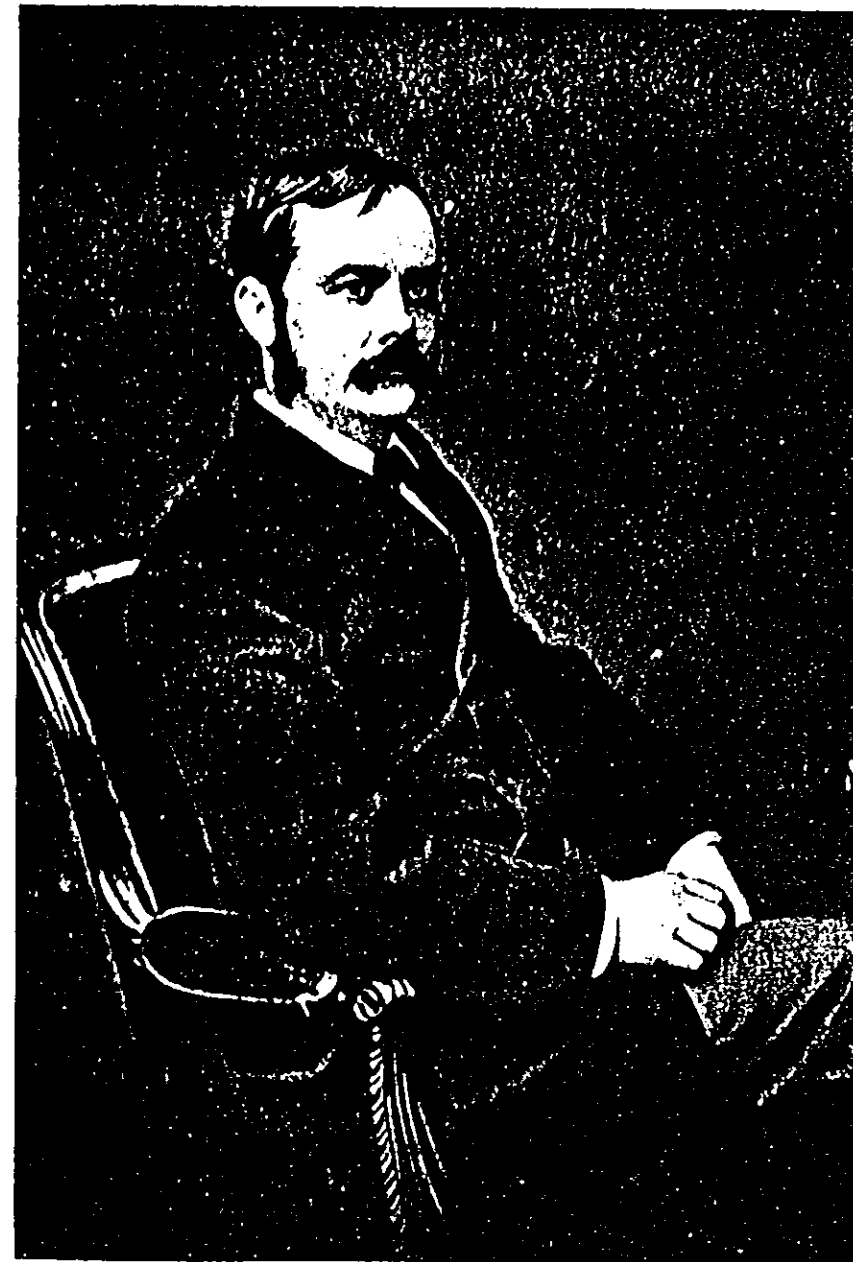


SURGEON-MAJOR TIMOTHY RICHARDS
LEWIS, M.D.

1841-1886

ONE of the most distinguished names on the roll of the Army Medical School is that of Timothy Richards Lewis. His original contributions to medical science, his patient, painstaking investigations into the world of the infinitely small, and his expert use of the microscope, combined with his earnest work as a teacher of research, had just earned him a high place as a pioneer in the history of tropical medicine, when death cut short his promising career at the early age of forty-four.

