

adhesiveness of the blood corpuscles is to their free transit through the capillaries; and I cannot but think that the two phenomena are analogous. It may be, for aught we know to the contrary, that the pigment granules may be themselves living entities. Their uniformity in size is in favour of such an idea. Our fathers would have been greatly astonished to learn that the chlorophyll grains of vegetables were, as has been shown in recent years, living organisms, multiplying by division like the nuclei of their containing cells; and though the pigment granules are much smaller, they are probably greatly surpassed in minuteness by many microbes, which, though hitherto invisible to us, we believe from analogy to be the causes of some infective diseases. But however this may be, the perfect mobility of the pigment cells seems to me a special property which they possess as constituents of the living body; in other words, to use once more the expression which in the present state of our knowledge is indispensable, a vital property.

If this be so, we understand what would otherwise be very unintelligible, namely, that when the pigment cells have their functions temporarily suspended by a noxious agent, the granules do not become diffused as they do when withdrawn from nervous influence, but remain exactly as they were before the irritant was applied, whether concentrated, diffused, or in any intermediate state. If we suppose that the pigment cells, like the blood corpuscles, acquire under irritation a tendency to mutual aggregation which they do not possess in health, it follows as a matter of course that when vital energy is suspended by the noxious agency, they will adhere together and retain for the time their relative positions.

After being appointed to the Chair of Surgery in the University of Glasgow, I became one of the surgeons to the Royal Infirmary of that city. Here I had too ample opportunity for studying hospital diseases, of which the most fearful was pyæmia. About this time I saw the opinion expressed by a high authority in pathology that the pus in a pyæmic vein was probably an accumulation of leucocytes. Facts such as those which I mentioned as having aroused my interest in my student days in a cause of pyæmia, made such a view to me incredible; and I determined to ascertain, if possible, the real state of things by experiment. I introduced into a vein of a living horse a short glass tube open at both ends, containing a piece of silver wire in which was mounted a little bit of calico, which I thought likely to give rise slowly to putrefactive change, shutting off the portion of vein concerned from the general circulation by means of ligature. After the lapse of some days I removed the venous compartment, and found that the blood in it had undergone very remarkable changes.

The limits of this lecture, which have been already too widely extended, make it impossible for me to enter into details, as I had hoped to have done, regarding the researches of which this was the commencement. I must content myself with stating the conclusion to which I was led at the time I am speaking of, and which was confirmed by later investigations, namely, that the introduction of septic material into a vein may give rise to the rapid development of large nucleated cells which, growing at the expense of the original constituents of the coagulum, convert it entirely into a thick yellow liquid. The pus so formed contains corpuscles which, like those which I sketched in the early case at University College, are not pus corpuscles in the ordinary sense, or leucocytes, but the variously-sized more or less granular nuclei of the large cells, the pellucid bodies of which constitute the so-called *liquor puris*. Into the question of the origin of these rapidly-proliferating cells I must not enter. This process of genuine suppuration of the blood clot removed all the difficulties I had felt in interpreting the *post-mortem* appearances in pyæmia and also its clinical features.

Having become familiar with the appearances of these cells in suppurating coagula, I was able to recognise them in acute abscesses in the human subject, and to demonstrate them to others by mixing carmine with the pus, so as to render clearly defined the limits of the pellucid bodies of the cells, which otherwise would have been regarded as *liquor puris*.

I am of course aware of the great importance of the emigration of leucocytes discovered by Cohnheim, and rendered immeasurably more interesting by Metchnikoff's observation

of their phagocytic powers; and I know that collections of pus have often such an origin. But I am quite satisfied that this is not the exclusive mode of pus formation, and that it is often produced by the proliferation of cells, as was first taught by my illustrious predecessor in this chair of two years ago (Professor Virchow) in the "Cellular Pathologie."

While these investigations into the nature of pyæmia were proceeding I was doing my utmost against that deadly scourge. Professor Polli, of Milan, having recommended the internal administration of sulphite of potash on account of its antiputrescent properties, I gave that drug a very full trial as a prophylactic. I have notes of a case in 1864 in which, after amputating the thigh for disease of the knee-joint, I gave 10 grains of the sulphite every two hours from the time of the amputation; and when on the sixth day an ominous rigor occurred, I doubled the frequency of the administration. Death, however, took place nevertheless; and this was by no means my only experience of such disappointment.

At the same time I did my best by local measures to diminish the risk of communicating contagion from one wound to another. I freely employed antiseptic washes, and I had on the tables of my wards piles of clean towels to be used for drying my hands and those of my assistants after washing them, as I insisted should invariably be done in passing from one dressing to another. But all my efforts proved abortive; as I could hardly wonder when I believed, with chemists generally, that putrefaction was caused by the oxygen of the air.

It will thus be seen that I was prepared to welcome Pasteur's demonstration that putrefaction, like other true fermentations, is caused by microbes growing in the putrescible substance. Thus was presented a new problem: not to exclude oxygen from the wounds, which was impossible, but to protect them from the living causes of decomposition by means which should act with as little disturbance of the tissues as is consistent with the attainment of the essential object.

It has been since shown that putrefaction, though a most serious cause of mischief in wounds, is not its only cause. In other words it has been proved that there are microbes which produce poisons that do not occasion unpleasant smell. But the principle that first guided me still retains, I believe, its full value; and the endeavour to apply that principle so as to ensure the greatest safety with the least attendant disadvantage, has been my chief life-work.

AN ADDRESS

ON

SOME PROBLEMS OF TROPICAL MEDICINE.

*Delivered at the London School of Tropical Medicine on
October 3rd, 1900,*

By SIR WILLIAM MACGREGOR, K.C.M.G., C.B., M.D.,
D.Sc., LL.D., etc.

WHEN in compliance with the request of Dr. Manson I consented to deliver to-day the opening address to the students of this School of Tropical Medicine, I felt I was committing myself to a task really beyond my powers. This feeling was deepened on glancing over the formidable syllabus of lectures and demonstrations to be given by the teaching staff. The ground to be covered is so vast, the subjects to be dealt with so very important, the extensive and diversified knowledge required both in teacher and student is so deep and wide, as to make one's own ignorance painfully apparent to oneself. I therefore find comfort in the fact that I am here to-night because I am an administrator, not because I am a doctor of medicine.

I understand that the objects of this school are to convey to its students a special acquaintance with the diseases that are of most frequent occurrence in tropical regions, and to train them for the investigation of such maladies on systematic and scientific lines.

There is excellent reason for believing that Her Majesty's Secretary of State for the Colonies took very seriously to heart the deplorable mortality among public officers and others in our more unhealthy tropical possessions. The calling into being of this school is but one of the many means

devised or fostered by the Right Honourable Joseph Chamberlain for curtailing the death roll of our fellow citizens in those insalubrious, over-sea territories of the empire. This school is but one link in the chain, and the chain is already a long one, and promises to be continuous.

