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ACCLIMATIZATION OF EUROPEANS IN TROPICAL LANDS.*

By Dr. L. WESTENRA SAMBON.

THE problem of tropical colonization is one of the most important and pressing with which European states have to deal. Civilization—by mitigating famine, war, and pestilence—has favoured unlimited multiplication, and thereby intensified that struggle for existence the limitation of which seemed to be its very object. The Old World would be unable to support its ever-increasing population if the balance were not kept by a constant flow of emigration, which fluctuates from year to year with the tide of social misery. This continuous dispersion has replaced the swarmings of savage life, when tribes of men were subject to such periodical migrations as are witnessed in the northern grey squirrel and the Norwegian lemming. I know full well that the question of emigration is beset with a variety of moral, social, political, and economic difficulties; but it is the law of nature, and civilization has no better remedy for the evils caused by overcrowding.

Looking for suitable areas whither to direct the torrent of our surplus population, we find that in the temperate zone there is no longer room for any great further immigration. Already North America and Australia resist the free immigration of paupers. But there remains the great tropical belt, with its vast and rich territories extending over more than a third of the surface of the globe. This, surely, must be the Promised Land; but we dare not enter, because at its gates stands a terrible monster—the Cerberus of prejudice.

It is the almost universal opinion that the European cannot colonize the tropics, but must inevitably fall, sooner or later, a victim to the influence of their deadly climate. I will endeavour to prove that this statement is wrong, and that there is no reason why the European should not conquer the tropical world.

The pessimistic opinion in regard to the tropical climate arose at a time when scientific knowledge was in its infancy, and when the enormous death-rate of Europeans, tenfold higher than that of the natives, seemed to prove beyond doubt that in the struggle for life in tropical regions the European was defeated. Within the last few decades, under the influence of sanitary science, wonderful changes have been wrought in the healthiness of tropical stations, and the changes have in many instances been so great that places which were considered the deadliest are now recommended as health-resorts!

In the light of new facts, the old theories were bound to crumble; but, strange to say, they still dominate public opinion. If the question of acclimatization has not closely followed in the train of modern thought, it is because of its complexity. It has hitherto been discussed mostly by statesmen, geographers, meteorologists, and journalists, who were bound to base their conclusions on such medical opinion as was accessible to them, no matter how obsolete and erroneous. Now, the medical aspect of the question is by far the most important, but, unfortunately, the one that has been most neglected, perhaps because we have necessarily more practitioners than scientists in the medical field.

The general opinion is that intertropical regions are inimical to the European on account of their climate. I will show you that this is not so; but, first, we must understand what is meant by the word "climate," because authors, when writing on tropical acclimatization, do not use it in its broad accepted meaning, but merely as a synonym of heat. According to them, the tropics are deadly because of their heat. Now let us consider this statement very carefully, because it is the pivot of the whole question.

* Paper read at the Royal Geographical Society, April 27, 1898.

Those who believe that the heat of the tropics is noxious to Europeans, uphold their contention by stating that it induces disease, and they mention anæmia, hepatitis, and sunstroke. At one time, undoubtedly, these diseases were attributed to the direct and sole agency of solar heat, just as malarial fevers were attributed to the moonshine; but now they have been inscribed deeply on the tablets of bacteriology, and certainly the demonstration that disease belongs to the domain of parasitism is the greatest advance that medical science has ever made.

Anæmia, in the tropics, has been considered one of the most obvious consequences of heat. Some authors thought it a normal and protective condition, and went so far as to induce it in new-comers by venesection. Dr. Felkin called it *physiological anæmia*! But anæmia, in the tropics as in Europe, is a morbid condition of the blood common to several diseases, such as malaria and ankylostomiasis. It is never induced by heat. The observations of Maurel, Marettang, Eijkman, and Glogner have proved beyond doubt that in tropical regions the influence of high temperature causes no change in the amount of red corpuscles or hæmoglobin in the blood.

The various diseases of the liver common to Europe are also met with in tropical countries; but there the accepted etiology is forgotten, and they are curiously attributed to heat. The frequency of liver abscess in tropical regions has been advanced as a proof that it is caused by heat; but its limited and peculiar distribution, altogether independent of climatic conditions, is strongly against the meteorological theory. The frequent association of liver abscess with dysentery has led authors to believe that it may be due to the same parasite which causes the latter, and the *amæba coli* has been incriminated in both diseases.

