spreading the disease.

1911.—The English Association for the Treatment of Tuberculosis founded as a National Memorial to King Edward VII. Specialist physicians in numerous districts appointed in 1912.

1888 (July 25 to 31).—First International Congress held in Paris.

1901.—An International Association was formed.

Other forms of tubercular disease are now treated in open-air hospitals, some of which are so constructed as to render it impossible to close the wards, and no heating apparatus of any sort is used in the wards, the patients being plentifully supplied with blankets, and, when necessary, woollen mittens for the hands and hot-water bottles for the feet.

" The results of this innovation were anxiously awaited, and have now passed the possibility of adverse criticism " (Sir R. Jones).

It is emphasized that children's hospitals must be situated in the country, and not in any densely populated districts.

1885.—A sanatorium was opened at Bowden, in Cheshire, a few miles from Manchester; in 1901 at Pinewood; and 1905 at Durham.

1900.—The earliest open-air hospital in the world was founded at Baschurch for crippled children. It was started by Miss Agnes Hunt and Miss Goodford " as a

PERMANENT OPEN-AIR WARDS AT THE LIVERPOOL CHILDREN'S HOSPITAL, NEAR THE RIVER DEE, AT HESWALL.

P. 127.

convalescent home." It has gradually developed into the Shropshire Orthopædic Hospital, to which Sir Robert Jones became Honorary Surgeon in 1904. In 1921 it was removed to Gobowen (Oswestry). There is now accommodation for about 300 patients.

1902.—Heswall Open-Air Hospital opened.

Sanitation.

Many notable advances have been made since 1873. Osler says "the most notable and beneficient feature of the nineteenth century is the introduction of modern sanitation."

The Great War was the first in history in which the mortality from casualties has been more than from infectious disease, and this was due to the diminished incidence of the latter from improved sanitation and prophylaxis.

The essential cause of the improvement has been the destruction of disease germs or the prevention of their growth and spread. Little was known about them in 1873 (*vide* Germs), although there was a fairly clear idea of "infection," for in 1873 E. A. Parkes defined disinfectants as "substances which can prevent infectious diseases from spreading by destroying their specific poisons."

The English sanitary system has been the most progressive, and has served as a model to other countries.

The incentive to legislation has in numerous cases been due to epidemic outbreaks. The aim of "sanitation" is the prevention of disease and the improvement in the conditions of work and of the home, with consequent extension of the average duration of life. The average length of life, as a matter of fact, has been increased.

To Wm. Farr is largely due the improvement in sanitary matters, both in this country and elsewhere, through

the effect of his published statistics, and also to Sir Edward Frankland's systematic water analyses for a long series of years. He published " Reports " of analyses of the water supplied to London by the various companies. These analytic reports were for the information of the Local Government Board. They have proved of great benefit.

1876.—Filtration beds were first used at Wimbledon.

1876.—Royal Sanitary Institute founded (London).

1885.—Frankland demonstrated purification of water by sand filtration.

1896.—W. J. Dibden introduced the bacterial treatment of sewage. This has greatly reduced the mortality from typhoid fever and other water-borne diseases.

1891.—Lister Institute founded.

1899.—Liverpool and London Schools of Tropical Medicine founded.

1901.—Rockefeller Institute founded in New York.

1906.—School of Tropical Medicine founded in Brussels.

Cholera and yellow fever have partly decreased owing to supply of water through pipes.

1875.—Diploma in Public Health (D.P.H.) was granted by Cambridge University at the suggestion of Dr. Arthur Ransome and Dr. Liveing.

Several very important Acts of Parliament have been passed.

1875.—The Public Health Act.

1891.—The Public Health (London) Act.

1889.—Infectious Disease Notification Act.

1890.—Infectious Disease Prevention Act.

1891.—Contagious Diseases (Animals) Act.

1893.—Isolation Hospitals Act.

1894.—Local Government Act.

1898.—Rivers Pollution Prevention Act.

1898-1907.—Vaccination Acts.

1907.—Notification of Births Act.

1909.—Housing and Town Planning Act.

1911.—National Insurance Act.

1914 (April).—Chair of Tropical Entomology founded in Liverpool in memory of Dutton. Professor Robert Newstead, F.R.S., first occupant. He had been lecturer on medical entomology and parasitology from April, 1905.

Factory Acts.—Acts have been passed raising the age limits for children working in mines and factories (to twelve years minimum).

In 1875 the law as to factories and workshops consisted of a perfect chaos of regulations contained in nineteen different statutes. In that year the whole subject was considered by a Royal Commission, whose Report, published in 1876, led to the Factory and Workshop Act, 1878, by which all the parts of the puzzle were fitted together in logical sequence, with such alterations as were deemed desirable.

No sooner, however, had that Act been passed than further extensions of the law were found necessary. Additional legislation took place in 1883, 1889, 1891, 1895, and 1897, which restored the old state of chaos and rendered it necessary to do the work of 1878 over again. This was done by the Act of 1901, which (subject to the alterations which it in its turn has received in 1903, 1906, 1907, 1911, 1916,* 1918, and 1921) is a complete code of the law relating to factories and workshops.

* The Police, Factories, and Miscellaneous Provisions Act, 1916, provided for the welfare of employés in factories. These provisions include first aid, drinking water, protective clothing, men's rooms and means of heating food, cloak rooms, baths, lavatories, rest rooms, etc.

1897 and 1906.—Workmen's Compensation Act.

1907.—Medical inspection and treatment of school children relegated to Board of Education.

1919.—Ministry of Health established.

1890.—Sir John Simon's "English Sanitary Institutions" published.

Sarcoma.

1911.—Peyton Rous transmitted sarcoma by means of a filterable virus.

Sciatica.

Its diagnosis has received more attention than previously to 1873, and the sign of Laségue has come more into prominence, for though he had drawn attention to it as early as 1864, it was known by very few physicians. He found that flexion of the hip with the knee fully extended causes pain in the nerve behind the upper part of the thigh, sometimes radiating down the leg. The pain ceases the moment the knee is flexed; sometimes it is quite impossible to raise the leg with extended knee to the perpendicular with the patient recumbent. In coxalgia, or rheumatism of the hip-joint, the leg can be so raised as a rule, and if it causes pain, it is confined to the immediate neighbourhood of the joint. Here, however, it was pointed out by H. T. Patrick* in 1917 that with the knee well flexed and the ankle resting on the knee of the sound side the thigh cannot be fully rotated outwards, whereas it can be so rotated in sciatica without eliciting pain.

Scurvy-Rickets.—*Vide* Barlow's Disease.

Sepsis.—*Vide* Germs, Antiseptics, etc.

Serum Therapy.—*Vide* Immunity, Anaphylaxis.

* *Journ. Amer. Med. Assoc.*

Shock.

An immense number of cases of shock occurred during the late war from gunshot wounds, severe contusions, operations, and fright. So common was it after the bursting of shells that in the early stages of the war the condition of the patient was said to be due to "shell-shock," but it was observed later that a precisely similar pathological condition was produced by several other factors than the bursting of shells. Many cases were confounded with neurasthenia. Now there is no doubt that some of the worst cases of neurasthenia occurred in men who not only never experienced the bursting of a shell, but also in men who never left this country during their time in the Army; in fact, well-marked cases occurred during training and even before the calling-up notice was received; such cases have been termed "anxiety neurosis." One of the worst cases I have seen recovered in a few days after being informed that he would not be called up. There is still some uncertainty as to the exact pathology of shock, but certain definite facts have been established.

The arteries and superficial veins are contracted, sometimes so much so as to render transfusion difficult or even impossible. Though the heart is acting strongly, yet the blood-pressure is low. There is a higher count of blood-corpuscles in the capillaries than in the veins, according to Cannon. It has been suggested that there may be a stagnation of blood in the muscles, intestinal villi, etc.

1920.—Rendle Short says there is a loss of Nissl granules in the sensory cells of the optic thalamus, cuneate nucleus, and nucleus gracilis. These are the centres that control muscle tone.