Timothy Lewis was born at Hafod in the parish of Llangan East, Carmarthenshire, on the 31st of October 1841. He was the eldest of the eight children of William and Britannia Lewis, both of whom came of well-to-do farming stock whose ancestors had farmed the land for at least three generations. His father carried on the family tradition with success at Crinow Farm, Narberth, in Pembrokeshire, a few miles distant from Hafod in the next county, and here Timothy was brought up. His mother, before her marriage a Miss Richards of Hafod, was a woman of much charm and a great favourite in the neighbourhood. Timothy attended the National School, the only school in the town, until he was nine years of age, when a new Grammar



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School was opened by the Reverend William Morris and he became one of the first pupils. The school was small but efficient; Timothy was a hard worker and formed a lasting friendship with the headmaster. At the age of fifteen, he was apprenticed to an apothecary in the town, and at nineteen obtained a position in London with a Mr Porter, a chemist of Streatham. From here he went as compounder and dispenser of medicine to the German Hospital at Dalston, a post which he obtained through a former schoolmate who had just vacated it, and here he acquired that useful accomplishment for a scientific life, a knowledge of the German language and, while still at the hospital, attended lectures at University College, winning the "Fellowes" silver medal for clinical medicine in 1866. He did not, however, take his degree in London, but went to Aberdeen University and qualified there in medicine and surgery in 1867, graduating "with honourable distinction." In 1868 he passed first in order of merit into the Army Medical School at Netley, and, at the end of four months, headed the list of those who passed out, distinguishing himself particularly in pathology, medicine and hygiene. He received his commission as Assistant-Surgeon on the 31st of March 1868.

At the time when Lewis left the Army Medical School, the problem of how to combat the onsets of Asiatic cholera, of which there had been three severe epidemics since 1831, was occupying the attention of those in authority. This disease, comparatively new to Europe, brought in its train, by reason of its sudden onset and grave consequences, something of the terror inspired by former epidemics of the plague; and after one or two experiences of

it public alarm was naturally easily aroused. Nothing was then definitely known of the manner of communication of cholera, although Dr Snow had published his paper *On the Mode of Communication of Cholera* in 1849, with an account of his theory of the propagation of this disease by means of the intestinal discharges and the part played by the sewerage of London in its dissemination; and by 1855, an enlarged edition with additional evidence in support of these theories had appeared. In Germany the theory of the fungoid origin of cholera, propounded by Professors Hallier of Jena and de Bary of Strasbourg, was attracting much attention, the idea being that the "poison" of the disease developed in a fungus which attacks rye in England and the rice-plant in India, and reached man through the food consumed. Still another theory had obtained some support from the researches of Professor von Pettenkofer, the celebrated Health Officer of Munich, who held that the soil, when it contained sufficient moisture, was the breeding-place of the cholera germ, or "poison," and that it lay dormant in the dry season awaiting the return of suitable conditions for its activity. The whole subject was very complicated, and the English Government decided to send two Army Medical surgeons to study the question in Germany and thereafter to make extensive investigations in India. For this purpose the two officers who had obtained the highest marks in the examination at Netley were chosen, Lewis from the Royal Army Medical Corps and D. D. Cunningham from the Indian Medical Service. Thus, at the very outset of his career, Lewis had the golden opportunity of devoting his talents to research. With Cunningham

he went to Germany and studied for three months in the laboratories of Hallier and de Bary, and afterwards with Pettenkofer, with whom he made great friends, at Munich.