The parasitic nature of anæmia and hepatitis having been generally recognized, sunstroke remained as the only condition that authors could bring forward to prove the noxious influence of tropical heat. But I firmly believe the febrile distemper called sunstroke in India to be an infectious disease (see *British Medical Journal*, March 19, 1898). My statement appears at first paradoxical, but it is far more surprising that the disease should have remained so long in the domain of astrology. The reason is perhaps that it was confounded with diseases and conditions of a very different nature, such as cerebro-spinal fever, pernicious malaria, cerebral hæmorrhage, alcoholic coma, and syncope, and because its mistaken nomenclature perpetuated an erroneous preconceived causation.

So-called "sunstroke," for which I have adopted the older and more appropriate name siriasis, is an acute disease characterized by intense fever, loss of consciousness, and embarrassed respiration. Its symptoms and post-mortem appearances are analogous to those of infectious diseases. Its onset is often sudden, as in cholera or plague, but usually it is preceded by premonitory symptoms, which indicate clearly a period of incubation. The frequent occurrence of relapses is another strong proof of parasitic nature. Like enteric fever and other infectious diseases, siriasis is closely connected with the hottest season; but—and this is a most important feature—it has a peculiar and restricted geographical distribution, which is not bound by isothermal lines, but, like that of yellow fever, is limited to a few coast districts, and to the valleys of some large rivers. Moreover, siriasis often prevails in epidemic form, and naturalization confers immunity to it, as it does to yellow fever.

All this may be very well, but theorists will not yield, and, not being able to offer any definite proof of their contention, they will tell you that the tropical climate induces deterioration. They remind me of squids and cuttle fish, which, being unable to fight their foes, cloud and darken the water with their ink as a means of defence. Most authors have mentioned a peculiar tropical deterioration,

but no one has ever described it in definite terms, because no one has ever seen it. Heat deterioration is a phantom that is vanishing rapidly in the light of modern science. Of course there are thousands of people within the tropics, both Europeans and natives, who show signs of bodily decline and of general debility, but in all these cases we can trace the deterioration to definite microbic processes. Deterioration in the tropics, as in Europe, is that condition of organic failure which is characteristic of long-continued (chronic) diseases such as tuberculosis and leprosy.

Two great causes of deterioration in tropical regions among Europeans are malaria and tuberculosis. Malarial diseases have a very wide distribution within the tropics, but their prevalence varies exceedingly in different regions. Some districts enjoy a complete immunity from malaria, notwithstanding the existence of climatic conditions which might be thought favourable to its prevalence. In others it is so greatly prevalent that the whole population suffers from malarial cachexia (chronic malaria). Tuberculosis is not a tropical disease, but it has been imported by Europeans to all colonies, and in some places it has become extremely prevalent. In the West Indies it causes now more deaths than any other disease, except dysentery. But most cases of tuberculosis amongst Europeans have not been contracted in the colony, but are outbursts of a latent infection contracted at home during childhood.

Deterioration is not limited to Europeans in tropical regions, but is equally prevalent among natives. The chief causes of deterioration among natives are leprosy, malaria, and tuberculosis; but the deterioration due to tuberculosis is far less prevalent than among Europeans, because in most places it is still rare, or confined to coast districts, and because when it attacks the natives it is rapidly fatal.

In Europe we find the same causes of deterioration, but with a very different prevalence. Malaria once prevailed extensively, but it has gradually disappeared, except in a few places, the chief of which are Southern Russia and certain parts of Italy. Leprosy was also prevalent in Europe as an endemic disease during the middle ages; now there remain only a few small centres, and even in these it is fast decreasing. On the other hand, we have the appalling deterioration caused by tuberculosis, rickets, and syphilis. The deterioration of the white man in his own climatic home has caused much discussion of late, and, indeed, it is deserving of urgent and serious consideration. Broad chests and powerful limbs are no longer common among labourers and artisans. The medical examiners of recruits reject a larger proportion every year, and those admitted into the ranks are certainly inferior to their predecessors. This deterioration is greatly favoured by the herding together of dense masses of population in large cities, a more strenuous struggle for existence, alcoholism, and immorality. In almost all nations, organic ruin is slowly progressing as the old country life is being merged into the miserable life of cities. The birth-rate in England, France, Germany, Holland, and Belgium shows a marked decline coincident with the increase of urban population; and, if we compare the mortality of the rustic labourer with that of the corresponding class in towns, we find that the countryman enjoys a life on an average three times as long as that of his metropolitan brother. Surely not over our colonies, but at the entrance of our cities, should be written Dante's inscription, "*Lasciate ogni speranza, voi ch'entrate.*"