Crile and Mott have reported changes in Purkinje's cells.

An extract of crushed muscle brings on shock when injected into the muscles, hence there would seem to be some chemical poison at work, a product of autolysis.

Shock is not due, as had been suggested, to exhaustion of the suprarenal glands, because in fatal cases they still contain plenty of adrenalin. The cells of the body suffer from oxygen starvation in consequence of the reduced blood-flow.

Treatment.—Many drugs have been tried—strychnine, adrenalin, alcohol, pituitrin. R. Short condemns them all, except in the cases where intestinal stasis is present, when pituitrin is useful. Transfusion has proved most beneficial, and Bayliss has introduced "gum serum" for this purpose. This consists of 6 per cent. of gum arabic in normal saline, of which 1 pint in fifteen minutes must be injected into a vein, and a further quantity if necessary. This is a good plan if it can be used early. Rectal salines should be used just afterwards.

1908.—Crile introduced his method of preventing shock after operations, especially about the head and neck. He calls it "anoci-association" (*vide* Anæsthesia).

1890.—H. C. Wood of Philadelphia introduced atropine to counteract shock.

Sino-auricular and Auriculo-ventricular Nodes.—*Vide* Heart.

Skin Diseases.

Many of these have been shown to be due to infection by toxic germs. Sabouraud has done the principal work on this subject, especially in regard to trichophyton (1894), eczema (1899), and alopecia (1904).

There is no doubt that some are directly caused, or at any rate favoured, by auto-intoxication from the teeth and intestines. Antitetanic serum, when injected, often

causes an erythema, and the same is also true of diphtheria antitoxin, etc. A roseola sometimes follows a soap enema.

The following original descriptions have been published:

1873.—Dysidrosis, (1881) hydroa, by Tilbury Fox.

1874.—Paget's disease of the nipple (eczema) described.

1876.—Giant urticaria, by John Laws Milton.

1882.—Neurofibroma, by von Recklinghausen.

1882.—Varicella gangrenosa, by Jonathan Hutchinson.

1882.—Scleroderma pigmentosum (1886) and lichen ruber moniliformis, by Koposi.

1876.—Idiopathic progressive atrophy of the skin, by Robert Wm. Taylor of U.S.A.

1889.—Widmark of Stockholm showed that sunburn is due to the action of ultra-violet rays.

1903.—Radcliffe Crocker's "Diseases of the Skin," third edition.

1904.—"Atlas of Skin Diseases," by American authors, edited by J. J. Pringle.

Perhaps the principal new drugs used in skin diseases are ichthyol and resorcin.

Sleeping Sickness.—*Vide* Trypanosomiasis.

Snake Venom.

This has been investigated by Sir T. R. Fraser.

1897.—He showed that 1,000 times the lethal dose, used subcutaneously, may be introduced into the stomach of an animal without injury; it is rendered innocuous by the bile.

Spinal Anæsthesia.—*Vide* Anæsthesia.

Spleen.—*Vide* Banti's Disease, Still's Disease.

1877.—It was first extirpated successfully by Jules Péan.

1888.—Spencer Wells had his first successful case, after several failures.

Spontaneous Generation.

The old controversy as to whether the formula *omne vivum e vivo* is true, or whether life ever arises *de novo*, seemed to have been settled in 1880 by Pasteur, who showed that germs do not appear in a sealed sterile fluid under what he regarded as crucial test conditions.

1913.—Charlton Bastian, as the result of numerous experiments, declared that spontaneous generation does occur.

It is difficult, and sometimes impossible, to prove a negative, and the demonstration that spontaneous generation has not occurred in certain experiments would not prove that under some pre-existing terrestrial state it did not occur. As far as practical medicine is concerned, spontaneous generation does not occur.

Statistics.

The study of statistics as a distinct branch of science was started by Sir F. Galton, who established a special laboratory for the purpose, in association with Karl Pearson and Weldon. Since Galton's death it has been under the direction of Karl Pearson, who alone, or in conjunction with numerous assistants and collaborators, has compiled a large number of statistics relating to physical characters and heredity.

1883.—" Human Faculty," (1889) " Natural Inheritance," and (1893) " Finger Prints," by Galton.

1897.—" The Chances of Death," by Pearson. " Alcohol and Heredity," by Pearson and Elderton.

1885.—" Vital Statistics," by Wm. Farr (posthumous).

Collective investigation of disease was initiated by Sir G. M. Humphrey.

Still's Disease.

1896.—Described by George Frederick Still, physician to the Great Ormond Street Hospital in London.

It is a kind of arthritis deformans, with enlargement of the spleen, occurring mostly in children.

Stomach.

Shape and Position.—The X rays have thrown much light on this subject. It has been shown that the long axis generally diverges considerably from the horizontal transverse direction, as previously taught. The changes it undergoes during digestion, and its rate of emptying, can now be observed by X rays. For this purpose, in 1898, Walter Bradford Cannon of Wisconsin gave a bismuth meal after a short period of starvation (*vide* X rays).

1917.—Carlson noticed in a patient with gastric fistula that the sensation of hunger was complained of when peristaltic waves occurred in the empty stomach.

Pain in gastric and duodenal ulcer seems to be due to hypersensitive nerves involved in the ulcer, as it occurs during contractions of the stomach, and is not due to hyperacidity. Ulcer symptoms are apparently often due to gall stones, and removal of the vermiform appendix cures about 75 per cent. of cases where there is nothing wrong locally in the stomach or duodenum, though ulceration has been suspected. Blood may flow from the mucous membrane without an ulcer being present.

Suprarenal or Adrenal Gland.—*Vide* Shock.

This gland consists of a cortical portion surrounding the central part or medulla. The medulla of the adrenals and the post-ganglionic elements of the sympathetic nervous system are developmentally homologous structures, and their influence is reciprocal; the sympathetic

excites the secretion of adrenalin (the active principle formed by the gland), whilst adrenalin stimulates the sympathetic nerve fibres.

The adrenals antagonize excessive action of the pancreas; when they are excised, there follows a continuous flow of pancreatic juice, which is arrested by injection of adrenalin.

The adrenals, in association with the action of the sympathetic nervous system, form a defensive mechanism against external foes, and become specially active when the body has to exert special effort, as in combating or escaping from enemy attacks. Cannon regards it as the chief source of physical energy. It is said to form an essential part of hæmoglobin. Excision is followed by fatal results.

Tizzoni in 1886, Langlois in 1893-7, Schäfer, and others, confirmed the earlier experimental work of Brown-Sequard (in 1856).

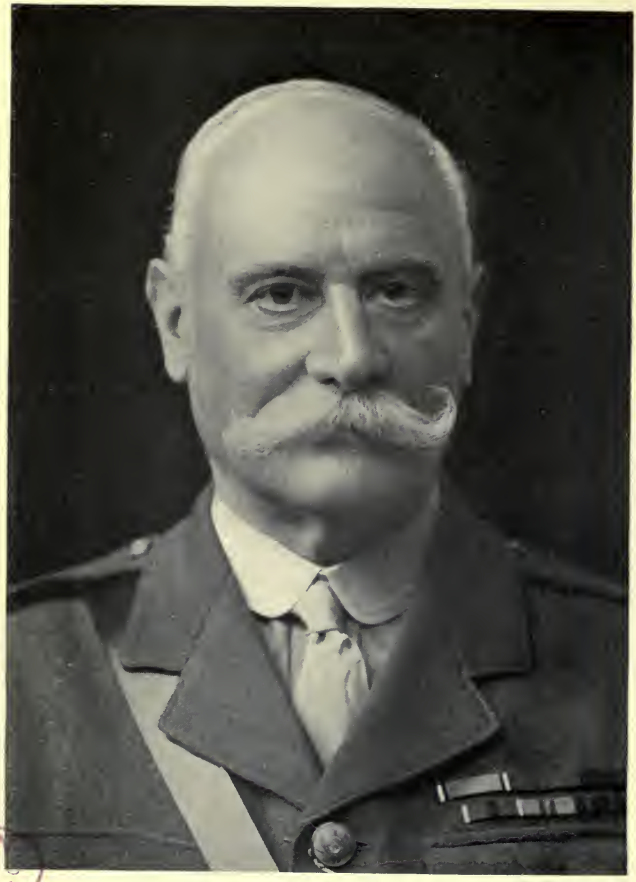
1894-5.—Oliver and Schäfer showed that extract of the gland, when injected, raised the blood-pressure.