THE TRAINING OF COLONIAL MEDICAL OFFICERS.

The leading idea of the school, therefore, is the appropriate training of colonial medical officers. It is, however, to be hoped that others may take advantage of it, that it may add another ring to the ever-widening stem of the already gigantic tree of medical knowledge. It is certain that there are a great many people in this country at the present moment suffering from what are usually called tropical diseases, and that these sufferers are not, and cannot be, attended by medical men that have had tropical experience. Very many of these patients must come under treatment by the ordinary medical practitioner. Cases could be adduced in which some of the most distinguished men in the medical profession in this country have been completely at sea as to the exact nature of certain tropical diseases and their sequelæ. The teaching supplied by such a school as this should be a useful addition to medical men practising in this country, especially if cases of tropical diseases in sufficient numbers can be made available to them for clinical study. The list of students that have passed through the courses since October 1st, 1899, does not show, however, that the school is patronised by the British medical practitioner. Taking into account the already immense and still growing traffic, the rapid and steadily accelerated communication between this country and the tropics, and bearing also in mind the intolerance of any form of quarantine in the United Kingdom, the probabilities are that the special study of tropical diseases will constantly be more and more forced on medical men in practice in this country, either by the systematic study of such maladies at the ordinary schools of medicine or at specific institutions such as this is. If this branch of medicine is neglected, then the sufferer from the tropics will be a certain loser, but not always the only one.

At the present moment, however, many of us are very specially interested in this school in relation to the medical services of our more unhealthy tropical colonies.

It is probably the case that not a few of those that have so far passed through this institution were already familiar with many tropical diseases, knew them by experience, and understood how to treat them. To students of that category the clinical study of these maladies here is not nearly so important as is the training to be had to fit them to investigate tropical diseases on the spot, on the most advanced systems known to medical science, and with a full knowledge of what has already been done in these matters in this country and elsewhere.

Any average medical officer that has sufficient training in making investigations of this kind will soon master the practical details of all tropical diseases in his district, provided he is given time, the necessary instruments, and proper accommodation. The best and most proper place for making such researches is undoubtedly the tropics themselves. It must be patent to every person that thinks at all on the subject that the training of medical officers to carry out investigations of this kind is of the utmost importance to each colony, to the empire, and to humanity at large. We all know, or ought to know, what has been done in this field by such men as my late highly esteemed friend Dr. Bancroft of Brisbane; by the distinguished Dr. Manson, the inspiring genius of this school; by the father of Strachan's disease, the present chief medical officer of Lagos; and by many others that have practised medicine in the tropics. These men had no specialised opportunities given them; they had not the advantage of any systematic training such as is offered now at this school. We are therefore justified in expecting a great deal from the younger men that now come forward here to learn at once the most suitable and most advanced methods of conducting original investigations in the great and rich tropical field.

STATE ENCOURAGEMENT OF MEDICAL RESEARCH.

But I can tell you that this training and preparation will not yield all that we are justified in expecting from it without the co-operation of the Secretary of State and of Colonial administrators. The trained medical officer must have time

and opportunity granted him. That the Secretary of State will in every possible way encourage, and suitably recognise, the researches of medical officers may safely be taken as granted. It is, however, at times a very difficult matter for an administrator so to arrange service affairs that he is able to grant to medical officers the time so necessary to carry on scientific investigations of this kind without their being submitted to grave or destructive interruptions. Colonial administrators and others in high authority have not always in the past lent to the head of the medical department the support required by him. They have not always given to their chief medical officer the confidence that Alexander the Great extended to his. I was myself very fortunate in the first new country in which I served in having as chiefs such enlightened men as Lord Stanmore and Sir William des Voeux. Whatever was really required for the new medical service in Fiji was granted. As one result of that there is no doubt that at the present moment the chief medical officer of that colony, Dr. Glanville Corney, is thoroughly familiar with the practical aspect of every disease met with in that country. Many other Colonies have been less fortunate, but if that is so now Mr. Chamberlain, who not only thoroughly understands the value of medical work, but also takes the deepest interest in it, and has done more than any other person ever did before to popularise scientific medicine, is just the man to see that medical matters are put right wherever they are wrong; they are, in my humble opinion, wrong where original work cannot be done. My own personal experience has been that the most unhealthy Colonies are, or were, those in which medical research was most neglected; that, however, is apparently being remedied everywhere. In Lagos, for example, no fewer than ten full equipments for medical officers of the scientific type have been provided by the Secretary of State. An excellent laboratory has been built, and an analytical chemist has been appointed.

This has been done there without any reference to any school of tropical medicine, and would have been carried out precisely the same had there been no such institution and no medical commission in existence. We look, however, to this school now, as a means of better enabling our medical officers to take advantage of the opportunities that will henceforth be given to them in Lagos, and no doubt similarly in other Colonies, for you may depend on it that Colonial administrators will know their duty sufficiently well to follow with zeal the course that has been taken by Mr. Chamberlain. Moreover, there is at the present time in this and other countries a volume and force of public opinion behind sanitary and medical work that has, perhaps, been dormant from the days of Moses and Machaon till now. It was only the other day that the celebrated Grassi lectured on malaria before the Queen of one of the Great Powers of Europe. Such an event is redolent of the times.

It is not my intention to occupy your time in speaking of the details of your training for the investigation of disease, beyond emphasising their very great importance. I would rather in a familiar way give those of you that have not yet practised in the tropics some idea of the extremely interesting and very important work that awaits you there.

OLD DISEASES AND NEW RACES.

You will still, for example, have many opportunities, especially in new countries, of acquiring valuable information respecting the original or natural location of disease, the landmarks of which are fast disappearing before modern civilisation. You will see how old diseases are being communicated to new people, and be able to watch the strange results produced. You will doubtless be in a position to add much to the existing knowledge of tropical diseases already more or less studied, and you will in all probability be able to establish the existence of maladies at present unknown and unrecognised; you will thus reduce the sum of human suffering. Can any man desire greater glory?

As different forms of disease were localised originally, and still remain more or less so, it follows that the experience of tropical medical officers differs largely according to country. Their opportunities are therefore diversified in an unusual degree. Perhaps I may personally have had exceptionally good opportunities of assisting—as a French writer observed sometime ago—at the dissemination of disease among new races.

TYPHOID FEVER.