The present pessimism on the question of the tropical acclimatization of Europeans has a parallel in that which was so strongly expressed by Dr. Knox and others about the English transplanted to the United States and to Australia.

In studying the question of heat as a cause of disease, it will not be out of place to consider the influence of high temperature on workmen in Europe.

Carpenter, in his physiology, tells us that Chabert, the "Fire King," was in the habit of entering an oven the temperature of which was from 400° to 600° Fahr. Other examples equally surprising, and certainly less suspicious, are on record, but, however interesting, they are of little value to us, because such extremes of temperature can only be endured for a short time, and provided the air be dry. Far more important is the study of some of our workmen who toil day after day exposed to far greater heat than ever raged in a tropical settlement. Metal-casters, glass-blowers, stokers, men employed at Turkish baths, and labourers in certain mines, occupy certainly a low place in tables of vital statistics, but they don't seem to suffer in any special way from the heat. Their diseases are certainly not those prevalent in hot countries; they die chiefly from rheumatism and tuberculosis.

If the diseases of the tropics were due to meteorological agencies they would surely be especially prevalent amongst sailors; but we know, on the contrary, that tropical diseases are characteristically land affections. The crews of ships sailing in tropical latitudes are strikingly exempt from them. When they do occur among seamen they are found invariably to have been contracted on shore, or introduced on board ship by means of food, drinking-water, or other supplies. Of course some diseases, like yellow fever, malaria, siriasis, may be conveyed to ships through the air by means of insects or dust; but this usually occurs only at short distances, when they are anchored off unhealthy shores. Ships may become independent centres of disease, especially when infected by yellow fever or beri-beri; and they may then convey diseases from one country to another, and land them by means of their crews or their cargoes, and possibly by means of rats, which, finding their way into almost every ship, land on almost every shore.

In speaking of climate, we must not forget that between the tropics there is not one climate, but an infinity of climates. Hardly any two places a few miles apart have precisely the same climate. Climates do not depend on the geographical position of the district where observations are made, but are largely affected by a variety of conditions, such as distribution of land and water, nature of the soil and vegetation, elevation or depression, and character of the land at or adjacent to the place.

Now, this very local character of climate has been advocated to explain why tropical diseases differ in nature or prevalence in various regions, but it falls very wide of the mark. In all tropical regions each district maintains its natural peculiarities of climate year after year; if these peculiarities were the causes of disease, the yearly quatum of malaria, dysentery, cholera, yellow fever, etc., of different districts should vary with the intensity of these conditions. Yet statistics furnish no support to this necessary sequence; on the contrary, we see diseases diminish or increase in prevalence quite irrespective of climatic conditions. Enteric fever in India has lately become more prevalent; cholera and dysentery have greatly decreased. The introduction of new diseases, such as malaria, in the islands of Mauritius and Réunion, has spoilt regions which were previously healthy; on the other hand, sanitation has rendered salubrious regions which at one time were deadly.

In a paper published last year in the *British Medical Journal*, I endeavoured to show that it was not heat that opposed tropical colonization; but it is with living organisms, from man, wild beasts, and snakes to protozoa and bacteria, that we have to struggle for existence. In India about 23,000 people and 60,000 head of cattle are killed every year by snakes and wild beasts, but no one would dream of putting those deaths down to climate. In Australia, since the introduction of sheep and dogs, echinococcus disease has become greatly prevalent, but even in this case no one would attribute to climate the ravages of this worm. Why, then, should we make climate

responsible for the mortality caused by other organisms, even though they be the lowliest in the scale of life and invisible to the naked eye?

