

Appendix

Thesis.

Two Propositions

On Public Hygiene.

by

Alexander Grant, etc. &c.

a confused writer

The ~~two~~ propositions have no connection.

S.B.



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Introduction.

Of the general question of Hygiene it is unnecessary to say much here; yet it will be useful briefly to point out the relationship of the special question discussed to the general subject.

The aims of Hygiene have been tersely stated to be, "to render growth more perfect, decay less rapid, life more vigorous, death more remote." (a). The same aims when directed to the great mass of the people constitute National or Public Hygiene. These aims might be forwarded by a sort of double method, by attending to the different effects of food, water, air, exercise, and climate, and also by studying disease when we find it. Both methods have the same end in view, but the one has more of a basis on Physiology, the other on Pathology.

The first proposition falls under the former of these heads, and, if a feeble, it is at least an earnest attempt to show that statistics — great as are the benefits we derive from them — might be rendered of still greater value, that their application to men and women simply as such might be extended and applied to men and women of different yet healthy physical constitution. Nor ought it to be forgotten, that some men are neither of a nervous, sanguine, bilious, or lymphatic temperament, but that sometimes two or even more of these may coexist in the same individual. It may then at times be difficult to assign an individual to his correct class. But this need not excite wonder. It cannot be forgotten with what difficulty and controversy the classes and orders of animals

of animals and vegetables are arranged, that sometimes animals are put in one class, sometimes in another. Nay more, how recent is the agreement that the unfortunate sponges, handed over by the zoologist to the botanist, by the botanist to the zoologist, have at length been acknowledged to belong to the animal Kingdom. When we find then such controversy as to whether a sponge be an animal or a vegetable we need not be surprised. Should cases arise when it would be difficult to say whether a man was bilious or lymphatic.

The second proposition is a plea for the study of the correlation of diseases, the special case selected being Variola and Typhoid. Data are scanty so that it is unsafe at present to theorize, but I have been unable to divest myself of the suspicion, that Dr Lawson's Pandemic wave theory is only a mode of this correlation. (b). Probably the great practical question of our day will be disinfection and isolation of all fever cases. (c). The influence of such treatment on public health would be enormous, not only by diminishing if not extinguishing many, perhaps most fevers, but also by decreasing common inflammations as well. (d). The 'Public Health Act', if rigidly enforced would help to a certain extent, but unfortunately in country parishes the carrying out of the Act is vested in Parochial Boards, who when they act at all, are apt to do so rather spasmodically and generally during a panic caused by cholera or some other epidemic. (e). Again how profitable to farmers would

would be the application of dry earth to retain the ammonia for their plants instead of bringing it from the ends of the earth as guano. (f). And how much more agreeable and profitable would it be for themselves and their customers to be strengthened by it as bread, rather than poisoned by it as gas. But the tune of "free country" though popular is waning in its popularity; and the day may not be far distant when it will be practicable to give effect to the other and truer Maxim "Prevention is better than Cure".

Notes and Authorities.

- a. Practical Hygiene. Prof. Parkes. 2^d Edition. Introduction.
- b. Army Medical Report for Year 1866 p 387.
- c. The great power Carbolic acid possesses in destroying lower vital organisms together with the success said by Prof. Parkes to attend its use in the prevention of Battle plague suggested to me the possibility of constructing a sort of gas mask to be worn by attendants in cases of virulent fever. The impure Carbolic acid drops easily through a capillary tube, the odour is not disagreeable, nor, so far as Shaw found, attended with any ill effects. But I suppose, unless results were more apparent, many would run any risk rather than put themselves to trouble.
- d. Science and Practice of Medicine. Prof. Aitken. 2^d Edition p 129.
- e. Public Health Act (Scotland) 1867
- f. Rev^d Henry Moulton's System.

Proposition. 1.

That statistical inquiry ought to be instituted with regard to the relationship of Temperament or physical constitution to climate and employment.

Every living creature may be considered as the resultant of two sets of forces, the one being the physical constitution which is transmitted from the parents, the other the sum of those forces that act posterior to birth, whether food or air or climate.

The great changes in development that can be induced in the lower animals have been well illustrated by Mr. Darwin in his experiments, and especially in those made with pigeons. (g) He informs us how long it takes, how many crosses it requires, to change the colour of the feathers, to alter the size and curve of the beak. Whether the theory he attempts to establish be or be not proved, the large array of facts he produces may be extremely valuable in bringing home to our conviction the great effect the parent has in producing the constitution of the offspring. (h) That these are experiments is true, that they are not natural is false, for man is himself a part of nature and all the experiments he can produce are only varieties of nature's processes. Undoubtedly they may be on a small scale, they may be easily observed, they may be hastened on more speedily than we are able to observe in nature but this
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arises from the vastness and infinite number of Nature's processes, so that a certain number of conditions can seldom be observed uninterfered with by others.

