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MALTHUS:

RE-EXAMINED

BY THE

LIGHT OF PHYSIOLOGY.

LONDON:

PRINTED BY HARRISON AND SONS, ST. MARTIN'S LANE,
Printers in Ordinary to Her Majesty.

1868.

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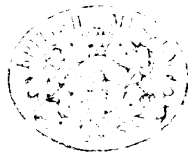
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TO SCIENTIFIC READERS.

BELIEVING that the speculation crudely sketched out in the following pages is in the main accurate, but being destitute of the scientific knowledge needed to make it good, and despairing of the leisure requisite for searching out corroborative proofs for myself, I have printed this outline of my theory in this rough form in the hope of obtaining assistance from better informed and more competent observers. And I shall feel deeply obliged if those into whose hands these sheets may come would be kind enough to note down, under the several sections, any facts, or references to accessible authorities, or qualifying considerations, which may occur to them, as they find opportunity, and then return the pamphlet thus enriched to me.

January, 1868.

MALTHUS RE-EXAMINED BY THE LIGHT OF PHYSIOLOGY.

CHAPTER I.

TOWARDS the close of the eighteenth century, more than two generations since, a sudden glow of the most sanguine faith in man's future spread over the world. A new era seemed to be opening for humanity. Not only the unthinking multitudes, but men of large experience and devoid neither of great reasoning nor of great observing powers,—not only the young and ardent but the old and the contemplative,—dreamed of perfectibility as well as of progress; of an approaching time in which both the moral and the physical condition of our species should become thoroughly satisfactory—subject only to the one drawback of mortality, and of mortality reduced to its simplest elements, to the mere fact of death in the ripeness of age and preparation; of a state of things in which every man, having enough of the necessaries, comforts, and even luxuries of life, should have no motive to envy or despoil his neighbour, and in which, therefore, all bad passions would die out from mere lack of nourishment. In a word, “our young men saw visions and our old men dreamed dreams,” and they not only cherished but

actually believed in their visions and their dreams. Men like Southey and Coleridge and Robert Owen, as in later times and in another country, men like Fourier and St. Simon, had their pictures and their programmes and their panaceas,—and not only men of that stamp, but far soberer and acuter minds. Those who wish to realise to themselves the sort of enthusiasm which anticipation of a state of diffused comfort and universal plenty and well-being excited in the general imagination and of the boundless delight and sweeping confidence with which it was received, and who have not patience to master the whole social and literary history of Europe from 1783 to 1793, should read GODWIN'S "Political Justice," and ask their grandfathers to describe the glow of generous emotion with which they followed the speculations of that singular book.

An answer, however, shortly appeared to Mr. Godwin which shattered all his sanguine pictures of an earthly paradise, and overwhelmed all such philanthropic dreamers with despondency and gloom,—and this cruel shock was administered by a man of singular benevolence and piety, a clergyman of the Church of England. MALTHUS demonstrated,* or was held to demonstrate that such a condition of universal comfort and plenty as was shadowed forth *could* never be reached on earth,—inasmuch as there was a constant and irremediable pressure of population on the means of subsistence; that it was in the nature, in the essence, of human beings to increase in a more rapid ratio than food; that as long as and whenever

* The first edition of the Essay on the "Principle of Population" was published in 1798.

population *did* increase faster than its sustenance, the great mass of mankind must be in a state of wretchedness; and that this incurable tendency could only be counteracted by—what were merely other forms of wretchedness—viz., profligacy, excessive and premature mortality, or abstinence from marriage,—or, as he phrased it, by vice, misery, or moral restraint. In other words, he maintained, and seemed to have proved, that mankind could only secure that sufficiency of food for all, which is the indispensable and main condition of virtue and comfort, on terms which must be held to preclude comfort and imperil virtue—with the majority, with all ordinary men, in fact, to be fatal to both;—that is, by seeing most of their children die almost as soon as they came into the world, or by themselves and their fellows dying rapidly and prematurely from defect of nutriment; or by viciously preventing children coming into the world at all; or by resisting and foregoing, habitually and generally, sometimes altogether, always during the most craving period of life, those imperious longings of the senses, and that equally imperious “hunger of the heart,” which, combined, constitute the most urgent necessity of our nature, and which the Creator must have made thus urgent for wise and righteous purposes.

It is obvious on a moment's consideration that the two former of the above three-named terms on which alone, according to the Malthusian theory, plenty can be secured for all, may be left out of consideration, and that practically, the sole condition is the last,—namely, the postponement of marriage as a rule during the years when it is usually most desired,

and the abstinence from it in many cases altogether;— in a word, resolute, self-enforced, and prolonged celibacy, precisely at that epoch of life, under those circumstances, and among those classes, in which celibacy is most difficult;—that is (as the rough common feelings of mankind at large would put it), that life in plenty and comfort can only be obtained by the sacrifice of the chief comfort in life, and of those joys without which even a life of material plenty is a very poor and questionable boon. And, be it observed, this is the form the proposition must inevitably assume in the minds not of the vicious, the sensual, the weak or the self-indulgent portion of mankind, but of the *natural*, unsophisticated, right-feeling, sensible,—if you will, unregenerate, and unsanctified,—mass of mankind.

No wonder that a proposition, which seemed to condemn the human species to such hopeless, universal, eternal—nay, *ever-increasing* pressure and privation, or to proffer an escape from that lot at a price which few could pay, and few would think worth paying, should have staggered and shocked those to whom it was first propounded. It sounded like the sentence to a doom of utter darkness and despair. It seemed to untrained minds utterly irreconcilable with any intelligible view of the Divine beneficence and wisdom. Yet its author appeared to have framed his conclusion with such caution, and to have clinched it, so to speak, with such close bands of logic and with such a large and indisputable induction of facts, that recalcitration against it was idle, and refutation of it impossible. He maintained it after full discussion and, with some modifications, to the end of

his career; and nearly all political economists of position and repute have accepted his doctrine as a fundamental and established axiom of the science.

Malthus never endeavoured to blink the full scope and severity of his proposition. In an article on Population, which he contributed to the 8th edition of the "Encyclopædia Britannica," and which I believe was the latest of his writings on that subject, he reproduces it in the most uncompromising terms. He lays it down as indisputable and obvious, that population, if unchecked, necessarily increases in a *geometrical* ratio, and that food, the produce of the soil, can only at the outside and under the most favourable circumstances increase in an *arithmetical* ratio. That the inhabitants of a given country or area will, as is seen, actually double their numbers in twenty-five years, and *might* easily double their numbers in a much shorter time; whereas, even if we concede that in the same twenty-five years the produce of the soil in the same given country or area may be doubled likewise, it is certain that in the *next* twenty-five years, while the population would again double itself or *quadruple* its original numbers, the soil could at the very utmost only again add an equal increment to that of the preceding period, or *treble* its original yield. What is true of a given country, farm, or district, he proceeds to say, must necessarily be true of the whole earth; and neither emigration, free trade, nor equal distribution of the land can affect the ultimate result. All that these could effect would be a temporary alleviation of the pressure of population and subsistence, and a certain calculable postponement of the day when the ultimate limit of

possible numbers and the extreme point of pressure would be reached. "Taking a single farm only into consideration, no man would have the hardihood to assert that its produce could be made permanently to keep pace with a population increasing at such a rate, as it is observed to do, for twenty or thirty years together at particular times and in particular countries." This is obvious and undeniable, and may be conceded at once. But, he goes on to say, "nothing but the confusion and indistinctness arising from the largeness of the subject, and the vague and false notions which prevail respecting the efficacy of emigration, could make persons deny in the case of an extensive territory, *or of the whole earth*, what they could not fail to acknowledge in the case of a single farm, which may be said fairly to represent it." It is in this sentence that lurks the fallacy which I propose to demonstrate, and which, if I can make it good, will be seen to upset both most of Malthus' practical inferences from his theory, as well as the soundness of the theory itself. There must always, everywhere, and to the end of time, he maintains—except in the rarest cases, and for the briefest periods—be pressure of population on the means of subsistence. "It is to the laws of nature, therefore, and not to the conduct or institutions of man, that we are to attribute the necessity of a strong and ceaseless check on the natural increase of population." This is the dictum which I hold, and trust to prove, to be erroneous.

As I have said, Malthus' doctrine has been accepted as undeniable by nearly every writer of repute on

economical subjects, and by none more unreservedly than by the greatest of them all, J. S. Mill.* None of the many authors who have questioned or assailed it, such as Ingram, Alison, Saddler, Doubleday, or Quetelet (?), have been able to shake in any degree its hold upon the public mind. Various theories have been put forward in competition, but none has obtained any currency, or perhaps deserved any. I may have to allude to some of them as I proceed, but it would divert attention from the main argument were I to discuss them here. It has remained the fixed axiomatic belief of the educated world, that pressure of numbers on the means of subsistence is and must remain the normal condition of humanity; that, in consequence, distress or privation, in one shape or another, must be the habitual lot of the great majority of our species; since they could only escape the distress and privation arising from insufficient food by voluntarily embracing the distress and privation involved in long-continued, and perhaps perpetual, celibacy. Reasoning the most careful and cogent seemed to have made this clear, and the observation and experience of every day and every land seemed to illustrate and confirm it.