In January 1869, he and Cunningham reached Calcutta, and were attached for special duty to the Sanitary Commission of the Government of India. Their instructions were to investigate the cause of cholera, especially in the light of Hallier's and Pettenkofer's theories with regard to its origin, and for ten years Lewis was occupied with this inquiry. After the severe epidemic of 1869, he visited the places in the North-West Provinces which had been the centre of the epidemic, among them Allahabad, Cawnpore, Lucknow, Agra and Fyzabad, making tests of the soil and the water in each locality, in addition to the investigations carried out on cholera patients. As a result of his first year's work, he published in 1870 a report "On Microscopic Objects in Cholera Discharges," which appeared as an Appendix to the *Sixth Annual Report of the Sanitary Commissioner with the Government of India*, and contained the first account ever given of the amœbæ found in the intestine. Lewis found no evidence in support of Hallier's theory of the fungoid origin of cholera, nor yet any evidence to confirm Pettenkofer's theory of the soil as the breeding ground of the disease; but he admitted that this last matter was by no means so simple that "he who runs may read," and that his researches had not gone very far. Two supplementary reports with D. D. Cunningham followed this in 1872 and 1874, entitled *Microscopical and Physiological Researches into the Nature of the Agent or Agents producing Cholera*.

In the intervals of his work on cholera, Lewis carried out many other important investigations, among them that which led to his famous discovery of the causative agent in the obscure disease of chyluria, the *Filaria sanguinis hominis*. While examining a specimen of urine obtained from a patient suffering from this disease in March 1870, he saw some microscopic worms. How easily these worms might have escaped detection of even such an expert in the use of the microscope as Lewis, may be judged from the description he gives of them in his report: "When first seen, I thought they were some detached filaments of fungus, judging from the structureless appearance presented; after a time, however, a few of them were observed to move slowly, when all doubt as to their nature was at an end. It will not be surprising that the existence of these worms was not suspected, when we consider that fully two hundred of the larger size . . . could pass abreast through a small pinhole, an orifice not exceeding the fiftieth of an inch in diameter, as may be verified by a simple calculation." A specimen of the worms was sent to Dr Parkes at Netley and they were identified as belonging to the *Filaridæ*. The report of this discovery was published with his report on cholera, and an abstract of it appeared in the *British Medical Journal* of 19th November 1870.

Lewis had intended to follow up the original case in which the worms were first seen, with further periodical examinations, but the patient was discharged unexpectedly from the hospital and left no address behind him, and although extensive inquiries were made through the native bazaar for this man, he could not be traced, as anyone familiar with

the conditions under which the natives live in India can readily imagine. In July 1872, whilst examining the blood of a native under the microscope at the Medical College Hospital in Calcutta, Lewis saw nine minute worms in a state of great activity and was able to identify them with those he had seen and described two years before in the urine of the patient who had disappeared. Up till this time these worms had not been known to exist in the blood, nor had their minute anatomy been described. In the intervening two and half years unremitting search had been made for the parent worms (for what Lewis had seen were embryos), and some investigators thought they had discovered them in the heart of the dog, but after many experiments Lewis proved these to be of a different genus. The account of this discovery was being printed in the Government Printing Establishment in Calcutta, when the author happened to look into the office, and there, to his utter surprise, he saw in front of him, putting his notes into type, the very man for whom such diligent search had been made. Although he was transcribing an account of his own case, "being rather below the average intelligence," said Lewis, "he had not the remotest idea to what the manuscript referred." But in the afternoon of the same day, whilst Lewis was preparing seven slides for the examination of this native's blood, the man reminded him that two and a half years before he had only prepared one slide, a circumstance which the doctor had quite forgotten. "This little incident," said Lewis in his report, "conveys its lesson; had I taken a dozen slides on the first occasion instead of one, the date of the detection of the *filaria* in the blood would probably

have been simultaneous with their detection in the urine."

