On accommodation to endemic influences

Thesis for M. D.

by

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Looking back through the thick haze of many ages, but dimly lighted here and there by the flacks of old record and tradition, and the steady though scantily reflected gleam of modern research, one may faintly trace out the far past history of the world — and by all the lights which render this history visible to the mental light, whether arrowhead inscription, hieroglyphic painting, ancient myth, sacred record, coal measure, by glacies, engraving, water drift, bone case, or Siberian ice cliff; this much stands shadowed forth beyond all doubt — the picture of an ever-changing earth, with ever-changing inhabitants.

That an intimate relation exists between these phenomena that change of habitat is the
Immediate and sufficient Cause of Change in the Habitat— is the net outcome of the entering research and profound generalizations of the Darwinian school.

This great doctrine in its full extent, does indeed still meet with bitter opposition, especially from those who having got some knowledge of the writings and tongue of ancient Rome, Greece and Judea, deem themselves learned whilst yet in deep ignorance of the ways of nature, and who use, as a test of truth, patient and precise observation, but compatibility with their own habits, notions, and emotional comfort.

But, whatever condition may yet remain as to the origin of species, there will be found few to dispute that within the limits of the species, the individuals vary constantly, and that from the variety being common to greater or smaller
Numbers of individuals, the species may be divided and subdivided into groups constantly increasing in number and lessening in size.

Nor will there be much question that within the limit of the human species at all events, there is an intimate connection between the individual and his surroundings, such as may be summed up in the following proposition,

I. The physical character of the individual is the result of
(A) The surroundings of his ancestors,
(B) The surroundings of his present self from which follows

II. Groups of individuals with common physical character have also either
(A) Common ancestry,
(B) Common surrounding, or both.

III. Variation of race is secondary, that of individuals being brought about by the longer life, greater fecundity of the latter. One way or another, most in accordance with change of
surroundings from which follows.

IV. The direct tendency of variation is to fit the tribe or community to its changed surroundings whether the change has come about:

(a) locally, by lapse of time, or
(b) by the tribe or community moving from its home.

The amount of variation in a particular section of the race is the product of the two factors:

(a) Amount of change in surroundings
(b) Time during which this has been at

Contrast the great difference between Briton and Negro, where both 'A' and 'B' are large, with the much smaller, though still distinct, variation in Briton and Yankee where both 'A' and 'B' are comparatively small.

These fundamental propositions, then being taken for granted, it is proposed in easy to inquire how far these general laws of variation can depend on chance.
of surroundings holds good under certain conditions which come naturally within the range of medical philosophy. More particularly it is proposed to show—

I. That among the changing circumstances which are the cause of variation must be reckoned those specific endemic influences which, being chiefly known by their power of setting up disease, are commonly called 'morbid.'

II. That besides the two factors governing variation referred to in the 5th of the foregoing propositions, there is, as regards the immediate results, another of great potency, viz.—rapidity of change, and that in strict dependence on the degree of rapidity there follow—

(a) Physiological Variation (general health main)
(b) Pathological Variation (general health degraded)
(c) Definite Disease
(d) Death.

The matter being brought to this point,
it is proposed to substitute more convenient terms, to use "Accommodation" as equivalent to "Variation" in consequence of change of surroundings," but in using the term to include the idea of actual constitution change and not only tolerance.

Also to use "Endemic influence" as equivalent to "Change of surroundings," meaning however by this phrase to include all the surroundings, whether specific organism or ordinary physical.

There is perhaps some begging of a question in defining "Endemic influences" as consisting only in change of surroundings, for the question to be put—What then is there to such thing as a stationary influence? Do the torrid climates and deadly marsh Malaria of West Africa or the yellow fever forest of the Caribbean coast cease to be Endemic influences?
because they are always there? The reply to this would be that both analogy, and all direct evidence, so far as it is obtainable, lead straight to the conclusion that the influence of surroundings is to fit the inhabitant (whether plant or animal) to the habitat. And from this it follows as an unavoidable corollary, that when, in course of ages, the inhabitant has become perfectly fitted to the habitat, the surrounding must cease to have any further influence. So that although they continue to exist as phenomena, they cease to exist as endemic influences, i.e., they no longer have any influence on the health or constitution of the inhabitant.

In the very cases alluded to there is no evidence that in ordinary seasons either the temperature or the malarias, or the specific agent of yellow fever, have any notable influence on the health or constitution of the people inhabiting
of the Coasts of Western Africa or Central America. Under such circumstances only strangers are affected and the natives only in seasons of special exaggeration. And in either case whether a man travels into fresh surroundings or the surrounding is exaggerated so as to influence the stationary inhabitant, it is clear that the circumstance which leads to the action of the phenomena on the man's health and constitution is change.
Theorem I

There is 'accommodation' to specific organic, as well as to ordinary physical epidemic influences.

Proof. It is held that this theorem will be proved if it be shown that man living under these specific influences undergoes a constitutional change which tends to give them immunity from the several diseases.

And that this constitutional change is greater in those who have been longest subject to the particular epidemic influences, being greatest of all in those who are under these influences and who inherit the constitutional impressions produced by them on many generations of ancestors.

It is not however contended that accommodation even in nature generally reaches the extent of giving perfect immunity from specific epidemic disease, but only that by dint of
Residence. There is a constant tendency to that direction. It is proposed to call witnesses to the fact that this follows under the endemic influence of —

Saludal Malara
Typhoid
Cholera
Ghullar Fever
Plague?

And it is further proposed to submit some observations on accommodation for specific influences of Syphilis and other loesothems which being connected with persons and not with places, do not act continuously on the constitution of any inhabitants, and the fore do not fall into the same category as the above with regard to this question of accommodation.
Saludal Malaria

During 1872 there were serving together in Chinia and the Straits settlement 1476 European and 676 Asiatic soldiers. The admissions from parasymal fever were per 1000 Europeans 106.9 and Asiatics 119.

In China alone the average yearly admissions and death per 1000 of soldiers was — Europeans (on average of 20 years) admissions 2978 deaths 483.

Admissions 1283 Deaths 229.

Average yearly death per 1000 from fever of European soldiers in Bengal (1870-71).