1901.—The active principle was obtained by Jokihi Takamine.

An extract of the gland raises the tone of both voluntary and involuntary muscles; its action is direct, and not through the nervous supply to the muscle fibres. The most marked contraction occurs in the abdominal blood-vessels, and to a lesser degree in the pulmonary. Adrenalin may therefore be used as a hæmostatic in pulmonary hæmorrhage. It is injected intravenously in shock and hypodermically in asthma. In the last-named disease it acts well in tabloid form given by the mouth. It has been injected into the wall of the ventricle of the heart in profound syncope.

With cocaine it is used for the prevention of hæmorrhage

SIR E. SHARPEY-SCHÄFER.



SIR FREDERICK TREVES.

—*e.g.*, in operations on nasal septum. There is very little definite knowledge as to the precise rôle of the adrenals in normal physiology of tranquil health.

1922.—Mott has shown that in dementia præcox there is a wasting and fibrotic change in the medulla of the gland.

Surgery.

The new procedures in surgery have been so numerous that it is impracticable to refer to more than a few of them. Several will be found mentioned under other sections.

1876.—Paquelin introduced the thermo-cautery.

1877.—Henry Austin Martin of the U.S. Army introduced the rubber bandage. August Bier extended its application in 1903 to the production of active and passive hyperæmia in the treatment of chronic sluggish inflammatory conditions of the skin, etc.

1892.—W. S. Halsted did the first successful ligature of the subclavian artery in its first portion for aneurism.

1890.—Halsted invented the rubber glove.

1877.—W. Whitehead of Manchester did the first successful excision of the tongue through the mouth with scissors. By 1891 he had had sixty-six cases, with only three deaths.

1878.—Bigelow introduced his operation of litholapaxy.

1881.—Billroth did first resection of pylorus for cancer. Auton Wölfler introduced gastro-enterostomy, and it was practised by Czerny in the same year.

1882.—Langenbüch excised the gall-bladder.

1886.—Miculicz Radecki did first resection of cancer from the œsophagus. He also performed lateral pharyngotomy for malignant disease of the tonsillar region.

The Prostate.—Increased attention has been paid to enlargement of the prostate and the resulting obstruction. There seems to be a fairly general consensus of opinion

that if it produces retention (with consequent decomposition) of urine it ought to be excised.

1886.—Mr. McGill of Leeds advocated and performed removal of the prostate by the suprapubic route. Treves says: "To McGill is due the sole credit of originating the operation."

1888.—The first prostatectomy in America was performed by Belfield of Chicago, and he was soon followed by Trendelenburg and others. Many surgeons approached it by the perineal route.

1896.—Sir P. Freyer established the suprapubic operation, and this is the one now generally adopted.

Intestinal anastomosis has been advanced by the use of Murphy's metal button, which Senn (a Swiss surgeon) replaced with decalcified bone about 1890.

Surgery (Bone).—*Vide* Bone.

Grafts from living bone have been used to restore gaps, especially in the jaw, radius, and tibia.

1911.—Macewen* showed that the periosteum limits the growth of bone; it should be included in the graft for this reason.

1912.—Kutner of Breslau reported cases where he transferred part of the shaft of femur and tibia, including the joint surface from the cadaver.

1912.—J. B. Murphy of Chicago described his method of arthroplasty, or restitution of functional activity in joints rendered useless by ankylosis. He places a pediceled piece of fat and fascia from the neighbourhood of the joint between the surfaces; this prevents bony union. Passive movement is begun in seven to ten days.

1910-13.—Howard Kelly, in his stereo-clinic, produced a permanent photographic record of recent surgical procedures.

* "The Growth of Bone."

The most important advances in operative procedures have been rendered possible by the adoption of strict antiseptic and aseptic measures, and are due indirectly, if not directly, to Lister.

Syphilis.

1903-4.—Metchnikoff and Roux succeeded in transmitting this disease to apes by inoculation, so that "the initial victory was won."

1905.—In May Schaudinn discovered that the disease is due to the *Spirochœta pallida*, and demonstrated the method of its detection by the microscope.

This is the most important discovery in the whole history of syphilis.

1907.—Wassermann introduced his serum test.

1921.—Professor G. Dreyer and Dr. H. K. Ward introduced their sigma reaction or flocculation test. It is simpler and less expensive than Wassermann's.

1909.—Ehrlich introduced the drug "606," afterwards termed "salvarsan," an organic compound of arsenic.

1912.—He introduced "914," or "neosalvarsan." It is more soluble than salvarsan.

These substances have a specific action; they rapidly kill many of the spirochætes, but it is doubtful when *all* are killed.

At any rate, syphilitic lesions very often clear up with remarkable rapidity after a few injections. They are administered either by injection into the gluteus medius muscle or into a vein.

Cases need watching after apparent cure.

1911.—Noguchi introduced his luetin reaction. He has artificially cultivated the *Spirochœta pallida*.

Numerous modifications have been introduced in the treatment of syphilis since "606" was first introduced, for it was found that this preparation caused much irrita-

tion when used intramuscularly. Neosalvarsan can be used in much stronger solution than "606" (about 15 to 1).

1914.—Ehrlich introduced "1206," which requires only distilled water for solution, or 0·4 per cent. saline. It is a compound of salvarsan with sodium.

1913.—Galyl introduced by Mouneyrat. It does not seem to be so active an agent as "914."

Luargol ("606,"+antimony and silver) is too irritating. It was introduced by Danysz.

Disodo-luargol, introduced later, is more active than "914," and does not possess the irritant properties of luargol.

Many observations point to the necessity for combining Hg in the treatment, and for the treatment to be continued over a much longer period than was at first thought necessary.

History of Syphilis.—There is an important essay on this subject, from the pen of Dr. Iwan Bloch of Berlin, in D'Arcy Power and Murphy's "System of Syphilis" (1908). The writer tells us that in 1882, when the International Medical Congress was held in Madrid, Dr. Montego-y-Robledo, a Spanish army surgeon, related the results of his long study of the subject. His views have been confirmed by Professor Binz (1893) and Professor Seler (1895) and by Bloch (1901).

Two opposite views have been held as to the existence of syphilis in Europe and adjoining territories before the time when Columbus returned from his voyage of discovery in 1492. Some say it did exist here, and quote certain parts of the Old Testament—*e.g.*, Psalm xxxviii.—in support of their view. Others say it was introduced into Europe by the sailors of Columbus, and brought by them from the New World. The most important witness for the latter view is Dr. Ruy Diaz de Isla (1462-1542). He was

in practice in Barcelona in 1493, and treated several of Columbus's men when they landed in that port from the island of Haiti, or, as it was then called, Española. The disease was new to de Isla and to the sailors themselves. The disease was later identified with what came to be known as morbus gallicus. About 1510 de Isla wrote a book on syphilis. This work was discovered by Montejo a short time before the meeting of the above-named Congress in the National Library at Madrid. In it de Isla calls syphilis "disease of the island of Española." Professor Elliot Smith says (*British Medical Journal*, March 26, 1921, p. 472): "Altogether, with his collaborators, he had examined some 40,000 bodies in every part of the Nile Valley belonging to every period of Egyptian history; in no single case was evidence of syphilis detected."