From the time that these worms were found in the blood they were named *Filaria sanguinis hominis*, and it was an account of this discovery that Manson read of in the British Museum in 1875, when on returning from China he searched London for information on tropical diseases, and especially on chyluria. And it was the life-history of this parasite that Manson traced within the body of the mosquito, thereby greatly facilitating later researches on the means by which malaria is transmitted from man to man. Lewis's report on this discovery, "A Hæmatozoon in Human Blood: its Relation to Chyluria and other Diseases," was published in the *Eighth Annual Report of the Sanitary Commissioner of the Government of India*, 1872, and in the *Indian Annals of Medical Science* of January 1874, and, finally, in *Quain's Dictionary of Medicine*, Lewis gave a masterly account of all that was then known of the disease of *Chyluria*. Shortly after the publication of the article in *Quain's Dictionary* under the title *Chyluria*, he had the good fortune to find the mature form of the worm in a patient suffering from elephantiasis. After a continuous search of eight hours in some of the matter taken from the tumour of the patient, the long-sought-for parent was eventually found. This discovery was made on the 7th of August 1877, and, independently of Lewis's work, Dr Bancroft of Brisbane in Australia had discovered the mature worm on two separate occasions, a notice of which was published in the *Lancet* of the 14th July 1877, by Dr Cobbold, the naturalist. Lewis's description of the parent worm was published both in India and in London before Dr Cobbold had

even seen the Australian parasites, which were forwarded to him for description; but Bancroft's discovery was actually made before Lewis's and therefore the adult worm was named *Filaria Bancrofti*.

In 1874, *The Pathological Significance of Nematode Hæmatozoa* was published. In these reports Lewis gave minute detailed descriptions and measurements of the tiny worms, illustrating his papers with numerous plates. Sometimes he would spend as much as five hours or more looking through the microscope before he found the worm and, as a caution to students expecting to find them casually, he said: "It must not be supposed that the *Filaria sanguinis hominis* are to be detected by taking a mere peep through the microscope. Anyone who imagines that they can be detected with the same ease as a white blood corpuscle had better not make the attempt." But, although the search was arduous, the result for Lewis amply repaid the labour. "The appearance presented by the *Hæmatozoon*," he said, "when first seen among the blood corpuscles, in the living state, will not readily be forgotten, and cannot possibly be mistaken for anything else. The remark made by a young Bengalee student on my requesting him to look into the microscope and tell me what he saw—'He is an incompletely developed snake, evidently very young, though very active'—so aptly describes the object as thus witnessed, that I feel sure that anyone seeing the *Hæmatozoon* alive will not fail to be struck with the accuracy of the quaint reply."

Lewis published *The Soil in its Relation to Disease* along with D. D. Cunningham in 1875. It contained an account of observations carried out to determine to

what extent peculiar conditions in the soil of Calcutta affected the prevalence of disease. The inquiry involved many investigations into the fluctuation of subsoil water; Pettenkofer wells for measuring the water were sunk, and it was at the special suggestion of the Bavarian Health Officer that many of the observations were made as to soil temperature, and the amount of carbonic acid in the soil as compared with Munich. In 1877, Lewis was elected a Fellow of the University of Calcutta, and in this year he published, again with D. D. Cunningham, a report on *Leprosy in India*, a disease of which they had made a study since 1873, and a paper on *The Oriental Sore*. 1878 saw the publication of an important monograph on "Microscopic Organisms found in the Blood of Man and Animals" in an Appendix to the *Fourteenth Annual Report of the Sanitary Commissioner*. It contained an account of Lewis's discovery in the blood of a rat of a *trypanosome*, the genus of parasite which is the causative agent in sleeping sickness. This was the first description ever given of a trypanosome found in a mammal, and it was named after the discoverer, *Trypanosome lewisci*. Although this, the first mammalian trypanosome, was discovered in 1878, it was not till many years later that the connection of trypanosome infection with human sleeping sickness and the mode of the transmission of *Trypanosome gambiense*, another species of this class of organism, by the tsetse-fly were definitely proved. In the same year, 1878, Lewis published another paper with D. D. Cunningham on *Cholera in Relation to Certain Physical Phenomena*, recording the seasonal fluctuation of the disease in Calcutta and among the troops. And at the end of

this year he took fifteen months' leave, spending six months of his time visiting the laboratories of Europe, in Berlin, Dresden, Prague, Vienna, Strasbourg and Munich, where he met his old friend Professor von Pettenkofer, Virchow, and many other distinguished scientists.