Age 1st year in India 2nd 3rd

Under 20 6.70 1.97 0.97
20-24 10.36 5.76 3.03

The crews of the three ships engaged in the Mizen expedition of 1840 were composed of Europeans and Negroes.
145. White 130 were attacked by Malarial fever.
158 Negroes 11 ———— none died.

The average yearly mortality per 100 of troops in India for 20 years was
Bengal 73.8
Madras 38.46
Bombay 50.7
European 17.9
Native 20.95

Scurvy and bowel complaint forming far the greatest amount of sickness.

Although the awful mortality which existed amongst the white troops on the west coast of Africa has led to their withdrawal, yet even with regard to negro troops Surgeon Major Howe wrote "as troops from the West Indies suffer invariably more on first arrival than they do subsequently, he is of opinion that the diminution in fever is distinctly traceable to a species of acclimatization and it becomes a matter for serious consideration whether the present tone of service of three years might not be
prolonged with advantage so far as the negro troops are concerned.

"Another question is whether from continued action of the poison, the organism becomes so blunted to its injurious influence that the symptoms of intoxication cease. At all events such cases are rare, and it is more frequent to find those where continued action of the malaria has only modified the symptoms of intoxication so far as to change a pure intermittent into an intermittent subsistens or chronic malarial illness without fever."

"Malaria by its depressing influence on the constitution afflicts silently undermines the health without the manifestation of any felicle disturbance."

When the human system has been exposed to the influence of malaria many have their constitutions undermined
without suffering from periodical fever at all. It seems probable that in these cases the poison is not presented to the system in a very concentrated form: the blood is so gradually changed that the organs become as it were tolerant of its presence."

"The hardy mountaineeer is a severe victim whether he visits the low country of the tropics or the marshes of a more temperate climate than the feebler man of those countries. The immunity the latter enjoys is probably owing to his habit of living in the noxious atmosphere, let him remove to a more healthy climate and then return to those regions of pestilence, and he will be found as susceptible of the poison as the healthier stranger."

"The climate of Bengal proper is most prejudicial to the health of the Up Country sepoys, for although according to Colonel
Henderson, but one fourth of the Bengal Army is stationed there, the deaths of that fourth are more than a variety of the whole. Mortality reported. Much of this mortality is doubtless due to the excessive humidity and to the malarious character of the climate.

"The Conformation or structural condition which permits the external cause to act is evidently not equal in different individuals and in different races.

"At Vera Cruz, Havana, and other towns on the Spanish Main, malarial yellow fever invariably attacks Europeans who may land there between the months of May or June, and October or November.

In all those localities where the disease is endemic, it seems to manifest a decided preference for the natives of the colder regions, and especially the coloured population are rarely attacked."
"We find that races born in the most malarious regions resist malaria completely, whilst a race introduced suddenly into such malarious regions from other parts of the world succumbs at once."

There appears also to be a certain state of the human frame which renders it more than usually susceptible to this disease (bilious remittent). The habit of warm and tropical climates are much less frequently attacked with paludal or tertian fevers than settlers or visitors from other lands. In the Mediterranean along the coast of Africa, in the East Indies, the West India islands, and in the southern states of the Union, New Comers of the northern latitudes are almost more attacked, and suffer much more severely from the fever than those who have been in the country. It is also found that those of medical men who after residing in a territory where paludal fevers abound, have been out of it for some time, an augmented susceptibility
to renewed attacks of the fever becomes manifest on their return.

"The character of every people is more or less clearly connected with that of its land; and we should take but a limited view of the effects of climate, and especially of localities abounding in marsh poison if we considered only the more familiar effects of those agents on the European constitution, such as the various forms of fever, anemia &c."

(quoted climate) Ronald Martin p440

At Cholapore, in the southern Deccan, in 1869 in connection with the making of the railway which now connects Bombay with Madras, the dam of an old artificial lake was raised about three feet with the result of greatly extending the marsh in the valley below. The effect on the soldiers (artillery) cantoned along the ground sloping up from the valley was
The illness that befell the Commander and depleted the wounded forces led to the abandonment of the quarters in the Prison for the women. The ladies, under the influence of the populace, accompanied the soldiers to the hospital. The actual facts were

Almost unknown to the soldiers, but

After returning from exile, there was a

Refuse Aid to the people.
from recurrences, or from the milder forms of yellow fever, the unac
climated European is everywhere and at all times the victim of the most viru
dent and fatal form of this epidemic.

It may be said in addition, that a first attack of yellow fever gives a cer
tain degree of immunity from a second and likewise also one that a previous residence in a warm climate greatly lessens the suscep
tibility to yellow fever.

Having on many occasions passed through the great jungle which fills the valley of the Nerbudda to the south of Manour without parties of recrui
ts and of old soldiers, the writer has found, that although old soldiers generally pass through quite scathless, a considerable body of newly arrived recruits marches through with the getting a certain amount of jaundice fever.
Typhoid

"Both Louis and Chomel have observed that the greater number of the patients who came under their treatment for Typhoid in Paris had needed these to a short time."

"In large cities such specific poisons are always more or less active, and their diseases always present; but in the country districts they only now and then occur. The occurrence of long intervals between epidemic diseases is not to be traceable to any weakness of the poison to act; for when the disease does become developed in these places, the ratio of persons attacked is incomparably greater than is ever seen in cities under like circumstances.

See Professor Acland's account of the fever in Great Norwood in 1837-58, and Dr. William Budd of Clifton Regis, and South Eaton; and his most interesting little book on the Propagation of Typhoid Fever. In large towns the death
are constantly charged with the mature morbid of specific disease.

At Cannanore the outbreak of the disease in December was obviously connected with the arrival during the previous month of a new regiment consisting largely of very young and immature men.

There is no suspicion of its having been imported by them, as no case had occurred in the regiment for years before its embarkation, and it is known to have existed at the station at any rate during its occupation by the last three regiments which have been stationed there.

"The susceptibility to Typhus (Typhoid) varies greatly with the individual.

There is one very interesting point which is also seen in other infectious diseases, that persons who have lived for some time in a place peculiarly liable to the disease — as Mumb — without being attacked, are in less danger when epidemics occur, than those
who have recently come to the place. It can hardly be supposed that this is because the former were originally disposed to the disease, because after long absence from their native place on their return to it, they are just as liable to the disease as new-comers who have only been there a short time.

