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AN ADDRESS ON THE NATION AND THE TROPICS

By WILLIAM OSLER, M.D., F.R.S.

Regius Professor of Medicine, Oxford

GIVEN AT THE LONDON SCHOOL OF TROPICAL MEDICINE, OCT. 26, 1909

THE evolution of our present hopeful condition, like that of organic life, looks uniform ; but examined more closely this uniformity disappears in a deeper parallel—the sudden intrusion of apparently new forces which have changed the broad surface of humanity quite as profoundly as did, for example, the glacial period the biology of the northern portions of the globe. Three outstanding events have loosened as a spring the pent-up energies of the modern world—the Greek civilisation, the geographic renaissance of the sixteenth century, and the scientific awakening of the nineteenth century. Greek thought not only stripped man for the race, but Greek methods gave him correct principles of training and clear ideas of the nature of the race to be run. Collectively we follow to-day occidental, Greek ideals, and what makes Western civilisation such a tissue of inconsistencies is the injection, Anno Domini, of an oriental morality which controls the individual, while powerless to sway the nations. The geographic renaissance has given to the progressive peoples of Europe a new pinnacle of outlook. To the lust of conquest succeeded the lust of commerce, to be followed by the burning zeal to evangelise ; and then a steady, sober plan of settlement which has encircled the earth with new nations. And the third great outburst of energy is the scientific awakening of the nineteenth century, which has not only placed in his hands a here-

tofore undreamed of capacity for material progress, but has given to man such a control of nature that at a stroke is removed the chief obstacle to a world-wide dominion.

The expansion of modern Europe, the completion of which was one of the great features of the latter part of the nineteenth century, has opened a broader vista than ever before looked on by humanity. The ascent of man began in the tropics, where the conditions of nature made life easy, and at least four of the six great ancient civilisations—the Egyptian, Phœnician, Assyrian, and Babylonian—rose and fell within, or close to the tropics. Once only in modern times has a tropical people, reaching a high grade of civilisation, spread far and wide, in the magic outburst with which the Arabians shook the very foundations of Christianity. In the last four centuries the expansion of Europe has changed the map of the world, and in conflict with the old civilisations in North and South America, and by wholesale appropriations in Asia and Africa, the children of Japhet have gone forth with the Bible in one hand and the sword in the other conquering and to conquer, taking the uttermost parts of the earth for their possession. In the course of this period they have partitioned among them one hemisphere, two continents, and a large part of a third. A glance at the map shows that as a result of this expansion many independent nations have sprung up; but a very large portion of the conquered earth is still in control of Europe, and linked to it by strong political ties. Practically these countries come in two divisions—the self-governing colonies and the dependencies. A majority of the former are in the temperate regions, and have reached a stage of maturity, and one of them has become the great nation whose representative honours us to-day with his presence.

Scarcely less important, and vastly greater in extent and population, are the dependencies, nearly all of which fall within the tropics, and with their destiny the problem of the twentieth century is bound up. If we take two lines, 30 degrees north latitude and 30 south latitude, the part of the earth between represents the great heat belt of the tropics, within which lie the whole of Africa, Arabia, India, Burma, the Malay States, Polynesia, the Philippines, Mexico, and the Central American Republics, with the West Indies. Mr. H. O. Becket, of the Department of Geography, Oxford, has prepared for me four maps (which I have much pleasure in presenting to the school) showing at a glance the tropical possessions of the four Western nations—England, France, Germany, and the United States. The following table gives the figures in population and in square miles of territory:—

	Tropical territory in—				Total tropical.	Home country.
	America.	Africa.	Asia.	Pacific.		
France	440,000 35,000	17,700,000 4,032,000	18,500,000 310,000	80,000 9,000	36,720,000 4,386,000	39,000,000 207,000
German Empire...	<i>Nil.</i>	11,700,000 931,500	<i>Nil.</i>	400,000 96,000	12,100,000 1,027,500	60,000,000 209,000
United Kingdom..	2,000,000 109,000	30,500,000 1,600,000	296,600,000 1,900,000	1,150,000 1,400,000	330,250,000 5,009,000	44,500,000 121,000
United States	305,000 47,500	<i>Nil.</i>	<i>Nil.</i>	7,707,000 134,500	8,012,000 182,000	76,000,000 2,970,000

Heavy figures give population.

Lighter figures give area (in square miles).

The tropical world has been appropriated, and this country has a burden of tropical population six times greater than the other three combined. A few comparatively small districts remain either independent, or as yet unexplored, as Abyssinia and parts of Polynesia.

