ALPHONSE LAVERAN AND HIS WORK.*

BY

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CHARLES LOUIS ALPHONSE LAVERAN was born in Paris on June 18th, 1845, a year later than Patrick Manson and in the same year as Elie Metchnikoff and Wilhelm Conrad Röntgen. There is no doubt that heredity and family surroundings exercised a decisive influence on his mental and moral development. The Laverans were of Flemish origin; and Alphonse was the son and grandson of doctors. His father, Dr. Louis Théodore Laveran, was a renowned teacher at Val-de-Grâce, being professor of military medicine and epidemiology at the Army Medical School, an institution of which he was later director. He died in 1879, on the eve of the discovery which made his son famous. As a great teacher he cultivated in his son a love of Nature and a taste for exact observation. Laveran's mother, who belonged to an old Lorraine family, was born in a village near Metz. Her father was Commandant d'Artillerie Guénard de la Tour, and two of her maternal uncles were celebrated soldiers under Napoleon.

Alphonse Laveran passed his early days in Paris; later, as his father's military service determined, he moved to Metz and then to Algeria. In 1856 he returned to Paris, and, after a period at the Collège Sainte-Barbe, entered the Lycée Louis-le-Grand, where he finished his classical studies. As soon as he had obtained his baccalaureate he decided to follow his father's career, and commenced his studies at the School of Military Hygiene in 1863. This was followed by a four years' course at Strasbourg, which, at this time, excelled in the teaching of histology. In 1866 Laveran became an intern at the Civil Hospital, and obtained his doctor's degree for a thesis on the regeneration of nerves. After a course at Val-de-Grâce he was appointed aide-major to the Military Hospital St. Martin. At the opening of the Franco-Prussian war Laveran served with the ambulances at the battles of Gravelotte and Saint-Privat, and retired with the broken French armies into Metz, where he remained throughout the siege. It is almost impossible to realize now the appalling conditions. The besieged town was filled with casualties; most of the wounds were complicated with septicaemia, erysipelas, and gangrene; dysentery and typhoid prevailed; and the resources of the medical service were inadequate. On its capitulation Laveran was taken prisoner, but, being a doctor, he was speedily released; on returning to France he was appointed to the Military Hospital at Lille. Here he remained till the end of the war. In the civil war that followed he was at his old post at the Hospital St. Martin, where patients and staff were injured during the bombardment. These events culminated in the great conflagration of May, 1871, which destroyed the Tuileries, the Hôtel de Ville, and many other notable buildings.

In 1874 Laveran was elected to the chair held by his illustrious father at Val-de-Grâce, and his lectures and practical classes on pathology increased his reputation. A year later he published a treatise on the subject of his lectures. During this time he was assiduously attending the laboratory of Professor Ranvier to perfect his knowledge of histological technique. When his term of office at Val-de-Grâce expired in 1878 he was appointed to the province of Constantine in Algeria. Now began his studies of the blood and viscera of malarial patients. He soon came to the opinion that the pigmented elements, first figured by Virchow in 1848, which had hitherto been thought to be melanin-bearing leucocytes, were of a parasitic nature, but he was unable to complete his investigations, being transferred to Biskra. As there was very little malaria in Biskra, Laveran made a study of the variety of oriental sore known as Biskra button. Next year, in collaboration with Dr. Tessier of Lyons, he published a book on clinical medicine and pathology in

two volumes, a work that reached its fourth edition in 1894. In 1880 Laveran was again appointed to the military hospital at Constantine, and resumed his studies of malaria.