In some of the regions that the European has attempted to colonize he has found the native to be a fierce opponent, but the greatest, the longest struggle is always with the lowest forms of life. The most fearful arrow is that which is smeared with soil containing the bacillus of tetanus. In Equatorial Africa a fly (*Glossina morsitans*) drives man away from certain districts by killing his domestic animals, and its poison is the deadly parasite trypanosoma, which it inoculates. In the French expedition of 1896 to Madagascar, only seven men were killed by the Hovas, and ninety-four wounded; but the deaths due to pathogenic micro-organisms numbered 6000, while 15,000 men were on the sick-list. In the expedition of 1802 to Jamaica, the French lost no fewer than 50,000 out of 60,000 from the germ of yellow fever.

A knowledge of the distribution of tropical diseases is of the utmost importance in the study of colonization. Unfortunately, geographical pathology is as yet in its infancy. Pathogenic micro-organisms have their peculiar dissemination like all other forms of life, and their distribution is likewise determined by a number of circumstances. Amongst these, meteorological and soil conditions occupy certainly an important place, but the most important of all are association and competition with other living organisms.

Running through tropical pathology, as far as it is known, we are struck with the peculiar limitations which most diseases offer. Some have a very limited area: verruga seems confined to some valleys of the Peruvian Andes, negro lethargy is found only in the west of Africa, endemic hæmaturia has a very limited area of distribution in Africa and Mauritius, and even the germs of yellow fever, plague, cholera, and dengue have restricted endemic areas, though at times, under favourable circumstances, they seem to swarm like locusts, and spread in wide epidemics.

Round the main error that the tropical climate is deadly to Europeans, other superstitions have gathered; they are, that children cannot thrive in the tropics over five years of age, that white men cannot work, that their fertility is abolished, that they become extinguished within the third generation. At one time, of course, these statements seemed the most logical deductions of facts, now it seems almost absurd to discuss their fallacy.

It is not true that children cannot thrive in tropical countries. Thirty years ago, Sir Joseph Fayrer conclusively proved, from the experience of the Lawrence Orphanage, that, under proper management, children could thrive in India as well as in England, not only in the hill stations, but in the very plains of Bengal. The general opinion as to the unsuitability of a tropical climate for children over a certain age is derived mostly from Indian experience. I know full well that a number of European children brought up in India grow up slight, weedy, and delicate; but this is easily explained—they usually come from poor stock, principally soldiers' wives, whose health, mostly poor before leaving home, certainly does not improve in the country on account of ignorance and neglect. The children are often brought up in unhealthy districts and are very foolishly managed. For fear of diseases, wrongly attributed to solar influence, they are constantly shut up in stuffy and darkened houses. Under similar conditions, believe me, they would thrive no better in England. Surely those who lay so much stress on the weakly condition of European children in India have never seen the bandy-legged little monsters of Glasgow, or the sickly, miserable children that swarm in darkest London.

In considering the question of European children in tropical countries, we must not forget that infant mortality varies greatly in different colonies; that it is always

lower than that of native children; that in the most unhealthy regions it is lower than that of many districts in Europe; and lastly, that under improved sanitation it has fallen considerably.

The belief that the white man cannot work in the tropics arose greatly from the assertions of the advocates of coloured labour. It is certainly disproved by facts. Farm labour is carried on by white men in Central and South America, in tropical Australia, in South Africa, in the West Indies, and in India, with no worse consequences than in temperate regions. The malarious districts of the tropics are no worse than those of the temperate zone. In England, malaria has almost entirely disappeared, but in Italy it is still deadly to the labourers of the Roman Campagna and the ricefields of Lombardy. In India the farmer may be killed by cholera or be mutilated by leprosy; in England he is carried off by pneumonia or crippled by rheumatism. The turning up of a virgin soil in certain localities may be dangerous. Hong-Kong was especially unhealthy during the first years of occupation, when the ground was being cut up and levelled for building purposes, and it has been observed again and again in different countries, and sometimes in our large cities, that extensive disturbance of the soil in connection with canals and railroads may, perhaps by disturbing soil drainage, give opportunity to an outbreak of disease.