THE DOUBLE BURDEN OF THE WHITE MAN.

It is no light burden for the white man to administer this vast trust. It is, indeed, a heavy task, but the responsibility of Empire has been the making of the race. In dealing with subject nations there are only two problems of the first rank—order and health. The first of these may be said to be a speciality of the Anglo-Saxon. Scarlet sins may be laid at his door—there are many pages in the story of his world-exodus which we would fain blot out; too often he has gone forth in the spirit of the Old Testament crying “The sword of the Lord and Gideon.” But heap in one pan of the balance all the grievous tragedies of America and of Australasia, the wholesale destruction of native races, all the bloodshed of India, and the calamities of South Africa, and in the other pan put just the one little word “order,” which has everywhere followed the flag, and it alone makes the others kick the beam. Everywhere this has been the special and most successful feature of British rule. We are entering upon a phase in which the natural results of this stable government upon the subject races are shown. Just as at home the fate of the rich is indissolubly bound up with that of the poor, so in the dependencies the fate of the strong and the weak cannot be dissevered; and whether he will bear or whether he will forbear, the brother’s keeper doctrine of the strong, helpful brother must be preached to the white man. The responsibility is upon the nation to maintain certain standards which our civilisation recognises as indispensable on the supposition that our Western ideas are right; but we have to meet the fact that the ways of the natives are not our ways, nor their thoughts our thoughts; and yet we place them in such

a position that sooner or later they become joint heritors with us of certain civil and social traditions and aspirations. It is in India and the Philippines that the political problem looms large, but no matter how large or how formidable it must not be allowed to interfere with the great primary function of the Anglo-Saxon as a policeman. There may be a doubt as to the grafting of our manners, and still greater doubt as to the possibility of inculcating our morals; a doubt also as to the wisdom of trying everywhere to force upon them our religion; but you will, I think, agree that the second great function of the nation is to give to the inhabitants of the dependencies, Europeans or natives, good health—a freedom from plague, pestilence, and famine. And this brings me to the main subject of my address, the control of the tropics by sanitation.

THE NEW CRUSADE.

When the historian gets far enough away from the nineteenth century to see it as a whole, perhaps one feature above all others will attract his attention, since amid all the movements of that wonderful period it has been most directly beneficent to the race. Political, social, religious, intellectual revolutions will demand his comments, but if I am not greatly mistaken the movement upon which he will dwell longest will be the introduction of modern sanitation. It is not possible to ascribe the credit of this to any one man or group of men in any country. The movement arose with the recognition of the true nature of the large division of what we call the infectious diseases, which are responsible for more than one half of the deaths in the community. This country may claim the merit of having first carried into practical effect sanitary laws,

which have resulted in a steadily diminishing mortality from this class. The cholera epidemic in the "fifties" did a great deal to arouse public opinion, and that remarkable group of men, comprising Chadwick, Budd, Murchison, Simon, Acland, Buchanan, Russell, and B. W. Richardson, and among laymen Charles Kingsley, put practical sanitation on a scientific basis. They had grasped the conception that the battle had to be fought against a living contagion, which found in poverty, filth, and wretched homes the conditions for its existence; and an immense impetus was given when in rapid succession, in the last third of the century, the germs of a large number of the most serious of epidemic diseases were discovered. The sum total has been the abolition of many infections, such as typhus fever; an extraordinary reduction in others, as in typhoid; the almost complete abolition of post-operative sepsis through Lister's work; and the perfecting of a sanitary organisation which gives confidence to the public and prevents commercial panics. Think of the shudder that would have passed over this country thirty years ago at the announcement of an outbreak of cholera in Rotterdam, yet in August last the presence of ten cases in that city was simply commented upon, but none felt the slightest anxiety. Altogether we may say that the home defences are in a fairly satisfactory condition, but there remain the complete victory over typhoid fever, the progressive reduction in the mortality from tuberculosis, and the limitation of the still very fatal diseases of childhood, and we have not arranged yet even a truce with that subtle and very progressive foe, cancer.