The late Sir Thomas Watson was very anxious to know whether typhoid fever was known in Polynesia. From inquiries made there in 1875 it appeared certain that this disease did not occur in the islands. In 1875, however, a case was observed in a gentleman recently arrived from Australia. It assumed the virulent form that is accompanied by petechial spots, and the patient died. Soon after this a case occurred in a European in the mountains of Viti Levu. The disease, it appeared, had been contracted in the locality where the first case was treated. Sporadic cases were met with at intervals, but they were, formerly at least, few in number. Perhaps their scarcity was largely due to the fact that houses were supplied by rain water collected from the roof and stored in metal tanks. There was, however, a form of continued fever in Fiji that very accurately simulated typhoid fever up to the ninth day, when it suddenly culminated, and the patient got well in a very few days. Typhoid fever was also unknown in British New Guinea. In that country the continued fever that in Fiji so closely resembled typhoid was not met with. Typhoid fever is also absent in West Africa. It would appear to be a by-product of civilisation, which is perhaps also true of cancer, diphtheritis, and some other diseases.

Fiji, by the mere fact of becoming occupied by a considerable number of Europeans, was a centre for the distribution of other diseases to her neighbours; but she sometimes received their maladies in return, as will be seen from what follows. The disease of yaws has been from time immemorial endemic in Polynesia. If a Fijian child escapes yaws terrible results are expected to the future health of a being so abnormally constituted. Yaws represented our measles, scarlet fever, chicken pox, diphtheritis, and whooping-cough in one.

YAWS.

The probability is that no medical officer will be long in the tropics before he is brought into contact with yaws. This disease, like most others in the torrid zone, is of course parasitic. I first met with it in the Seychelles Islands, in African slave children liberated there by our cruisers and indentured as plantation labourers. It is curious that this disease is much more mild in the African and Papuan than it is in the Polynesian. It may be that it is newer to the latter. In the African it is sometimes so ill-marked that only a medical practitioner of some experience can recognise it at first sight. It is not very contagious to Europeans, but when caught it is loathsome and troublesome. I have never looked on yaws as a disease that could be cured under from three to six months.

I was once invited by my superiors to take up the extermination of this disease in New Guinea, but being then the only medical man in a colony larger than Great Britain, and having absolutely no means of dealing with an endemic contagious malady, I was obliged to say, in somewhat different words, that I might as well try to arrest an earthquake. In Polynesia, if not in New Guinea, there is not only the endemic nature of the disease to contend against, but also the very strong native prejudice of "the conscientious objector" in its favour, a prejudice difficult to deal with, though the disease is not made an object of worship there as is the case with smallpox in West Africa.

Though yaws was indigenous to Fiji, *tinea imbricata* was not known in that colony till introduced by plantation labourers. Many Line Islanders were brought to Fiji as plantation hands, and among them *tinea imbricata* is endemic, while yaws was unknown to them. The Fijian gave yaws to the Line Islander, and the latter gave his loathsome tinea to the Fijian. The Solomon Island recruit also brought *tinea imbricata* to Fiji with him, and he in turn left the colony, in a great many cases, with venereal disease in some form or other.

VENEREAL DISEASE.

Venereal disease was not known to the Pacific Islanders, nor to the Papuans, till taken to them by Europeans. Certain social habits of these peoples facilitated the rapid spread of these maladies, and they flourished with the usual luxuriance of a crop on new soil. It was very extraordinary how the Pacific Islander was affected by soft chancre. Very frequently the sore developed into a great spongy mass that bled profusely if touched. In not a few cases the ulceration caused

death by penetrating the abdominal wall. These specific sores were also remarkably contagious. On the other hand, syphilis, being more slow in its processes, did not immediately effect the ravages that might have been expected. Gonorrhoea was all but incurable in native women. At first many of them were brought to Fiji as plantation hands. It was extremely rare that one returned home with a child. The trader had some small share in spreading these diseases, but it was insignificant compared to what was done by the labour traffic. Yet in the face of all this, some good Churchmen, and at least one Bishop, that visited the recruiting islands expressed themselves as favourable to the labour traffic. These good men did not see behind the calico "Come storpiato è Maometto."

MEASLES.

Fiji was also the centre for the distribution of measles in 1874, a disease introduced there by one of Her Majesty's ships of war. The epidemic that followed destroyed between a third and a fourth of the whole population, affording a striking example of the exuberance of a new disease among a new people. In this respect, however, measles was not more surprising in Fiji than was the usually insignificant disease of itch in British New Guinea. This latter malady, introduced in some old clothes, sped like a tidal wave along the coast, and in a few weeks thousands of people were covered from head to foot by the most exaggerated form of the disease. It probably spread much faster from the fact that one shirt might be worn by several people in one day. When matters were beginning to assume a somewhat serious aspect, the disease, having spent itself, began to abate, and soon declined to the level it will probably always keep in a community where clothes are common property and itch attacks the human face.

DYSENTERY.

There are few scourges that require the same thorough and exhaustive study that dysentery calls for. This disease, in its epidemic and contagious forms, was unknown in British New Guinea half a score of years ago. In recent years it has caused many deaths there. It began in Fiji with the advent of a European population, and led to considerable mortality among them, even before annexation. But during the prevalence of measles, and frequently afterwards, it assumed an epidemic form. From the first introduction of the disease there it was regarded as contagious. When settlement became better established, and the houses of Europeans were provided with rain water stored in metal tanks, dysentery among them became much rarer. But on large plantations, and in native villages, it took on at times a very malignant form. Instances occurred in which even 50 and 75 per cent. of the Polynesian labourers on an estate died of this disease, which was new to them. Excessively high mortality from the same cause occurred also on some of the Queensland plantations among the Polynesians employed there. I was once received at a certain plantation by an interesting-looking boy of about 14 years of age, who was evidently not of the usual class of recruits. On being asked who he was, he said he was so-and-so from New Britain. To the question, "How many are there of you," he replied, "Plenty all die, only me." I found there had been 115 of them, and that he was the sole survivor. This was the work of dysentery. The treatment in each epidemic was at first like groping in the dark. In a very deadly outbreak that occurred amongst some three score of recruits landed out of a vessel in which they had had been battened down for thirty hours during a hurricane, an examination of the contents of the intestines of those dead but an hour or two showed that these consisted of a mass of what was then called vibrios. In consequence of this observation a mixture of corrosive sublimate was given to the two score survivors, all in hospital. The remedy acted like a charm and not another case ended fatally. But this remedy failed utterly in two or three succeeding outbreaks elsewhere in the colony. During one season salicylic acid acted with extraordinary success. Then it in turn ceased to be of any use.

From many observations of this kind it appeared that dysentery is made up of entirely different diseases, or of one disease that presents widely diverse stages. It offers a splendid field to the humanitarian and to the enthusiastic scientist that we trust may be sent out from this school. Were I to judge

from my own personal experience I should say dysentery causes more deaths than any other disease in tropical countries. No other malady is so universally distributed and of such constant occurrence.