But, with the exception of low swampy districts, experience in all tropical regions has proved that white men are far more healthy when engaged in outdoor labour. The truth about the labour problem is that white men will not work; they go to the tropics with a fixed resolve to gain wealth by coloured labour, which only too often is another word for slave-labour. However, it is certain that Europeans will not work side by side with natives, and wherever coloured hands can be obtained, field labour is considered degrading and unworthy of the white race.

As to sterility, we find no direct evidence to prove it, but, on the contrary, we have many examples of continued and even increased fertility. Thus the Spaniards, who in their own country have a yearly birth-rate of 37 per 1000 inhabitants, have one of 41 at Cuba, and one of 46 in Algeria. The French offer a birth-rate of 26 at home, and one of 41 in Algeria.

It has been asserted that white men cannot exist longer than for three or four generations in the tropics. It is not easy to obtain facts in large numbers to disprove this statement, because in most places the time of occupation has not been long enough, and in others there has been more or less admixture of native blood or fresh blood from Europe has continually arrived throughout the period of settlement.

Sir Clements Markham, in a valuable paper which he read at the Seventh International Congress of Hygiene and Demography, gathered all the available information, much of which he had carefully collected himself, and proved that families of pure European blood had been settled for upwards of two centuries in places within the tropics, and that in each case the living representatives were quite equal to their progenitors in moral and physical development.

Not long ago, it was the general belief that each species of animal or plant had been created in the beginning in those very areas in which it is now found; but the principles of evolution have swept away these old preconceptions. We know now that the surface of the Earth has continually changed. Land has sunk beneath the ocean, fresh land has risen up from it destitute of land-life; mountains have been elevated, altered, crumbled; the physical conditions of districts have been modified again and again. Organic life has therefore been subject to continuous displacement and alteration. But, even independently of topographical changes, we know that plants and animals are continually altering their areas of distribution in the daily struggle for life. It is difficult to realize what changes have taken

place in the vegetation of Europe since the dawn of civilization. They must have been very great, but we have no complete history of them. It is otherwise with some of our colonies. Take New Zealand, for instance. Its native flora was investigated before it had been much disturbed by European immigration. The changes which have taken place during the short period of European occupation, are almost incredible: over five hundred species of exotic plants have become naturalized in New Zealand, and many have become so abundant in certain districts that they have displaced the native plants.

Some plants, when first introduced into a new country, seem unable to thrive, but we must not rush too hastily to the conclusion that the new climate is not suitable. If we could only know all the facts which bear on the case, we should probably find the reason to be a very different one. The red clover would not grow in New Zealand until bumble bees were introduced to fertilize its flowers; now it displaces the native grasses. Leguminous plants will not thrive in a soil which does not contain their peculiar nodule-bacteria. Botanists have sown the seeds of many hundreds of species of exotic hardy plants in what appeared to be the most favourable situations, but very few have ever become acclimatized. This proves that competition and association with other forms of life are far more efficient agencies in determining their distribution than the mere influence of climate.

What we have said of plants is equally true of animals. If we inquire into the origin of our domestic animals, we shall find that twelve of them came from Asia, two from Africa, and three from America, while only five are European. Again, we have successfully acclimatized in America and Australia those animals which had previously been acclimatized in Europe from Asia and Africa. There were no sheep in America and Australia, now their number is simply countless. Horses and cattle have thriven marvellously in South America. In New South Wales horses have turned wild, and have increased with alarming rapidity. The rabbit, introduced into Australia and New Zealand, and the sparrow in New Zealand and the United States, have grown into pests of appalling proportions.

Thousands of examples might be given from the animal world; the latest is, perhaps, the invasion of Europe by the brown rat from East Central Asia, which has practically expelled the black rat from Europe, just as the latter has been ejecting weaker rodents from South America.

Thus we see not only that plants and animals can become naturalized in other climates, but that they have often prospered better in the new environment than in that of their original habitat, altogether disproving the old theory that each species occupies those districts and surroundings best suited to its life.

Turning to man, we find that anthropologists have divided mankind into several races, which, according to individual authors, have varied from three (Cuvier) to fifteen (Bory de St. Vincent). These races were formerly considered quite distinct ethnic groups, and were believed to have originated independently of each other; but now the unity of the human species has become an accepted fact, and we again believe, as Hippocrates did two thousand years ago, that "races are the daughters of climates."