This flowery and flattering picture is true of the little island which forms the centre, and it is true, fortunately, to a great extent of the Confederate States, but when we take a glance at the Empire at large, at the

huge area which we see represented on the map, we find a totally different state of affairs. Out of the total population 60,000,000 perhaps live under good and constantly improving sanitary conditions, but of the vast dependencies with their teeming millions there is a very different story to be told. With an awakening of an interest in the Tropics men have learned to recognise the primary importance of good health and the possibility of mitigating conditions which favour the persistence of widespread and destructive epidemics. Of tropical diseases of the first importance may be mentioned malaria, plague, cholera, yellow fever, dysentery, beri-beri, and relapsing fever, and certain parasitic disorders as ankylostomiasis. They vary in their prevalence in different localities, but together they make the Tropics' great enemies. It is interesting to note that of all but one we know the germs, the conditions of their growth, and in nearly all the mode of propagation. Quietly but surely this great work has been accomplished by a group of patient investigators, many of whom have sacrificed health and life in their endeavours. Let us pause a moment to pay a tribute of gratitude to these saviours of humanity who have made the new mission possible—to Pasteur, to Koch, to Laveran, to Reed and his fellows, to Ross, Manson, and Bruce. And let us not forget that they built upon foundations laid by thousands of silent workers whose names we have forgotten. A great literature exists in the contributions published during the past century by the members of the medical department of the old East India Company service and of the army in both the East and West Indies. I should like to awaken in your memories the names of Lind, Annesley, Moorehead, Pringle, Ballingall, MacGregor, Hillary, Waring, Cheevers, Parkes, Malcolmson, and Fayrer. Many did work of

the very first quality with very little recognition at home or abroad. I sometimes think of the pathetic letters received from that splendid investigator Vandyke Carter, of Bombay, the first in India to confirm the modern studies upon malaria in the early days when we were both working at the subject, how he spoke of his isolation, the difficulties under which he struggled, the impossibility of arousing the apathy of the officials, and the scepticism as to the utility of science.

No one has expressed more deeply this sentiment of lonely isolation in the Tropics than Ronald Ross in his poem *In Exile* :—

“Long, long the barren years ;
Long, long, O God, hast Thou
Appointed for our tears
This term of exile.”

Few have been able to sing with him the pæan of victory when he discovered the mode of dissemination of malaria through the mosquito—

“Seeking His secret deeds
With tears and toiling breath,
I find thy cunning seeds,
O million-murdering death.”

And the pathway of victory is strewn with the bodies of men who have cheerfully laid down their lives in the search for the secrets of these deadly diseases—true martyrs of science, such as were Myers, my friend and former assistant, Lazear (both of whom died from yellow fever), Dutton, and young Manson. Of them may fitly be sung in words from the noblest of all American poems, that in which Lowell pays a tribute to the young Harvard men who fell in the war of secession :—

“Many in sad faith sought for her,
Many with crossed hands sighed for her;
But these, our brothers, fought for her,
At life's dear peril wrought for her,
So loved her that they died for her.”

As a result of 25 years' work we have an extraordinary volume of knowledge concerning the causes of most of the tropical diseases and the nature of the measures required for their prevention. And yet when one considers the existing conditions it is safe to say that our task has scarcely begun. When we read in *The Lancet* of Oct. 23rd that during the last four months of 1908 400,000 deaths from fever were reported in the Punjab, and that it is estimated that a fourth of the total population of the province suffered from malaria, one realises the truth of such a statement. And yet the situation is one full of encouragement, particularly in connexion with the practical prevention of insect-borne diseases. For centuries there has been a popular belief in the transmission of disease through mosquitoes and flies, and in the middle of the nineteenth century that remarkable clinician and anthropologist, Nott of Mobile, suggested the association between the mosquito and yellow fever and malaria. A more scientific presentation of the question was made by the French physician Beaupérthuy, an enthusiastic student of the epidemics in the Spanish Main. But the first clear demonstration of a mosquito-borne disease was made by Manson in the case of filariasis. The whole story is told in a fascinating way in Sir Rubert Boyce's just issued work, *The Mosquito or Man: the Conquest of the Tropical World*. The discovery by Laveran in 1880 of the parasite of malaria, the demonstration by Ross in 1897 of the part played by the mosquito in its transmission, have a greater significance for a greater number of persons than any single observations ever made in connexion with disease. Then followed in 1900 the demonstration by the American Army Commissioners, Reed, Carroll, Agramonte, and Lazear, of the transmission of yellow fever by the mosquito. Many scientific

discoveries have afforded brilliant illustrations of the course to be followed in a modern research ; but one is at a loss to know which to admire most, the extraordinary accuracy and precision of the experiments, or the heroism of the men, officers and rank-and-file, who carried them out, all the time playing with death and some of them paying the penalty. The conditions were favourable to the demonstration on a large scale of the practical value of the discovery. It was a fortunate thing that the head of the American occupation of Cuba was General Leonard Wood, himself a well-trained physician, and deeply interested in problems of sanitation. Backed by the military arm it took Dr. Gorgas and his colleagues nine months to clear Havana, which had been for centuries a stronghold of the disease. With the exception of a slight outbreak after the withdrawal of the American troops the city has remained free from yellow fever. What is even more important, in the great centres in South America, particularly in Rio, similar measures have been carried out with signal success ; indeed, we may say that the possibility is in sight of the extermination of one of the world's greatest plagues, which has cost millions of lives and has at intervals interrupted the commerce of half a continent.