Laveran says "Le paludisme est certainement la plus répandue des maladies endémiques," and Manson says of malaria "It is the great disease of the tropics." My experience is different. I have served in two countries where there was no malaria; never in one where people did not die of dysentery. Last year of 39 cases of dysentery treated in Lagos Hospital 10 died, say 1 in 4; of 128 cases of malarial fever, 4 died, 1 in 32. Dysentery is the chief agent in the rapid depopulation of the Pacific. It swells the death rate in West Africa, but not so much amongst Europeans as amongst natives. But there one does not see the wholesale depopulation from this disease that is sometimes so clearly observed on a Pacific island from the return home of a single labourer suffering from contagious dysentery. There can hardly be any doubt as to the contagious nature of some epidemics of dysentery. We regarded the common house fly as an active agent in its spread in plantation hospitals, and took precautions accordingly. The communicability of this disease has always to be taken into account in the tropics, more particularly in places like West Africa, where the sewage of a number of houses often flows into the great clay pit from which the houses have been built, and out of which the same houses draw their water.

The man that will work out an effective and practical means of dealing with contagious dysentery will be the greatest benefactor of the races that live in the tropics. He may claim to be the saviour of the Pacific Islander, the most loveable man of men now living. It is a study that I most earnestly commend to your attention and on which I trust you will all turn the searchlight of science. Dysentery is a destructive giant, compared to which strong drink is a mere phantom.

MALARIA.

To the tropical European, though perhaps not to the tropical native, the most important study is probably that of malarial fever, the investigation of which has already furnished us with some of the finest examples of human intelligence, perseverance, and observation, and unveiled to us some of the most wonderful workings of Nature. To myself this chain of marvels, full of poetry and religion, nowhere better seen than in the splendid illustrations of Drs. Ross and Fielding-Ould, always recal the words of the second greatest Teuton of the century:

Wie alles sich zum Ganzen webt,
Eins in dem andern wirkt und lebt!
Wie Himmels Kraefte auf und nieder steigen,
Und sich die goldenen eimer reichen!
Mit segnen duftenden Schwingen,
Vom Himmel durch die Erde dringen,
Harmonisch all das All durchklingen!

The prediction that malarial fever would be found to be due to a parasite having its cycle in man and the mosquito, is fit to be compared with Goodrick's theory of the cycle of Algal; with Leverrier's and Adams's assigned position of Neptune; with Murchison's prediction of gold in Australia. To my own mind it recalls the early teaching of the germ theory of anti-septics by the immortal Lister. It may not improbably lead to an equally great revolution in medicine. The position assigned by foreign writers to our British scientists in this, the greatest of recent discoveries, is and must remain most honourable to them and to our nation. The name of Dr. Manson, one of the brilliant lights of this institution, will always be connected with the fertile hypothesis that has led to the astounding revelations of that prince of observers, the great Ross, of Grassi, Celli, Bignami, Bastianelli, Koch, and others.

The whole subject of malarial fever is of more importance to the Italians and to ourselves than to any other nation. The Italians have, they say, eleven millions of themselves exposed to it, which, according to Celli, furnishes them with two million cases a year with an average mortality of 15,000. It is true that it is almost unknown in Great Britain itself. But Laveran states: "Morehead estimait qu'aux Indes les fièvres palustres compaient pour 40 sur 100 dans la mortalité générale." This is probably not proved. Manson at the Royal Colonial Institute showed what a serious matter malaria is on the West Coast of Africa. This is enough to demonstrate of what vast national importance it is to the British Empire.

There seems to be some tendency at the present time to seek the origin of malarial fever in coloured tropical children. Surely it must be acknowledged to be an old domesticated disease in the United Kingdom and on the Continent of Europe, for which aboriginal children could not at any time have been held responsible. You all remember how in the beginning of this century the *Anopheles* completely routed one of the most powerful British armies ever sent to the Continent of Europe. Then, again, our history supplies few more pathetically ridiculous pictures than the kingly founder of the Royal Society dodging his doctors to take his Peruvian bark on the sly. Of course Dr. Schwalbe would say at once that the King contracted his fever abroad. As the two chief attacks occurred nineteen and twenty years after His Majesty "came to his own," the probabilities are strong that he owed them to the genuine domestic English *Anopheles*.

In these modern investigations into malaria the Italians have nobly done their share; so have the Germans, through the illustrious Koch. We owe, further, a very great debt to Laveran. I have often been asked by non-medical friends who has done this great work, whether it is all British? It appears to me to be more or less like this: Manson was the surveyor, Laveran made the road, Ross built the bridges and laid the rails, and Grassi, Bastianelli, Bignami, and Celli provided the rolling stock.

Grassi says: Preciso perciò che la scoperta che gli anofelli inoculano la malaria umana è uscita dal mio cervello, seguendo una via da me ideata. Naturalmente anche la mia scoperta, come moltissime altre, non sta isolata, ed io non ho mai esitato a dichiarare che sono parvenuto ad essa giovandomi della ipotesi dei mosquitos svolta tra gli altri da Laveran, Manson, etc.

Angelo Celli writes: Sotto i consigli del Manson, cioè del celebre parasitologo che aveva già descritta la vita della filaria nel corpo delle zanzare, il Ross, maggiore medico inglese nelle Indie, fece pungere da zanzare uccelli.....(e) ricostrusse le fasi del ciclo di vita nella zanzara. He speaks again of "questo che possiamo chiamare ciclo del Ross."

M. Emile Bertaux thus expresses himself: Les deux observations initiales sur lesquelles repose la nouvelle théorie de la malaria n'ont pas été faites en Italie. C'est au docteur Laveran qui revient l'honneur incontesté d'avoir observé, dès 1880, le parasite dont la présence dans le sang humain est la cause directe et unique de l'infection palustre. Mais c'est le médecin Anglais Ross, qui, le premier, détermina rigoureusement l'agent de transmission d'une maladie analogue à la malaria humaine.

Koch tells that: Ueber das eigentliche Wesen der Malaria haben wir erst in der neuesten Zeit Erläuterung erhalten durch Laveran.

As long ago as 1892 Laveran used these prophetic words: "J'ai émis l'hypothèse que les moustiques jouaient un rôle dans la propagation du paludisme comme dans celle de la filariose." You know how powerfully Manson championed that doctrine, based as it was on his own original and independent work.

A great deal still remains to be done in connection with this subject, perhaps much more in tracing analogies in other diseases than in connection with malaria itself. There are now many workers in the field, and doubtless their ranks will be strengthened from this school.

THE DESTRUCTION OF THE MOSQUITO.

To my mind the parasitic cycle in malarial fever is proved by demonstration. Although this is so, the experiments now being carried out by some of our countrymen here and in Italy are by no means superfluous. Those that care to read Dr. Christy's book will find at pages 27, 29, and 69 that similar experiments have already been made by the Italians, by whom they have been fully described. But it is highly desirable that they should be performed in a more sensational form, and in British blood, to impress and convince the British public. These experiments are the more to be commended that they can be carried out without any greater risks to the subjects of them than is incurred by any European that lives for a few days on the west coast of Africa, perhaps beyond reach of doctor, nurse, or any other European. The chief use of these experiments is to demonstrate the truth of the theory advanced. There is, of course, no comparison

between the position of men sent into a malarial region provided with every appropriate appliance, and with the sole duty of protecting themselves from mosquitos, and the case of those that mount guard, that nurse the sick, that tend machinery, at night; or to the case of the man belated in "the bush," or stranded on a mud flat.