Yet there were not wanting certain facts and considerations calculated to suggest to thoughtful minds a misgiving as to the correctness of a conclusion so uncomfortable. The doubt did not bear

* McCulloch in his notes to his edition of "Smith's Wealth of Nations," Vol. IV, p. 133. J. S. Mill, "Principles of Political Economy," Vol. II, § 2 (both quoted at length by Senior in his "Two Lectures on Population").

so much upon the accuracy of Mr. Malthus' ratiocination as upon the possible incompleteness of his premises. It was suspected, somewhat vaguely, perhaps, that there might exist some law which science had not yet discovered, or some circumstances which statistics and natural history had not yet brought to light, that would materially modify the economist's conclusions, or, perhaps disperse them altogether.

1. In the first place, it was noted that the *actual* fecundity of the human race never equalled, and scarcely ever even distantly approached, its *possible* fecundity; and that this difference was observable when there was neither vice, misery, nor moral restraint to account for it;—that in the midst of the most ample supply of food, where there need and could be no anxiety as to the future, where parents were healthy, where the climate was good,—where, in a word, every circumstance was as favourable as possible to the unchecked multiplication of the species, where everybody married, and where marriages were as early as is compatible with health,—the population did not increase nearly as fast as theoretically it might have done. The most rapid known rate of augmentation appears to be that mentioned by Humboldt, in some parts of Mexico, where, judging from the proportion of births and deaths, he calculated that, if there were no interfering circumstances, the population would double itself in 19 years.* This was in a tropical climate, where the marriages were unusually early, and the births as numerous as 1 in 17, or occasionally 1 in 15. In the United States

* Encyclopædia, p. 342, "Population." Hanboro Essay.

and Lower Canada, which come next, it is calculated that when the large immigration is subtracted, the period of doubling by natural increase is 25 years.* But both these fall far short of the possible rate of

* This is Malthus' calculation, nor does it seem to be excessive. The population of the United States at the several censuses was as follows:—

	White.	....	Total.
1800.....	4,304,000	....	5,306,000
1810.....	5,862,000	....	7,240,000
1820.....	7,862,000	....	9,638,000
1830.....	10,537,000	....	12,866,000
1840.....	14,196,000	....	17,069,000
1850.....	19,553,000	....	23,192,000
1860.....	26,976,000	....	31,445,000

The population in 1835, therefore, would be about 12,300,000 whites, and 14,500,000 in all.

The figures for the two last periods of 25 years would then stand thus:—

	White.	....	Total.
1810.....	5,862,000	....	7,240,000
1835.....	12,300,000	....	14,500,000
1860.....	26,976,000	....	31,445,000

This shows more than re-duplication within 25 years, but in order to arrive at the natural increase we must deduct not only the foreign immigrants who arrived to swell the population, but the natural increase of this immigration. The first we know, the second it is perhaps scarcely worth while to guess at. Between 1810 and 1835 the immigrants were nearly 460,000, and, of course, all whites; between 1835 and 1860 they numbered 4,660,000: the figures rectified by deducting these would then be—

1810.....	5,862,000
1835.....	11,840,000
1860.....	22,316,000

It will be observed that the rate of increase is somewhat slower in the latter period than in the earlier one.

Perhaps the highest rate yet known of *actual* natural increase, unaffected by immigration, occurs among the *French* population of Lower Canada. Calculating from the figures in Mr. Hurlbert's paper, "Social Science Transactions, 1862," p. 894, their numbers, which were 130,000 in 1790, had increased to 263,000 in 1815, and to

theoretical increase; since, adopting data which are actually reached and, indeed, exceeded in many instances, the population of a country can double itself in less than 10 years.*

Again, the ordinary size of families in England and Wales, judging by a comparison of the yearly

481,000 in 1840. In the 25 years between 1835 and 1860 the increase was still more remarkable, viz., from about 420,000 to 845,000.

By the census of the American population, there were 26,933 out of 100,000 between the ages of 18 and 40—that is about 13,466 marriageable couples. If all were married, and if each couple had three children in four years (a rate often reached), and if the deaths were 1 in 50 (a rate reached in Switzerland, and approached in England), the population would double itself in less than ten years; or if the births were 1 in 20 (a rate sometimes exceeded) of the population, and the deaths 1 in 50, the population would double itself in If the births were 1 in 25 (a very common average), and the deaths 1 in 50, the population would double itself in

* In 100,000 of the American population (census taken in 1820) there were 26,933 people living between the ages of 18 and 40 years, that is about 13,466 marriageable couples.

I.—Suppose that all eligible were married and had on an average 3 children in 4 years, the total births would be $\frac{13466 \times 3}{4} = 10,099$; and if the average of deaths were 1 in 50 of the population—that is 2,000 in the 100,000, the births would exceed the deaths by 10,099 - 2,000 = 8,099. This increase is in proportion to the population as 1 is to 12.3,

(Thus—8,099 : 100,000 :: 1 : 12.3)

and, according to "Euler," would double the population in nine years. (See table "Encyclopædia Britannica.")

II.—Suppose to each marriage the average of children was 2 in 3 years,

Then $\frac{13,466 \times 2}{3} = 8,977 =$ the annual births.

Deduct the deaths 2,000

6,977 = increase to population.

Annually, and in proportion as 1 to 14.3. Doubling period 10 years.

marriages with the yearly births, is now about 4.15 children, and we may fairly assume that with us no artificial means, of abstinence or otherwise, are employed to prevent each marriage yielding its natural number of offspring. But as this mode of ascertaining the number of children to a marriage is only strictly correct when applied to a stationary population, we must add something to the above figures; and there is, I believe, no reason why we may not take Mr. Malthus' calculation, and call the number 4.5. We cannot with any accuracy ascertain the number of children born to a marriage in America, as statistics there are so complicated by immigration, migration, extension, and other causes, but I believe no one would place the average higher than 6. There is, therefore, no reason for believing that the average in the most favourable circumstances exceeds this. But the *possible* number of children to a marriage—the *natural* unchecked number under the best conditions is far beyond this—certainly four-fold. The child-bearing ages of women extend over nearly 30 years—certainly over 25, or from 16 to 40, inclusive, on a moderate estimate. Twenty-five children to each marriage is therefore no impossibility; in favourable conditions we should say no unlikely occurrence. We all of us know cases where it has been realised. In Italy such instances are not very unfrequent—even in England they are not unexampled. In Lower Canada we find they are by no means uncommon;* from 14 to 16 is a usual number. A recent traveller

* "Social Science Transactions, 1862, p. 894," Mr. Hurlbert's "Paper on Canada." Increase of French in Lower Canada, unexampled by natural increase alone :—

there assured us he had met with one woman who had borne 32 children.

Yet how rarely—even when food is abundant, health unquestionable, habits good, an entire absence, that is, both of the preventive and the positive check—do we see this potential fecundity even approached! Does not the contrast point to some other, as yet occult, influence, wholly apart from any of those enumerated by Mr. Malthus, which operates as a natural and unconscious limitation on human reproduction?

2. Some doubt as to the completeness of Malthus' premises, and the consequent correctness of his conclusions, appears to be suggested by the fact that every man is able by his own labour to produce food enough not only to sustain himself and those naturally helpless and dependent upon him, but enough also to exchange for the shelter and clothing which are as necessary as food to the human animal—and he can do all this and yet leave himself ample leisure for other occupations or amusements. Without endorsing Mr. Godwin's extravagant calculation that half an hour a day devoted by every individual in a

1790.....	130,000	} 3 per cent. per annum.
1800.....	169,000	
1810.....	220,000	
1820.....	286,000	
1830.....	370,000	
1840.....	481,000	} 4 per cent. per annum.
1861.....	880,000	

This is doubling itself in less than 25 years.

In Belgium, perhaps the most fecund as well as the most densely peopled of old civilized states, the average children to a marriage (according to Quetelet) is 4·75 in the least prolific, and 5·21 in the most prolific provinces.

community to agricultural labour would suffice to raise an adequate amount of nutriment, there can be no question that a very moderate amount of regular industry, whether applied to the production of one article or of many, would secure to man an abundant supply of all the necessaries, and most of the comforts, of life—at least in all temperate or tropical climates. In the article in the Encyclopædia already quoted, Malthus declares that as long as good land was attainable, “the rate at which food could be made to increase would far exceed what was necessary to keep pace with the most rapid increase of population which the laws of nature in relation to human kind permit.” It was obvious, therefore, since every man can produce much more than he needs, and since, given the land and the labour, food can easily be made to increase faster than population, and would naturally do so, all that is wanted to put man at his ease is a field whereon to bestow his industry. It is not that population has a natural tendency to increase faster than food, or as fast, but simply that the surface of the earth is limited, and portions of that surface not always nor easily accessible.