The first notice of his historic discovery is found in the *Bulletin de l'Académie de Médecine de Paris* (1880, 2 sér., tome ix, p. 1268).¹ It is a simple record that M. Laveran addressed a note on a new parasite found in the blood of several patients suffering from malarial fever. There is no text. In the same *Bulletin* (p. 1346) there is a second note relating to a new parasite found in the blood of patients suffering from malaria. Here again there is nothing in the text except a few remarks by M. Colin. Laveran's first paper was a communication from Constantine dated December 15th, 1880, to the Société Médicale des Hôpitaux de Paris and published in the *Bulletin* of that society (1881, 2 sér., xvii, pp. 158-164). The author states:

"On the 20th October last, while examining by microscope the blood of a patient suffering from malarial fever I observed in the midst of the red blood corpuscles the presence of elements which appeared to me to be of parasitic origin. Since then I have examined 44 cases, and in 26 have found the same elements. I have searched in vain for these elements in the blood of patients suffering from diseases other than malaria. I have described the elements as Bodies No. 1, No. 2, and No. 3. Bodies No. 1 are elongated elements more or less tapering at the extremities, often curved into crescents, sometimes of oval form. They measure 8-9 thousandths of a millimetre. They are colourless, except towards the central part, where there exists a blackish spot formed of a series of rounded granulations, which appear to be pigment granules. Some of the bodies show on the concave side a pale curved line which appears to tie together the extremities of the crescent. Bodies No. 2 show different aspects in rest and in motion. At rest they are spherical and show a circle of granules of pigment. In movement there is a rapid change; very transparent filaments animated by active movement are seen outside the bodies. The filaments are symmetrical. A free filament of one of these bodies is figured. Bodies No. 3 are generally spherical but larger than No. 2, and show alterations in shape."

Although we have improved our microscopes and methods of staining we can recognize at once the completeness of this succinct description and the identity of his reproductions.² He discusses several possible objections in regard to the nature of these protozoa. Bodies Nos. 2 and 3, he observes, appear to him to be different phases of the same parasite. He remarks that the parasitic elements under consideration had hitherto been confused with melanin-bearing leucocytes, and he concludes that the presence of these parasites in the blood is probably the principal cause of the symptoms of malaria. This was confirmed in 1882, when he found the parasite in the same forms while studying malaria in the Roman Campagna. But to his questions, What becomes of the elements? How are they introduced? How do they cause the disease? there was, as yet, no answer. It was natural that Laveran's early observations on the haematozoon of malaria should be received with scepticism. Bacteria had been known since 1683, when they were observed and figured by Leeuwenhoek, whose only instrument was a small simple lens.³ The improvements in microscopy, especially the development of the compound microscope, had increased enormously the number of micro-organisms known to science, but the haematozoon of malaria was the first pathogenic microbe of animal origin to be described. The work of the Italians was particularly valuable; Golgi made a notable contribution in his discovery of the plurality of the parasites of malaria.

In 1889 Laveran received the Bréant prize from the Academy of Science, and two years later, as professor of military hygiene at Val-de-Grâce, he published his *Paludism and its Haematozoon*, which was enthusiastically received. It was recognized, as Professor Ranvier said, "that the discovery of the haematozoon was not a matter of chance. It was the result of the perseverance and great talent of the observer." Many honours were

* Abstract of presidential address at the Laveran Jubilee Meeting of the Kenya Branch of the British Medical Association, which was devoted this year to the study of various aspects of malaria. A report of the proceedings appeared in the *Supplement* of March 22nd (p. 92).

¹ In the small room where the discovery was made plaques commemorating the event have been set up by the military doctors at Constantine and the civil practitioners in Algeria.

² Dr. Sequeira showed a lantern slide of a tracing of the woodcut in Laveran's original paper.

³ Leeuwenhoek's papers were published by the Royal Society.

conferred upon him, not only by his own country, but by many foreign academies and learned societies, among them the Jenner medal of the Epidemiological Society. In 1894, having completed his term at Val-de-Grâce, a "narrow and paltry militarism" detailed him for administrative work at Lille and Nantes. (His character and independence had offended certain Ministers.) In these posts he had no hospital and no laboratory for his researches. When the expedition to Madagascar was being organized in 1895 his assistance was not invited, although the danger of malarial infection was generally realized. The atmosphere was uncongenial, but he carried out his duties with characteristic energy until the following year, when, in spite of the urgent protests of friends and colleagues, he retired from the service. Just over 50 years of age, and freed from official restrictions, Laveran offered himself as a voluntary worker at the Pasteur Institute, where he was welcomed by MM. Duclaux and Roux. He was appointed chief of the honorary service, and shared a workroom for several years with M. Mesnil. Here he extended his researches to the pathogenic protozoa of the animal kingdom, and described and studied a number of new organisms. These included the intracorporeal haematozoa of birds, which are of special interest in relation to the work of Ronald Ross.

