

## THE PRINCIPLE OF POPULATION

## "Overgrown Populations."

It is remarkable that the origin of war should be frequently attributed to the same thing as poverty, namely, overpopulation. That these dual symptoms are believed, even though erroneously, to be due to populations overgrowing themselves is some reason for suspecting that organised violence and the unequal distribution of wealth do in fact possess intimate relationship.

The hoary and decrepit fallacy put forward by Malthus, that population tended to increase at a greater rate than subsistence, was interred long before the Great War by Henry George particularly,<sup>1</sup> who explained how "overpopulation" was really produced. Nevertheless, its spook still walks the earth, and is referred to as a living theory by estimable clerics, Fabian supermen, and even scientific gentlemen.

These, with the point of view of the Sadducee, quote J. S. Mill with gloomy severity: "Little advance can be expected in morality until the producing of large families is regarded with the same feelings as drunkenness or any other physical excess."

Moreover, misled by deceitful appearances, there is sporadic interest taken in the ghostly illusion of Malthus by the imperialists. In a pre-war age of superstition, the complacent acceptance of a doctrinal anomaly, that it was natural for those who produced wealth to be impoverished, was in accord with a similar belief that it was a "sacred duty" for one civilised nation to set its unrequited wealth-producers to kill similar citizens of foreign countries. Those who said that "War is a biological necessity" considered this method of diminishing populations better than civil

<sup>1</sup> See *Progress and Poverty*.

strife, in which respective citizens of each nation slaughtered one another in the struggle for "a place in the sun."

#### **Poverty among Mankind and the Lower Animals.**

Poverty among free animals in nature is of rare occurrence, and exists only when abnormal climatic or other conditions supervene. At times of temporary poverty, say among herds of cattle, all suffer in equality alike, just as they enjoy equally the opportunities in times of plenty. Hence the most industrious animals in search of food at any time are usually in the best condition.

Among mankind, on the other hand, we were presented before the outbreak of the Great War with the extraordinary spectacle of large industrial sections of the population of every land, mainly in those countries proud of their civilisation and wealth, who were suffering from interminable famine even in times of comparative prosperity. Concurrently, other sections, not necessarily industrious, of the same communities had a superabundance. Since the close of hostilities, the unequal distribution of goods has rather increased and poverty has become more widely spread.

In pre-war days it was alleged that the poverty was due to the thriftlessness of the poor, who were, moreover, lazy and shiftless; but while this may have accounted for some cases, it by no means accounted for all, nor did it provide a reason for the overflowing plenty of the idle well-to-do. There were certainly innumerable instances of discouraged men and women who allowed themselves to be broken down, trodden into the mire of vice, dirt and hopelessness, but this fact did not prove the truth of the allegation, only that indigence which is hopeless destroys all vigorous exertion.

It is in man's power by virtue of his special intelligence so to provide for the future that he can cover any conceivable combination of adverse circumstances, and thus he need never suffer even the occasional periods of poverty felt by the helpless lower creation. To a large extent he has already achieved this consummation by world-wide commerce, and there is no reason, short of his own short-sighted acts, why there should be famine in any country.

Since a multitude of honest toilers working long hours, engaged in producing wealth for themselves and others, often end their days in abject poverty, while others, without exerting themselves, accumulate vast possessions, it is simply unreasonable to infer that this state of affairs is the result either of inherent tendencies or inadequate capacity on man's part to produce and exchange.

It is reasonable to believe that there is something wrong with our super-organic environment!

### Darwin's Perplexity.

Owing to his Malthusian atmosphere, Darwin was frequently led into awkward positions. It is evidence of his greatness, however, that he was free from any tendency to subordinate facts in deference to chauvinistic sentiment, and thus he did not allow his common sense to be enslaved by mere preconceptions.

In spite of the plausible reasons given and the superficial seeming necessity for interference, he cautiously deprecated putting into practice the teachings of the neo-Malthusians, pointing out that such interference would operate as a prudential check upon the multiplication of better members of society.

As an example of Darwin's perplexity, under the heading of "Extinction of Races," in the *Descent of Man*, he demonstrated that the change which brings about the disappearance of species or races may be scarcely discernible, that it is not requisite to believe that some cataclysm is necessary in order to extinguish species of either plants or animals. On the American continent, within quite recent geological times, not only many species but whole genera have disappeared, there being no evidence of violence. In some cases of disappearing varieties or races, he observed that only slightly lessened fertility was responsible for the shrinkage.