3. It was pointed out again by the late Mr. Senior, as another very suggestive fact, that, taking the world as a whole, and history so far as we are acquainted with it, food always *has* increased faster than population, in spite of the alleged *tendency* of population to increase faster than food. Famines, which used to be so frequent in earlier ages and in thick-peopled countries, are now scarcely ever heard of, while, at the same time, the average condition of

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the mass of the people has on the whole improved, that is, that they have more of the necessaries of life than formerly. Probably the only cases in our days of scarcity of food amounting to actual famine are to be found where the staple crop of a whole country has been destroyed by locusts, as sometimes in Asia; or by drought, as occasionally in Hindostan; or by vegetable disease, as in the potatoe rot of Ireland. In sparsely-peopled Australia famine has often supervened; in densely-peopled Belgium never. "I admit (says Mr. Senior) the abstract *power* of population to increase so as to press upon the means of subsistence. I deny the habitual *tendency*. I believe the tendency to be just the reverse. What is the picture presented by the earliest records of those nations which are now civilized? or, which is the same, what is now the state of savage nations? A state of habitual poverty and occasional famine. . . . If a single country can be found in which there is now less poverty than is universal in a savage state, it must be true that under the circumstances in which that country has been placed, the means of subsistence have a tendency to increase faster than the population. Now, this is the case in *every* civilized country. Even Ireland, the country most likely to afford an instance of what Mr. Mill supposes to be the natural course of things, poor and populous as she is, suffers less from want, with her eight millions of people,* than when her only inhabitants were a few septes of hunters and fishers. In our early history, famines and pestilences, the consequence of famine, constantly recur. At present, though our numbers

* This was written in 1829.

are trebled or quadrupled, they are unheard of. Whole colonies of the first settlers in America perished from absolute want. Their successors struggled long against hardship and privation, but every increase of their numbers seems to have been accompanied or preceded by increased means of support.

“If it be conceded that there exists in the human race a tendency to rise from barbarism to civilization, and that the means of subsistence are proportionally more abundant in a civilized than in a savage state—and neither of these propositions can be denied—then it must follow that there is a natural tendency in subsistence to increase in a greater ratio than population.”—(*Two Lectures delivered at Oxford by N. W. Senior. Lect. II.*)

An interesting correspondence between Mr. Senior and Mr. Malthus followed the publication of these lectures, and was appended to them, leaving the point of the controversy pretty much where it originally stood, viz., that while the theoretic *power* of population to increase faster than food was undoubted, the practical fact was that this power was scarcely ever exercised, Mr. Malthus holding to his former doctrine that the reasons of its non-exercise were to be found solely in the severe and general operation of the preventive check.

4. Lastly. The repellent character of the conclusion arrived at appeared in itself a ground for suspecting its truth. Nor do I think this ground is to be put aside as unphilosophical. It is unphilosophical to reject indisputable and proved conclusions because we do not like them, because they disturb our serenity, shatter our hopes, or run counter to our

prejudices. It is not unphilosophical to doubt the accuracy or completeness of any course of reasoning which has brought us to results at variance with other results which appear at least equally certain, and which have been reached by similar processes of thought. Nay, more, it would be unwise *not* to doubt in such cases, not to suspend our judgment, not to reconsider our inferences and our data. There are certain truths which the general sense of mankind has adopted and clings to as undeniable, partly from instinctive conviction, partly from overpowering proof, partly from religious teaching,—such as the wisdom, power, and ultimate, essential, universal goodness of God. It is right and wise to doubt any doctrine which contradicts or seems to contradict these truths, and which has been arrived at by steps of logic. And it is so for this simple reason,—that, though we may feel confident of the justness of our *inferences*, if scientifically drawn by cautious and well-trained intellects, and sanctioned after due examination by other qualified minds, yet we can scarcely ever feel similar confidence as to the perfect accuracy and completeness of our *premises*. Unless we can be certain that we know everything bearing upon the subject, that we are in possession of *every* datum necessary for framing our conclusions,—a certainty which is very seldom attainable,—it may well be that there is something we do *not* know, some facts which have escaped our observation or research, which, if taken into account, would have materially modified, or altogether overthrown our conclusions. Logic fails far oftener from defective premises than from careless processes. Not only there-

fore is *doubt* justified by sound philosophy, where improbable doctrines are sought to be thrust upon us by even the most close and cogent steps of ratiocination, but the doctrines may be of such a character, may be so irreconcilable with beliefs that have become axiomatic, may so revolt our innermost convictions, that we should be warranted—not in rejecting them if positively proved, but, in declaring that there *must be* some deficiency in the premises, some omitted or undiscovered data, which the future progress of knowledge would bring to light, and which, when introduced into the question, would wholly change its present aspect. Now Malthus' theory of population was precisely one of those doctrines, and therefore justly led numbers who could find no flaw in his reasoning, to feel satisfied that there must be some error or hiatus in the bases on which it was grounded; and who, in consequence, while unable to refute his conclusions, were equally unable to adopt them.

Malthus himself felt this so strongly, that he took much pains to argue that his theory was in no way irreconcilable with the goodness of God, but on the contrary harmonized with what we know of his general dealings with mankind. While admitting that it was incompatible with the happiness, if not the virtue, of the great mass of mankind, that it called upon them to do violence to their strongest instincts and to some of their best and most natural sentiments, and opened a terrible vista of probable wretchedness for the future of the race, he argued that this world was designed to be a state of probation, not of enjoyment,—that man was called upon to keep all his appetites in check, and was warned

and punished by the laws of nature if he did not,—and that only by the exercise of such check could he ever advance in civilization or in moral dignity. The allegations may be quite irrefragable, the plea has no doubt a certain force, but it is impossible not to see and feel that it does not really meet the objection it was intended to neutralize. For, in the first place, though Providence may have designed this world to be a state of probation, he assuredly did not design it to be a state of misery, and a state of misery to the majority it must be, as Malthus repeatedly concedes, if his view of the laws of nature be correct and complete. In the next place, though man is bound, both as a condition of progress and under pain of suffering, to *control* his propensities and to *moderate* his appetites and desires, he is not bound to *deny* them. If he is idle and prefers inordinate rest to reasonable work, nature says that he shall starve or live miserably; but nature never says that he shall not sleep or rest at all, or not during the best years of his life, or the dark hours of night. If he eats or drinks immoderately, nature punishes him with dyspepsia and disease, but nature never forbids him to eat when he is hungry, and to drink when he is thirsty, provided he does both with discretion. Indeed she punishes him equally if he abstains as if he exceeds, if he eats too little, or not at all, as if he eats too much. If he indulges to excess in sexual pleasure, nature punishes him with premature exhaustion, with appropriate maladies, with moral enervation and corruption; but she does not punish the rational and legitimate enjoyments of love. On the contrary she *does* punish enforced and total absti-

nence, occasionally in the one sex, often, if not habitually, in the other, by nervous disturbance and suffering, and by functional disorder.

Now, if Malthus' doctrine be correct, the great majority of men and women, if they are to escape a condition of perpetual misery and want, must not only keep within moderate bounds the strongest propensity of their nature, but must suppress it altogether, must deny it even the most sparing indulgence, always for long and craving years, often, and in the case of numbers, for the whole of life.* Do the laws of nature say this? If so, they speak in a language which is wholly exceptional, and which here, and here only, has to be interpreted in a "non-natural" sense. Is there any other instance in which nature says in the most distinct and imperious language, "Thou shalt do this?"—and also in language

* It is obvious that the most temperate indulgence of the sexual appetite, *if it be indulged at all*, is just as conducive to the increase of population as the most immoderate. Once a week is surely moderation, approaching to ascetism: yet once a week, if Malthus be right, would amply suffice to overfill the world. Moreover, postponement of marriage for many years would not answer the purpose of checking the too rapid increase of the population. There does not seem any reason to believe that late marriages, *i. e.*, *moderately* late, or prudent marriages, are less prolific than early ones; there does seem some ground for believing the reverse. *Quetelet* gives as the result of his investigations, that very early marriages have a tendency to become barren (*amènent la stérilité*), and that fertile marriages, as a rule, are followed by the same number of children, whatever the age at which they are contracted, if not beyond 33 for men and 26 for women, a limit which, if reached, implies at least ten years of celibacy or abstinence, which Malthus would surely allow to be "moderation." (See *Quetelet Essai de Physique Sociale*, i., 55—65.) But as a great proportion of this writer's data are taken from the utterly untrustworthy book of *Sadler*, we cannot rely upon them with any confidence. [Examine other Statisticians.]

equally imperious, if not equally distinct, "If thou dost, thou shalt be punished as in other cases those only are punished who *transgress* my laws?" I know of no analogous instance. Let us look thoughtfully at one or two features of the case. *First*, the desire in question is the especial one of all our animal desires—if not the only one—which is not *wholly* physical—which is redeemed from animalism by being blended with our best and purest affections,—which is ennobled by its associations in a way in which the appetites of eating and drinking and sleeping can never be ennobled—in a degree to which the pleasures of the eye and ear can only be ennobled by assiduous and lofty culture. That longing, which lies at the root of life, which enters into the elements of chivalry, which nature has inextricably intertwined with the holy joys of maternity, is singled out as the one, the only one, which must be smothered if we would live in comfort and in plenty. It is not enough that perverted religionists and corrupted imaginations should denounce it as sinful and hint that it is shameful; but a priest of nature comes forward to declare that its *tendency* is fatal to the well-being of the race. Does this sound rational?