Let us now pass on to the human species and consider different races of men, and in the first place two such extreme races as the Esquimaux and the Negro. The general belief is that all mankind are descended from one pair, and we think there is no difficulty in believing that the different physical conditions of different regions, latitudes, employments, acting through a long series of years, are quite sufficient to account for all known diversities from a common type. Nature's law, indeed, is, Conform or perish. If sufficient adaptive power be not possessed by a transplanted race, it must return to its original habitat, or cease to exist. And this gradually acquired power, this naturally selected adaptation as it were, is transmitted to the offspring, so that it may happen that they will at length last be so formed as to be unable to exist for any considerable time under the original conditions of the progenitors. And so in regard to two branches of the same race, it may happen that the descendants of each will be unable to endure an exchange of climate or conditions with the other. To take the instances cited, the Esquimaux accustomed to a dense air and cold temperature is unable to exist for any length of time in the warm climate so suitable to the Negro; the Negro, on the other hand, accustomed to the rare atmosphere

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and burning temperature of the torrid zone, is soon extinguished by the opposite conditions in the frigid. It is not difficult to discern the conditions of this difference, the structural and functional difference in the two. The different densities of the air will require different aerating space in the lungs, the modes of employment and the temperature will require in each case a great difference in the food; and this difference of the food will react on all the nutritive organs accustoming them to absorb that adapted for each. So also the difference in the amount of heat will create difference in the transpiring qualities of the skin so as to maintain the heat of the body near to a common standard.

As might have been expected then the races of temperate climates are found more capable of enduring either the heat of the tropics or the cold of the frigid zone than the natives of either of these climates the conditions of the other. As a rule, however, their life is very considerably shortened under either of the changes (h^2).

But if, instead of this sudden change, the conditions be altered gradually, i.e., in the course of many succeeding generations, each generation helps in the adaptation and transmits to its posterity the altered structural change. The race in this case does not perish but it becomes perceptibly altered. This is well illustrated by the case of the Siak Posh a branch of Hindu descent living in the cold mountainous regions of Kohistan. (i). They, we are told, have now "arched eyebrows a fair complexion

Complexion, blue eyes, and Grecian features." An instance of alteration under conditions the reverse of this is also given by Sir Ranald Martin. It is that of Persians found in India. Instead of their naturally fair complexion, they have even in the course of a few centuries become dark, and they are found darker and darker the farther south they are traced in India. (f).

But there is another and a quicker mode of adapting races to a great change of conditions, but then it is only by the sacrifice of many of the qualities of the race - when the incoming race mixes its blood with the native. The native race in this case imparts to the mixed offspring the physical constitution necessary to existence in the climate, and as a rule the incoming, and probably the conquering race, imparts greater intellectual capacity. If races were to overrun countries and subdue the inhabitants through a mere lust for conquest it would not be possible to attribute to them, at least as a rule, greater intellectual superiority, for the subdued might be far superior in many of the higher qualities. But all races are engaged in the struggle for existence, in a struggle to satisfy the conditions of life, or to obtain what is a main element of existence, food. (K) This has been very clearly and forcibly shown by the lamented Buckle in his History of Civilization, especially in regard to the eruptions of barbarians in Medieval Europe. So also in modern times, though masked by the great divisions of employment that exist in our complicated civilization, the great object of permanent conquest or colonization is the same as before.

as before. Admitting then that the conquering is superior to the native race, the fact still remains that, if the climate be greatly different, they will deteriorate, they may soon perish. For that climate, then, descendants derived from mixture of blood will be the best available. The Malatto lives where the white man dies out, he is far superior to the negro. The Eurasian is said to multiply in India where the pure white soon dies. (C).

But when we come to consider different individuals of the same race, individuals born and living under apparently similar conditions, the difficulties of the inquiry are greatly increased. We know that all living beings are subject to the law of causation, that in nature nothing is ever lost. We may compare the study of the laws of life in different climates, and in the same climate, to that of astronomy and geology. In each of the former cases fewer facts have to be noted, all being reduced to a few general laws. In the latter, the conditions are complicated and interwoven. In astronomy when we have calculated distance, density, motion, as of Neptune or Jupiter we disregard as having no calculable effect on the result the intimate or chemical structure. If this had to be taken into account the science of astronomy, instead of being one of the most advanced, would have been, perhaps hopelessly, in its infancy. In geology, on the other hand, the innumerable and counter-acting causes have baffled ^{research} and multiplied the difficulties of the inquiry. As in astronomy so with races in different climates, a few general conditions so overshadow and overpower the