The fact probably depends on some unexplained accommodation to Typhus (Typhoid) poison.

That enteric fever in India, as in the parts of the world, is a disease affecting chiefly the young, and from which the visiting are infected locally are much more liable to suffer than the permanent inhabitant of that locality may be considered as beyond doubt.
Cholera.

Yearly deaths per 1000 of European Soldiers in Bengal on average of 6 years 1865-70.

<table>
<thead>
<tr>
<th>Age</th>
<th>under 20</th>
<th>20-24</th>
<th>25-29</th>
<th>30+ upwards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year of service in Bengal</td>
<td>9.58</td>
<td>15.89</td>
<td>16.78</td>
<td>20.47</td>
</tr>
<tr>
<td>2nd year</td>
<td>6.6</td>
<td>2.16</td>
<td>4.44</td>
<td>4.90</td>
</tr>
<tr>
<td>3rd year</td>
<td>0</td>
<td>0.17</td>
<td>2.62</td>
<td>4.91</td>
</tr>
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"During 50 years (1815-67) the mean annual mortality from Cholera per 1000 of European strength in Bengal was no less than 9.4.

The Cholera mortality was not owing so much as might have been supposed to service in the stations in Bengal proper. The so-called endemic home of Cholera—for the mean mortality in Bengal proper was below that of the Punjab—where Cholera is occasional—. In Bengal proper the mortality is more steady, but the average of years is lower than in the other two districts (Central India & the Punjab) where the mean mortality is heightened by occasional tremendous outbreaks.
Mean Mortality per 1000 of Europeans for 11 years 1861-71

Bengal proper — Agra Central India Punjab
3-32 10-68 7-8

"While Cholera is never absent from Europeans in Bengal proper, the endemic it never attains the destructive prevalence which occurs in Central India and the Punjab; where it is sometimes entirely absent for years, and yet the severity of the outbreak when it does occur makes the mean Punjab and Central India cholera mortality greater than the cholera mortality of Bengal proper."

The result of an extensive series of observations ranging over more than 20 years shows that in the presidency of Bengal the annual mortality of Europeans killed from epidemic cholera is about 1.16 per cent. While of the Bengal sepoys Army it is 0.22. Here we perceive that the lowered strength of the European does w
By the power of his high and mighty presence and influence of his Royal Person, he was able to resist this terrible scourge. He stood steadfast, and below his comparatively gentle nature, he said, "I am my brother's keeper."

"In India the percentage of attacks is much higher for European than for native troops."

"Nearly every person native or European who comes to Calcutta suffers more or less just at first from some kind of bowel complaint."

The writer, who lived a considerable time in Calcutta, has formed the opinion that the painless diarrhea which is prevalent there is for the most part cholera in a mild form. At any rate it seems to differ little from the cases commonly seen at the beginning of the acute disease, which, though only cases of diarrhea in form, are yet potent enough to spread the disease."
Surg. J. G. Maclean in his lectures on Tropical Diseases at Netley in 1873 said much stress on the comparative mild character of the disease in its endemic home.

The well known fact that in the course of an epidemic, the attacks at any place become gradually less and less grave in character, is very suggestive of the establishment of a certain amount of accommodation even during the epidemic prevalence of the specific zymotic influence.

"The period of the Epidemic however greatly influences the mortality for in the first onset 90 of those attacked perish. Then in the proportion of deaths forms a gradually decreasing 6th, 4th, 2, 1, 3/5 till towards the close; a large proportion of those attacked is covered. The uniformity of this law in every country affected with Cholera, whether Europe, America, India or China is extremely remarkable."
"In the onset of many epidemics we learn that sudden deaths occur apparently from the concentration of the process. Men are thus struck down at the outbreak of yellow fever and Plague as well as in Cholera. During the onset of epidemic Plague almost all who are attacked with it perish - death occurring in from 24 to 48 hours; whilst after a short time death is deferred to the 4th, 6th, 14th, and even to the 20th day. Many cases recovering health at length the pestilence loses its malignity altogether."

Of course this remarkable decrease in the effect of Cholera on those attacked by it during an epidemic admits of another explanation viz. that the specific existence of the specific agency is very transient, and after its first development soon dies away, so that those infected later in an epidemic get a smaller dose of the poison."
It is however worthy of grave attention that the same rule as to decreasing mortality during epidemics holds good with regard to other specific influence (notably those of Plague & Yellow Fever) the life of which appears to be perished enough. And is it not reasonable to suppose that a common character in the epidemics of these diseases is due to a common cause?
Yellow Fever (specific).

In Sierra Leone 1817-37 there were yearly among the troops per 1000 admissions 2978 deaths 483.

At the same time about 17 per cent of the whole white population died annually.

The chief diseases were malariais fevers which caused much illness but no great mortality and yellow fever which caused an immense mortality.

Amongst the black troops the return 1861-70 gives per 1000 admissions 1263 deaths 2249, the deaths being chiefly from lung disease.

"In older time it was always noticed that the worst attacks in regiments quartered in the West Indies occurred during the first 24 and especially during the first 12 months.

In 13 epidemics in different regiments 14 occurred in less than 6 months after landing, 7 in less than 12 months and 2 in less than 24 months."
Mr. Thomas considers non-acclimatized as the chief or even the sole determinant cause of yellow fever, for it hardly exists for the acclimatized.

But this immunity is lost by the small class of residence in Europe or in countries where yellow fever is not known.

In Guadaloupe out of 433 in (French) who formed the garrison, there were 49 killed and 12 attacked, while the Creole population enjoyed perfect health.

"This is essentially la fièvre bury afflicting by a preference almost exclusively the fair race and being most severe on the natives of cold climates. The natives of the infected locality and those of tropical regions generally, being but mildly or very little affected by the epidemic."
Dr. Macdonald speaks of the morbid discoloration of the blood of some healthy persons residing within the range of infection. Also, "the live is especially active in persons especially exposed to the specific infection of the disease without however yielding to its influence."

"A recent residence in a temperate climate, the race, or complexion of the individual--will enter into an estimate of his chances of recovery."