I mentioned yellow fever first because its history illustrates the importance of effective organisation. It has been an added merit to Dr. Ross's great merit that, like the fiery Peter of old, he has preached a ceaseless crusade in favour of organised effort against malaria. Everyone knows that the control of the Tropics is bound up with this disease, and it is a problem the practical solution of which will tax to the uttermost the organising capacity of the Anglo-Saxon. A singularly happy combination of circum-

stances has demonstrated on a large scale the efficiency of modern sanitary measures in one of the world's greatest death-traps.

THE STORY OF THE PANAMA CANAL.

In a general way the story of the Panama Canal is well known, but as I do not think an up-to-date version has ever been presented to the British public I propose to tell you in a few words a marvellous history of sanitary organisation. The narrow Isthmus, separating the two great oceans and joining the two great continents, has borne for four centuries an evil repute as the white man's grave. Silent upon the peak of Darien stout Cortez with eagle eye gazed at the Pacific. As early as 1520 Saavedra proposed to cut a canal through the Isthmus. There the first city was founded in the new world which still bears the name Panama. Spaniards, English, and French fought along its coasts; to it the founder of the Bank of England took his ill-fated colony; Raleigh, Drake, Morgan the buccaneer, and scores of adventurers seeking gold, found in fever an enemy stronger than the Spaniard. For years the plague-stricken Isthmus was abandoned to the negroes and the half breeds, until in 1849, stimulated by the gold fever of California, a railway was begun by the American engineers, Totten and Trautwine, and completed in 1855, a railway every tie of which cost the life of a man.

The dream of navigators and practical engineers was taken in hand by Ferdinand de Lesseps in January, 1881. For 23 weary years the French company struggled against financial difficulties at home and insuperable sanitary obstacles on the Isthmus. Little did the 19 Frenchmen, who reached Panama in January,

1881, think that the secret of success lay 7,000 miles away with a young countryman of theirs, an army surgeon in Algiers called Laveran, unknown, solitary, unrecognised, who was quietly studying malaria in a military hospital in Algiers, doing work which alone could make possible the completion of their plans.

From the outset the chief obstacle proved to be the fevers. It is a sad record. Within seven months from beginning work the mortality had risen to the rate of 119 per 1000 for the month. As the number of employees rose, so in a certain measure did the death-rate, which reached the maximum in the month of September, 1885, in the appalling figures of 176·97 deaths per 1000. This would appear to be about the maximum death-rate of the British army in the West Indies in the nineteenth century. The average in Jamaica for the 20 years ending 1836 was 101 per 1000. At several stations it reached as high as 178 per 1000. But this is nothing to some of the seventeenth-century records, which show that a regiment of 800 lost two-thirds of its strength in a fortnight.¹ The maximum number of employees was in 1887 and 1888 from 15,000 to nearly 18,000. The maximum mortality in these two years was 72·48 per 1000. Then for a period of eight or ten years the work lagged, and the total number of men employed annually was for many years under 1000; a large proportion coloured and the whites chiefly immunes. Only once in these years did the mortality rise above 133 per 1000, which was in the month of January, 1903, and this seems largely to have been due to an epidemic of smallpox. Yellow fever, malaria, and dysentery were responsible for the large proportion of deaths. From 1890 yellow fever practically disappeared,

¹ Maunsell, Jamaica branch of the British Medical Association, Proceedings, Year 3, No. 12.

with the exception of a small epidemic in 1897. During the French occupation 6283 of the employees died in hospital, thousands died along the course of the canal; many thousands were damaged permanently in health, or died after their return to their homes. In Philadelphia in 1888 I had a telegram from a contractor asking what accommodation could be given in the hospitals for two ship-loads of workmen returning from the canal, the great majority of them ill with malaria and dysentery. The mortality had been very high as yellow fever had been raging. One of the ships came to Philadelphia and I do not remember ever to have seen a more appalling sight when these victims of chronic dysentery and malaria were landed; many were anæmic, others worn to the bone, and not a man of them had escaped serious damage. Not 50 per cent. of those who had gone out returned, and a very large proportion of those who landed in New York and Philadelphia died subsequently.