Dr. Bloch concludes: "All available statements and facts point to the last decade of the fifteenth century—particularly the years 1493 to 1500—as the time when syphilis first appeared in the Old World. There is not a particle of evidence to show that the disease existed in Europe before that date."

The disease described in the Psalm mentioned is much more like a gonococcal infection than syphilis.

Syringomyelia.

1882.—First described by Kahler of Prague, and in 1888 by Schultze of Dorpat.

1895.—Special monograph by Schlesinger, in which he describes five types, one of which he identifies with Morvan's disease, described by Augustin-Marie Morvan in 1883.

Tabardillo, or Mexican Typhus.

1910.—Ricketts and R. M. Wilder discovered that this disease is transmitted by the *Pediculus vestimenti* (the

body louse). Nicolle observed the same in Europe in 1909.

Teeth.

Dental caries appears to play a decided part in the production of several morbid conditions. The pyorrhœa resulting from disease of the teeth undoubtedly leads to dyspeptic troubles, and in some cases there appears to be a close relationship between caries and rheumatism, though numerous instances may be observed where caries and pyorrhœa are present without any complaint or signs of rheumatism.

1904.—Prowazek showed association of *Entamœba buccalis* with pyorrhœa alveolaris.

M. Steadman, a dental surgeon of London, claims that there is a very close causal connection between pyorrhœa and cancer of the mouth, rectum, and female genitals.

1922.—Mellanby showed that cod-liver oil exerts a good effect on the development and soundness of the teeth—at any rate, in some of the lower animals.

Testis.—*Vide* Glands.

Tetanus.

1884.—*Bacillus tetani* discovered by Arthur Nicolaier.

An antitetanic serum has been introduced, and was largely employed during the Great War.

Tetany.—*Vide* Thyroid.

Therapeutics.—*Vide* Drugs, etc.

Three systems have come into vogue, and have found a fair number of adherents—viz., Christian science, faith healing, and autosuggestion as practised by Coué.

Throat.—*Vide* Nose.

1889.—Horace Green, U.S.A., performed the first laryngeal operation through the mouth with external illumination.

1880.—Ottomar Rosenbach, and a little later Sir Felix Semon, described effects on the vocal cords resulting from complete and incomplete paralysis of the recurrent laryngeal nerve.

Recent works on the nose and throat are:

1880.—"Manual of Diseases of the Throat and Nose," by Sir Morell Mackenzie.

1881.—One by F. H. Rosworth.

1890.—One by Lennox Browne.

1914.—"Diseases of the Ear, Throat, and Nose," by George Nixon Biggs of London.

Thyroid.

This gland has received probably more attention during recent years than any other single organ of the body, both from the physiological, clinical, and therapeutic points of view. In 1873 it was looked upon as a vestige, and practically nothing was known of its share in the production of disease beyond its own boundaries. In 1878 Theodor Kocher began to excise the gland in cases of goitre. He soon found that many cases were followed by the condition which he termed "cachexia strumipriva."

This was observed to be practically identical with the condition described by Sir Wm. Gull in 1875 as due to absence or deficiency of the gland, and which, from its resemblance to the condition found in cretins, he termed "the cretinoid state."

1877.—The same condition was described by Dr. Ord more fully. He termed it "myxœdema."

1882.—Reverdin of Geneva produced myxœdema by total thyroidectomy.

1883.—Kocher observed 30 cases of cachexia strumipriva in 100 thyroidectomies.

Horsley and F. Semon showed that cretinism and

myxœdema are essentially the same disease and due to lack of thyroid activity.

1884.—Moritz Schiff of Frankfort-on-Maine, had sixty cases of fatal excision of the gland in dogs (he had been experimenting since 1856), and he made the important discovery that thyroidectomized dogs could be saved, after excision, by the previous graft of part of the gland into some other part of the body of the animal.

This was about the earliest observation on "internal secretion."

1885.—Victor Horsley observed myxœdema in some thyroidectomized monkeys, but this result did not follow after partial removal of the gland; hence he came to the conclusion that when thyroidectomy is performed it is well to leave a portion of the gland behind.

Myxœdema and cretinism occur in various degrees, and are due to deficient activity of the thyroid when not the result of operation.

This condition is often called "hypothyroidism."

1891.—G. R. Murray of Newcastle-on-Tyne introduced the treatment of myxœdema* by the hypodermic administration of thyroid extract.

1892.—Dr. Hector Mackenzie and Dr. E. L. Fox found oral administration equally effective. It is now available in tabloid form, and has proved of immense benefit.

Hyperthyroidism is the condition of increased activity of the gland. It occurs in Graves's disease, and many cases of tachycardia. Enlargement of the gland is not necessarily associated with increased activity; sometimes it is associated with exophthalmos and tachycardia, but in other cases the condition approaches myxœdema.

* "Note on the Treatment of Myxœdema by Hypodermic Injections of an Extract of the Thyroid Gland of the Sheep" (John Bale and Sons).

MYXŒDEMA BEFORE TREATMENT.

(*Courtesy of Dr. G. R. Murray, Manchester.*)

P. 144.

MYXŒDEMA: SAME PATIENT AFTER TREATMENT.

P. 144.

G. R. Murray divides hypertrophic cases into three classes or groups—viz.:

1. Simple hypertrophy.
2. Toxic adenoma with hyperthyroidism.
3. Exophthalmic goitre or Graves's disease.

In some of the most pronounced cases of Graves's disease there is very little hypertrophy.

Test.—In doubtful cases glandular activity may be tested by Goetsch's method. He injects ½ c.c. of adrenalin solution of the strength of 1 in 1,000 hypodermically. A rise of more than 10 per minute in the pulse rate, or 10 mm. of blood-pressure, indicates excessive activity of the thyroid gland.

1902.—Anton von Eiselsberg produced tetany in young cats by excising the gland which he had previously transplanted into the abdominal parietes, and he also produced cretinism in the rabbit, lamb, goat, and ass, together with atheroma of the aorta.

1922.—McCarrison described results of his experiments on the etiology of hyperplasia. He found it to be caused by fats and butter, but not by cod-liver oil. The last named contains iodine, and this accounts for the difference between it and the other fats. Goitre results when there is a deficiency of iodine in the diet. Oleic acid is specially potent, and this may result from the action of intestinal bacteria. It may be that the bacteria seize on the iodine. Others have found a meat diet to cause goitre in fowls (Watson and Edmunds).

The thyroid is undoubtedly intimately associated with iodine metabolism. It needs a certain (though small) quantity to perform its normal physiological functions. If iodine is deficient, the gland increases in volume in the effort to carry on its work of producing its hormone or

internal secretion. Its secretion is necessary for the integrity of the cutaneous and nervous systems, and for the activation (in some way not yet understood) of some of the other ductless glands.

Iodides, and especially iodoform, stimulate the thyroid; they are taken up by it and secreted into the blood as iodothyrin. Oswald has shown that in goitre the gland colloid is very deficient in iodine.

In children on the breast the gland may enlarge in order to obtain more iodine from the mother.

1896.—Baumann isolated iodothyrin.

After Baumann's discovery Kendall isolated from the colloid substance a crystalline *indol* derivative—*thyroxin*—rich in iodine, having the formula $C_{11}H_{10}O_3NI_3$, "which is said to be effective in curing myxœdema and cretinism" (R. Short). One ton of fresh gland contains about 9 grams of thyroxin.

Dr. White has shown that in myxœdema the basal metabolism may drop as much as 40 per cent., as estimated by the nitrogen in the urine, and Paterson and W. Watson have shown that the pulse varies directly and the weight inversely with the metabolic rate.

The rôle of the thyroid is of extreme importance, although it is not yet fully understood. Like other ductless glands, it takes an important share in development, but its activity continues throughout life, and may be above or below the normal amount. When deficient, it is probably due to heredity or lack of sufficient iodine in the food. Excess is often associated with nervous causes.