Even in its present state of development the new doctrine of malarial fever is such that no conscientious administrator could take the responsibility of ignoring it.

In the West African coast it must now be reckoned with at every step. Hospital management must be fundamentally affected by it. Wards will have to be painted of a colour that will facilitate the discovery of mosquitos; and probably some of them will have to be furnished for fever patients with doors and windows of gauze wire netting. Every bed, without distinction, will have to be provided with a fine muslin mosquito net. All water tanks must be supplied with wire net coverings to prevent the ingress of mosquitos. Wells and reservoirs and flower pots will have to be similarly protected. In hospital discipline it will be considered a serious offence to allow a fever patient to be bitten by a mosquito. All mosquito breeding places near a hospital or other dwelling will have to be made unfit for these insects, as far as this is practicable. Much attention will have to be given to the teaching of the new doctrine. All hospital nurses must obtain a mastery of the subject; and so, of course, must sanitary inspectors, otherwise they will be unfit for their posts. But the general public also must have the leading lines of malaria genesis put before them in a way they can understand. It should form a subject of tuition in all the public schools of a place like Lagos, and prizes should be given to the best scholars in the malaria class. The nervous individual that does not know one genus of mosquito from another will, in future, lead an unenviable life in the tropics. Ladies that understand the mosquito theory will not dine in low evening dresses; nor will gentlemen sup with their ankles under the table and covered only by black thin silk socks.

The steps mentioned above, and many others like them, are all very obvious, and seem very simple in theory. I regret that I cannot completely share the rosy optimism of our leaders and teachers in this matter. I do not overlook the fact that malaria has been practically extinguished in this country, which is not congenial to it for reasons of meteorology. Malaria in the tropics is much more difficult to deal with than typhoid, rabies, or small-pox here, and those are not yet vanquished. It is to be feared that in a country like Lagos, when all that can be done shall have been accomplished there, the results may be somewhat disappointing. Lagos is on a lagoon that crosses the territory from east to west, at some places four or five miles broad. It is all fresh water except near the town of Lagos, where it is brackish. We know from the Italians, and by our own experience, on the great western coast of British New Guinea, where there is no fresh water, that the *Anopheles* can breed in brackish water. The lagoon water is full of aquatic plants; it has very little current; it rises and falls probably five or six feet; it cannot be drained; it cannot be enclosed within banks: it cannot be kept at the same level. One thing could be done; Lagos Island could be surrounded by a sea wall that would render the current there generally too fast for the *Anopheles*, according to the measurements of Celli. It is believed in Italy that the velocity of water, to ensure against the breeding of the *Anopheles*, must not be under about 1,900 yards an hour. Then, Lagos Island contains very likely 200 acres of swamp, with all sorts and sizes of water puddles. These could be filled up. If, however, the statement of Grassi is well founded that "*gli Anopheles si sviluppano la dove sono.....paludelli anche microscopici,*" mosquito hunting at Lagos will never lead to the extermination of the *Anopheles* there.

It may be said that the remedy for all this is to abandon Lagos town, and go further inland. Alas! we cannot transport the lagoon, and it is necessary for our commerce. A considerable number of people must remain at Lagos, even if the seat of Government is shifted to some other place. My own opinion is that were the harbour opened, the island surrounded by a sea wall, and the swamps filled in, Lagos would then be fairly well protected from fever, but not otherwise.

In the absence of these costly undertakings we must trust more to the paradox of preserving the *Anopheles* from infection than to anything else. We must give quinine to all and sundry gratuitously, and we must see, especially, that it is given to children. Our fever patients and our convalescent stations must be carefully guarded, and kept, when possible, where there are no mosquitos. Our medical staff is numerically weak. We must train native youths in Lagos itself to the extent of making them able to deal with such things as small-pox, malaria, and dysentery. This has been done elsewhere, and therefore should be carried out at Lagos.

If the sanitation of the Lagos railway now under construction is not thoroughly taken in hand on sound principles two results will follow: the railway will increase malaria; increased malaria will augment the cost of working, perhaps make the railway a financial failure. We have many swamps in our large towns, and huge clay holes in all towns and villages to deal with; add to this that our population is half naked. We have also to face the immense fecundity of the mosquito. Ficalbi says one mother mosquito may in the fifth generation be the progenitor of twenty milliards. Howard shows that one rain barrel may contain 19,110 larvæ, and that they may produce at least twelve generations in one summer. This at seventy eggs a mosquito would produce in a summer a number of mosquitos expressed by twenty-five figures. These are among our difficulties. In our favour we shall have the support and encouragement of the Colonial Office; a chief medical officer that is himself a successful worker at the malarial theory; and we shall have a number of medical officers trained here. It is also in our favour that we have no rice fields; that our soil is sandy and dries very quickly, resting on a shingly subsoil. It will be interesting to watch the result of a malarial campaign under such circumstances.

A very important point to determine at Lagos is the distance an *Anopheles* will fly to a feeding ground. Will they cross the lagoon? To Mr. Fagan I am indebted for the recent work on mosquitos by the American, Howard, referred to above. From it we gather that mosquitos may travel fifteen miles on a light wind. Celli, whose new book cannot be spoken of too highly, admits that mosquitos will extend, probably, three miles in a horizontal direction. I have had painful verification of that on the New Guinea Coast and on Lagos lagoon. Celli seems to cite the case of Sezze to show that the limit of oblique propagation of the mosquito is attained at an altitude of 1,000 feet. Koch finds them at 3,000 feet in fever communities in Java. We were punctured by mosquitos in our camp on Mount Scratchley at 10,000 feet. They were very troublesome at 5,000 to 6,000 feet. Mere altitude cannot therefore be taken as a safe guide to safety from fever. Before we can shift establishments to the Olokemeji hill, 1,000 feet high, and fourscore miles from Lagos, we must station residents for a year on the hill, in order to ascertain how far it would be fever-free.

My own personal experience of the *Anopheles* has been somewhat interesting. I never saw one in Fiji, where malarial fever is, or was in my day, unknown. Dr. Finucane tells me it is still absent there. But amongst the recent consignments of mosquitos from Fiji, Mr. Theobald has found the remains of one *Anopheles*. If it is established that there are *Anopheles* mosquitos there, the matter becomes one of much scientific interest. Fiji would therefore be in the position of Mauritius and Bourbon before the terrific outburst of fever there in 1867; that is to say, there would be given a country hitherto free of malaria, but furnished with Indian coolies with fever blood; from which at any time the propagation of malarial fever may be set agoing in Fiji. So far Mr. Theobald has not had any *Anopheles* from Mauritius. No doubt they will turn up soon. I first saw the *Anopheles* on the afternoon of the first day we visited the west coast of British New Guinea, about nine years ago. I saw something on the forehead of Mr. Cameron, one of my officers, that looked like a small brown peg, and was surprised to find it was a mosquito standing as it were on the end of its proboscis, projecting nearly at a right angle to Mr. Cameron's forehead. It soon filled with blood and began to void it till a drop of blood fell from it to the ground, on which Mr. Cameron thought he had enough of it. We all had sufficient experience of it before night, for it is not the case that the *Anopheles* bites only at night, nor that its puncture is always painless.