When in 1904 the United States undertook to complete the canal everyone felt that the success or failure was largely a matter of sanitary control. The necessary knowledge existed, but under the circumstances could it be made effective? Many were doubtful. Fortunately, there was at the time in the United States army a man who had already served an apprenticeship in Cuba, and to whom more than to anyone else was due the disappearance of yellow fever from that island. I know that to a man the profession in the United States felt that could Dr. Gorgas be given full control of the sanitary affairs of the Panama zone the health problem, which meant the canal problem, could be solved. There was at first a serious difficulty relating to the necessary administrative control by a sanitary officer. In an interview

which Dr. Welch and I had with President Roosevelt he keenly felt this difficulty and promised to do his best to have it rectified. It is an open secret that at first, as was perhaps only natural, matters did not go very smoothly, and it took a year or more to get properly organised. Yellow fever recurred on the Isthmus in 1904 and in the early part of 1905. It was really a colossal task in itself to undertake the cleaning of the city of Panama, which had been for centuries a pest-house, and the mortality of which, even after the American occupation, reached one month as high as 71 per 1000 living. There have been a great many brilliant illustrations of the practical application of science in preserving the health of a community and in saving life, but it is safe to say, considering the circumstances, the past history, and the extraordinary difficulties to be overcome, the work accomplished by the Isthmian Canal Commission is unique. 1905 largely dealt with organisation; yellow fever was got rid of, and at the end of the year the total mortality among the whites had fallen to 8 per 1000, but among the blacks it was still high, 44. For three years with a progressively increasing staff which had risen to above 40,000, of whom more than 12,000 were white, the death-rate progressively fell.

Of the six important tropical diseases, plague, which reached the Isthmus one year, was quickly held in check. Yellow fever, the most dreaded of them all, has not been present for three years. Beri-beri, which in 1906 caused 68 deaths, in 1908 caused only 38. The hook-worm disease, ankylostomiasis, has steadily decreased. From the very outset malaria has been taken as the measure of sanitary efficiency. Throughout the French occupation it was the chief enemy to be considered, not only because of its fatality, but on account of the prolonged

incapacity following infection. In 1906, out of every 1000 employees there were admitted to the hospital from malaria 821; in 1907, 424; and in 1908, 282. The mortality from the disease has fallen from 233 in 1906 to 154 in 1907 and 73 in 1908; that is to say, with a force more than a third larger in 1908 there were only a third the number of deaths that occurred in 1906. Dysentery, next to malaria the most serious of the tropical diseases in the zone, caused 69 deaths in 1906; 48 in 1907; and in 1908 with nearly 44,000 only 16 deaths. But it is when the general figures are taken that we see the extraordinary reduction that has taken place. Out of every 1000 engaged in 1908 only a third of the number died that died in 1906, and half the number that died in 1907.

The death-rate among white males has fallen to 3.84 per 1000. The rate among the 2674 American women and children connected with the Commission was only 9.72 per 1000. But by far the most gratifying reduction is among the blacks, the rate of which had fallen to the surprisingly low figure in 1908 of 12.76 per 1000; in 1906 it was 47 per 1000. A remarkable result is that in 1908 the combined tropical diseases—malaria, dysentery, and beri-beri—killed fewer than the two great killing diseases of the temperate zone, pneumonia and tuberculosis—127 in one group and 137 in the other. The whole story is expressed in two words, *effective organisation*, and the special value of this experiment in sanitation is that it has been made, and made successfully, in one of the great plague spots of the world.

In Italy, in India, in many parts of Africa, and in the United States the anti-malarial campaigns are being pushed with the same vigour and success, but time will not permit me to dwell upon any of these or upon the

brilliant success which has followed the work of Bruce and his colleagues in clearing Malta of Malta fever, but I must stop to refer briefly to certain dark shadows in the picture of tropical medicine. Within ten years the investigations in Africa have shown the wide prevalence of formidable diseases of animal and man, unknown or previously but imperfectly known. The knowledge of the group of diseases caused by the trypanosomes has added terror to tropical life. The dreaded sleeping sickness which now extends over some million of square miles is one of the serious problems of life in Africa. A vigorous plan of campaign has been instituted, and already in Uganda, as the Governor's report shows, there is a steady diminution, and no whites have been attacked since 1906. The public will find in Boyce's book the whole story of the relation of tropical diseases to flies and insects, and this most timely contribution should help to call attention to the medical problems of the tropics and the supreme interest to the nation of these new maladies. And there is another dark spot in our story.

THE RECRUDESCENCE OF PLAGUE.