The extract, as already stated, has been found to be beneficial in such conditions as cretinism and myxœdema; and also in many conditions not at first thought to be connected with thyroid efficiency, as arteriosclerosis,

atheroma, gummata, and tertiary ulcers, and even undescended testis.

The great desideratum is to find a cure for the hyperactivity, as seen in Graves's disease, certain cases of tachycardia, etc. Much work has been done in this connection.

Quinine hydrobromide has lately come into favour, but so far the best results have been obtained from the use of X rays.

Lanz introduced *radogen*, a precipitate from the milk of thyroidectomized goats.

Kocher and the Mayos have performed partial excision, with good results; some say that vegetables should be very restricted in the diet, because they supply most of the iodine. Iodoform has been seen to produce toxic effects, probably from its action on the thyroid.

Kocher used cocaine or eucaine instead of a general anæsthetic. In 2,000 operations he had a mortality of 6 per cent.

Parathyroid.—The different results which were observed to follow excision of the thyroid produced conflicting views as to its functions, but also led to closer investigation of its precise structure and anatomical boundaries, with the result that in 1880 Ivar Sandström, a Swedish anatomist, discovered two tiny accessory glands in close relation with the thyroid, and he named them parathyroids.

1891.—Eugene Gley showed that a fatal result follows thyroidectomy more rapidly if the parathyroids are removed at the same time as the thyroid.

1892.—Von Eiselsberg noted that tetany results after removal of transplanted parathyroids.

1895.—Kohn discovered and described a second pair of parathyroids, and that excision of all four proves

rapidly fatal with marked tetany. He also showed that the signs are the same with or without removal of the thyroid. If one parathyroid be left intact, the animal may live, but tetany occurs.

This has been confirmed by Vassale, Moussu, and Edmunds.

In 1907 H. Leischer published an important paper on the subject. He removed the parathyroid and transplanted it immediately into the peritoneum, and no result was observed to follow. Then after an interval he excised the transplanted gland, and tetany soon appeared.

1908.—W. G. MacCallum and C. Voegtlin showed that calcium salts will remove tetany even in man, and that the parathyroids are connected with calcium metabolism.

1909.—Removal has thrown much light on the function of these glands. Halsted showed that it produces tetany.

1922.—W. R. Grove and H. W. C. Vines threw further light on the subject, and demonstrated that they are intimately associated with calcium metabolism, and that $\frac{1}{10}$ grain of parathyroid taken daily by the mouth improves chronic toxæmias, such as varicose ulcers, otitis, nasal sinusitis, etc., by modifying the Ca metabolism. It is said to change the combined Ca into ionic Ca.

Rendal Short relates a case of tetany cured by grafting human parathyroid.

One of the most important articles in the literature of the thyroid is that by Dr. E. Hertoghe of Antwerp, published in 1915 in the *Practitioner*.

1916.—" The Endocrine Organs," by Sir E. A. Schäfer.

1900.—" Diseases of the Thyroid Gland," by G. R. Murray, M.D.

1922.—" Diseases of the Thyroid Gland," by Arthur E. Hertzler, M.D., Professor at Kansas, U.S.A.

1922.—"The Thyroid Gland," by G. W. Crile and others.

Tonsils, the.

Have received a great deal of attention in recent years, and a great number of children are now treated in school clinics for enlarged tonsils and adenoids. Removal, for many years, was performed generally by means of Mackenzie's guillotine, or some modification of it. It was found, however, that there was a tendency to recurrence of the tonsillar trouble within a few years, and the operation had to be repeated. Enucleation by means of the instrument introduced in 1910 by Whillis and Pybus of Newcastle is now gradually replacing the earlier tonsillotomy, and, as it lifts the whole tonsil out of its bed, the cure is more certain and complete. The wound is smaller than that produced by the Mackenzie type of guillotine. Dr. Greenfield Sluder's name is associated with enucleation of the tonsil. He read his first paper before the American Medical Society on June 9, 1910. Whillis and Pybus read their first paper before the Northumberland and Durham Medical Society on January 20, 1910.

Toxæmia.

This condition is now known to be due in many cases to auto-infection, and to be the cause of most chronic diseases.

Toxins.—*Vide* Germs, Immunity, etc.

1888.—These were first isolated and named by Ludwig Brieger.

Transfusion.

1875.—L. Landois showed that animal blood-serum will hæmolyze human blood, and thus revolutionized transfusion procedures.

The direct arm-to-arm method may be used, or citrated blood. The citrate does not alter the coagulation time of the receiver's blood. Donors may give 1 pint of blood.

In America there are professional donors.

Abel has found that the red blood-cells of the bled animal may be washed and suspended in Locke's fluid, and are still just as efficient as fresh whole blood. This method was largely employed in the Great War.

Rous and Turner used cells after being kept in a citrate-dextrose solution for two or three weeks.

It is of the utmost importance that an appropriate "donor" should be selected. According to Moss, there are four distinct classes or groups of blood—viz.:

Group	I.	occurring in	5 per cent.	of people.
,,	II.	,,	40 ,,	,,
,,	III.	,,	10 ,,	,,
,,	IV.	,,	45 ,,	,,

Stock sera of Groups II. and III. are used as indicators.

Two glass slides are taken, and a single large drop of serum of Group II. is placed on one slide and a similar drop of Serum III. on another slide; a little citrate is mixed with each. Then a small drop of the donor's blood is added to each drop of serum and mixed well. Agglutination, visible to the naked eye, will or will not follow in five minutes.

If agglutination of the blood-corpuscles occurs with both II. and III., the donor belongs to Group I.; if with III., but not II., the donor belongs to Group II.; if with II., but not III., the donor belongs to Group III.; if with neither, the donor belongs to Group IV.

Group IV. has been termed a "universal provider," and such blood may be injected into any individual.

It is found in practice that the donor must belong to the same group as the patient, or else to Group IV.

Tropical Diseases.—*Vide* Malaria, Yellow Fever, etc.

1921.—" Manson's Tropical Diseases," edited by Philip H. Manson-Bahr, M.D.

1909.—" Mosquito or Man," by Sir Rupert Boyce.

Trypanosomiasis.

1880. — Griffith Evans, M.D., McGill University, M.R.C.V.S., a veterinary surgeon of Bangor in Carnarvonshire, when in India, discovered a trypanosome as the cause of Surra, a disease of cattle, horses, mules, and camels. In 1885 this, after a good deal of discussion and opposition, was confirmed by other observers, and the protozoon was named by Steel and Crookshank *Trypanosoma evansi* (1885).

This was the starting-point of protozoon pathology.

(In 1878 Lewis had discovered a trypanosome in the body of the rat, and Gruby as early as 1843 one in the frog, but they are both non-pathogenic.)

1888.—Victor Babes, a Roumanian physician, discovered a protozoon in sheep in a certain disease, and in 1895 Theobald Smith discovered the same or a similar one in Texas fever, which he named *Pyrosoma bigeminum*. With F. L. Kilburne, Smith showed that it is transmitted by a tick.

This was the earliest demonstration after Manson's of transmission of infection by a blood-sucking insect.

1894.—Sir David Bruce found that the tsetse fly disease is due to *Trypanosoma brucei*, which was discovered in Zululand. It is conveyed by the fly from big game to cattle and horses. The fly is named *Glossina morsitans*. It imbibes the protozoon when it bites.

1901.—J. Everett Dutton of Chester found the *Trypanosoma gambiense*, as he named it, in the blood of man. It had been first seen by Todd of the London School of Tropical Medicine; he showed it to Dutton, who recognized its nature. This was the earliest discovery of a trypanosome in man.

In 1901 Dutton went out to Gambia alone.

In 1902 he went with Dr. Todd to Senegambia, and in 1893 to the Congo. In 1903 Aldo Castellani of the London School of Tropical Medicine found *T. gambiense* in the cerebro-spinal fluid and in the blood in five cases of sleeping sickness. He was the first to connect the parasite with the etiology of this disease.*

1903.—Then Bruce and Nabarro found that the tsetse fly is the vector of the disease (sleeping sickness), and that Gambia fever, first seen by Dutton and Todd in 1902, and sleeping sickness are two stages of one and the same disease. They transmitted sleeping sickness by the tsetse fly.