Thor temperamental

the others as to produce results that are quite apparent. But when we come to consider the individuals of the same race we find, instead of a few overpowering or easily detected conditions, a host of less manifest causes, some of which are sometimes acting, sometimes absent. The different hereditary physical constitutions are known as temperaments, and it is to the relation of these to occupation and climate that I urge the necessity of national statistical inquiry. In our widely scattered Empire the boast of which is, that on it, the sun never sets, of how great value would it be to the intending emigrant to know that in some of our possessions where wages were high his constitution would be of more value than that of many of his countrymen, that in others it would be of less. And so, though perhaps not to the same extent, of the different modes of employment within our island how much energy would it conserve by each learning so far as careful observation could accomplish, which would suit him best. It is unfortunately too true that there are some occupations, such as the coal miner's or knife grinder's that soon become fatal to the most healthy. And in such cases the primary consideration, of course, is, to discover means for lessening the force of causes so fatal to all. But if I am told that for various climates and different occupations it matters little what special constitution a man is of, provided he be "strong and healthy", I answer in the first place that health has never yet been satisfactorily defined, and that ~~the~~ strength and

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and health may exist in the nervous man, in the sanguine, or in the bilious, and in the second I ask on what statistical data the belief is founded that in each of these under varying external conditions the life-value will be the same. Not only might a mode of lessening the mortality be discovered but the number of "sick days" might also be diminished. (m). In this case the hard earned wages of the working man would be saved, less sickness and attendance in sickness would have to be provided for, more money would be available for the purchase of nourishing food for his children, and healthier children and a healthier generation would come after.

Notes and Authorities.

g. Origin of Species. Darwin.

h. Causes of the Phenomena of Organic Nature. Prof. Huxley. p 147
Here Mr Huxley shows what Mr Darwin ought to be able to do in order to found his hypothesis on a sure foundation.

h². Atkin. Edition quoted. p 1035.

i. The Influence of Tropical Climates on European Constitutions. by Sir Ronald Martin. Lond. 1856. p 212.

j. Martin. See Cit.

k. History of Civilization. H. Y. Buckle vol 1st.

l. Practical Hygiene. Parkes p 431. Note at same page.

m. Description and Statistical Account of the British Empire by J. R. M^cCulloch. Fourth Edition 1854 p 542. "When one person in 100 dies annually, two at the least are constantly sick."

Corollary.

That the above injury would be likely to lessen considerably the expense of providing European soldiers for India.

The good effects attending the greater attention that is now paid to sanitary science in the army, are nowhere more apparent than they are in India. This may be understood at once by any one who compares recent army 'Medical Reports' with those regarding the India of former times. The mortality in the whole of India, which in the years 1817 to 1836 is stated to have been 71.5 per 1000, diminished in the years 1838 to 1856 to 59.5 per 1000, and from 1860 to 1866 it still further decreased to 26.75 per 1000. (N). And when we compare the tables of 1860 to 1866 by calculating the average annual mortality of the first and last three years we still find the results satisfactorily improving. Thus from 1860 to 1862 the average annual mortality per 1000 over all India amounted to 28.08 whereas from 1864 to 1866 it diminished to 23.87 per 1000.

In like manner when we compare the admissions we find the amount of disease, as estimated under that head, to be very much diminished, though not to such an extent as the mortality. Tables of the admissions for the period 1817 to 1836, the first 'death period' quoted above

above do not seem to exist; but for the years 1838 to 1856 the admissions per 1000 for the whole of India amounted to 1968. For the period 1860 to 1866 they amounted to 1581.9.

And of these diseases we find dysentery, fevers, Cholera, hepatitis and pulmonary diseases the most fatal. (O).

It is quite unnecessary to enter here into the generally received doctrines of the diminution in the elimination of Carbonic acid and the increased amount of work thrown upon the liver, on the consequent intestinal derangements, and on the disinclination for much exercise produced by the climate. An available increase of lung tissue in use such as would aerate the blood by the elimination of only a few grains more of carbon per diem in the highly rarefied atmosphere of the plains of India might possibly decide between the existence of health and disease. Whether it might be possible, by calculating the difference in the volume of easy and forced respiration, to arrive at any valuable results as to the availability of further lung aerating power in the conditions of a warmer climate I am unable to say, but the point seems to be worthy of attention.

Moreover these Indian tables show such an excessively high mortality compared with those of the army at home and in other quarters of the world, that for that reason, even if there were no other, they ought to incite us to follow out every mode of research likely to have any influence in alleviating

alleviating such a calamity. With this end in view the estimation of the life value of the different temperaments in an "excessive" climate like India seems to be a point worthy of grave consideration.