Certain epidemic diseases are very much like the fabled "Hydra," from which so soon as one head was cut off another sprang up to take its place, or, what is just as bad, grew again. Even the eternal watchfulness which safety demands is not of any avail against the workings of nature when we do not understand her laws, and when we are face to face with certain mysterious phenomena, the sweep of whose orbit we have not yet measured. Geologists tell us of epochs when there must have been a wholesale destruction of certain types, possibly by disease. More than once within historic days it must have seemed as if the very existence of

the race was threatened, so vast and overpowering had been an epidemic invasion. No disease had so shaken the foundations of human society as the plague, which in the second century and again in the thirteenth has shown a capacity for wholesale destruction not shared by any other. In reading the Abbé Gasquet's picture of the effects of the great pandemic of the thirteenth century one gets the impression of the loosening of an irresistible cosmic force which swept like a tornado over the earth, leaving it desolate and almost uninhabited. We have traced the orbits of the planets, and the advent again of Halley's comet shows us how fully we understand the stars in their courses, but these are mechanical things, the laws of which are plain and legible in comparison with the many and as yet insoluble problems of life. One of these relates particularly to the extraordinary reappearance or recrudescence of certain epidemic diseases. Twenty years ago when one spoke of the plague memories were recalled of the history of Athens in the days of Pericles, of Rome in the days of Marcus Aurelius, of the great pandemics of the Middle Ages, and then of the dwindling smaller epidemics of the sixteenth, seventeenth, and eighteenth centuries. But to the profession and to the world at large the plague was a closed book. A few knew that it lingered in certain centres, but none dreamed that it would again burst like the comet into our orbit. There was a certain fitness that it should have started on a world mission of destruction at Hong-Kong, the port which boasts the largest and most world-wide tonnage. When one considers the dynamic energy of the plague, its powers of resistance, its terrible killing capacity, exceeding all known vital forces, who can doubt that had its advent been in the middle instead of at the end of the last

century civilisation might have had to face again the prospect of destruction. With slow deliberation since in 1894 it started in Hong-Kong it has reached 52 countries in every district of the world (J. M. Eager).

The outbreak in India, which began in 1896, has shown that under suitable conditions the disease has lost none of its old malignancy. With the exception of a slight decrease in the years 1900 and 1906, there has been a constant annual increase in the number of deaths, the total amounting now to between 6,000,000 and 7,000,000. On the whole, in other countries it has been held in check, and for so pandemic a prevalence during 15 years the total mortality cannot be said to be excessive. The two serious features relate to the difficulty of enforcing successful measures in India, and the extraordinary tenacity it has displayed in spite of the most vigorous measures for its total suppression. It is not without significance that at Glasgow, where there were small outbreaks in 1900 and 1901, two cases occurred in 1907 which could not be traced directly to shipping. As Lucretius says, in describing the great plague in Athens: "Appalled and doubtful mused the healing Art"; but we have made a great step in our knowledge of the means of its dissemination, and though we may well be appalled at the virulence of the disease in India, we have no cause to doubt the efficacy of the machinery which is keeping it in check all over the world. As an offset to the dark picture, India is the very country above all others in which the health of the European has progressively improved. The army statistics show an extraordinary reduction in the death-rate from typhoid fever, dysentery, and from malaria. Lord Kitchener remarked the other day that the improvement of the English troops in India in the past 10 years was equivalent to adding 2000 men to the strength of the army.

PLAN OF CAMPAIGN.

I have indicated briefly to you the pressing necessity to take up the heavy burden of securing health in the tropics. To make our knowledge effective, to make it as effective as Dr. Gorgas has done at the Isthmus of Panama, as Ross has done at Ismailia, is the problem which to-day confronts us. Enough has already been accomplished to indicate a successful plan of campaign. Two things are necessary. First, organised centres from which the work may proceed; a model of this sort is the "Sleeping Sickness" Bureau under the auspices of the Royal Society. The work which it has done and which is under progress shows the value of central organisation. Similar central bodies have already dealt with plague and malaria, but these organisations should be placed on a permanent basis and unified in some way under a central Tropical Institute, the different departments of which would be in touch with its workers all over the world.

How fascinating to stand at the window of the Norddeutscher Lloyd's office in Charing Cross and see the chart of the position of every ship of their great fleet as it plies the seas of commerce, and one turns away with a tribute of admiration to enterprise and organisation. Given two not unattainable features, an Imperial Tropical Institute and strong affiliated schools, the health side of the burden of Empire might be undertaken with a staff of highly trained workers who could be sent hither and thither wherever there was a disease to be investigated or a pest-hole to be cleared up. A map would show one hundred or more expeditions planted in India, Africa, and America, all, like the Lloyd's ships, a testimony to organisation and enterprise. And this is no vain dream.