In May, 1903, Sir W. B. Leishman described the trypanosome of "dum-dum" fever (named from a place near Calcutta), also called kala-azar, and tropical splenomegaly.

1906-7.—Walter Scott Patton described the development of the germ in the bed bug.

1904.—Nabarro, Ross, and Milne, independently in Uganda, and Dutton and Todd in the Congo State, discovered the spirillum of relapsing fever of Africa.

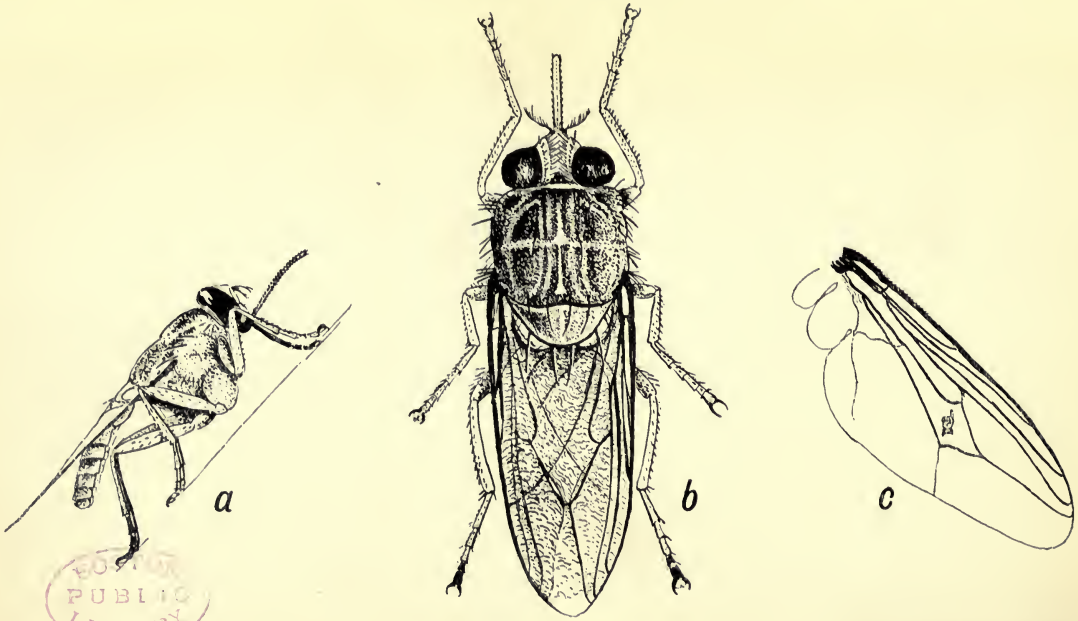
Dutton died of the disease near the Stanley Falls after he had proved its transmission by a tick—the *Ornithodorus monbata*.

1910.—Robert Newstead published an illustrated account of the tsetse fly.

* "Etiology of Sleeping Sickness," *Journ. Trop. Med.*, 1903.

JOSEPH EVERETT DUTTON.

P. 152.



From Drawings by R. Newstead.

TSE-TSE FLIES (*Glossina*).

a, Profile view of insect at rest. *b*, Dorsal view. *c*, Wing showing unique venation; hand points to the strongly curved fourth vein. All figures magnified approximately five diameters.

1910.—H. S. Ranken perfected the method of intravenous injection of metallic antimony for sleeping sickness, first indicated in 1907 by Plimmer and Thomson of Lister Institute, and in 1911 for yaws (in Sudan). Castellani discovered the *Spirochæta pertenuis* as the cause of yaws.

In the latter years of the nineteenth century sleeping sickness spread from the Congo State to Uganda, and caused an extensive epidemic there.

1922.—A case of sleeping sickness in a man was sent by the Liverpool School of Tropical Medicine to Hamburg, to be treated by Bayer's "205." After two injections the patient, apparently cured, went on a walking tour in the Black Forest, and then returned to Africa.

1908.—Sleeping Sickness Bureau founded in London.

Tsetse Fly (Glossina morsitans).—*Vide* Trypanosomiasis.

Tuberculosis.

1877.—Julius F. Cohnheim produced tuberculosis in the rabbit by inoculating the anterior chamber of the eye with tuberculous material. This solved the problem of its infectivity.

In 1880 he published "Die Tuberculose vom Standpunkt der Infectionslehre."

1882.—Robert Koch discovered the tubercle bacillus, and announced his famous "postulates" required to prove the pathogenic properties of any micro-organism. He demonstrated that tuberculosis is due exclusively to this bacillus. "It took the world by storm."

1890.—Koch introduced his tuberculin treatment.

1897.—Introduced his new tuberculin.

Koch's discovery led to the further establishment of sanatoria, more healthy houses, and the German system of insurance.

1898.—Theobald Smith was the first to differentiate between human and bovine T.B. This was confirmed and specially emphasized by Koch in 1900. His statement was contested by many observers, and it cannot yet be stated dogmatically what is the exact relationship between the two strains of bacillus.

1907.—Calmette introduced the conjunctiva reaction as a test for T.B.

1907.—Von Pirquet introduced the skin test.

1882.—Ehrlich introduced the present fuchsin stain for the tubercle bacillus, showing that it is "acid-fast."

1876.—The first sanatorium on modern lines was established by Peter Dettweiler at Falkenstein in the Taunus. He employed the reclining rest chair, open air, and special receptacles for sputum, etc.

The death-rate has notably decreased; from 1856-60 the rate was 2,565 per million, and from 1891-3 the rate was 1,512 per million—a reduction of 41 per cent.

Twilight Sleep.—*Vide* Anæsthetics.

Typhoid Fever.

1880.—Carl Joseph Eberth discovered the bacillus.

1882.—Ehrlich introduced his diazo-reaction test (*vide* Urine).

1884.—George Gaffky, Koch's pupil and successor in Berlin, procured the first cultures of the *Bacillus typhosus*.

1888.—Widal and Chantemesse vaccinated against it.

1895.—Haffkine of Odessa, when in London, persuaded the Netley Pathological Laboratory authorities to undertake inoculation with typhoid vaccine in those going to tropical countries.

1897.—It was begun and has since then been largely employed, especially in the Great War.

1896.—The vaccine was first prepared by Sir A. E. Wright and Major D. Semple of the Army School at Netley (*vide British Medical Journal*, January 30, 1897).

1896.—Widal and Sicard introduced the agglutination test which they discovered for typhoid.

1898-1900.—Wright inoculated over 3,000 soldiers in India and the whole force in the South African War.

1900-3.—Sir A. E. Wright introduced preventive inoculation with the opsonic index as a guide. To him is chiefly due the perfecting of vaccino-therapy.

1904.—"Treatise on Antityphoid Inoculation," by Sir A. E. Wright.

1912.—The value of vaccination was clearly demonstrated by Major F. F. Russell of the American Army. He vaccinated 20,000 men with "absolute success." The experiments were begun in 1909 by Surgeon-General G. H. Tornay and F. F. Russell, and gradually the whole American Army was vaccinated. In 1909 there were 173 cases of typhoid, with 16 deaths. In 1912 only 9 cases and 1 death, whilst in 1921 there was not a single case. Similar results have been observed in India and South Africa. Osler (*vide* "Counsels and Ideals," 1921, p. 315 *et seq.*) refers, on the other hand, to the terrible ravages produced by typhoid in the American Volunteer Army in 1898, and contrasts its prevalence in America with its rarity in Great Britain.

1894.—Careful inquiry has shown that about 40 per cent. of cases of typhoid fever are due to sewage contamination.

Paratyphoid.—1898.—The first case seems to have been studied by Gwyn, and in 1901 it was described by Schottmüller.