Man, anatomically and physiologically a mammal, is subject to the same laws which govern all other forms of life, and therefore he must have had a restricted primitive area. To suppose that he appeared in the beginning, everywhere that we now see him, would be to make him a unique exception; and, in the absence of direct proof, we should have to deny it. However, it is an undisputed fact that widespread migration and consequent acclimatization have taken place in all times, and the researches of ethnologists to-day are continually bringing new evidence.

The whole history of mankind is one of invasions and displacements, one restless

movement of individuals and masses. The swarms of colonies thrown out by Phœnicia and Ancient Greece, the Slavonic and Teutonic flood which swamped the Roman empire in the fifth and sixth centuries of our era, and the wanderings of the vast Mongolian hordes in more recent times, are good examples. These migrations followed in every possible direction along the lines of least resistance, generally along river-valleys and across the lowest mountain passes. They moved very rarely northward, and only under the irresistible pressure of stronger neighbours. Often they followed the parallels of latitude, but mostly they tended in a southward direction to warmer and richer regions. The emigrants usually settled in climates not greatly different from that to which they were accustomed, but there are exceptions: the Vandals settled in North Africa.

In following up the evolution of some of the swarms of men which settled a few centuries ago far from their ancient seats, we find that they have fallen under the same laws which govern the dispersion of all organic beings; thus, according to circumstances more or less favourable, while some people have totally disappeared, others have continued to exist. Of the latter, some have been greatly transformed by the new conditions of life, and by mixing and crossing with local people, others have hardly changed, and have succeeded so well that they have assimilated, displaced, or pushed wholly out of existence the former occupants. Thus in India, while the Rohillas, the Rajpoots, and the Parsees of Aryan race have remained unchanged after centuries, the Portuguese of Bombay and Goa have altered immensely, and are now as black as Kohls or Bhils.

Now, if Aryans of remote immigration have not only been able to thrive, but have even absorbed the semitic dwellers of India, why should the Aryan of to-day be unable to colonize even those parts of the great peninsula which have been called "the English climates of India"?

The French thought at one time that they would never be able to thrive in Algeria, although descendants of anciently immigrated Aryans are still to be found in the province of Constantine and all along the Atlas from Mount Aures to Morocco. The climate of Algeria was considered deadly to Europeans. General Buvivier declared "*que les cimetières sont les seules colonies toujours croissantes en Algérie.*" Now we send invalids to Algeria, many of its places having obtained the reputation of excellent sanitaria!

The Red Indian inhabits the frozen wastes of Hudson bay and the hottest regions of tropical America. In the Republic of Ecuador, he thrives at a height of 12,000 feet on the Andes, and in the low plains at their western base. But if the red man can do this, why should it be impossible to the white man, who certainly has greater facilities of accommodation? The Jews have succeeded admirably in climates very different from that of their native land. They thrive just as well in Poland as in South Africa. The Spaniards and Portuguese have become completely naturalized in some of the hottest parts of South America. The death-rate of the Spaniards in Cuba is less than in Spain.

The Dutch have prospered in South Africa and in the Moluccas. At the Cape, where they have been settled and nearly isolated for about two hundred years, they have hardly changed. They are fair, tall, and robust. Indeed, they are the finest men in South Africa.

It has been often repeated that the southern European nations stand a better chance than the northern ones in the colonization of tropical lands. Prof. Virchow suggested that the reason might be a certain amount of semitic blood, and Dr. Felkin the greater proximity of their home to the tropical zone; but the south Europeans can not only endure more heat, but also greater cold. It was remarked by the famous Larrey, that in Napoleon's campaigns, whether in that of 1806-7 or

the later disastrous one of 1812, the troops which endured the cold best were not the northern ones, but the southern, such as the Spaniards, Italians, and southern French.

I believe that the greater adaptability of southern Europeans is mostly due to influence of national habits. The Italians, the Spaniards, the Portuguese, like the Irish, the Jews, the Chinese, show a great facility of accommodation by reason of their frugality and perseverance.