Only on the extremest doctrines of asceticism could it be made to appear so. Those who hold that flesh was made to be mortified, that sleep and food are low indulgencies which ought not to be conceded if the wretched frailty of humanity could do without them, and which should be granted only in the scantiest measure,—those and those only, in a word, who revere St. Simeon Stylites as the sound philosopher of all time, can reasonably look upon the

sexual appetite as one to be denied and killed—if possible;—and with such few, accountable to God for the use of their time, will pause to argue. For, *secondly*, consider the enormous over-provision of this appetite which nature has made. If, indeed, it was sent to torment man, to try and tempt him, to be a thorn in the flesh, a perpetual intestinal enemy of terrible strength and sleepless activity, in one long conflict with which he was to wear out life, nothing more effectual could have been devised. But, on any other supposition than this impious and insane one, the over-provision is, as I have said, enormous. It arises early, it lasts long, it defies want and privation, it survives disease, it continues sometimes to within an hour or two of lingering death, it inspires numbers (nay, nearly every one) to face all the toils of life, and too many, alas! to venture on great crimes and risk a violent death, rather than forego its gratification. It masters and overpowers every other passion. All this is incomparably beyond what was needed for the continuation of the species, even under difficulties and discouragement. Why should the desire be prolonged over two-thirds of life? Half-a-dozen years would suffice for the mere purpose of reproduction. Why, again, should it be perennial? A fit of longing once a-year, such as we see to be the law with most of the lower animals, would be ample were the peopling of the world the only aim of Providence in thus endowing us. Indulgence once a-year for six or eight years would be adequate for the “replenishing the earth” at a most rapid rate of increase. Nature has provided for and prompted a thousand fold more than this—indulgence almost

daily during at least thirty years of life—without any of her usual warnings that such indulgence is excessive. Would she have endowed man with a capacity and appetite so vehement and so enduring had she intended to attach so fearful a penalty as Malthus announces on its *moderate* indulgence? It *may* be so; but, assuredly, before accepting the conclusion, wise and good men will require to be convinced that there is no discoverable flaw in the reasoning, and no conceivable inaccuracy or incompleteness in the premises on the faith of which the announcement has been made.

On the whole, then, it was natural that the “law of population,” and the alleged inevitable and perpetual pressure of population on subsistence, should be received with misgivings by those who felt the logical inferences from that law to be improbable and repellent; when it was admitted that every man could produce four or five times as much as he needed for his own subsistence, give him only a field for his labour; when the actual fecundity ever known under perfectly favouring circumstances fell, for some reason or other, so far below its possible and apparently probable amount, and when, as a matter of fact, so far from the numbers of mankind increasing faster than their food, food, as a rule, and through all history, has increased faster than population. These natural misgivings, whatever may be said of some of the considerations on which they were based, I hold to have been well warranted, and instinctively correct. I hope to show in the following pages that Malthus’ logic, though so keen and cogent, was at fault,

because based on imperfect and insufficient premises; that in addition to the *positive* and *preventive* check to over-population enumerated by Malthus, there exists a *physiological* check which escaped his search, and which will prove adequate for the work it has to do; that the pressure of numbers on the means of subsistence (where it exists), and the misery consequent upon it, which he attributed to the laws of nature, are really traceable to human ignorance, or human laws, or human folly; that if we were wise and virtuous, the positive checks would entirely disappear (with the exception of death, in the fulness of time), and the prudential check be only called upon to operate to that degree which is needed to elevate and purify and regulate the animal instinct, and which is quite reconcileable with and conducive to virtue, happiness, and health;—in fine, that Providence will be vindicated from our premature misgivings when we discover that there exist natural laws, whose operation is to modify and diminish human fecundity in proportion as mankind advances in real civilization, *i.e.*, in material well-being and intellectual development; and that these laws will (unless we thwart them) have ample time and space wherein to produce their effect, long before that ultimate crisis shall arrive which the Malthusian theory taught us so to dread.

CHAPTER II.

SPARSE POPULATION OF THE EARTH AT PRESENT.

LET us now see precisely what is the thesis we have to investigate and test the truth of. It is obvious that if the whole earth were already peopled up to the utmost limits of subsistence, no further increase of numbers would be possible without misery; and if the reproductive faculty remained as now, *excessive*, *i.e.*, more than sufficient to replace deaths by births, either the positive or the preventive check must come into operation. Thus stated, no one would dispute the theory of population. But this is something very different from Malthus' proposition, and the world is very far indeed from being thus peopled.

If any one island of limited extent and already moderately peopled, Great Britain, for example, were to be effectually isolated from the rest of the world, either by natural causes or by human laws, it is obvious that, in a comparatively short time,—the reproductive faculty remaining “excessive,” as it is now, and as it probably would continue to be—population would press upon the means of subsistence, and either increased mortality, or increased privation and misery from the necessity of an augmented severity in the preventive check, must be the result. Thus stated, Mr. Malthus' proposition may be granted at once. But no country is thus completely isolated,

and no near approach to such isolation can arise, except from human folly, indolence, or ignorance. Such isolation and absolute impossibility of expansion as would render the Malthusian theory self-evident and indisputably true, would be traceable, not, as he alleges, to the laws of nature, but to man's interference with those laws.

Again, since a man can produce from the soil a great deal more than is needed for his own subsistence, and since in consequence, food will and may increase faster than population,—*granted only an unlimited supply of available land*,—it is obvious that there can be no *necessary* pressure on the means of subsistence, until all the available surface of the globe is taken up and fully cultivated. Any pressure that occurs before that extreme point is reached, it is clear, can only be caused by impediments to expansion; and all these impediments are to civilized man artificial, not natural, of human not of Providential origin. It is obvious that a single family or a single tribe, surrounded by an unlimited territory of uninhabited and productive soil, might go on multiplying indefinitely and without restraint, on the sole condition *of spreading as they multiplied*; and that, so long as they fulfilled this condition, they would never have an idea of what pressure of population or subsistence meant, till they had reached the bounds and exhausted the resources of the habitable earth.

Now what are the practicable impediments to this gradual extension of man over the earth, analysed and traced back to their source? Why do men not thus spread as they multiply? Why have they not always done so? That they have a natural tendency

to do so we know. It is the dictate of nature and of common sense to take in a fresh field from the outlying waste, or to extend their forays over a larger hunting-ground, as children grow up and marry, and as more mouths have to be fed. It has been the practice of mankind to act thus in all times and in some form, so far as history can reach back. There are two ways in which men may spread: they may either actually disperse and settle on other lands, or they may remain at home and exchange the products of their industry for the products of those other lands. The one is emigration, the other is manufacture and commerce. The process by which the earth has been peopled has been usually a mixture of the two, and for the purpose of our argument it is immaterial which is followed, or in what manner the two are blended. People who multiply and live in plenty bring new land into cultivation, and virtually spread themselves, whether they cultivate that new land with their own hands, or through the instrumentality of others whom they employ and pay.

The impediments to the spread of man over the globe are either natural or artificial, physical or moral. The physical ones, properly regarded, will be seen to be, and to have usually been, nearly inoperative. They are climate, sea, and distance. As far as distance is concerned, this is practically not an impediment at all. In the beginning, of course, a community spreads from the outside and *gradually*, and as it spreads, and as civilization increases with numbers and dispersion, roads are made, and means of communication are opened up in all directions. Even mountains and rivers are mere difficulties to be

overcome, not obstacles to prevent. Sea, as we know, operated to check expansion only in the earliest times, in a very slight degree, and in rare and isolated spots, such as some of the remoter Polynesian islands. To civilized man it is a prepared highway, a channel of communication, not a barrier to migration. Climate, where, as in all natural cases, the expansion of the community is gradual, merely *directs* the course of population, and does not check it. Man accommodates himself to climate and provides against its rigours, as long as it yields him a fair recompense for his labour. When it ceases to do this, if he lives according to nature, he turns elsewhere, and virtually the limits of the habitable world, or at least of available land, have been reached in that direction.

The real impediments to expansion—the reasons why man has not spread freely as he multiplied—have all been of a different order, and have proceeded from himself alone. The first has been his *indolence*. He was too lazy or unenterprising to go far afield for his food; he preferred to remain on the land where he was born; he chose to be satisfied with scanty food at home rather than seek plenty a few miles away; he was willing even in barbarous times to fight with his brethren for subsistence, or to abstain from marriage, or to let his children die from insufficient nutriment, or even sometimes to kill them, rather than rouse himself to the exertion of seeking abundance in a new home. This indisposition to spread operates everywhere and always in some measure and in some form. With some it is ignorance of what new fields offer them, and how

easily they can be reached—as with the Dorsetshire peasants. With others it is mere “concentrativeness”—a tendency to the *maladie du pays*—as with the French and some Celtic nations. But in all cases, so long as the land is there, and the means of reaching it exists, the impediment is human; and man has no right to speak of “pressure of population on subsistence,” and to reproach Providence in his heart.

The second impediment is meeting with hostile nations who compress each other and forbid mutual expansion. They may not be to blame; for as long as boundless, unoccupied lands exist, each tribe may be entitled to say to every other, “Go and expand elsewhere, and leave us alone.” But this impediment, like the other, is easily to be surmounted by sense and energy, and comes not from God but from man.

A third set of obstacles is often interposed by human laws. Restrictions on migration and restrictions on commercial interchange are such obstacles. The old law of settlement which forbade the Buckinghamshire labourer starving on seven shillings a week to migrate to Lancashire where he might earn twelve shillings, or which discouraged his doing so, and the old corn laws, and other analogous fiscal enactments, which debarred Englishmen from the free use of the rich lands of the Mississippi, are specimens in point. No one can call obstacles of this sort natural.