Looking at the matter merely in a money point of view we must consider the soldier, and especially after transport to India - as an expensive skilled laborer. And then we find in how lamentably short a time a regiment dies out, and what a large amount of disease is constantly recorded on the rolls (p). That no individual of our race can be acclimated in India in the true sense of the word we concede, but we also think that any inquiry which adds to our knowledge of the physical conditions least unsuited for such a climate, would tend to the increase of the soldier's life, happiness, and remuneration (p²). His place would then have to be filled up by his skilled but expensive successor less frequently, the national resources would be saved to some extent, and the general welfare of our overtaxed people somewhat promoted.

Notes and Authorities.

m and p. Tables ^{on} next leaf.

0. Practical Hygiene Prof Parker p 588.

Journal of Statistical Society of London vol X p 100. Vital Statistics of the East India Company's Armies in India, European and Native. by Lieut-Colonel Lykes.

p². Prof Atkin. Work & Edition quoted. p 1035-

Note n. Statistical tables.
Years 1817 to 1836.

Bengal.	Deaths.	75.6
Madras	—	76.1
Bombay	—	62.8
India	—	71.5

Years 1838 to 1856

Bengal.	Admissions	2047	Deaths	76.2
Madras	—	1741	—	41.5
Bombay	—	2117	—	60.9
India	—	1968	—	59.5

The above are from Dr Graham Balfour's Summary of Reports on the Health of the Army previous to 1859. Army Reports vol. 2. The following averages have been calculated by the Author & they show a constant improvement.

Years.	1860—6		1860—2		1864—6	
	Admissions	Deaths.	Admissions	Deaths.	Admissions	Deaths
U. Kingdom	969.7	9.32	1022.3	9.31	920.3	9.49
Bengal	1733.6	30.16	1942.9	37.49	1516.	24.14
Madras	1395.4	21.95	1344.9	19.76	1492.7	24.09
Bombay	1616.7	28.15	1839.	27.01	1403.	23.29
India	1581.9	26.75	1708.9	28.08	1470.5	23.87

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Proposition 2.

That the relationship of Variola and Typhoid fever is such as to render necessary the reconsideration of the question of Vaccination.

The poison of Variola, perhaps in greater degree than that of any other disease, has been the cause of disappointment and hope both to the public and the profession. At one time the terrible, unpreventable scourge of humanity, it has been so far held in check by the happy discovery of Jenner, that infinitely fewer deaths now occur from it, and could we only have the yield within our control, this death-cause might be eliminated from the lists.

Dr. Jenner himself, wiser than his followers did not form the sanguine hope of the immediate extinction of small pox; on the contrary, bearing in mind the fact that variola will itself recur, he expresses the opinion that the disease will occur after vaccination in about the same proportion. (9) But notwithstanding this, we find him continually attempting to show, whenever a case of varioloid did occur, that there had been imperfect vaccination. This point could only be determined by his successors.

It has been found by Hein and Marson after trial of many thousand cases that 30 per cent can be successfully revaccinated. (12). By successful revaccination is meant the formation of a true Jennerian vesicle arriving at maturity

on or near

on or near the eighth day. Midway between those who can be successfully revaccinated, and those on whom no visible effect can be obtained, there is another and a smaller class on whom a modified effect is produced. These we do not at present mean to consider further than to remark that the modified vesicle, if the vaccination has been properly performed, would seem to show that the effect of the primary vaccination had not yet been wholly eliminated from the system. The 30 per. cent. who can be successfully revaccinated form what Mr Simon calls the "Endangered Class". It is not meant that the members of this class would infallibly suffer from the disease if exposed to an infected atmosphere (for, as Mr Simon says, inoculation of lymph is a finer and more delicate test of susceptibility than the breathing of an infected atmosphere) but that from among these the sufferers would almost wholly come. (See A Scientific medical history of the members of this class promises results of incalculable benefit to mankind. One link in the chain of events seems to have been discovered by Mr Daniell of Swavesey. The following is quoted from Mr Paget's Harveyan oration for 1866: "At Swavesey, a populous village in Cambridgeshire, typhoid fever was very prevalent and severe in the year 1850. In 1865 on the occurrence of a few cases of small pox, the inhabitants in alarm, young and old alike, sought for vaccination. Accordingly Mr Daniell the Resident Surgeon vaccinated 616, many of whom had been vaccinated on a former occasion, or had had small pox. Of course in a large proportion of these Mr Daniell's vaccination

" was

"was unsuccessful, but by no means in all such. Mr. Daniell
 "noticed the remarkable fact, that the cases of successful vaccination,
 "in those who had been already vaccinated, or had had small pox,
 "were chiefly, or almost wholly, among persons who had had the
 "typhoid fever in 1830. One was a woman aged 60, who had had
 "small pox twenty years before, and whose face was pitted with
 "it. The vaccination proceeded with her quite normally. She had
 "had typhoid fever severely in 1830." (t).