The most important, the essential condition of acclimatisation is the acquirement of immunity against new diseases. It is the general belief, in all tropical countries, that new arrivals must pass through an attack of a seemingly specific fever which is supposed to be essential to acclimatization. I need not point to the absurdity of this statement, but it is certainly true that new arrivals are far more susceptible to the peculiar diseases of a place than the natives or old residents, and this is especially so in reference to siriasis and yellow fever. At Vera Cruz, the magnitude of an epidemic of yellow fever depends entirely on the number of new arrivals.

New arrivals show towards the diseases of a new place the same susceptibility that the natives show towards a newly introduced disease.

A great deal has been written about racial immunity, and that of the coloured races from malaria was once considered as an indisputable fact. More recent observations have proved that differences are usually small, and mostly unfavourable to the natives. On the other hand, it is frequently stated that the dark races are more liable to elephantiasis than the white. This is undoubtedly true in some countries in which Europeans live a more hygienic life, and are more careful about the water they drink. But when whites assume the habits of the natives, they are quite as liable to acquire elephantiasis, as Indian and Brazilian experience has proved.

We know as yet nothing positive as to the mechanism of immunity, and it is certainly not correct to state indiscriminately that it can be transmitted by heredity. Facts from experiments are mostly adverse, and moreover, of the diseases which confer immunity, it would be difficult to name one in which a second attack might not occur. Much of the immunity of natives is only apparent, because we must not forget that those we meet are the survivors. Therefore, I believe we can safely state that the immunity of the native is not a natural (racial) but an acquired immunity, and that the colonizer can acquire it just as well.

To acquire immunity, it is not necessary to suffer the disease in its full development. Laboratory experiments have shown us that the inoculations of small quantities of bacteria, though not producing all the symptoms of the disease, nevertheless confer immunity to subsequent more abundant inoculations, which, if practised in the first instance, would have produced the disease in its worst form and caused death. The same happens in nature. We are constantly struggling against disease germs, and we acquire immunity against them without even being conscious of having been attacked. Sanitation, preventing the swarming of pathogenic germs, by the maintenance of conditions unfavourable to their development, will greatly reduce the possibility of overwhelming attacks.

Authors generally maintain that sudden transference to an extreme climate is unfavourable to acclimatization. The ancient migrations of primitive people were necessarily accomplished step by step, and the wanderers accommodated themselves gradually to surroundings which differed but little from those they had previously left. We proceed in a very different way: our railways and steamers transfer us in a few weeks to distances which in old days would have cost centuries. It is only in a few savage tribes that progressive colonization is still witnessed.

Progressive colonization would be impossible nowadays to European emigrants ; but if it were possible it would certainly not be preferred. And, in fact, what are the losses in our system of colonization compared with those of the past ? The primitive migrations are not recorded by history, but by analogy we may easily imagine how millions of individuals were hurled to destruction in their desperate struggle with men and surroundings. Every step was a battle. The Kalmouks, in their exodus of 1771, were over 600,000 when they left the Volga, but, five months later, only 350,000 reached the frontiers of China. In the present day we transfer shiploads of emigrants to any part of the world with hardly a single loss, but we land amongst them a host of weaklings. In the old perilous migrations of people, only a small minority ever reached the promised land ; but they were the survivors of the fittest. This was the secret of their success.

A question of the greatest importance in colonization is that of racial inter-marriage. Crossing with native stock or with immigrants better adapted to the new environment is considered by many as the best and most rapid mode of securing acclimatization. Inter-marriage is said to be the secret of Spanish and Portuguese success in Mexico and in the Philippines.

Race-crossing is certainly present in all colonial populations. Considering only the half-breeds which have resulted from the intercrossing of the white race with the coloured ones, we find that there are over 18,000,000. It is a natural process, which, by gradually blending varieties, tends to unity of character.

But intercrossing is by no means essential to acclimatization. Half-breeds resist no better than pure whites in unhealthy colonies. The Portuguese who intermarried in India with the native women have been almost entirely absorbed ; on the other hand, the most successful examples of naturalization have occurred where there has been a complete absence of crossing, as among the Jews in the Bourbon islands and the Boers in South Africa.