On the contrary, we found it often as sharp as a prick from a needle. Of course all mosquitos love dark ways, and will prefer to bite at dusk; but the *Anopheles* will not hesitate to feed, at all events on a dull day or among trees, when it gets the chance. Specimens were then sent to Mr. Savile Kent, who pronounced them a new mosquito.

It seemed strange that we were repeatedly camped for weeks at a time in the mud and swamps of the western or *Anopheles* country and yet left without any cases of fever. The reason is that for some hundred and fifty miles of coast there were no human inhabitants, which would seem to show that blood diet is not necessary to the hatching of *Anopheles*. We had been at work a couple of years in the central and eastern districts and had suffered much from fever there before we visited the west, yet the *Anopheles* was new to me when I saw it there. Koch has, however, shown that the fever parasite is in very common in Kaiser Wilhelmsland, from which it may be inferred that I overlooked the *Anopheles* in Eastern New Guinea. Those that suffered most from fever in British New Guinea were the crew of the steam yacht *Merric England*, who were far more frequently ill than those people that travelled daily in swamp and forest, no doubt because *Anopheles* had become domesticated in the men's quarters on board.

Now we require to know how and why mental excitement, any considerable change of temperature upwards or downwards, whether caused by the sun, cold draughts, rain, or other agency, should bring on an access of fever long after possible infection and in spite of long-continued and large doses of quinine. In my own person an access of fever seems to be sometimes caused by exposure to bright sunlight, without reference to temperature.

TEXAS FEVER.

In British New Guinea we never doubted that the horse and dog suffered from malaria, but this part of the problem seems to be solved by the experiments of Koch, which show that even the fever parasites of man and of the anthropoid apes are different and not transferable from one to the other.

Although the specific nature of the human parasite seems thus proved, it still leaves open for investigation on the West Coast of Africa a cognate question of great social and economic importance, to which I venture to invite your special attention—namely, that of the disease that makes it so difficult to keep a horse alive in the forest country near the coast. I do not scruple to suggest that you should investigate this equine malady or maladies, for two reasons. In the first place, it is of very great importance; and, in the second place, if medical men do not examine it, it is not probable that any other competent person will do so. I for one shall be surprised if it is not found that the disease is a parasitic one, though poison has been often suspected. Could I find the money, I should be prepared to advise the Secretary of State to offer a handsome prize to whomsoever should discover the means of rendering horses immune to this fatal disease. My fellow-administrators are enterprising men, and something may yet be done in this direction by combination.

Koch¹ is convinced that a practical inoculation against Texas fever can be arrived at. This and his observations on the *Surrakrankheit*,² coupled with the observations of Smith and Kilborne, are sufficient to justify any such expenditure as that proposed, showing as they do that certain breeds of animals are already immune to the tsetse malady and to Texas fever.

ELEPHANTIASIS.

It has been announced lately that the mosquito has been found to be concerned with that strange disease, elephantiasis. This is a malady that I have seen in man on perhaps every part of the body, from the crown of the head to the sole of the foot; but I have never witnessed it in any other animal.

In practice and in origin there does not, according to my experience, seem to be any connection between elephantiasis and malarial fever. In Fiji, where there was no malarial fever, elephantiasis was very common, in certain small islands phenomenally so. The largest scrotal tumour removed there weighed 122 lbs. There were several over 80 lbs.

in weight. In British New Guinea, where malarial fever was very common, elephantiasis was rare. The same is true of Lagos. It would therefore seem that these diseases are in those places more or less in inverse relation to each other. I have not heard of any case in Lagos nor in British New Guinea where a European contracted elephantiasis. Two European officers, at least, became affected by it on the Island of Rotumah. Though, therefore, it is a matter of minor importance compared to dysentery or malarial fever, you will still find elephantiasis to be a very interesting subject for investigation.

PHTHISIS.

It does not appear that phthisis was a disease known to the Papuan. The natives of New Guinea are, however, very subject to a form of pleuro-pneumonia common in epidemic form at the beginning of the cold season, apparently contagious and most likely parasitic, to which many succumb. Phthisis was not originally a Fijian disease. Its primal distribution you will find to be a question to the solution of which you can still contribute something.

DIPHTHERIA.

Neither in Fiji nor in British New Guinea was there any such disease as croup or diphtheria; they had not reached the latter colony when I left it in 1898. The first case of diphtheria that occurred in Fiji was about twenty years ago in a little girl 7 or 8 years of age. This little patient brought the disease from Sydney, and both the child and her mother died of it. A few weeks later a case appeared among the prisoners in gaol in the same town. Sporadic cases occurred later, and probably the disease has now become domesticated in that country, but it is, I believe, still rarely met with there. It does not appear to occur in the Lagos territory in West Africa, and Koch notices its absence in German East Africa.

CANCER.

In some of these new countries there are interesting points to note with regard to cancer. I do not remember to have ever operated on a Polynesian or Melanesian for cancer, though I had to do so several times on Europeans in Fiji. For nine and a-half years I never saw a case of cancer in British New Guinea, but at the end of that time there occurred an example of osteosarcoma of the tibia in the person of a Papuan that had for seven or eight years lived practically a European life, eating tinned Australian meat daily. It seemed hardly possible that he could have become infected from any previous case. *Lupus exedens* is very common in New Guinea, but it is always clearly distinct from cancer. The latter disease is of course very prevalent in Australia. It may be remarked in this connection that the Polynesian and the Papuan are practically vegetable feeders. Dr. Johnson of Lagos, now in this city, tells me that in Lagos during a practice of fourteen years' duration, he has five times seen cancer in native patients, and that in each case the sufferer had lived as Europeans live. In West Africa there are, however, very marked cases of destructive lupus.

TETANUS.

An equally remarkable experience was met with as regards tetanus. In the disturbances that took place in Fiji in 1876 and 1877, when the mountain chiefs refused to recognise the authority of the Queen, and Lord Stanmore had to reduce them to obedience by force of arms and without any army, we treated about one hundred and fifty wounded men, suffering from all kinds of injury. Although the nursing and dressing must have been very imperfect, and operations were performed under difficulty, there was not a single case of tetanus.