It remains plain, therefore, that, even granting the premises of Malthus to be complete and his reasoning irrefragable, there can be no NECESSARY insufficiency of food, or pressure of population on subsistence, or

indispensable demand for the preventive check, till the whole earth is peopled up to the limits of its productive powers, or till all available land is brought into cultivation; and that any pressure of population on subsistence, and consequent misery which may arise previous to that distant time, is traceable solely to human agency or human short-comings. Since if men were wise and well-trained enough to know their interests and to follow them, to see their duty and to do it—if they knew what boundless fertile lands lie around them and within reach; if they were energetic enough to make the necessary efforts to reach them and to assist their less capable brethren to do so, and to do this in time; if all laws directly or indirectly interfering with free expansion and free intercourse were repealed, and their lingering consequences neutralized; if, in a word, there were only among us rough freedom, thorough sense, and a reasonable amount of goodness, mankind might multiply unchecked, if only they would disperse unchecked.* And that pressure of population on the means of subsistence, with all the misery it involves, which Malthus held to be not only *ultimately* but *perpetually* inevitable, is wholly gratuitous and needless, and under wise regulations ought never to be encountered till that future day, of whose distance from our era I will now attempt to give some idea.

The thesis we have to meet, then, is reduced to

* J. S. Mill dwells urgently on the necessity of workmen limiting their numbers if they wish their wages to increase and their condition to improve. I wish to show that the object will be as effectually gained by *dispersion* as by *limitation*. It is not multiplication, it is multiplication *on a restricted field*, on a given area, that lowers wages and brings privation.

this: "THAT, when the whole earth is peopled up to a given density, misery, either in the form of the positive or the preventive check, must inevitably supervene. YES, if the procreative *faculty* shall then remain as "excessive" as at present. NO, if there be physiological laws, clearly indicated by recognised facts, in virtue of which that faculty will then have been so diminished in intensity as only to replace the deaths and maintain the population in a stationary condition.

Let us first observe how far the earth, as a whole, is from being peopled up even to that moderate degree of density which is attained practically in some quarters, and which we know to be quite compatible with comfort and with plenty. The figures we give may not in all cases be strictly accurate, for the areas of different countries are often given, in the authorities we have had to consult, in different measures—sometimes in hectares, sometimes in acres, sometimes in square miles, sometimes in square leagues,—and it is not easy to reduce these into any common denomination with correctness. But our errors cannot be wide enough to affect in the least degree the truth of the impression the figures are calculated to produce.

It is not only probable but, I apprehend, quite certain, that no country is really peopled up to its full possible limit of plentiful subsistence. But there are two or three countries in Europe which may be considered to *approach* this limit,—and these, therefore, we will adopt as our standard of comparison;—the more readily as they differ materially in their physical conditions. One of them, Belgium, has a

climate by no means enviable, and a soil originally, and in many parts the reverse of fertile. Another, Lombardy, has a soil naturally rich, a warm and genial sky, and great facilities of irrigation. Some of the cantons of Switzerland maintain probably as large a population, and certainly as prosperous and well fed a one, as can anywhere be found,—Zurich, Appenzell, Argovie, Thurgovie, for example. Of these we will select Zurich.* Of course the comparison we are instituting cannot be a very exact or rigidly conclusive one, inasmuch as countries vary indefinitely in their natural advantages and their capacity for supporting inhabitants. Still there are not many in Europe much better off in this respect than Lombardy, nor much less favoured than Belgium; while Zurich presents an instance of the condition which may be reached by a people who unite good sense and good government to *fair* natural advantages.

Inhabitants to a Square Mile (English).

Belgium.....	440	Ireland	180
Lombardy	370	German Confederation....	180
Zurich.....	365	Austria	164
England and Wales.....	350	Switzerland	157
Holland	300	Spain	90
United Kingdom	225	Turkey in Europe.....	76
Italy	225	Russia in Europe	30
France.....	180	Sweden	22

It would appear clear from this comparison that of all the states of Europe, only Great Britain, Belgium, Holland, Switzerland, and perhaps Italy, can

* Some of the cantons, and some which we believe are more purely agricultural than Zurich, have even a denser population; thus Basle has 420, Argovie 398, and Thurgovie 368 to the square mile.

be regarded as amply populated. There are three of the largest which assuredly are very far from being so; viz., Spain, Russia, and Turkey. France, with a soil and climate in the aggregate superior to those of England, supports only half the numbers, though she supports them no doubt more exclusively from the produce of her own soil. A great part of the north of European Russia is, we know, unfitted for the production of human food, though yielding largely the materials for human warmth, clothing, and shelter. But no one who is aware how wretched is the state of agriculture even in the provinces most favoured by nature, and over what a vast part of the empire these provinces extend, and how sparse is the population which now inhabits them, can doubt that the country as a whole could support with ease 250,000,000 instead of 60,000,000 as at present. The case of Turkey is almost as strong. The productiveness of many of its provinces is well known; yet with the same area as France she counts only 16,000,000 of people, instead of 36,000,000, and with four times the area of England, and a far finer climate, she only maintains a population smaller by one-eighth. Spain is just as backward, and more blameable, for her soil and climate are, or might be made, productive in the extreme. Her extent is nearly as great as that of France (183,000 square miles to 207,000), yet her population per square mile is only one-half that of France and one-fourth that of England. What increased numbers she might support may be guessed from the fact that some of her provinces do even now show nearly 250 to the square mile. She might easily support 70,000,000, instead of her present

16,000,000, and still not exceed the proportions of Belgium, a far less favoured land. Hungary, too, ought to be specially noted. It contains now about 11,000,000, or not more than 135 to the square mile. Considering the extraordinary fertility of her soil, she might unquestionably find room for 30,000,000, if human ignorance and folly interposed no artificial obstacles. On the whole it is a moderate calculation that the 270,000,000 of which the population of Europe now consists, might become 500,000,000, without any crowding or *necessary* inconvenience.

A much larger number is pointed at by another mode of calculation. It is estimated (for authorities see Alison on Population, II. 480), that an acre of wheat can supply three persons with food, and an acre of potatoes ten persons. But people must be clothed, housed, and warmed, as well as fed; and for these purposes wood must be planted and domestic animals must be kept. We may therefore allot (say) one acre and a half to each individual for all his needs—assuredly a liberal estimate, for in the Canton of Zurich, an acre and a quarter is even now found sufficient. Now Europe contains 2,421,000,000 of acres; and if we throw aside, being guided by the average of Ireland (one of the worst lands in this respect), one-third as unavailable by reason of its being water, or rock, or high mountain, or unmanageable bog,—it would still maintain, at the above proportion, 1,070,000,000, or four times its present population. If we allow 2 acres per head, it would support above 800,000,000.

I have no idea of examining the actual and pos-

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sible density of population in Asia and Africa in any detail. Our knowledge of those quarters of the world is too imperfect, and their statistics far too loose to render any such investigation in the least degree satisfactory. A reference to a few specific facts is all that is necessary. Thus, the population of the Asiatic provinces of Turkey shows only 24 to the square mile, yet Syria and Asia Minor and parts of Mesopotamia are among the most favoured countries in the world, and used in former days to sustain far greater numbers than at present. To the traveller of to-day, they present the appearance in many parts almost of a desert land. We have no doubt that under a good government, and with a sensible and energetic race, they might contain ten times their actual numbers, and still not approach the density of Belgium or Lombardy. Their 16,000,000 may easily become 160,000,000. Probably nearly the same may be said of Persia.

The African dependencies of the Ottoman Porte are said to contain only about four inhabitants to the square mile. But much of their territory is desert. If, however, we look to South Africa, we find an almost unlimited territory thinly inhabited, yet capable of rich cultivation, and swarming with animal life in its lower phases. The entire of Africa is estimated according to the latest authorities to have an area of 12,000,000 English square miles, and a population of 120,000,000, or about 10 persons to the square mile. But British Africa, of which we know most, has an area of about 120,000 square miles, and a population of 350,000, or not three to the square mile. It is obvious that here we have space for nearly indefinite

expansion. A five- or ten-fold increase (*i.e.*, about 1,000,000,000 for the whole continent) would be no extravagant estimate of ultimate possibilities, especially since recent discoveries have proved that even Equatorial Africa can sustain large and populous nations in what to them is plenty.

But it is in America and Australia that we shall find the widest field for the dispersion and multiplication of mankind. America, it may be said, is only just beginning to be peopled. Except in a few localities it is only *sprinkled* with human beings. To say nothing of the older regions of the Hudsons' Bay Territory, there is a vast district lying between Canada and Vancouver's Island, with scarcely any inhabitants, though capable of containing many millions.* A great portion of this district is represented as singularly fertile, far more so than the corresponding longitudes belonging to the United States. Yet the Red River is the only settlement yet inhabited by Europeans, and these are few in number. The day will come, there can be little doubt, when it will be the centre of a nation of 50,000,000. The population of the Canadas was in 1861 only 2,500,000, or less than 8 to the square mile. It might easily become 75,000,000, or 240 to the square mile. As we proceed to the United States, we find that the oldest provinces, though far the poorest by nature, are the most densely peopled. The six New England States averaged, in 1860, 49 inhabitants to the square mile, Massachusetts reaching as high as 130. The

* Article in "Edinburgh Review," British America, April, 1864.

six Middle States, including Maryland and Ohio, averaged 70,—Ohio and New York, the one with its vast tracts of rich soil, and the other with its commerce, industry, and great cities into the bargain, only showing densities of about 62 and 80 respectively. We say nothing of the Slave States, which only averaged 18 to the square mile, nor of the desolate territory, near the Rocky Mountains. But if the seven North-western States and Texas were peopled even to the extent that New England and New York have already reached—say 60 to the square mile—they would contain a population of 30,000,000; 200,000,000 is a moderate estimate for the future members of the Great Republic.