Although absorbed in his new work Laveran did not lose his interest in malaria. The fruitless search for the haematozoon in air, water, and soil led him to the conclusion that the organism must pass a phase of its existence in an animal host, and, like Manson, he thought that the host was probably the mosquito, which was well known in all malarious districts. Manson had already, in 1878, demonstrated the role of the mosquito in the pathogenesis of filariasis. Up to 1894 the predominant opinion was that flagellation was the result of the death and disintegration of the parasite. Manson, on the other hand, maintained that "since the flagella appear only when the malarial blood gets outside the body, their purpose must be to continue the life of the parasite in the outer world . . . for the purpose of infecting mosquitos which suck the blood of patients." MacCallum showed that the flagella were microgametes, and he and Opie proved the crescents to be sexual forms. At Secunderabad in 1897, Ronald Ross, then a major in the Indian Army, found in the stomach of two "spotted winged" mosquitos, bred on larvae and fed on a patient whose blood contained malaria crescents, certain pigment cells indistinguishable from those observed in malaria parasites. He confirmed these observations in another species of anopheles also bred from larvae, and sent in his report. A week later he was sent on official duty to Rajputana, and his researches were stopped for six months. Speaking many years later at the opening of the Ronald Ross Gate Commemoration in Calcutta (1927) Sir Ronald referred to Laveran as "his master" and to Sir Patrick Manson as "my sponsor and the man who put me on the right track." Fortunately Manson was medical adviser at the Colonial Office, and by his intervention Ross was transferred to Calcutta for "special duty." There he studied the details of mosquito transmission in the allied parasite of birds, as few malaria patients were available. Even when he had worked out the cycles of avian malaria his shortsighted superiors failed to realize the importance of his discovery, and he was sent to Assam to investigate kala-azar. It thus fell to the Italians—Grassi, Bignami, and Bastianelli—to verify Ross's observations in human malaria. The final and complete proof that malaria is carried from individual to individual by mosquitos, and by mosquitos alone, was made in 1900. At Manson's suggestion the Colonial Office and the recently founded School of Tropical Medicine sent Drs. Sambon and Low to live in a mosquito-proof hut for the three most dangerous months at Ostia, a heavily infected area in the Roman Campagna. They lived normal lives during the day, taking no quinine or any other precautions. The only condition carefully observed was that from sunset to sunrise they remained in their anopheles-protected hut; as a result they enjoyed complete immunity, while all

their Italian neighbours were attacked by the disease. The complementary test was made at the same time. Mosquitos that had been fed in Rome on malarious patients were sent to London and allowed to infect the late Dr. Thorburn Manson⁴ and Mr. George Warren, neither of whom had been abroad or exposed to malaria. Both developed the characteristic fever, and the haematozoon was found in their blood in the initial attack and in the relapses.

Laveran was naturally one of the strongest supporters of the malaria-mosquito theory, and soon developed its practical application. After an exhaustive study of the mosquitos of Corsica he presented a report in 1901 to the Academy of Medicine, urging that an organization should be formed to combat malaria on the lines suggested by the recent discoveries. The following year the Corsican Anti-malaria League (*Ligue Corse contre le Paludisme*) was inaugurated with Alphonse Laveran as honorary president. Under the energetic direction of Dr. Battesti the league devoted its attention to such matters as the destruction of breeding places, the prophylactic use of quinine, and propaganda in schools. A similar league was formed in Algeria during the next year, and organizations working on these lines are now found all over the world. It was the immediate development in this branch of research that cleared Havana of yellow fever and freed the Panama Canal zone of mosquito-borne diseases.