The agglutination test is used to differentiate the two

diseases from true typhoid. It is due to infection by *B. coli* of Escherich or *B. enteritidis* of Gärtner.

Typhus.

Has been practically extinguished in this country owing to improved sanitation. There was a terrible epidemic of typhus in the Near East during the later period of the Great War.

1915.—*Bacillus typhi exanthematici* discovered by Harry Plotz in New York.

Ulcer.—*Vide* Parathyroid.

Urine.—*Vide* Kidneys.

1892.—Dr. T. R. Bradshaw described his test for albumose in the urine in association with disease of the bone-marrow. Albumose differs from albumen in the fact that after precipitation with strong HCl it is redissolved on boiling, and again comes down as the urine cools to below about 140° F. (*Medical and Chirurgical Journal*, 1898, and *British Medical Journal*, November 24, 1906).

Uterus. For structure, *vide* Pregnancy.

1893.—Hofmeier showed that the current produced by the cilia in the Fallopian tubes is directed outwards—*i.e.*, towards the uterus—and not, as formerly stated, towards the ovary.

Excision.—1874.—Keith of Edinburgh did his first hysterectomy for myoma. "He first turned the tide in the direction of success" (Treves).

1878.—Performed by Wilhelm A. Freund for cancer, but the mortality was so great that the operation was abandoned.

1879.—Vaginal hysterectomy revived by Czerny.

1900.—Wertheim performed his radical operation for cancer, and it has frequently been repeated (it had

been done by Walter Burnham, U.S.A., successfully in 1853).

Bardenheuer excised for myoma, with good success: six out of seven recoveries.

1887.—Howard J. Kelly introduced "suspension" for retroflexion.

1892.—Bowerman Jessett of London, and W. J. Smyly of Dublin, practised the same procedure.

Vaccination.

1880.—Ernest Hart (editor *British Medical Journal*) induced the Government to supply calf lymph only in place of human lymph, as used previously in arm-to-arm vaccination.

Vaccino-therapy.—*Vide* Typhoid.

Vaquez's Disease, or Cyanotic Polycythæmia.

1892.—Described by Henri Vaquez of Paris.

Veins (Varicose).

1873 (December 4).—First excised by Sir H. G. Howse of Guy's Hospital.

Vermiform Appendix.—*Vide* Appendicitis.

Vincent's Angina.

The appearance and distribution of the patch or patches in the throat so closely resembles that of diphtheria that the disease can only be positively diagnosed by the microscope.

1899 (August).—Professor H. H. Vincent of the Val de Grace, Paris, first described this disease. Two micro-organisms are generally present—one spindle-shaped, the other a spirillum. The fusiform bacilli had been described by Babes in 1884.

Virus.—*Vide* Germs, etc.

Filterable.—**1898.**—Of foot and mouth disease. This was discovered by Löffler, Paul, and Frosch to be due to a virus which will pass through the finest stone (Berkefeldt) filter. It was the earliest observation of the kind. Other filterable viruses have been demonstrated.

1900.—By Reed and others in yellow fever.

1903.—Confirmed by Rosenau.

1905.—In yellow fever and molluscum contagiosum, by Julius Bing.

1907.—In dengue, by Ashburn and Craig.

1908.—In trachoma, by Bertelli and Cechetto.

1910.—In typhus, by Nicolle.

1911.—In tabardillo, by Howard F. Ricketts.

1911.—In measles, by Goldberger and Anderson.

1911-2.—In chicken sarcoma, by Peyton Rous.

Other diseases believed to be due to a filterable virus are: Rabies (Pasteur), variola, scarlet fever, pertussis (Bordet), infantile poliomyelitis (Flexner).

Viscera Transplantation.

1902.—Alexis Carrel of the Rockefeller Institute published his work on this subject (*vide* Surgery).

Vitamins.—*Vide* Beriberi, Scorbutus, Rickets.

Also called "accessory food factors" (Hopkins). Owing to the investigations of Voit, Pettenkofer, Rubner, and Bunge, it had been accepted that, for normal growth and health, the body must be supplied with a sufficiency of protein, fat, carbohydrate, and certain inorganic salts, and it came to be generally believed that these included everything that was absolutely necessary. Milk was found to contain all these substances, and was therefore regarded as a perfect food for the young animal.

1881.—C. Lunin found that mice could live for several months in good health on a diet of milk alone, but that they invariably died within a month if they received a ration composed of what he believed to be the essential ingredients of milk—namely, caseinogen, milk fat, milk sugar, and the ash of milk—and he concluded that "other substances, indispensable for nutrition, must be present in milk besides caseinogen, fat, lactose, and salt."

1906.—Hopkins in London, and

1911.—Osborne and Mendel of the Carnegie Institute, U.S.A., confirmed these results.

1911.—Stepp found that the addition of a small quantity of milk or egg-yolk to the purified foodstuffs restored their nutritive value.

1912.—Hopkins found in one series of experiments that 2 c.c. of milk per day, added to the purified foodstuffs, restored normal growth and health in rats that were rapidly declining.

These observers came to the conclusion that some "accessory factor" is necessary, and that only very small quantities (of little or no direct nutritive value) are required.

1913.—McCollum and Davies, in America, pointed out that an accessory factor is present in butter and eggs, but not in lard or olive oil. In 1915 they termed it "fat soluble A," as it exists apparently in intimate association with fat, and they also produced evidence of the existence of another substance which they called "water soluble B."

Lard, olive oil and white fish, margarine, white wheaten flour, and polished rice contain neither of these.

1914.—Casimir Funk introduced the term in his "Die Vitamine." Water soluble B is also called the anti-beriberi and anti-neuritic factor. Its absence from

polished rice is said to be the cause of beriberi in Japan and the Philippine Islands, a disease studied by Eijkman in 1897. He observed its occurrence in birds fed on the rice. The rôle of lemon and orange juice for sailors on long voyages was long ago pointed out by Lind. These are now known to contain a third vitamin called the "antiscorbutic or water soluble C."

An extremely important fact has been discovered about the pulses (peas, beans, and lentils). In the dry state they contain no vitamin C, but if moistened and allowed to germinate for two days they contain a large amount. They can therefore be carried on ships in the dry state, and made to germinate as required.

The swede turnip contains as much vitamin C in its juice as exists in the juice of the lemon or orange. Lime juice is only about a quarter the value of the swede, orange, or lemon in this respect. Yeast extract, which is sold as "Marmite," contains a large percentage of vitamin B.

An extremely important series of experiments has been carried on lately by Dr. Mellanby and his associates of the Medical Research Committee of the Lister Institute. Bland-Sutton made some important observations on the feeding of rickety lion cubs at the London Zoo.

Many proprietary foods are advertised as containing all the essential vitamins, but on being tested by actual experiments the vitamins are found to be present in insufficient amount, or even entirely absent.

1919.—Report on vitamins by Medical Research Committee.

1922.—"Vitamins and the Choice of Food," by Violet G. Plimmer and R. H. A. Plimmer, D.Sc. of London.

Vivisection.

To discuss this with anything like completeness would require too much space. Dr. James Peter Warbasse of

New York has written an interesting epitome entitled "The Conquest of Disease through Animal Experimentation," 1910.

Weil's Disease.

1886.—First described by Weil, a German physician.

1916.—Inada and Ido published a paper reporting their discovery in 1914 of a spirochæte in the liver of a guinea-pig which had been injected with the blood of a patient suffering from this disease. In 1915 they came to the conclusion that it is the cause of the disease.

Whooping-cough.

1906.—Bordet and Gengou discovered the specific bacillus.

Women (Medical).

In 1873 only one woman's name was on the Medical Register; women were not allowed to register as medical students in this country. Their entry into the medical profession is chiefly due to the persevering labours and struggles of Dr. Sophia Jex-Blake.

1874 (October 12).—The London School of Medicine for Women was opened, and classes commenced October 12. It was founded by Miss Jex-Blake.