Mexico is a splendid country, of vast capabilities, both of soil and climate. Its present population is estimated at 8,000,000, or about 8 to the square mile. In Humboldt's day, a far larger area contained only 5,800,000 souls. The country, there can be no doubt, would be scantily peopled at 160 to the square mile, or twenty fold its present number of inhabitants. Of Central America we know little, except that its population was once far greater than at present. Parts only of its surface are unhealthy, and even these probably not necessarily or incurably so. The best geographers estimate its actual inhabitants at about 2,000,000, or 13 to the square mile. It certainly might maintain five or ten-fold that number. As for South America, it is impossible to state with any approach to accuracy, either what numbers it does or might contain. Enormous areas of its surface cannot be said to be inhabited at all, though very copiously endowed by nature. Thus—

Chili has to the square mile about.....	6
Brazil " " nearly.....	3
Peru " " ".....	2
Paraguay " " ".....	4
The Argentine Republic ".....	1
Uruguay and Patagonia " not.....	1

There is certainly ample room yet for 200,000,000 or 300,000,000 on the continent of South America, and as certainly for another 100,000,000—probably twice or thrice that number (for each successive exploration discovers fresh wealth of fertile land)—in the great colonies of Australasia.*

No one who even looks over these statistics can avoid the conclusion that the earth is not yet one quarter—perhaps not one-tenth—peopled. No one who reads books of travels in much detail can avoid having this conclusion deepened into a vivid impression and conviction. The entire population of the globe is calculated by the best geographers to be about 1,100,000,000, and probably this is rather an extreme estimate. Of this Europe furnishes nearly 300,000,000, and Asia upwards of 600,000,000, leaving only two for the vast continents of North and South America, Africa, and Australia. We cannot form even an approximate conjecture of the length of time which has been

* The average density of the two Americas is about 6 to the square mile. "The Gazetteer of the World" states that of Africa at 7, of Asia 32, and of Europe at 82. These, however, are only rough estimates.

New Zealand contains as nearly as may be the same acreage as the British Isles, but New Zealand has only a population of 100,000, Britain a population of 30,000,000, or 300 times as great, yet New Zealand is probably superior to our islands both in soil and climate. Australasia has a larger area than Europe—upwards of 3,000,000 square miles. There is nothing, so far as we know at present, to forbid the expectation that it may one day maintain an equal population.

needed for the prolific powers of man, acting under the disadvantageous circumstances of comparative ignorance and social barbarism, to people the world up to its present numbers. It may have been 20,000 years; it may have been 200,000; it may have been incomparably more. No one, we fancy, whose opinion is worth considering on a scientific question, would place it below the smallest figure I have named. No doubt the increase of the human race must be expected to proceed at an accelerated pace in future, unless there should be some retarding influence among yet unrecognised physiological laws, such as we have hinted at, and hope to prove. Agriculture has made vast improvements; famines are not to be dreaded as formerly; few now in any country die of want, and fewer will die from this cause every year, as the world grows older; communication between distant lands—between those whose population is redundant, and those whose land is cheap and plentiful—becomes easier day by day, and mankind may now disperse as fast as they multiply; wars, too, and pestilence may, it is to be hoped, grow rarer and less desolating; and assuredly the average duration of individual life is on the increase. Still, I submit that the thesis intended in this chapter has been made good, viz., that before the earth can be peopled up to its fair limit of density—the limit, that is, compatible with an ample supply of the necessaries and comforts of life—a sufficient number of generations or ages must elapse to permit all the influences developed by civilization to expand and operate. TIME is all we want and time, in adequate measure, we may surely count upon.

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CHAPTER III.

IMPERFECT CULTIVATION OF THE SOIL.

NOT only is the earth not yet a quarter peopled, but even the inhabited portion is scarcely yet a quarter cultivated. In many countries the soil is barely scratched. Even in England it is not made to yield on an average to more than one-half of its capacity. Perhaps only in Belgium, Switzerland, and Lombardy, do the *actual* and the potential produce of the soil in any measure correspond. We can pretend to no accurate estimate of the number of bushels of wheat, or tons of hay or of root crops which an acre of ordinary land under good farming might be made to yield, nor to any statement, proveable by authentic statistics, of what such land does yield, as at present handled. All we can do is to collect a certain number of reliable facts from the best authorities bearing on such comparison. The conclusion will be as convincing as if we were able to draw it out in formally calculated tables.

The average yield of wheat in England is considered to be about $3\frac{1}{4}$ qrs., or 26 bushels per acre. The author of "Lois Wheedon Husbandry," on not special land, and with no manure beyond the straw, obtained for 19 years an average of 34 bushels. A farmer in Hertfordshire, also not peculiarly favoured,

averages 30 from all his land, and has often reached 47, and even 57 bushels per acre. Mr. Lawes, another farmer in the same county, has averaged 35 and 36 for 12 years, and in 1863 and 1864, he reached as high as from 40 to 55, according to the manure he used ("Times," Oct. 19, 1864). Even 60 bushels to the acre has been achieved in good years.

Of oats in England, the ordinary yield is 40 bushels to the acre. But 60 are often reached, and 80 by no means unfrequently.

In Ireland the average of wheat is about 24 bushels to the statute acre, and of oats about 40. The variation between the produce of different countries in the same year is enormous—ranging from $7\frac{1}{2}$ cwts. to 12 cwts. of wheat, and from 11 to 19 cwts. of oats—and in the same counties in different years, from 8 to 14 cwts.

Of mangel wurzel, some farmers grow 30 tons, and some 60 or 64 to the acre. Of swedes some 16, and others 40 tons.

It is clear then that the average actual produce of cereals and root crops in England falls short, probably by one-half, of what it might be even with our present lights and practice, and of what actually is obtained by individuals in many instances. Belgium and Lombardy surpass our best farming, with perhaps very few exceptions. It is stated ("Gazetteer of the World,") that the wheat yield of Belgium is 32 bushels for 2 of seed, or 16 fold; whereas that of Great Britain is only 8 to 10 fold.* But France,

* McCulloch (Geog. Dict.) states the produce of the Waes county, the most fertile and highly cultivated part of Flanders, to be $20\frac{1}{2}$ bushels of wheat and 41 of oats to the acre.

we find, falls as far short of England's average in its agricultural productiveness, as England's average falls short of England's best. France has as good a soil and a far better climate than we have, and, to set against deficient science and inadequate manure, has the advantage of *la petite culture* in a very high degree. Yet, on the unquestionable authority of M. Leonce de Lavergne, its yield in every article is only half of ours. The following are a few of his statements:—*

The yield of oats in England is 5 quarters to the acre, and sometimes as high as 10; in France it is only $2\frac{1}{2}$ quarters. The yield of wheat in England is $3\frac{1}{2}$ quarters to the acre, or 25 hectolitres to the hectare; that of France averages only 12 hectolitres to the hectare. In the case of animal production the disproportion is even greater. England is estimated to maintain two sheep per hectare—France only two-thirds of one sheep. Each cow in England is estimated to yield 1,000 litres of milk—in France only 500. The average yield in meats of cattle slain in France for food is 100 kilogs.—in England 250. ‘With 8 million head of cattle and 30 million of hectares to feed them on, British agriculture produces 500 millions of kilogs. of meat. France, with 10 millions head and 53 millions of hectares, only 400 millions of kilogs.’ M. Leone de Lavergne sums up by a calculation, showing the entire gross produce of soil (animals and vegetables) in the two countries, the the result of which is that England yields 200 francs’ worth per hectare, and France only 100 francs’.

We are accustomed to consider the western pro-

† *Economie Rurale de l'Angleterre*, c. ii., iii., iv.

vinces of Canada and the United States as offering about the most fertile and unlimited wheat fields in the world. Nearly boundless in extent they certainly are, and for the most of extraordinary natural fertility. But this only enhances our surprise at finding how very moderate the present yield even of their best lands actually is, and our conception of the vast difference between what they do and what they might produce. The best lands in Canada, and Michigan, and Illinois, for example, are far superior both in soil and climate, to the good lands of England; yet neither their average nor their maximum produce in wheat approaches ours. Our average, be it remembered, is about 26 bushels to the acre, and our maximum may be put at 60. In the state of New York the average is 14, and the maximum about 20. In Michigan the average is 11, and the maximum 18. New Brunswick the usual yield is 18, in Canada West 13, in Ohio 15. Yet in most of these districts the soil is represented to be of almost inexhaustible richness—virgin soil in fact. The above figures are collected from Johnstone's Notes on North America—a first-rate authority on these subjects. There can be little doubt that English farming on Michigan or Ohio land would give a result far exceeding anything yet obtained in either country,—and why should this combination not be? Is it not certain that some day or other it will be? In order to give some conception of the vast space yet to be travelled over before even the cultivated portions of the temperate regions yield the amount of human sustenance that they are capable of yielding, we will place some of the above facts in a tabular form,—

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calling attention merely to the circumstance that the soil and climate (those of Great Britain) which stand at the head of the list, are, of all those mentioned, about the least favoured by nature.