Among the many subjects which Laveran studied at the Pasteur Institute were the trypanosomes, and he and M. Mesnil described at least thirty new species. His book, *Trypanosomes and Trypanosomiasis*, published in 1904, became a classic. In the same year he reported the first case of infantile kala-azar, a disease now known to be widespread on the European and African coasts of the Mediterranean. In 1907 he received the Nobel Prize.⁵ At this period the council of the Pasteur Institute decided to purchase an adjoining property, comprising a dwelling-house in the Rue Falguière and large stables and coach-houses. The house was made into laboratories, and the second story was placed at Laveran's disposal. The other premises were converted into stables, kennels, aviaries, and aquaria. To this laboratory of tropical diseases Laveran contributed 100,000 francs (then worth about £4,000) from his Nobel Prize. Here he worked from 1907 to 1922, taking his share of the courses on microbiology, malaria, piroplasmiasis, leishmaniasis, and sleeping sickness. In his second floor apartment, the door of which was indicated by a modest visiting-card fastened with a tack, his advice and counsel were sought by workers from all parts of the world. In 1908 Laveran founded the Society of Exotic Pathology and was president for twelve years. The bulletins of the society bear witness to his amazing industry. During the war he served on numerous commissions and visited nearly every army corps. In the Salonika campaign his advice was, of course, of great value.

These duties must have imposed a heavy strain on a man of 70, but he continued to work at the Pasteur Institute, where only a single attendant had been left. Despite difficulty he brought out his book on leishmaniasis, which was similar in scope to his classic publications on malaria and trypanosomiasis. He presided at the centenary fête of the Academy of Medicine in 1920, but his strength was failing, and he died on May 13th in the same year as the British Father of Tropical Medicine, Sir Patrick Manson.

It would be difficult to give a finer example of sustained action or of higher ideals of duty. Laveran was devoted to his home and family. A man of rather slow speech he had inherited a certain reserve, but his kindness was always apparent to those who worked with him. The world-wide recognition of his contributions to medical science is shown by the honours he received at home and abroad. He was an honorary fellow of the Royal Society and of the Royal Society of Edinburgh, honorary fellow of the Royal Society of Medicine, of the Pathological

⁴ Dr. Thorburn Manson's lamented death was not due to malaria.

⁵ Ross had received it in 1902.

Society of Great Britain and Ireland, of the Society of Tropical Medicine and Hygiene, and of the Institute of Public Health. The University of Liverpool, which has done much to foster research in tropical disease, conferred upon him an honorary doctorate.

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New Zealand.

[FROM OUR CORRESPONDENT.]

Social Insurance.

THE national scheme of medical service propounded by the British Medical Association has received some prominence in the cablegrams to New Zealand. Legislation in New Zealand may be considered advanced in many ways, but in this country there is no system of national health insurance apart from that which is connected with the various lodges or friendly societies. The public hospitals here are to a great extent under the control of the Government and of local bodies, and have unusually large out-patient departments, which lessen the need for a national medical service. Domiciliary visits are authorized to a very limited extent by the hospital and charitable aid boards, this being our nearest approach to a Poor Law medical service. The New Zealand Branch of the British Medical Association is not in sympathy with general medical insurance. Dr. Erwin Lick in his book *The Doctor's Mission* condemns at least the German system of medical insurance; he considers that the promotion of hypochondria, and the wholesale malingering to obtain incapacity payments, as well as other evils, outweigh its obvious advantages. The comments on the outlines of the scheme propounded by the Association may be invalid because of insufficient knowledge here of the actual proposals, but one of our leading journals, *The Dominion*, may be quoted to express the views of an influential class in New Zealand.

"Tendencies should be carefully studied in New Zealand before any attempt is made to introduce social insurance in its various forms. It is not only that great bureaucracies grow up and fatten on such schemes, but that the so-called beneficiaries are morally debauched, losing in self-respect, self-reliance, and independence. They are not even happy because they have put away the salt of life—its constant quest and effort and adventure and every spice of risk—to rest snug in a slack and savourless security. In fact, however discouraging it may be to reformers and however sad a reflection it may cast on weak human nature, experience suggests that social insurance tends to create the very ills it sets out to cure."

Hospital Policy.