"Dr. Mc Kinley of the Navy speaking of the yellow fever of the Brazil coast says—my own opinion is that the disease was not imported to Brazil. On the contrary, that it was of endemic origin. Of this course I feel convinced that people arriving there especially from a cold country in a harbour like Rio, Bahia or Pernambuco, when the disease is prevalent there, will almost to a certainty get the disease.
Ronald Martin even if they never touch A human be
loc. at p 374. or susceptible agent in these places.
Plague

The area in which Plague occurs has been slowly and steadily retreating in a direction from N. West to S. East. Thus it appeared last in

Iceland 1493, Edinburgh 1645, London 1665, Lapland 1670, Copenhagen 1712, Spain 1721, Portugal 1757, Wallachia 1770, Moscow 1771, Malta 1813, Calabria 1816, Corfu 1818, Bulgaria 1828.

And since the latter half of the present century, it has extended no further West than Egypt, Syria, and the country bordering on the Caspian Sea. At the same time, the Eastern boundary has been advancing.

During the outbreak at Alexandria in 1835, the deaths per cent. of population were

Negroes 84 per cent., Maltese 61 per cent., Arabs 55 per cent., Greeks 14 per cent., Armenians Jews 11 per cent. of Europe 7, English, French, Russians, Germans 5.
And earlier, when Plague ravaged Copenhagen, the English, Dutch, and Germans were exempt from the disease.

In the Mediterranean cities where Plague has prevailed, Epidemic of Anthrax etc are common. It is extremely probable that these diseases are cognate to the true plague.

In May 1795, fifteen black slaves being brought down the Nile, all died of Plague before reaching Madder, whilst not one of the sailors or other passengers was affected.

These facts seem to suggest that the races inhabiting the Countries from which Plague has disappeared have acquired accommodation to the Disease, and that the disappearance of the Disease from these Countries may be partly due to this widely spread and inherited accommodation to the specific epidemic cause and the excessive susceptibility of Negro.
maybe due to Plague having never been endemic in their native country. But of course the facts given do not amount to proof of this, and the suggestion is only submitted for consideration - quantum valeat.
Syphilis &c.

Syphilis and other exanthems being communicated from person to person, have not the opportunity of continuously and slowly acting on the constitution so as to produce accommodation, but therefore the Malthusian Argument of this theorem does not apply to them.

There is however some evidence that the manifold though sudden applications of these agencies on individuals, have by virtue of their great number, an influence on the body akin to that resulting from actually continued action.

In the case of Syphilis indeed it is thought that the evidence to be submitted amount to fair proof that this is the fact. And in the case of other specific exanthems there are some facts which at any rate seem to be suggestive.
In 1812 Dr. Ferguson came to the conclusion that Syphilis had become so much propagated in Portugal by reason of general diffuseness of other causes, that after running a wild course, it exhausted itself and ceased spontaneously.

Dr. Ferguson further mentioned that he had reason to believe that at that time in other countries the disease had become modified in a similar way. He mentions that in certain German regiments and in some districts of the Russian Empire, the medical attendants had found that mercury was not necessary for the treatment of Syphilis. And that in the patient to whom he referred, the disease from being allowed to run its course for ages, had become as latent as it was in the Portuguese.

All adventitious diseases say Dr. Ferguson that are not Connate, namely, nor sporadic, appear worse or less to run this course of exhausting themselves while
Retained upon the same ground to which they have been transplanted, let the field be changed, and fresh soil of development be presented, and they will instantly resume their primal powers, and, taking a fresh departure of violence, repeat the almost-forgotten inflictions of their original visitation.

The powers which they thus acquire bear some resemblance to a phenomenon which is everywhere observed in the vegetable kingdom. The same species of seed may be sown upon the same ground until it shall be so degenerate in point of vigour, as to become almost incapable of reproducing itself, but let it be changed to any other kind of soil, though less of far inferior quality and it will immediately display new powers of life, and fructify a vegetable with its native strength.

Corresponding with this description of years to have been the effect of violence of the exhausted syphilitic vein
Portugal into the Constitution of the British or other strangers. It was in some measure new, therefore unfriendly, and seems to have had the power of exciting new actions of more than ordinary violence. The Portuguese, through Apathy, and at a dreadful price levied on the generations that are passed, and none or all probability to be redeemed by their descendants, appear to have gained a great exception from both syphilis and smallpox, but the price is too high for us even to offer up our bodies to be the irresistible subjects of disease, the fatal consequences of which, though they might go far to extinguish the one or two ill, would be felt in the deterioration of our race to the most distant ages.

The same facts will regard to the modified form in which Syphilis appears in some of the lower classes of the community, have been observed in our own country.
If we grant, as we must, the two postulates first, that Syphilis is transmissible to offspring, and second, that it is protective for a certain time against second contagion—then we are only to admit that just as the disease itself may be transmitted, so may the immunity which it affords. Here again we have as yet very little clinical evidence on which to build, but what we do possess certainly favours the view that those who have suffered severely in infancy from inherited disease are to some extent protected.

In the history of Congenital Syphilis, however, nothing is more common than to meet with cases in which the eldest child of a family suffered severely in infancy, the second slightly, the third still more slightly, and the others not at all. I have at present several families under observation in which this has been the case, and in which all the children have lived, the intervals between the births...
The younger members of such families often appear to be in robust health.

Now, if in such cases the oldest enjoys immunity, probably the second also does so in some degree, and so on through the whole, the degree of protection diminishing in ratio to the distance from the original fault. Do we not here touch upon a law of the utmost importance, not only in respect to Syphilis but to its congeners also? Is it not probable that a very considerable portion of the community, being the descendants of those who have suffered injury in a certain degree, sufficiently slight in many but powerful in others, immunity from further attacks? The manner in which a slight degree of inherited immunity would become manifested would probably not be to entirely escape from smallpox, but in the production of a much milder form of the disease. This is what occurs in cases of smallpox after vaccination, or after
A previous attack of the true disease and indeed in second attacks of any of the specific fevers, it is surely impossible to believe that the constitution of a person who has passed through the stages of any of the diseases ever again returns into precisely the same condition in relation to the virus in question, that it occupied before and it is equally inconceivable but that some share of this peculiarly to be transmitted to offspring. A child born of parents, neither of whom are liable to small-pox or to Syphilis as the case may be, must be in a different position as regards these diseases from the child of parents both of whom are liable. In like manner a half result ought to be expected when the parent is escaped, and the other liable.