According to Gregory (u) the death rate from variola
 is highest in children under five years of age, but from varioloid
 it is proportionally higher between the ages of 20 and 30. These
 data fall in very easily with the theory of typhoid. Thus:
 In natural small pox most are liable more or less and take
 the disease on exposure to its influence, but after vaccination
 the individual is for a time rendered insusceptible until he
 reaches the age to which typhoid and allied diseases are
 most hostile. If this age be passed without any of these dis-
 eases supervening, the insusceptibility will still continue but
 otherwise, if typhoid has occurred, the insusceptibility will be
 destroyed. One case of successful post-typhoid revaccination
 deserves special mention on account of its presenting, so far
 as the ~~unfortunate~~ uncertainty always attending negative
 evidence will allow, some of the characters of the crucial test.
 A girl Cruickshank, aged 13, was vaccinated in her infancy
 and bore on her arm several large cicatrices. About three years
 ago, she went along with her sister and was revaccinated by
 an

an experienced practitioner with lymph direct from the arm, but not the slightest effect followed. Afterwards she had typhoid fever, presenting all the typical symptoms, including spots. A few months after her recovery she was again revaccinated by four marks, not with lymph direct from the arm but by a less sure method - with lymph from a Capillary tube. All the punctures rose and on the eighth day the most skilful eye would have been unable to detect the slightest difference between them and those of a primary vaccination. (V).

Premature theory, though it sometimes turns out to be erroneous, is often useful. It serves the mind as a connecting link, and if not clung to, when further investigation shows its fallacy, it can at least do no harm. The theory at present generally held in regard to Smallpox is: That some element is present in the body at birth, less, infinitely less, in people descended from parents who have suffered from the disease; (W) that this element is capable of being eliminated from the body by vaccination or by an attack of small pox; that it may again be renewed and again counteracted by vaccination. To this theory we think facts warrant this addition: That one mode of reinducing susceptibility is through typhoid disease; that variola and typhoid are somehow empirically connected, correlated, as it were, to some higher law of the system. We do not claim for them a ~~causal~~ ^{causal} connection, because to a ~~causal~~ ^{causal} law there can be no exception, and we are not supplied with statistical data so as to be justified in asserting with regard to this question that

that no exceptions occur. Again, typhoid is not an entity. It is merely the name of a certain class of diseases, a class which, as knowledge increases, will probably be divided into several.

May more, for aught we know the same state of system which typhoid induces in a short time, might be produced gradually under certain conditions not strong enough, or hindered by other conditions from exhibiting the violent effects of disease.

Facts for further generalization are wanting. We must wait for the slow but sure advance of scientific induction.

Notes and Authorities.

- g. Life of Dr Jenner by Dr Barron.
- h. Papers relating to the History and Practice of Vaccination, Mr Simon's Report. pp xxxiii and xxxiv.

After going over the Army Reports and examining the statistics therein regarding the revaccination of our fifty thousand recruits I find the result to coincide pretty closely with Mr. Marson's statement.

- i. Report, Mr Simon's. p xxxiv.
- k. Mr. Paget's Harveyan oration (1866). Quoted from Medical Times and Gazette April 13th 1867.
- l. Eruptive Fevers. Dr Gregory. Tables at pp 215 and 216.
- m. Cases by Author of this Thesis. See Appendix.
- n. System of Medicine. Dr Reynolds.

Appendix.

Appendix.

I have vaccinated four people with typhoid fever, all of whom bore marks of previous vaccination.

Case 1. Miss —, had typhoid many years ago, but from the history I have been able to get, I have little doubt of the disease. I vaccinated her by three punctures and they all rose beautifully.

Case 2. Georgia Crutchank. This is the case cited in the text. It was a very severe case of fever.

Case 3. J. Crutchank. Sister of last. A milder case of fever, but the vaccination held quite normally.

Case 4. A girl Lamb. A very mild case of fever. The vaccination held but the marks were not so large and full on the eighth day as any of the others. Whether the mildness of the attack could have had any influence in producing this result I know not. Still a vaccinator would have pronounced the vaccination successful. It is quite recently that it occurred and after the thesis was written. Had it been earlier I might have made some reference to this point in the text.

Finis.