Produce of Wheat per Statute Acre in Bushels.

Michigan	average.....	11
Canada West	„	13
France	„	13
New York	„	14
Ohio	„	15
New Brunswick	„	18
American	maximum.....	19
Belgian	„	20
English	average.....	26
„	maximum.....	60*
Possible American	„	80

It is clear from the above comparison that we are not* overstating the case, when we say that the actual produce of some of the most extensive and fertile wheat fields in the world is not above one-third of the potential produce, even on the loose agricultural system which at present prevails almost universally. And the same proportion probably holds good of nearly all other crops. But a few facts, fully ascertained and placed beyond doubt, will suffice to satisfy us that an increase far beyond what has been just mentioned, is within our reach.

Economy of seed is one mode in which the available yield of cereals may be greatly increased. The ordinary consumption of seed wheat in the broadcast

* This is the maximum yet reported in regular farming. Mr. Hallett, however, by his process of wide sowing and selection, had reached a rate of 108 bushels per acre. (*Journ. Agric. Soc.* xxii., p. 377.)

sowing commonly practised is $2\frac{1}{2}$ bushels, or 10 pecks, to the acre, and this, as we have seen, yields an average crop of about 26 bushels, or *ten-fold*. In drilling, or "dibbling," 1 bushel, or 4 pecks, is held to suffice, and to yield heavier crops—often 30 bushels, or *thirty-fold*. In one case 4 pecks of seed yielded 40 bushels, or *forty-fold*. One experiment tried in the state of New York, where only 2 pecks of seed were used, showed a yield at the rate of 80 bushels to the acre, or *one hundred and sixty-fold*. ("Year Book of Agricultural Facts," 1860, pp. 110, 129, 131.) But all these cases fade into insignificance before those recorded by Mr. Hallett, as the result of a long series of careful experiments. The extent to which economy of seed is possible may be guessed from the statement made in reference to the "tillering," or horizontal spreading out of the seeds of wheat, "that the stems produced from a single grain having perfect freedom of growth will, in the spring, while lying flat on the surface, extend over a circle three feet in diameter, producing at harvest 50 or 60 ears." Now, each ear contains from 50 to 100 grains. The above increase, therefore, is 2,500, or 6,000 fold. Of the extent to which economy of seed has been practically carried experimentally, we can produce no more signal or instructive instance than the following:—Two adjacent fields, similar in all respects, were selected and sown with the same seed wheat. In the one case 6 pecks per acre were sown, and yielded 54 bushels, or 934,000 ears; in the other case, $4\frac{1}{2}$ pints per acre were used, planting them in single grains a foot apart, and the yield was 1,002,000 ears, or a larger quantity than was produced at the other side

of the hedge *from more than twenty-one times the seed employed.*—(“Journal of Agricultural Society,” xxii, p. 372, *et seq.*) But, allowing this to be an extreme case, it is clear that 2 pecks, if not 1, will suffice where 10 are now habitually used; and the saving thus effectable would be equivalent to a virtual increase of the wheat crop from 8 to 10 per cent.*

Selection of seed is another point to be noticed. Of the gain attainable by this precaution, the celebrated “pedigree wheat” exhibited in 1861 may be cited as probably the best example. In the article just referred to, published in the “Journal of the Agricultural Society,” Mr. Hallett gives a detailed account of his experiments, and their remarkably successful result. By simply selecting a couple of ears of moderate size, and excellent quality originally, and then in successive years’ sowing only, and carefully, the best and largest grains from the produce thus inaugurated, he had in five years doubled the length of the ear, increased the number of ears springing from one grain from 10 to 52, and the number of grains in the ear from 47 to 123. I will not go into any further detail, which, for my purpose, is quite unnecessary; but two points brought out by Mr. Hallett are important as showing the *possible* powers of reproduction in the wheat plant when properly treated: “I have now (he says) a field of seven acres planted with the produce of a single grain planted

* Mr. Hallett found that a field planted with 6 pecks per acre yielded only 54 bushels, and one of inferior soil, planted with one peck, yielded 57 bushels, showing that the extra quantity of seed used was worse than thrown away. He estimates the average waste of wheat thus caused in England at a million of quarters annually. (Vol. xxii., p. 380.)

two years ago—one acre of it with the produce of a single ear planted one year ago.” Again: the ordinary yield in fair farming, that is where two bushels of wheat are used for seed, he states, is considered to be about one ear, or 100 grains, for every two grains sown, or about 50 fold. His best grain produced the first year 688 fold; after two years’ repeated selection, 1,190 fold; and after four years, 2,145 fold. The *possible* increase we have seen to be 5,000 or 6,000 fold.

The use of *appropriate manures* is another mode by which the produce of the soil may be increased to an amount as yet incalculable. Though *careful* husbandry, such as is practised in Belgium and Lombardy, and in some parts of France, where *la petite culture* prevails, is by no means in its infancy, yet *scientific* husbandry is. By scientific husbandry, I mean the adaptation of the crop to the soil, and the use of appropriate manures which will return to the earth what the present crop needs or what previous crops have exhausted. Attention to, and comprehension of, the latter point date from Professor Liebig’s works, *i.e.*, from our own time, and indeed are not yet diffused. Thousands of facts bearing on the subject might be accumulated, but they are not needed. We will cull a few, mainly from Liebig’s “Modern Agriculture.” Where an unmanured plot yielded 15 lbs. of grain, and a similar plot supplied with inappropriate manure gave 16 lbs., the plot treated with the fitting nutriment gave 36 lbs. (p. 57). Mr. Lawes records an experiment where the proportionate result was as follows (p. 77):—

Yield without manure	1000lbs.
With one sort of manure.....	1690lbs.
With the right manure	2000lbs.

Liebig considers (p. 267) that by the use and improvement of phosphate of lime, "the amount of provender for cattle has been increased as much as if the area of every field for green crops had been doubled." What the introduction of guano has done for agriculture—especially for the turnip* and the sugar cane—we have all a general idea. A couple of hundred weight per acre, according to Lawes and Caird, will, even for wheat, give an increase of eight bushels of grain, or 30 per cent., besides 25 per cent. in straw; and one ton of guano is equal in value to 33 tons of ordinary farm-yard manure.—("Nesbit's History of Guano," p. 21, 25.

Again, another indication of the vast increase of food obtainable from land already settled and cultivated may be found in a comparison of the number of cattle and sheep which may be kept on a given acreage, by merely grazing, and by arable cultivation and stall feeding, either exclusively or in combination with grazing. Thus a cow requires from three to four acres of pasture land; whereas one acre of well managed land under tillage would suffice; some say even less. (Consult Morton's "Cyclopædia of Agriculture.") If this be correct, the production of animal food might be doubled in Great Britain, and trebled nearly everywhere else, by a simple change of system, and the application of more labour to the soil, without the addition of a single

* In one case the unmanured field yielded 17 tons, and that treated with Guano 31 tons.—(*Journ. Agric. Soc.*, xxii., p. 86.)

acre. M. Leon de Lavergne states that on an average England keeps two sheep on a hectare, and France only two-thirds of a sheep. In the case of cattle the comparison is still more unfavourable to France, both as regards the size and number of animals. The milk yielded by each cow is double in England, and "with 8,000,000 head on 30,000,000 hectares, England produces 500,000,000 of kilos. of meat, while France with 10,000,000 head on 53,000,000 hectares only produces 400,000,000 kilos." Thus France has not only a vast distance to travel before she reaches England, but England has at least as far to travel before she reaches an easily attainable ideal. Other countries, *à fortiori*, are still further behind the possible.

There is yet another mode in which the amount of human life sustainable on a given area, and therefore throughout the chief portion of the habitable globe, may be almost indefinitely increased, viz., by a substitution *pro tanto* of vegetable for animal food. Practically of course we should never wish to encounter the risk of again feeding a whole people mainly on potatoes, though Irishmen have thriven on that diet, and though an acre in potatoes will sustain three times the amount of human life of an acre in wheat. But a given acreage of wheat will feed *at least* TEN times as many men as the same acreage employed in growing mutton. It is usually calculated that the consumption of wheat by an adult is about one quarter per annum, and we know that good land produces four quarters. But let us assume that a man confined to bread would need two quarters a year; still one acre would support two men. But a man con-

fined to meat would require 3 lbs. a day, and it is considered a liberal calculation if an acre spent in grazing sheep and cattle, will yield in beef or mutton more than 50 lbs. on an average;—the best farmer in Norfolk having averaged 90 lbs., but a great majority of farms in Great Britain only reaching 20 lbs. On these data, it would require 22 acres of pasture land to sustain one adult if fed only on meat. It is obvious that here, again, is the indication of a vast possible increase in the population sustainable on a given area.