Now, it is a matter of well-known observation, that any specific disease will be especially severe when imported into a community previously free from it.
The ravages of small-pox in a given race are something far beyond what is ever known in a community long accustomed to the disease. There are also good reasons for believing that Syphilis has become during the last two centuries a milder disease than it was when it first invaded Europe. This amelioration we may most satisfactorily explain by recourse to the hypothesis above suggested.

Small-Pox

"It is particularly destructive to the darker-skinned races. The blacks who come to the Small-pox hospital suffer more from the disease than the native inhabitants of Great Britain. The same thing has been found to take place abroad.

The majority of those attacked are from 18-25 years old. This may be partly accounted for by persons of this age..."
Coming to London to act as servants
in those &c.

Persons coming from India to England
should be revaccinated.

The small-pox nowadays is not the
malignant small-pox of the time of
Sydenham. Nevertheless it is small-pox

Measles

This disease which is a comparatively mild affair
in Great Britain, where it is constantly occurring,
has been found to cause most fearful devastation
when introduced into isolated or virgin populations.

In 1846 the contagion of Measles was imported by
a sick sailor into the Faroe Islands, leading to an
epidemic which attacked more than 6,000 out of the 7,782
people only the persons who previously had had the disease or
who were kept out of reach of contagion, but before the
time there had not been a case in the islands for 63

In 1824 Measles was imported into Malta, spread to
freely and fatally; it had not been in the island for many
The recent epidemic in the Fiji Islands killed off 3000
out of an estimated total population of 140,000 within 6
These remarks this much, which may be said of almost all these diseases. That we only recognize the existence of these specific influences by the diseases they set up, and that in the course of epidemics, cases are constantly met with, in which the phenomena of the diseases are so very slight as to be only just recognisable, but in which nevertheless accommodation becomes quite established, so that the individual is protected against further attacks.

Also we often meet with persons who seem to be protected from attacks of the disease without their having any history of having suffered from it.

Is it altogether unwarrantable to consider that the latter case may be in fact but a step beyond the former, and that in this latter case, this immunity is really due to accommodation either inherited, or acquired by exposure to the specific influence in such a modified manner, that the Constitutional Change
has been effected without any constitutional commotion?

Such a line of thought might lead inevitably to the conclusions: I state the occurrence of a specific disease is but an accident in the course of the action of the specific influence on the Constitution.

II. That this accident might or will be a preventible one if only we could get to know a little about the natural history of these specific influences and could find a means of bringing them to bear on the human constitution in a gradual or modified degree.
Theorem II

The effect of endemic influences is governed chiefly by the rapidity with which they are brought to bear and in strict dependence on the increasing degree of this rapidity there will follow:

1. Normal accommodation (general health maintained).
2. Abnormal accommodation (general health depends).
3. Definite disease.
4. Death.

The term 'rapidity' is here meant to refer to the proportion existing between the amount of change of surrounding which constitutes the endemic influence and the time within which the change occurs — so that it might formulated:

\[
\text{Rapidity} = \frac{\text{Amount of change of surrounding}}{\text{Time within which the change occurs}}
\]

But although it is held that the effect of an endemic influence is mainly dependent on the rapidity with which it is brought to bear, it is not contended the latter of the events named may follow in
Case of all the influences which affect our lives—there is no such thing as accommodation to actual deficiency of the prime necessaries of life—food, water, air.

What is held is rather this—that in the case of an endemic influence which may cause either accommodation, disease, or death, the question as to which of these will follow depends on the rapidity of its action. And that will regard to a great many of these influences, any of these events may follow.

The question as to what is the precise difference between normal and abnormal accommodation, and again between this latter and disease, is not easy to answer, but it is assumed that there is no degradation in health to a 

population so long as it

maintains its members by births being at least equal to deaths, or for an individual so long as his life is maintained to the average life length of his race.
It is questioned whether any mere difference of colour or stature or muscular or mental power, can be fairly taken as a sign of degradation.

The Negro, the Esquimaux, the Red are doubtless less developed both physically and mentally than the Briton, but they are the normal (because slow) outcome of their respective endemic influences, and therefore they maintain their race and live out the full span of their lives under conditions where the mental Briton can only struggle through a few sickly years of life, and when the British race would perish miserably.

It is of course generally supposed that the type of more colour may possibly exist in the temperate zone is higher than can live perennially in the other two, and prove this is true; but even then it may well be thought that the standard of the possible man is already more nearly reached in this zone—for the
Progress in recent centuries has been far more rapid – and that the ultimate difference between the inhabiting races will be much less than at present appears.

To draw any line of separation between degradation of health and definite disease is felt to be impossible. Such degradations merge insensibly into chronic disease.

Influence of Temperature

Probably the main factor in differentiating the peoples of the Arctic, Temperate and Torrid zones has been difference of temperature, together with the difference in food and social habits which it involves. And the very fact that regions of the earth differing so widely in mean temperature are peopled by tribes whose numbers appear to be limited mainly by the food supply is sufficient proof of the perfect accommodation of man to extremes of temperature.
(Note also the accommodation of the Patagonians to extreme hardness in a climate of excessive rigor.)

"We have seen that the temperature of Man varies very little in the whole extent of range between the tropics and the pole. That he can support the intense heat of the former with as much elevation of his inward heat, that he can live where the mercury is solid mass like lead, with the most trifling depression of his vital warmth. But it must not be supposed that the constitution of the Man is the same in these two opposite conditions; it is indeed widely different. In the one he enjoys what may be termed a summer constitution; in the other a winter constitution. And we all without knowing it have a summer constitution to harmonize with the warmth of summer, and a winter constitution to enable us to resist effectually the inclemency of that season."
As evidence of accommodation with degradation of health may be cited the following:

There can be little doubt that the body does accommodate itself within certain limits to greater heat, as we have seen that the lungs act less, the skin more, and that the circulation lessens when Englishmen pass into the tropics.

There is so far no accommodation or alteration impressed on the body by unaccustomed heat. And we may believe that this effect is permanent, i.e., that the lungs continue to act less, and the skin more, as long as the European remains in the tropics.