The average daily number of occupied beds in the public hospitals of New Zealand in the eighteen years from 1911 to 1929 increased from 3.1 to 5.8 per 1,000. During the same period the number of in-patients annually receiving treatment rose relatively to the population to the extent of 148 per cent.; out-patient services developed to a still greater extent—that is, from 18,867 out-patients in 1911 to 73,952 in 1929. The gross annual maintenance cost of public hospitals has in the same period increased from £200,691 to no less a sum than £1,206,190 for last year, disregarding indirect expenses and also expenditure on district medical nursing and ambulance services. The Minister of Health states that the provision of public hospitals, including administrative expenses and interest, and depreciation charges, entails a burden on local and general taxation exceeding £1,000,000 per annum. If these figures continue to increase at the same rate it will not be long until hospital expenditure will become a very

serious burden for the taxpayer. Under the present hospital system the class of people who pay most in taxation for the upkeep of public hospitals do not themselves obtain treatment in the public hospitals except to a very limited extent. Arising partly out of these considerations a conference was held recently of representatives of the hospital boards, the Health Department, the New Zealand Branch of the British Medical Association, and the New Zealand Section of the College of Surgeons of Australasia, and the following resolutions were adopted:

1. That all members of the community requiring treatment in hospital be eligible for admission to public hospitals.
2. That patients in public hospitals who need, because of the nature of their illness, accommodation other than in the large wards shall be provided for by an adequate number of one to four-bedded wards.
3. That patients voluntarily availing themselves of such special accommodation shall pay the full cost of maintenance, including overhead expenses, provided that no distinction is made in the case of patients unable to pay.
4. That the medical attendance of patients be in the hands of a visiting staff with the assistance of a requisite number of resident medical officers, the foregoing not in any way to interfere with the administration of the hospital or such powers as are already vested in the medical superintendent and stipendiary staff.
5. That each hospital board must determine the number of the visiting staff, but it be recommended that in arriving at a decision the board shall, consistent with the convenience and smooth running of the institution, appoint as many of the medical practitioners residing in the district as possible.
6. Subject to the approval of the board, that the right of attending their own patients admitted under Resolution 3 be extended to all practitioners except such as may for special reasons be deemed unsuitable.
7. That in making appointments to the visiting staff, and in determining the suitability or otherwise of practitioners for the privilege of attendance on patients, the hospital board should be guided by the advice of a special consultative body, or, in the case of the smaller hospital districts, by the advice of the Director-General of Health.
8. That such special consultative body comprise the consulting staff, if any, of the hospital or the senior members of the medical profession of the district, such senior members to be selected by the hospital board.
9. Patients unable to pay the ordinary hospital fees shall be attended by the visiting medical staff in an honorary capacity.
10. Patients entering the hospital and able to pay for medical attendance in addition to maintenance fees shall make their own terms with their medical attendant, who will be responsible for collection of his own fees.

Belgium.

[FROM OUR CORRESPONDENT.]

Progress of the Campaign Against Syphilis.

AN important statement has been published by Professor Bayet and Dr. Timbal detailing the results obtained during recent years in the reduction of nine-tenths of the prevalence of syphilis in Belgium. The number of chancres treated by the dispensaries and clinics fell from 2,504 in 1920 to 204 in 1927, and the incidence-per 1,000 of primary syphilis in men on military service from 13 in 1930 to 0.43 in 1926; this incidence rose slightly to 0.59 in 1927, but it then fell again, reaching an approximate figure of 0.4 in 1928. All the available evidence, notably that obtained by recent investigations of the National League of Belgium against Venereal Diseases and of the health administration, indicates that, during the last two years the position has remained favourable. Yet here and there a slight increase is still manifest from time to time in the number of fresh infections; it may be that these sporadic outbursts are inevitable, and imply that the decline in prevalence has reached a stage below which it will be difficult to pass. Alternatively, the arrest of the fall in the statistical curves may be associated with the restrictive measures which came into existence in January, 1926. It would be premature to draw final conclusions yet, but, whatever may be the cause of this halt, the Government is determined to continue the campaign energetically. Its sanitary health visitors will follow up syphilitic women detected in the obstetrical departments of hospitals and ante-natal clinics, and will endeavour to secure the return of defaulters to