Lewis's marriage to Miss Emily Brown of Lewis-ham took place on the 8th of October 1879, and immediately after this he returned to India. He was attached to the secretarial staff of the Surgeon-General, and went with him to Simla in the hot weather. In 1881 he published a *Memorandum on the Diets of Labouring Prisoners in Indian Jails*, a comprehensive work, surveying the amount and kind of food required in the performance of muscular work, in the light of the then new theory, that sugar-producing foods were the basis of muscular work as opposed to Liebig's theory of a nitrogenous basis, a subject which Parkes had chosen for his Croonian Lecture of 1872. In 1882, after investigating the cholera outbreak among the Somalis at Aden, he published a report on this subject, and this was the last of his work in the East, for in 1883 he was offered the post of Assistant Professor of Pathology, under his old teacher, Professor Aitken, at Netley, and in March of that year he returned to England and took up his work at the Army Medical School. The methods of practical instruction in bacteriology which Lewis's pioneer work in India had evolved, were now introduced at Netley for the first time. The science was then in its infancy, but Lewis could scarcely be excelled in his expert use of the microscope and he had the processes of staining and counter-staining at his finger-ends. It was in a great measure due to

him that the foundations of research work at the Army Medical School were so securely laid.

Lewis represented the Government of India at the International Sanitary Conference at Amsterdam in 1883, and again at Rome in 1885, and it was due to his protest, because of their inefficacy, that the strict regulations for quarantine against cholera were somewhat modified. Meanwhile in 1884 he had been to Marseilles to investigate the cholera outbreak there, in the light of Koch's alleged discovery of the cause of cholera in the comma-bacillus. As a result of this inquiry, the report of which was published in the *Lancet* of 20th September 1884, he claimed that a curved or comma-like bacillus, identical in size, form, and in its reaction to aniline dyes with those found in cholera, is ordinarily present to a greater or less extent in the secretions of the mouths of perfectly healthy people, whereas Koch and many other distinguished investigators had announced their inability to find the comma-bacillus except in cases of cholera. Lewis was subsequently secretary to a committee convened by the Secretary of State for India to report on Koch's discovery under the Chairmanship of Sir William Jenner, and this report, drawn up by him, was signed by every member of the committee. Subsequent experiments confirmed Koch's discovery of the comma-shaped bacillus as the causative agent in cholera, but it was not till 1894 that this was generally accepted by the medical profession.

In the spring of 1886 Lewis developed pneumonia, as a result, it was said, of accidentally inoculating himself with some micro-organisms while engaged in an experiment in the Army Medical School. To the great loss of the scientific world and the deep regret

of his colleagues, he died on the 7th of May, and was buried in the Royal Victoria Hospital Cemetery at Netley. He had not reached his forty-fifth year, yet the record of his work is a formidable one, and especially so when it is remembered that it was done before the great advance in scientific knowledge of recent times. Shortly before his death, he had been recommended by the Council of the Royal Society for election as a Fellow, and had he lived but a few weeks longer, he would have received this great distinction.

REFERENCES.—*Timothy R. Lewis "In Memoriam,"* arranged by Sir William Aitken, M.D., F.R.S., G. E. Dobson, F.R.S. and A. E. Brown, B.Sc.: London, 1888, Published by Lewis Memorial Committee. *Roll of Army Medical Service* by Colonel Johnson: Aberdeen Univ. Press. *Timothy Lewis* by Clifford Dobell, F.R.S., *Parasitology*, vol. xiv., Nos. 3 and 4, 28th December 1922.