On the other hand, an officer that received very serious injuries from the explosion of a charge of dynamite in the interior of British New Guinea died of true traumatic tetanus. He was camped at the upper end of the alluvial country on a piece of ground cleared by us, close to the foot of the hills, some 60 miles from the sea. Four or five days later, after a journey down the river, during which we camped each night on its alluvial bank, he was got on board the steamer, and a few days thereafter showed the unmistakable symptoms of tetanus. He was taken straight to the Cooktown Hospital, and died there of this disease. No

¹ *Aerztliche Beobachtungen in den Tropen.*

² *Reise-Berichte, 1898.*

case of tetanus in man or animal had ever been heard of before in British New Guinea.

It is not clear that the case of Commodore Goodenough, reported to have died of tetanus from an arrow wound received at Vanikoro, is parallel to this one. It is quite possible that the detachable bone point used by Papuans and some Micronesians on the tips of their arrows may in his case have been left in the wound and have caused septic poisoning. These bone points, prepared by scraping down a piece of human bone, would contain septic matter, yet I have not known these to produce tetanus in New Guinea. It may here be mentioned that erysipelas was unknown in those countries.

TINEA IMBRICATA.

The steady stealthy progress made by a new invading disease was well seen in British New Guinea in the case of tinea imbricata. It was a domesticated disease in the West, on the Fly River, for example, where it is known by the same name that is applied to tobacco. It was also domesticated in the east end, where it is called by a word that in a certain district means "to curl" or "fold up." The central district was still free from it as recently as ten or twelve years ago, but it is slowly and surely gaining on that region, and during the last three or four years cases have been appearing even at Port Moresby. In a few years it will be endemic over the entire coast, a great eastern wave from the Line and Solomon Islands meeting a wave equally great and irresistible coming from the west. There, as in Fiji, the best treatment was found to be sulphur fumigation, but it is not possible to apply the remedy universally in New Guinea so as to extinguish the disease.

ANKYLOSTOMIASIS.

I can only mention by name several other tropical diseases I have met with that are of special interest and that require investigation. There can be no doubt that ankylostomiasis is indigenous in the Pacific. In 1876 it was found in Fijian mountaineers, and in recruits from the Solomon Islands. Perhaps some of you may be able some day to explain its wide distribution and its exact significance. Cerebro-spinal meningitis was not a native disease but appeared amongst Indian coolies in Fiji. How it came there was a mystery. Beri-beri was not, I believe, a Fijian malady, but has been introduced by plantation labourers from Japan. In New Guinea it is indigenous but not common.

UNKNOWN DISEASES.

In New Guinea there is a curious multiple tumour often met with as large as a walnut. It occurs most frequently about the elbows or the parts of the body that touch the ground when one is asleep on it. This has not been investigated. It is probably parasitic. In the Pacific there is a strange *post-mortem* appearance that is extremely common, and that I trust some of you may throw light on. In the hilum of the kidney there is very often half a teaspoonful of brown or purulent fluid. It is found in the greater number of bodies even if dead only an hour or two. Its cause or origin, so far as I know, has not been made out.

DINGOES AND RABIES.

As an example of the kind of medical legislation as to which you will have to give advice, I may first cite from my own experience with rabies. As you all know there is a species of dog, the so-called "dingo," native to Australia and New Guinea. Where that animal came from is not clear. My distinguished friend Professor Giglioli, of Florence, gives good reasons for regarding the Australian aborigines as degenerated Aryans. If they are so, they probably brought their dogs with them, and at a time when rabies did not exist in Aryan communities. We shall not consider here whether the barking of dogs is a modern accomplishment, or whether the dingo gradually forgot the art. The dingo and dog cross readily, and the first cross between them barks. Doubtless, therefore, the dingo would be readily susceptible to rabies. There is a wild dingo on the top of the Owen Stanley range in British New Guinea, and a complete specimen was secured and deposited by me in the Queensland Museum, but the result of its examination is not yet known to me. The domestic dingo is very common in New Guinea as a pet, as a hunter, and as a table delicacy. All the dingoes of a village meet several times a day to howl, and they never separate without a fight. They are provided with long, thin, sharp teeth, which they use

in season and out of season, but by preference when out of sight. It closely resembles or is identical with the Australian dingo. I have never seen a native dingo in the Pacific Islands.

The point that most concerns us here is that the Australian and New Guinea dingoes were free from rabies. The Australian colonies have protected themselves from rabies by instituting a term of quarantine on imported dogs. It was seen that rabies introduced into a country like New Guinea with swarms of ill-tempered biting dingoes, among a barefooted, bare-legged population, and with a wild dingo in the mountains and numberless pigs everywhere, would be a very serious matter not only for that country but also for the whole of Australasia. The matter was therefore dealt with on the broadest platform. A representation was made to the great colonies that had charged themselves with part of the burden of maintaining British New Guinea, urging that the Secretary of State should try to induce France, Germany, and Holland to introduce laws similar to those of British New Guinea to prevent the introduction of rabies into their possessions in those seas. The then Prime Minister of Queensland, Sir Samuel Griffith, saw at once the importance of the measure and warmly supported it; it was, I believe, also approved by the Government of New South Wales. The then head of the Government of Victoria thought the proposal more or less ridiculous, and was of opinion that France and Germany would give no attention to such a trifle. Lord Knutsford and Lord Salisbury, however, obtained at once the cordial co-operation of the three foreign Governments. There is therefore good reason for hoping that now the whole of Australasia is, with reasonable care, secured for all time against the terrible disease of hydrophobia.

THE "JIGGER"

The question of the introduction of "the jigger" is one that has recently occupied the attention of the Indian Government. To such matters even as the control and distribution of this flea you require to devote time and study. Guided by our experience in Lagos we could only report to the Secretary of State that "the jigger" does not cause any noticeable inconvenience on official expeditions, and appears in private life to claim very little attention. But a medical officer advising his Government in India would require to know a great deal about the insect before he could venture to recommend any legislative steps regarding it, or could suggest that no action whatever should be taken.

LEPROSY.

It is probably now generally conceded that the disease of leprosy is communicable, and that the isolation of lepers should be carried out in the interests of the community. No aboriginal people I have known have ever entertained the slightest doubt as to the contagious nature of the disease. The natives of West Africa isolate the lepers. In the South Seas they kept them apart, and often buried them alive when they reached an advanced stage of the disease. More than twenty years ago I read in a German author that leprosy was extinguished in Scotland "durch die Entmannung der Männer." I have not been able to find the authority for that statement, the author of which is dead many years. It was at one time apparently not uncommon in Scotland. In the *L'Histoire Universelle* of M. Rambaud it is stated that Scotland's most celebrated king died of this dread disease.

The whole subject of leprosy now requires to be studied exhaustively in the light of the new pathology.

No doubt some of you must be aware that the native Fijian treatment was to bake the sufferer from leprosy near a slow fire. It was confidently affirmed that cases were cured in that way. It will be very interesting to see whether a fuller knowledge of the disease will offer any explanation of such a cure.