Doubtless, if the race were perpetuated in the tropics, succeeding generations would show fixed alterations in these organs. We may conclude that the converse holds true, and that the cold of temperate regions will influence natives of their tropics in the opposite way, and this seems to be rendered likely by the...
way in which lung affections arose in many of them.

"From the results of personal observations in active field service both in India and Aea, I am led to conclude that mere heat, unless long continued — is very rarely the direct cause of disease —

These remarks must be understood to apply only to sudden efforts or brief exposure, for it is now well known that to a duration of heat more than its intensity — to a long continued exposure to a high range of temperature more than to the temperature itself — must be referred much of the injurious influence of tropical climates on European constitutions."

"The fair races of Northern Europe below the Arctic zone find Jamaica Louisiana and India to be extreme climates: And they and their descendents are no longer to be recognised after"
prolonged residence there. When an Englishman is placed in the most beau-
tiful part of Bengal or Jamaica, where malaria does not exist, although he may
be subjected to its attack of acute disease, but may live with a tolerable degree of
health his three-score years and ten, he nevertheless ceases to be the same healthy in-
dividual he once was; and, moreover, his descendants degenerate. He complains
bitterly of the heat, and becomes fanned; his skin, phlegmatic frame becomes attenuated;
his blood loses fibrine and red globules; body and mind become sluggish;
grey hairs and other marks show that
age has come on prematurely — the
man of forty looks fifty, years old; the
average duration of life is shortened,
(as shown in life assurance tables);
and the race in time would be ext-
terminated if cut off from fresh sup-
pplies of emigrants from the home country.
The European in the Antilles struggles
with existence — a prey to fever and
Ascentancy. He is unequal to all labour, becomes wasted and wan, and finally perishes. His decay is premature; and, but for the constant influx of European blood, he becomes rapidly extinct as a race.

The European inhabitants of Jamaica, of Cuba, of Hispaniola, of the Windward and Leeward Islands, have made no progress since their first establishment there. They cannot execute labour, hence the necessity for preserving and maintaining the black population. Their offspring are pale, wan, and sickly, and in half a century cease to be productive.

Although the Constitution of the man may be modified that composite health may be retained, yet there is a marked degradation of the physical and intellectual constitu...
As showing the influence of more sudden change, the following quotations are submitted.

"The negro is evidently killed by cold. He is the native of the hottest region of the globe where he goes naked in the scorching rays of the sun and can lie down and sleep on the ground in a temperature of 150°, but if removed from such latitudes to places beyond 40° north, he steadily deteriorates and ultimately becomes exterminated. The statistics of New England, New York and Philadelphia prove this where the mortality is double that of the whites."

"The African children brought out to England by the Sierra Leone Company for education, seldom survive the third year in this country."

"In 1817 a regiment of negroes at Gibraltar was nearly destroyed by pulmonary phthisis."

"In 1835 out of 57 negro soldiers sent up to..."
Moureu Elia in Ceylon (6700 feet) died within the year.

"In the retreat from Constantine (Algeria) the thermometer did not descend more than 2° below freezing. Yet there were great accidents of frost bite amongst many of the soldiers."

In the expedition to Bon Shalet from Constantine in December 1846 - the thermometer fell only 2° below freezing and the column was only exposed to this cold for two days. Yet out of 2800 men, 208 were frozen on the road, 532 gravely injured were taken into hospital (of whom 65 operated on and 22 died) 1800 slight cases were, on an average, 35 days ill, for military duty - 2500 were murdered by their sudden accession of cold in a hot country.
Yearly deaths at 1000 of European soldiers in Bengal 1866-70 from heat apoplexy.

<table>
<thead>
<tr>
<th>Age</th>
<th>Under 20</th>
<th>20-24</th>
<th>25-29</th>
<th>30-200+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>2.40</td>
<td>3.80</td>
<td>10.02</td>
<td>17.40</td>
</tr>
<tr>
<td></td>
<td>1.08</td>
<td>2.66</td>
<td>3.60</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.48</td>
</tr>
</tbody>
</table>

In May 1834 the 73rd Regt. a fine corps of men in robust health had then recently arrived at Madras, and on being much exposed to heat during a funeral parade, many men were struck down with heat apoplexy, and 3 died.

The 13th Regt. consisting partly of old soldiers from Rangoon and partly of recruits from England being exposed to great heat in drill parade and on a march, "The day closed with a side list of 63 and 18 deaths out of the right wing alone (from heat apoplexy) both the sickness and the deaths being principally confined to the recruits."
In 1862 a battery of artillery and a company of the 95th Regiment were stationed at Hyderabad in Sind. On the evening the sky became overcast, and the thermometer rose rather suddenly to 115° in the shade. Five men were brought almost together to hospital with brain apoplexy. Two of these died, and three recovered. But a number of incipient cases were restored in their barrack by being drenched on the spot with water from a deep well at the suggestion of the writer. Most of the men attacked were recently from England.
As illustrating the result of change in air pressure the following are cited

Colonel Hall and Monsieur Boussingault inuyuge to get to the top of Chimborazo experienced such lassitude, and such great dyspnea on movement that they were unable to proceed. Yet the busy movement in the streets of Bogota and Potosí, the bull fights at Cuzco show that perfect accommodation may be acquired to low air pressure.

"Delicate women dance all night at balls at a height at which pleasure could hardly sustain his instruments."

The writer when on a shooting expedition in Sattoor Sher (11,600 feet) in the Himalayas found that at first dyspnea rendered active exertion difficult, but that after the first day or so the lungs gained a deeper and slower rhythm, and running and climbing became easy enough.
Dr. Colladon records that on descending in a diving-bell at Howth near Dublin, he and his companion experienced such great pain in the head and ears that they were obliged to suspend the descent, while the workmen with whom he descended, who were accustomed to descend, felt no inconvenience. The workmen however had at first suffered in the same way.

Influence of Change in Motions.

With the wet season in Bengal there comes an indescribable feeling of languor and oppression with an exhausting perspiration. The Muscular systems, and that of the heart are relaxed and weakened so that after a time they become irritable and fall defective in tone.

The writer can bear witness to the great depression of nerves and muscular energy experienced on making the
sudden plunge from the western edge of the Ocean table land, down into the still and saturated Air of the Concan during the Vars. The descent of nearly 2000 feet being made over the great Railway incline in half an hour — the pulse gets weaker and intermittent — there is palpitation on moderate exertion, and the oppressive "besoin de respirer" is only relieved by frequent and deep voluntary inspiration.