1877.—Women were admitted to the Royal Free Hospital.

Miss Jex-Blake graduated M.D. at Bern.

1877.—Later in the year, the King and Queen's College of Physicians, Ireland, was the first to admit women to its examination, and several women who already held a foreign qualification obtained the diploma.

1878.—London University admitted women to its medical degrees.

1885.—The Royal College of Surgeons, Ireland, was opened to women.

1886.—The Scotch colleges were opened.

1888.—The Society of Apothecaries admitted women to the examinations.

1892.—Women were admitted to the British Medical Association.

1885.—Miss Jex-Blake founded the Edinburgh School of Medicine for Women.

1894.—The classes were recognized by the Edinburgh University.

Dr. Elizabeth Garret Anderson had received the L.S.A. in 1865, being the first British qualification gained by a woman.

From 1876 to 1898 she lectured on midwifery at the hospital for women which she had started. In 1896 she was elected president of the East Anglian Branch of the British Medical Association, having been admitted a member of the association in 1892. In 1897 she graduated M.D. in London.

The earliest modern graduate was Elizabeth Blackwell of Bristol (England), who graduated at Geneva in the United States in 1849.

Woolsorter's Disease.—*Vide* Anthrax.

X Rays (Radiography).

1893 (November 8).—Conrad Wilhelm Röntgen, Professor of Physics at Würzburg, discovered X rays.

1895 (December).—He published an account of his discovery, and his paper was reproduced in *Nature* in January, 1896.

1897.—The Röntgen Society started in England.

In this country the development of radiography is largely due to the early experiments of Sir Oliver Lodge in 1896, and the encouragement of Sir Robert Jones

C. Thurstan Holland

RADIOGRAPH OF STOMACH, SHOWING HOUR-GLASS CONTRACTION OF EXTREME DEGREE.

A A, Diaphragm. B, Upper sac of stomach. C, Stricture. D, Ilium. E, Lower sac of stomach, showing vigorous contraction. F, Pylorus. G, Duodenal cap. H, Ulcer cavity, with gas bubbles above bismuth food. S S, Spinal vertebræ.

in the same year, and to Mr. C. Thurstan Holland, Ch.M., who was from the first associated with them in Liverpool; whilst Dr. Hugh Walsham, in London, early devoted himself to this branch of study, and has contributed several important essays on the subject.

Owing to the fact that most metals and compounds of the heavy metals and dense bone are opaque to the Röntgen rays, whilst the soft parts of the body are comparatively pervious, the rays rapidly came into use for diagnostic purposes, more particularly for pathological conditions of the skeleton and the localization of foreign bodies such as needles and bullets; but the more recent improvements in X-ray apparatus have rendered them useful in detection of tumours and consolidation of various organs—*e.g.*, cancer of the stomach, tuberculous infiltration of the lungs, even in a very early stage of the disease, aortic aneurism, etc. Radiography has shown that the opinion current at the end of the last century as to the shape and position of the stomach in health was incorrect. It has proved extremely useful in the investigation of disease of the pituitary gland, and shows unmistakably the presence or absence of renal calculus. As a therapeutic agent X rays are useful in ringworm, goitre, lupus, and the various manifestations of malignant disease.

1896 (October 2).—A coin was shown by radiography to be sticking in the œsophagus of a boy who had been for more than a year treated by specialists for tuberculosis of the lung.

1896 (May 11).—Dr. MacIntyre of Glasgow showed the first radiograph of a stone in the kidney, which was later removed by operation (*Lancet*, July 11, 1896).

1897 (May).—Thurstan Holland began his work on calculous disease of the kidney and ureter, and has produced brilliant results.

1905.—Bergonie and Tribondeau showed that they may produce atrophy of the seminal vesicles and concomitant hyperplasia of the interstitial glandular elements of the testes—the same result, in fact, that is produced by ligature of the vas deferens; also that X rays may be applied to one testicle to rejuvenate an old man! (Leonard Williams, *British Medical Journal*, May 27, 1922).

In gastric ulcer and obstructive conditions it is necessary to give a meal containing some opaque material such as bismuth, as employed by W. B. Cannon of Wisconsin in 1898.

In the early days various untoward results occurred from the employment of X rays, and particularly severe dermatitis. Afterwards protective clothing and gloves were introduced.

Yaws.—*Vide* Trypanosomiasis.

Yellow Fever.

1881.—Carlos Finlay discovered the part played by the mosquito, *Stegomyia calopus*, in causing yellow fever, but the announcement received no credence until 1900.

1883.—Hirsch, the medical historian, wrote: "Hypotheses as to the nature of yellow fever poison have exhausted the ingenuity of the profession without advancing our knowledge by a single step" (vol. i., p. 369).*

1900.—Early in the year Henry R. Carter, of the U.S. Public Health Service, showed that a lapse of twelve to fifteen days is necessary before a case of yellow fever becomes dangerous to others.

1900.—Reed and his co-workers produced yellow fever by mosquito bite, by injection of blood, and by injection

* In 1853 Beauperthuy declared that yellow fever is not "a contagious disease," and that what renders marshes unhealthy is "the presence of mosquitoes."

R. Newstead, del.

THE TIGER MOSQUITO (*Stegomyia calopus*) WHICH CONVEYS YELLOW FEVER FROM MAN TO MAN.

Note the dark body and the banded legs. Compare attitude of body as seen in top figure with that of the malaria mosquito.

of filtered blood-serum, thus proving the existence of a filterable virus. These observations were confirmed by Rosenau in 1903.

In 1899 Reed, Carrol, Lazear, and Agramonte made an elaborate study of the disease in Cuba, where it was endemic and epidemic. They proved its transmission by the *Stegomyia fasciata* (or *Stegomyia calopus*), as had been suggested in 1881-2 by Carlos Finlay.

The committee (which was sent out by the U.S. Government) proved that it is *not* transmitted by clothing, bedding, or fomites. Major Reed had a special building constructed, and after a long quarantine a young private was bitten by an infected mosquito; he developed the disease in three and a half days in a typical form; afterwards three men slept in the room for twenty nights surrounded by articles of clothing and bedding that had been used by yellow-fever patients and soiled by their discharges. Not a single case developed the disease, and the same experiment repeated on several occasions was followed by the same negative result.

Yellow fever can be produced by subcutaneous injection of blood of a patient taken during the first, second, and third days of the disease. An interval of at least twelve days must elapse after the mosquito has bitten a yellow-fever patient before it is capable of transmitting the disease, and it is capable of transmitting the infection for at least fifty-seven days after contamination.

James Carrol, one of the members of Major Walter Reed's commission, allowed himself to be bitten by mosquitoes, and developed a severe attack of the disease. Jesse W. Lazear also offered himself to be bitten, and he died from the disease—a " martyr to science."

1901.—In February Major W. C. Gorgas, as the Chief Sanitary Officer of Havana, began to screen yellow-fever

patients and to destroy mosquitoes, and within three months Havana was freed from the disease for the first time in 150 years.

In connection with the work of the Panama Canal, Colonel Gorgas has freed that part of the isthmus, not only from yellow fever, but from all other dangerous infections, and through his great triumph in sanitation Panama, formerly a notorious plague spot of disease—"the White Man's Grave," as it was called—is now one of the healthiest communities in existence (Garrison).

Prevalence.—At Havana, during the forty-seven years previous to 1899, the death-rate from yellow fever was 745 per annum.

In Panama zone in 1907 there was only one case.

1909.—The whole of Cuba was free from it.

Equally striking results have been observed elsewhere.

1910.—"The Differential Diagnosis of Stegomyia Fasciata," by Robert Newstead. He designed an illustrated propaganda card, issued by the Liverpool School of Tropical Medicine.

1911.—"Yellow Fever and its Prevention," by Sir Rupert Boyce.

INDEX OF SUBJECTS

INDEX OF NAMES

H. K. Lewis and Co., Ltd., 28, Gower Place, London, W.C.