By far the most useful work in British medicine during the past 20 years has been the result of just these carefully planned expeditions, sent out, partly by the liberality of the citizens of Liverpool, particularly Sir Alfred Jones, and partly as commissions by the Government and by the Royal Society. Not only have they added enormously to our knowledge of tropical diseases, particularly of plague, Malta fever, and sleeping sickness, but they have demonstrated the necessity of working at these diseases in the regions of their prevalence. It is not too much to say that the reports of the Liverpool School and of the Royal Society and the Government commissions are among the most valuable contributions made of late in this country to scientific medicine. More than this, there has in consequence taken place an extraordinary awakening of the profession to the importance of tropical disease, societies for its study have been organised in different countries, an international Society has been formed, special journals founded, at large sea-ports hospital wards devoted entirely to tropical diseases have been opened, and lastly schools for the study of tropical diseases have been organised. And here I come to one of the great factors in securing proper sanitation in the tropics—suitable provision for the training of workers. The country may feel a just pride in the schools which have been started in the two great sea-ports of the nation. In the hands of Ronald Ross and Rubert Boyce the Liverpool school, founded 10 years ago by Sir Alfred Jones, has had a career of exceptional vigour. Backed by the citizens, and particularly by those princely souls Sir Alfred Jones and Mr. William Johnston, and with the co-operation of the University of Liverpool, it has drawn students and investigators from all parts of the Empire and from foreign countries. As an indication of its vitality I may mention that the

school has already despatched 21 research expeditions to the tropics. And I am told that the entire "plant" of the school and the cost of the expeditions have been less than £75,000, a very modest sum considering the results. Started just 10 years ago by the wise support of Mr. Joseph Chamberlain, who will always be gratefully remembered as the statesman who taught us to think tropically, this school has had the great advantage of the guidance and the prestige of the name of Sir Patrick Manson, the dean of all students of tropical medicine. To him more than to any one man we owe the strong position occupied by the subject to-day in Great Britain. You have been singularly fortunate in securing a staff of teachers well-known for their researches in tropical medicine, such as Sandwith, Simpson, Duncan, Cantlie, and Sambon, a director of such unusual experience as Daniels, and such well-recognised authorities as Leiper and Wenyon on helminthology and parasitology. In the heart of the Empire, in its richest and largest city, to which all the world pays tribute, one naturally expects a foundation commensurate with its advantages and responsibilities. With the aid of the Government and a few liberal friends a good start has been made and the school has taken a strong position among the educational institutions of the country. In the short time of its existence, it has trained nearly 1000 men for work in the colonies and dependencies, it has fostered original research in tropical diseases, and it has been an important centre for the diffusion of scientific knowledge. Need I dwell upon its peculiarly fortunate situation in the very midst of the commerce of the world, where sailors from every region congregate, bringing with them the diseases peculiar to their homes. The possibilities exist for the greatest of all schools of tropical medicine if London will but rise to the occasion.

Liberal and encouraging at the outset, the Government has taken the usual course and has thrown upon the public the chief responsibility for its support. After reading a statement of the finances of the school furnished by the secretary, I am astonished that so much good work has been done with so meagre an endowment. Only the self-sacrificing devotion of the staff has enabled the school to achieve its marked success. I am sorry to have to say that neither the City of London as a corporation, nor its rich guilds, nor its citizens have contributed to the cause as might have been expected. The total expenditure on the school has been less than £40,000, a sum not more than sufficient to endow one department. As we all know, the extraordinary demands upon London are met in a way that makes it the centre for all beneficent enterprises. For church missions alone millions are contributed annually. It is not too much to ask for rich endowments for the missions of science.

I have tried to indicate the position which the new crusade occupies in the work of the nation, a work co-ordinate with, and almost of the same importance as, that of maintaining order. We cannot expect much more from the Government, which throws the onus of endowment upon private hands, but it makes the struggle hard when we come into competition with the Government-supported institutions of other countries. London, which should be the centre of the Empire, not alone commercially but in every relation, cannot be said to have kept pace in science with modern demands, and it has never realised its imperial position for post-graduate study. It is not a good thing for the Empire to find that so many of our young men who come from overseas for work slip away to the Continent where they find conditions more favourable and better organised. It

is not the sort of impression which one would like to have taken away from the Imperial capital.