The direct influence of sudden increase of moisture however is no doubt small compared with its indirect action in aiding the development of specific influences — whether by decomposition or growth.

As to the connection of dampness with Phthisis there seems to be some obscurity — not as to the fact of the greater prevalence of the disease in damp localities, and of its becoming much lessened in those localities by drainage; for this is well enough looked for — but as to
Now the damp acts.
For if it be put forward that the damp acts by chilling — then there is the objection that the very Coldest Climate is only Any Fail to cause Phthisis —

In Iceland and in Greenland the Disease is unknown, and cind India is rare. And on the other hand it prevails extremely amongst the coloured population of the West Indies. But if it be suggested that damp acts by favouring the development of some specific organic matter in the soil, then the objection arises that Phthisis by no means prevail. Most where the conditions favouring such development, are most marked —

Pulmonary Maladies is even held by some to be antagonistic to Phthisis. In India it is far less common than in England and occurs later in life.

And again, in opposition to the idea that damp acts by favouring the decomposition of floating epithelial Areas
Other personal emanations — a theory which seems to fit in with many of the known facts — these remain, that the coloured populations who suffer so much from the disease in the West Indies pass very much of their lives in the open air.

It is worthy of note that the lungs of Europeans who have lived long in India get lighter, and the respiratory rhythm becomes slower and shallower.

Also that British soldiers who have served long in India suffer from Phthisis on their return thence in a ratio far beyond that of those who have remained at home.

"A regiment of Infantry during four years (1864–67) service in the Bengal Presidency lost yearly 6.6 of its strength by Phthisis. During the four years next after its return to England it lost from the men who had served in India — yearly 24.2 per 1000"
lives for this disease — the average loss of infantry at home being 7 per 1000. The records from the depot battalions which consist partly of men returned from the foreign stations of their regiments, but mainly of health recruits preparing to go out — show the same results — the loss from Phthisis being 14.2 per 1000 or nearly double that of infantry at home, notwithstanding the fact that the returned soldiers found varying but not the average a large proportion of these men.

Facts show pretty clearly that in the returned Briton, as in the Negro, the predisposition to Phthisis on changing from a hot climate to Great Britain is increase.

The direct influence of unusual height of the air in causing even discomfort is small — there is generally a fuller and stronger pulse, and a bough at times.
of increased muscular and mental power.
Indirectly, however, by the rapid change in temperature, which this great dryness permits, it is very harmful to the European, especially if newly arrived in a hot country. In inland India during December, January, and February, when scarcely a cloud is in the sky, and a dry N.E. breeze rapidly dries up the scanty vegetation, the range of temperature within the 24 hours is variable (in tents 40° to 50°) and under these circumstances hepatic disease and dysentery abound.

With regard to the effect of rapidity on the action of the known specific endemic influences, an endeavour has been made to show that in the case of many of these, their slow and continued action does bring about true accommodation. And in other cases, there is at least some probability that this result follows.
And with regard to Relatual Malaria and yellow fever it is thought to be fairly made out that although the natives of these localities where these prevail have in course of ages acquired the power of maintaining their numbers and the full span of their lives, while exposed to these influences yet with Europeans it is not so but that these by unit of continued exposure may get some immunity from attacks of the specific disease they do so at the price of certain degradation of health both in themselves and in their children.

The lessened susceptibility to Typhoid which the people have may perhaps have been bought at the same price, for it does not seem at all beyond reason to put the lowered general health and higher death-rate of citizens as compared with country people, as being in part due to long exposure to this specific influence.
In the case of the locusts, however, such as Scarlet Fever, Measles, Smallpox, etc., there is no evidence of anything of the kind. Whether accommodation to these influences is gained by exposure followed by an outbreak of the specific disease as is most common, or whether gained as the writer submits is sometimes the case, by inheritance or by exposure not followed by the disease — it is clear that the accommodation is got without any notable loss of general health.

It may however be again remarked that Scarlet Fever, Measles, Smallpox are not endemic influences at all in the sense in which Palludal Malaria, Cholera, Yellow Fever, and Plague are endemic in their respective habitats.

For, although they may never be absent from some large cities, they exist there only as epidemics, limited perhaps as to space...
but always on the move, within that space, like sparks in burnt paper.
The specific influences of the former class indeed—which arise from persons and not from places—as we seem to have any true endemic home at all.

There is, however, fair evidence that the average rate of life from these various specific diseases has lessened during the present and the preceding century. There is also evidence that the type of general health has been at the same time altered.
There remains to be considered the influence of rapidity of change in that range of endemic influences which we call climate. Climate in its larger sense is no doubt the chief power by which the human race has been and is being differentiated. But the local climate in its ordinary sense, as meaning a certain temperature and moisture of the air does but inadequately represent the extent of the local influences which quietly, but constantly, are moulding the inhabitants of various countries. For it is here maintained that beside these meteorological conditions, which are commonly noted by our senses, and scientific instruments, and besides the potent operations of social habits and institutions, there are numbers of organic influences which largely help in the result that e.g. the Bengali qua Bengali is the product not only of a certain mean temperature and moisture of the air,
plus roughly waste, plus rice diet, plus
centuries of civil and religious wisdom,
but of all these plus malaria, plus,
not-present-cholera germs, and plus probably
a number of other organic influences
which we know nothing about.

It may perhaps be somewhat useless
to speculate as to the existence of organic
influences which can neither be submitted
to the senses nor be connected with the
prevalence of definite disease.

But the possibility of the existence
of such undetermined influence, becomes
clear if one only considers that almost all
we know about the organic influence of
salutary malaria and yellow fever is
that in unaccommodated persons the set
ups explosions of disease. But suppose the
potence of these agencies to be so lowered
that they no longer set up disease in
strangers but only quietly degraded the
general health. Then these influences
though still of grave importance would be bi
Page 73

Peculiarly known to exist.
And not only is the existence of
such an undetermined organic climate
very probable "a priori," but the assump-
tion goes far to explain the fact that
change of death-rate consequent on
the migration of bodies of men is not at
all in exact dependence on the amount
of change in physical climate, nor
even on the exposure to the action
of known organic influences.