The native problem is a very difficult one. Two distinct races, to whom inter-marriage and social equality would be impossible, cannot subsist side by side. The struggle between the white man and the aborigines of America and Australia is an example. Our pioneers showed themselves cruel, treacherous, merciless. The natives were shot down like wild beasts or poisoned by strychnine. Small-pox was purposely disseminated amongst them, and in New England, so late as 1756, the government paid money for Indians' heads. It is a cruel page in the history of mankind, but such is the struggle for life.

In sketching the various facts which bear on the problem of colonization, I hope I have succeeded in proving how unimportant are meteorological agencies in themselves. I do not mean to say that heat and moisture have no direct influence on our well-being, because certainly they have. But we have two strong means of protection against meteorological agencies. One is that wonderful process of organic adaptation, which can change into hair the wool of European sheep imported to the West Indies or to the west coast of Africa ; the other is advancing civilization, which has almost freed us from the bonds of nature.

The true obstacles to colonization are the multitudinous living mites which team in the tropics like every other form of life. Against these nature can only give us fair play ; they are her creatures as much as ourselves. But we worship Science, and that goddess will surely lead us to victory.

The almost incredible reduction in mortality obtained in all tropical colonies through improved sanitation, shows that the diseases of the tropics are greatly under our own control. But what has been the sanitation of the past ? A blind application of measures which had proved useful against other diseases in our own climates.

To act efficiently in the prevention of diseases, we must have a thorough knowledge of the parasites which induce them; we must know their areas of distribution, their extra-corporeal habitat, the conditions favourable to their development, the means by which they are conveyed to man. A great deal has already been achieved in tropical pathology by a host of noble workers, such as Pasteur, Koch, Laveran, Hansen, Manson, Kitasato, Bruce, Sanarelli, but a great deal more remains to be accomplished. There are numberless diseases in the tropics of which we know nothing, except that they kill. The young practitioner generally goes out to the colonies with only a limited knowledge of the diseases most common in Europe, unprovided with means of scientific research or totally unfit to pursue it. Whatever he sees there he groups round the few familiar types. What matters if there are striking differences? he will easily explain them by the special climatic influences of the locality. A favourite expression of Indian medical reports is that "malaria dominates the pathology of the region." In such reports, relapsing fever is malaria, blackwater fever is malaria, typhoid fever is malaria, and so are other diseases.

If attempts at colonization in the past have often been unsuccessful, if they have always cost immense sacrifices in lives and money, it is because they were made in complete ignorance of the conditions essential to success. I hope that this afternoon's discussion may finally extricate the question of tropical colonization from the old exploded theories, and place it on the sound basis of modern scientific knowledge. It would be ridiculous to continue further to dispute the possibility of tropical colonization, now that over ten million white men and their descendants are already settled within the tropics, laying the foundations of new and perhaps greater civilizations.

Before the reading of the paper, the Chairman, Sir JOHN KIRK, said: The President regrets very much being unable to attend, being still indisposed; he has asked me, therefore, if I will take his place on this occasion. The subject announced for discussion will be introduced to you by Dr. Sambon, who has had great opportunities of studying the question of acclimatization of white men in tropical Africa. I will ask him now to give us an account of his views on the subject.

After the reading of the paper, the following discussion took place:—

Dr. PATRICK MANSON said: I have prepared a few remarks on the subject of this discussion, but before reading them, I express my astonishment at the wonderful similarity between the observations I make here and those that Dr. Sambon has already given expression to—a fact, it seems to me, which goes a long way to prove the truth of his statements and deductions.

In former years, under the influence of early teaching, I shared in the pessimistic opinions then current about tropical colonization by the white races. In recent years, however, my views on this subject have undergone a complete revolution. This revolution began with the establishment of the germ theory of disease; it gathered force as, one after another, the great disease scourges of mankind, of beasts, and of plants were proved to be caused by living organisms; and it was complete when I had personally convinced myself that Laveran's immortal discovery of the protozoal germ of malaria was indeed a fact. I now firmly believe in the possibility of tropical colonization by the white races. Its practicability has already been proved for many countries. I believe the time will come when it will be proved for all countries; theoretically it is already proved, but how long we shall have to wait for the practical proof, I cannot pretend to say. Its postponement is entirely a matter depending, in the first place, on the growth of knowledge,