This great question of tropical sanitation, in which we have only made a start, is bound to loom in larger and larger importance. Of the nations, England has the heaviest responsibility, as the figures I have quoted show, but she has the advantage of the first start and of strongly ingrained national ideas on the value of health. It is not too late to seize the opportunity. The United States, Germany, France, Holland, and Japan are in the field. Now is the time for new enterprise and a more complete organisation. That the Government is friendly and begins to realise the importance of the work is evident in the appointment of an entomological commission; but this is a vast and complicated problem which needs an organised effort on the lines I have indicated. An Imperial Institute would represent the general staff of an army of sanitation, the expeditionary forces of which could concentrate at any place and could be used for investigation, education, and supervision. Each unit would represent the staff of one of Dr. Gorgas's 17 divisions of the Panama Canal Zone and would take hold of an insanitary district and leave it pest free. Affiliated and ancillary would be the two schools which would serve as training colleges for investigators and sanitary administrators. Take, for example, this school. If I were Minister for tropical dependencies and a friend of a Chancellor of the Exchequer with a big balance, I would first establish six professorships, two of tropical medicine with a hospital of 200 beds, a good clinical laboratory, and a system of graded associates and assistants; a professor of pathology with a separate institute—and the model of the new one at Leipsic would be thought good enough; a professor of protozoology; a professor of helminthology; a professor

of entomology—all of whom would have *carte blanche* for their laboratories, museums, and libraries. I would establish subsidiary schools in the tropics, in West Africa, Uganda, and India which would serve as centres for the mission work in those countries. By no means a visionary scheme, and well within the possibility of achievement, it would not demand an endowment of more than a couple of millions. Once get the intelligent business men to take up this as a business scheme in the interests of the whole Empire, and they will not, as they never have in the past, shirk their duty, but in slow and steady streams of a few thousands now and then, in big rushes, let us hope, of a hundred thousand now and again, the necessary amount will be made up.

Is it likely that the white man can ever thrive in the tropics except as a sort of exotic, as he is at present in the West and East Indies? As the nations of the north and south increase and multiply, doubling every century, will he find an outlet by settlement in the tropics, or will he simply use them as Rome did Egypt, as a granary? It cannot be said that so far the European has been a success as a settler in the tropics, since no white colony has ever prospered below 30 degrees of northern latitude; but has he ever had a chance? In contact with brown and black races, which have become inured to heat, tolerant of parasites, and more or less immune to the worst of the tropical diseases, he has so far never had an opportunity to show of what he might be capable when placed in really sanitary surroundings. The 8000 whites now at the Isthmus work eight hours a day in the burning sun, and they with their wives and children thrive and enjoy a health quite as good as dwellers in any town in the United States. Heretofore man has never met nature on equal terms; now science has taught him how to be master, but the

knowledge is so new and so recently made effective that we have not the data from which to make a clear judgment. How far the introduction of tropical diseases has accounted for the decadence of Greece has been discussed by W. H. S. Jones and Ronald Ross, who seem to have made out a good case, but given a white race living in the tropics for two generations, and free from malaria and parasitic anæmia, would it show the hardy vigour at present the characteristic of the Anglo-Saxon? Time alone will tell. Personally I doubt it. Man is a lazy animal, and the best thing that ever happened in his history was when Adam's wife ate the apple and they both were turned out of a tropical Eden to earn their bread by the sweat of their brows. As Sir Charles Dilke has remarked, the banana is the curse of the tropics, and when have ever "the blossom-fed Lotophagi" done anything for the race? The most successful attempt has been in the English West Indies, but commercial conditions have been adverse, and to-day the negro may be said to possess the islands where the white man lives, it is true, but hardly thrives. No, it has been found in the past, and it will be found in the future, that the men of mettle, the men who have made the world their Odyssey, have been reared in Ithaca's rugged Isle "of hardy youths a nurse of name." It is good for man to have the "rebuff that turns earth's smoothness rough," and this is not what he gets amid the fascination and fertility of the tropics, which, as Homer says, breeds—

" A race
Of proud-lived loiterers that never sow
Nor put a plant in earth, nor use a plow,
But trust in God for all things."

When Isaiah was discussing the burden of Babylon, the burden of Tyre, and the burden of Egypt, I wonder

what he would have said could his prophetic eye have glanced at the map on which is depicted the burden of the British Empire. Surely no nation in history has ever had such a load of responsibility. But fit as it has been in the past it will ever be fit so long as *salus populi* remains *suprema lex*. It only behoves us to see that we are well equipped for the second great task—the task of the future, to give to the teeming millions of our dependencies that greatest of all blessings in life, good health.