QUARANTINE.

I would for a moment call your attention to a medico-legal subject of great importance to many Colonies, and to which I trust some passing attention may be given in the courses of this school. I allude to quarantine against the introduction of infectious or contagious disease.

In all international conferences on quarantine matters British delegates take their stand against the imposition of quarantine. Their system is the isolation of affected or suspected individuals; the disinfection of vessels, and sometimes of cargo. This procedure can be carried out success-

fully only in a country where there are highly developed police, health, and sanitary services. It requires ample hospital accommodation where patients and prospective patients can be isolated; it needs a staff of trained and intelligent officers to exercise surveillance over people that may have been exposed to possible contagion, and it requires the means of dealing with any of these wherever he may be found. Here in the United Kingdom cleansing and disinfecting can be carried out with scientific accuracy and completeness, and at small cost.

In this country, then, in the face of the drainage, the ventilation, the accessibility to suspected persons, and the means of dealing with those as well as with infected persons, an outer line of defence may not at any time become necessary. But it is widely different in most colonies. Here the outer line of defence, imposing quarantine on infected or suspected vessels or persons, becomes a necessity. You will find it will tax your powers to the utmost to advise your Governments how best to combine the public safety with the minimum of disturbance to trade, for that in practice is the problem to solve. At Lagos we have tried to combine the two systems, by providing the medical department with the powers necessary to protect us from outside by imposing quarantine on arrivals, and to exercise surveillance ashore over persons exposed to a possible infection, but who cannot or need not be detained in quarantine. Ashore, the medical officers may remove from a community, and isolate, an infected individual; or they may put a house, a village, or a district, in quarantine. The small numeric strength of the staff available, the inadequacy of accommodation, the evil sanitary condition of all towns and villages over a great and populous area, make it practically impossible that we should depend entirely, or even chiefly, on our inner line of defence against epidemic disease. You are perhaps aware that in Australia a system of federal quarantine has been in force for several years. The geographic position of the Australian continent is very favourable to this line of action, yet recent events have shown that both the outer and inner ring of defence may be insufficient to keep out disease. The whole subject is one that will call for special and serious study at your hands.

THE WATER QUESTION.

Let me impress upon you the extreme desirableness of becoming experts in the examination of water. Nothing is of greater importance in the tropics. Although the new doctrine of malarial fever shows that water is only an indirect agent in the production of that disease, it still remains an essential factor in its continuation and spread. It retains all its former importance in respect of other diseases. In West Africa the medical officer should be able to say whether a given well is safe or not on account, for example, of guinea worm. Water is popularly credited with the origin of the "craw-craw" disease in Europeans. It doubtless has much to do with the spread of dysentery, typhoid fever where that exists, cholera, and several other maladies. Altogether it is one of those subjects to which you cannot give too much attention. Personally, I have always contended that the quality of the water used by a community may have as much, or nearly as much, influence on them as has the quality of the food they eat, or of the air they breathe. A medical officer is constantly liable to be asked by his Government to report fully on the water supply of some place or community.

I cannot conclude these somewhat dry and disjointed remarks without offering my hearty congratulations to you that are to become students at this school. In my opinion your lot is the most enviable of any body of men in this great country. You have already travelled over the ordinary road of medical education and have become acquainted with the more frequented parts of the limitless field in which you are to labour. You have become ordinary members of the greatest, most beneficent, and therefore the noblest of all professions. It can be said with greater truth to-day than it could three thousand years ago: *ἰητρος γὰρ ἀπὸ πολλῶν ἀντάξιος ἔνδραν.*

Here you are now to be taken into some of the bye-paths of medical study. There you will be brought face to face with some of the most interesting problems of science, questions of vast importance to the life and health of the individual, and that will exert a reflex action that will be felt in many of the

transactions of public, national, and even of international life. I trust and hope that you will leave this school well fitted by your knowledge of your profession to do your part in the exercise of your calling, and that you will have securely planted in your mind that high sense of duty that is the life and soul of religion, of patriotism, of every efficient public service, and that enables the medical man to devote by instinct, and unselfishly, all his mind and all his strength to the prevention and cure of every disease that affects humanity.

OPENING OF THE MEDICAL SCHOOLS : INTRODUCTORY ADDRESSES.

UNIVERSITY COLLEGE, LONDON.

By GEORGE VIVIAN POORE, M.D., F.R.C.P.,
Professor of the Principles and Practice of Medicine.

SCIENCE AND PRACTICE.

It is nineteen years since I last had the honour of delivering the introductory address to the students of the Faculty of Medicine in this college.

Since October, 1881, inevitable changes have taken place. Many of those who were then our chiefs are now no more; others have retired from the labours of professional work; their places have been supplied, let us hope, by good men and true, all of them anxious to maintain the high traditions of this college.

In 1881 some of my colleagues were beginning to talk of reconstituting the University of London. That reconstitution has now taken place. The headquarters of the university have been removed from the City of Westminster to the newly-incorporated town of Kensington, and all the medical schools in London have become constituent colleges thereof. Since 1881 the Universities of Oxford, Cambridge, and Durham, as well as the Victoria University at Manchester, have made, and are making, ever-increasing efforts to meet the needs of the medical student. In connection with the new University of Wales, a medical school has been founded in the flourishing town of Cardiff, and the present year has witnessed the foundation of the University of Birmingham, which, under the guidance of the Right Honourable Joseph Chamberlain and Professor Oliver Lodge, both of them former students of this college, may reasonably be expected to attain a large measure of success.

I believe that competition is the very essence of progress and that the largely increased competition in the matter of medical education is full of good omen for the future of medicine in this country. So long as the competition be really free there is nothing to fear. So long as men be really free to back their own judgment in the matter of gifts and endowments and so long as the medical student be free to choose the schools and the teachers to which he will take his educational fees there can be no doubt that the law of the survival of the fittest will continue to exert its beneficent influence and that progress will result.

SCIENCE AND PRACTICE.

I purpose to-day to address myself to those of you who are about to commence the study of medicine proper. Your studies hitherto in chemistry, anatomy, and physiology, studies which are a necessary preliminary to the study of medicine, have been pursued by the aid of dead material, and by methods which are largely artificial; methods many of which have no counterpart as far as we can tell in Nature. You have learnt to recognise and to name the various parts of the human body, and to understand the relation which the various organs hold to each other.

You have learnt by methods which are largely artificial to recognise many of the cellular elements which go to the building of our complex bodies, and by means of anaesthetics and sundry artifices you have had an occasional glimpse of vital movements—a momentary and imperfect glance of the fringe of Nature's robe. You have learnt how the chemist, by methods of his own, tears organic matter into fragments, and designates the bits by dodekasyllables; and represents them by mystic formulæ which sometimes perhaps illustrate