For example—

French soldiers in Algeria die
at double their home rate, though the
towns in which they chiefly live—
Algiers, Constantine—are hardly at
all Malarious.

The writer can bear witness to
the fact that the children of the French
settlers in North Africa are exceedingly
free from malaria.

But French soldiers
in New Caledonia, only one at the half the home rate—And yet the mean temperature of New Caledonia is some 10° higher than that of Algiers (77° to 66.5°).

No can one attribute to either heat or malaria the remarkable increase the death-rate which attends on the removal of tropical races to foreign tropical countries. For example, see the following table given by Boudoumas of death-rate amongst British Auxiliary Troops:

<table>
<thead>
<tr>
<th>Serving in their Native Countries</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maltese Merciles</td>
<td>9</td>
</tr>
<tr>
<td>Zottenlots (Cape)</td>
<td>12.5</td>
</tr>
<tr>
<td>Bengalis (mainly from coast)</td>
<td>13.5</td>
</tr>
<tr>
<td>Lascars (Ceylon)</td>
<td>26.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serving out of their Native Countries</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Madrasse in Penaceem</td>
<td>12</td>
</tr>
<tr>
<td>as and Bengalis in Ceylon</td>
<td>13.5</td>
</tr>
<tr>
<td>Malups in Ceylon</td>
<td>26.5</td>
</tr>
</tbody>
</table>
The history of the human race indeed shows clearly that in search of food or dominion men have constantly wandered into new lands, but history shows just as clearly that the experiment has always been a hazardous one, and that men have never retained their hold of foreign countries without undergoing a slow but profound constitutional change.

No doubt vast ages have been required to differentiate the leading races of mankind as we now find them, but even within modern historic time the influence of change of surroundings in moulding the constitution of immigrant races is very clear — contrast e.g. the Spaniard and South American Creole, Indian and Parsee, Burmese and Jollee.
This normal accommodation is the secret of successful colonisation, and it is abundantly clear, that if the change of surroundings is too rapid for normal accommodation to occur, then degeneration, disease and death will follow, and the immigrants will find in their new country only an early grave.

Large illustrations could be given of this fact which governments and people are so slow to learn.

Tacitus says that under Nero the soldiers, sent as colonists to Farentum and Aventicum could never people those countries, but died without posterity. "Neque conjuges, nec frati, nec amici, nec eleusis libris libris, nec avus libris, domos relinquunt."

Volney says that neither the Mamelukes, who were a Cacuminum race, nor the Turks, who are Mongolian, unless they married native women, which the Mamelukes never did, could continue their race in 8 or 9 years. All their offspring perishing in the first or second generation.
The poor Fellah, on the other hand, though always a slave, overworked and underfed, lives on and multiplies. Now, as in the time of the Pharaohs, in virtue of the excellent accommodation acquired by his ancestor through a score of centuries.

Since 1816 the Negro population in the West Indies have been steadily diminishing, and it seems as Colonel Godey says, in British Annals of Medicine, that before the termination of another century this race will have almost ceased to exist in the West India Islands.

A table by Mott (lectures on the Natural History of the Caucasian and the Negro) shows a remarkable increase of insanity pari passu with the spread of
The Negro Northward in the United States. He states the population
of insigne amongst Negroes to be in
Louisiana 1 in 4310
South Carolina 1 - 2477.
Virginia 1 - 1299
Massachusetts 1 - 43
Main 1 - 14.

The ground which lies within the
scope of this thesis, has now been
gone over. By submission of
the evidence of reputable witnesses
and by simple deduction from this
evidence, it has been sought to establish
these two distinct points
(First) The great natural law, that
the habitat slowly moulds the habitant
into fitness to itself, holds good of the
specific endemic influences as of the
other factors which go to constitute the
habitat.
(Second) The normal moulding
Action of all these endemic influences is to slow as not to injure health, and it is only when brought to bear too quickly, that they effect constitutional change, at the cost of such constitutional corrosion as leads to disease or death. And this also applies even to those by the influences which — being directly known to exist only by their causing disease — are termed "infectious." For there is good indirect evidence that they may, and often do, act on men without causing disease at all.

It is not at all contended here that the specific organic — and the ordinary physical — endemic influences stand in the same category in every respect. Such a contention would be idle, for there are doubtless many and clear differences between them as to extension, mode and result of action etc., but such considerations as these, do not affect the
argument which has been put forward in this thesis, and it is submitted in conclusion, that if it be established that the action of these mysterious organic influences is in any large respect subject to great natural laws—then the physician will be, by this knowledge, so much the better prepared armed to meet them, and to either ward off or mitigate their terrible power.

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This Essay was begun by reference to the dense haze which hangs over the early history of Man and his surroundings. As the investigator is brought down Century by Century this haze grows less and less dense until, in the full light of accurate observation and reliable record, the picture stands fairly revealed. But although in these latter times, the facts bearing on the Malthusian
been clearly enough shown forth, the lesson of the close connection between man and his surroundings has been hard to learn.

Very slowly— as the limit at which he placed the supernatural has been pushed further and further back by his growing knowledge of the Natural— has the recognition dawned on man that he holds his health and life in immediate dependence on an intricate combination of external circumstances. Very slowly even now, and only under the stress of bitter punishment is man learning that although he may to some extent choose and modify his surroundings, yet that the surroundings, being there, are to him a fate, which will either mould or mar, or kill him.

But it may be said that at least, although our knowledge of these matters is still very deficient, and we hardly know anything of
The Natural History of the specific endemic influences which are to ahead to our race, we have attained to at least this knowledge — that there is much to be known, etc.

And, it is hard to think that this matter will rest so. Rather, may the assured belief be held that with more accurate and extended search, and perhaps, better means of searching men will attain to some clear knowledge of matters which are to them of such great import — that having got to know, they will be able to change and modify some of their surroundings, and so to bring their lives into harmony with those that are unchangeable, as to lessen disease, lengthen their lives and improve their race — and that thus the tracing of man's future development, though oscillating surely, will tend as surely upward.
I certify that the foregoing thesis has been composed wholly by me—though the transcription of this copy from my original draft, has been, from lack of time, committed to another hand.

Edwine Blair

1 Belgrave Crescent, Edinburgh
21st April 1849