But there is much more yet, all tending in the same direction, and confirming our former inferences, if it were needful, or if we had time to go into it. There is an enormous area employed in the production of mere superfluities, such as tobacco, and in *dispensable* luxuries like tea and wine. There are the boundless riches of the sea, as yet not half explored, or utilized, or *economized*. We all know how salmon has been rendered scarce, and how easily it might again be made plentiful, as shown by Alexander Russel, in his entertaining book. If sea fisheries were protected by a law making it illegal to destroy fish while breeding—giving them, that is, a couple of month's immunity, it is calculated that this article of food might be at once increased ten-fold in quantity, and probably reduced twenty-fold in price. For every female mackerel or herring destroyed in full roe, about 500,000 ova perish.

Finally, there is every reason to believe that *cooking*—scientific cooking, that is—by which we mean the intelligent treatment of food so as to extract from it the utmost amount of healthful nutriment,—

is in its infancy, or rather has scarcely entered into life. Probably it is not too much to say that at present, owing to our ignorance, carelessness, and clumsiness on this head,—added to the extravagance and excess of some,—one-half the food consumed is *wasted*; and that twice the numbers now living on the globe—certainly in many of the most civilized countries of it—might be maintained on the *existing* produce of the soil.

CHAPTER IV.

POSITION OF THE ARGUMENT.

LET us now pause for a moment to summarize the results we have thus far attained. We have seen that even the most densely populated countries in Europe are probably not peopled up to the full numbers they might comfortably maintain; that many of them fall vastly short of the maximum actually reached by others not more favoured by nature; and that as a whole there is every reason to believe that the European continent could support three or four times its present numbers. We have seen that a similar conclusion may be adopted with almost equal certainty in reference to a great part of Asia, and perhaps the whole of Africa. We have shown that probably in Africa, and certainly in the two Americas, there are vast tracts of fertile land, with fair, if not splendid climates, which are scarcely inhabited at all, and others which contain a mere sprinkling of human beings; and that in Australasia the case is even stronger. In fine we have seen that while Belgium and Lombardy, which are the best peopled districts in Europe, contain about 400 souls to the square mile, Paraguay contains only 4, and the Argentine Republic only 1. From the aggregate of these facts we are warranted in concluding that

an indefinite number of generations and long periods of time must elapse before the world can be fully peopled,—that before that consummation shall be reached we have cycles of years to traverse, ample to afford space for all the influences which civilization may develop to operate to their uttermost extent.

But this is not all. Not only are few countries in the world adequately peopled, but none even of the most peopled countries are adequately cultivated. England has the best tilled soil in the world, though by no means the best climate; yet in England the average produce of the soil is not half—perhaps not a third—what it might be, and what in many districts it actually is. But the average yield of France, usually regarded as a very productive country, is only half that of England: nay, the average yield of the splendid grain-growing provinces in America, which ought greatly to exceed that of England, falls short of it by one half. Without bringing a single additional acre under the plough, the production of the world, by decent cultivation, might be easily trebled, or quadrupled. In addition to this hopeful prospect, we see vast openings for still greater expansion of our conception of the amount of human life that might be maintained in comfort on the earth's surface, in the wasted or neglected riches of the sea, in the utilisation of lands now devoted to the production of needless or noxious superfluities, in the more skilful extraction from the materials of our food of the real nutriment they contain, and in the transfer of much land from pasture to cereals, and in other economies too numerous to mention.

The above considerations prove that *the world is in*

no danger of being over peopled just at present, whatever *local* congestion may exist; that centuries must elapse before population really presses, or *need to press*, on the means of subsistence; and that civilization will have time enough to do its work, to perfect its resources, and to bring all lands and all mankind under its modifying influences. We have next to show that there are certain influences attendant on the progress of civilisation—and which may be made to attend it even more surely, more universally, and more promptly than they do—which check fecundity, and reduce the rate of increase, and which there is reason to believe tend to do this so effectually, that the danger *ultimately* to be apprehended is the very reverse of that which Malthus dreaded,—that in fact, when we have reached that point of universal plenty and universal cultivation to which human progress ought to bring us, the race will multiply too slowly rather than too fast.

The thesis which I believe, and which I hope to be able to collect facts and indications enough to prove, or at least to make highly probable, is that there exist *two* physiological causes which tend powerfully to check procreation and diminish human fecundity, and that progress and civilization are constantly at work to bring these causes into operation and to render them established and universal.

I. The first physiological law which I think will be found to be indicated by a large number of irrefragable facts is, THAT SCANTY AND INSUFFICIENT FOOD HAS A TENDENCY TO STIMULATE PROCREATION, AND ABUNDANT NUTRIMENT TO CHECK IT.

II. The second is, THAT CEREBRAL DEVELOPMENT

consequent on the sedulous cultivation of the mind, HAS A TENDENCY ALSO TO CHECK PROCREATION;—not perhaps so much to deaden desire as to reduce fertility.

I need not dwell upon the minor proposition, that the progress of the world, if its march be, indeed, deserving of the name of progress, must promote both the supply of food and its fit distribution, as well as the diffusion and increase of mental culture; and that when civilization has attained that culminating point towards which we strive and for which we hope, all stomachs will be fully nourished and all brains amply cultivated and developed.

It is to the two physiological laws above specified that I solicit the contribution of any facts, references to books, or corroborative indications, with which the reading or observation of scientific friends can furnish me.



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CHAPTER V.

FIRST PHYSIOLOGICAL LAW.

§ I. FACTS from the *vegetable* world, indicating that starvation, depletion, danger to life, temporary removal of roots from the soil, and the like, *stimulates* flowering and seeding; and that too rich soil has a contrary operation.

Doubleday, c. ii.

II. Analogous facts from the *animal* world. The law notorious to cattle breeders. Fat animals won't breed. Cows can be *thinned* into fertility, or fed into barrenness. Effect of rich pastures and the reverse. Prize animals.

“Journal Royal Agric. Soc.,” xxii, p. 13.

“Enc. Brit. Art. Agriculture,” p. 244.

“Carpenter, Physiol.”

“Dict. des Sciences Medicales.”

“Doubleday, Law of Pop.,” c. 9.



III. Analogous facts from the *human* world. The race seems chiefly to multiply from its lowest classes. No insufficiency of food seems to check procreation. In "the struggle for subsistence" the generative organs appear to take precedence of all others, to be first served, as it were. Curates. Irish. Comparison of fish eating and meat eating tribes (Brillat Savarin, *Phys. du goût*). Neither desire nor power checked by disease;—stimulated, even, by some diseases, as consumption and scrofula. Apparent determination of nature that the race shall not be *starved out* at all events. Cases from various savage races.

Doubleday. c. iii. *Sadler*, II, Book III.

Sir F. D'Ivernois or Montreux (curious). (Senior's Tracts).

The weak point of my argument here is that, though I have little doubt that it may be proved that *insufficient* nutriment stimulates procreation, and that *excessive* nutriment destroys it, I cannot show that *ample* nutriment (when not overdone) reduces it. But at least we may feel sure that progress and civilization will put an end to that unnatural stimulant which inadequacy of food now supplies.



CHAPTER VI.

SECOND PHYSIOLOGICAL LAW.

INTELLECTUAL culture—cerebral cultivation—tends to diminish fecundity. [Here, again, the same weak place in the argument is discernible as in the last chapter. There is not much difficulty (probably) in showing that *over* culture or use of the brain is unfavourable to procreation, but much difficulty in showing that moderate and rational culture, such as the mass of mankind will be brought to in the progress of civilization, is thus unfavourable.]

Individuals. Let each of us look round among his own acquaintances.

Classes. Dying out of certain ranks. *Doubleday*, c. iv. *Sadler*.

Facts showing increase in the number of *barren marriages*. Most frequent in the highest classes?



CHAPTER VII.

MISCELLANEOUS CONFIRMATIONS.

MISCELLANEOUS *corroborative* indications.

Civilised nations at different epochs. Examine fecundity of *Peers*. Number of families constantly dying out, wherever circumstances enable us to trace them Peers, Baronets, &c. Quakers? Savage races dying out, even when food is ample, and dying out, not from disease or death, but from non-procreation. Maories. Polynesians. Papuans. N. A. Indians. Peru. Indications of some moral or *mental* cause of sterility, quite apart from either vice or starvation. Among ourselves, certainly the best fed classes, the highest, do not seem able to keep up their numbers.

Athletæ in old times—whose body was cultivated up to the highest pitch of strength—were said to lose their procreative faculties altogether. (References).

Doubleday, c. v.

Census of native population of New Zealand, taking in 1865, showed, as far as gone, 100 men to 75 women, and 50 children only. ("Times," March 16, 1865.)

Diminishing fertility in France.

1780. Children per marriage	4·2	1780. One birth to 25·7 of popu-
1826. " "	3·75	lation.
1853. " "	3·20	1820. " " 31·6 "
1864. " "		1864. " " "

Saddler ii, 135. Block i, 61 ; ii, c. 30.

Maories. ("Journal Stat. Soc.," xxiii, 512, &c.)

Quakers. ("Journ. St. Soc.," xxii, p. 220, &c.)

In *Sweden* fecundity appears to have increased as marriages become rarer. (See "St. Soc. Journal," June, 1862.)

Miscellaneous. ("Journal St. Soc.," xii, 69; xiii, 146; xiv, 8, 73, 79, 299.)



4.5.7

9.07.1

2.14.6