If increase of population were so pressing that, in addition to great mortality due to accidents and attacks of enemies, it were necessary also for disease, vice, misery and starvation to claim their toll, then no delicate balance could be said to exist. Yet such a balance undoubtedly does exist.

There is a limiting dimension to the racial quantity just as there is an average size for the individual. But the earth is very thinly peopled, and growth of populations persists towards this limitation in spite of artificial restraints, nor can Art extend the boundaries of the races beyond those set by Nature.

We see a similar limitation in the proportion of the sexes, which Darwin was perplexed to discover did not admit of solution according to the theory of natural selection. The fact that the proportion of the sexes is maintained without the necessity of painful checks is not more incredible than that without painful disease, vice and misery, Nature provides naturally for the principle of population.

#### **Some Preliminary Considerations.**

Every student of nature is familiar with examples of limitations which prevent tendencies of some kind running beyond normality and resulting in dangerous consequences.

Because water as it cools contracts, becomes denser and sinks to the bottom, it might be assumed by an inexperienced observer that water would therefore freeze from the bottom upwards. Disastrous consequences would ensue to organic life upon this planet if perchance it did so, but Nature provides that just before freezing-point is reached water expands slightly, and the formed ice, being lighter than the liquid water, floats upon the surface and thus checks radiation of sensible and latent heat.

A structure with a high centre of gravity is unstable when at rest, but that fact is no ground for disputing its stability when in motion; the sceptic would have to deny stability for the spinning top and the bicycle in motion.

Grains of sand are blown about in the wind; why, therefore, are not blocks of greater dimensions and of the same material? The reason for the limitation is based upon the fact that mass increases as the cube of the dimension, while the surface exposed to the wind pressure increases only as the square.

Because a baby doubles its weight in six months is no warranty for assuming that it will do so indefinitely. It would be absurd to conclude that this was the tendency of growth increase, but that, owing to the means of subsist-

ence increasing at a lesser rate, there was automatically provided a starvation check by providence, which was reinforced by those of vice and misery developing as the child reached wicked manhood!

Vice and misery, shrinkage and distortion in the individual as in the race do exist, but they are symptomatic, allied to war and civil commotion, the cause of which we are seeking.

It is important to preserve a due sense of proportion.

Upon the assumption that each child reaches maturity and that each female is fertile, then every woman must give birth to two children in order to sustain the present population of the earth in quantity. But some children die in childhood, others perish before marriageable age, as the result of disease or accident; many are not fertile either by nature or from choice. In order, therefore, to sustain the level of the earth's inhabitants in number, each mother upon an average must have nearer four than three children. But this is an average, and thus a family of six or more must be common, if population is not to suffer a decrease in numbers.

That the means of subsistence is not the most potent factor regulating the size of families is a fact which requires no enlargement. Even ducal families, with a premium put upon succession, frequently become extinct. A tendency to increase in numbers among the "higher" classes is often reversed into a tendency to diminish as idleness and luxury enervate descendants.

On the other hand, there is a high birth-rate accompanied by a high death-rate among those living an animal existence. The inhabitants of unhealthy city and village slums are frequently diseased mentally and physically, and it is a common saying in which there is much truth, "The large family is Nature's last effort to continue the race." How often such progeny die prematurely or are sterile, brought up under the same conditions as the impoverished fathers and mothers!

In an abnormally dry situation, or after a severe long winter succeeded by dry, fine weather, the gardener is familiar with the appearance of plants running rapidly to seed in an attempt to propagate themselves, the parents perishing

in the struggle. But human poverty manufactured by social maladjustments is not temporary in an intermittent sense; hence side by side with never ceasing premature decay and death there exists also stimulation to excessive reproduction in the unconscious effort to continue the race.

In new countries, for a different reason, large vigorous families are common. It is instinctive to provide against the greater risks in the wilderness; moreover, the happiness and welfare of each individual are increased in a greater ratio than the increase in the total number of social units. Population, in a new country possessing a suitable climate for the settlers, sometimes doubles in twenty or thirty years, but this tendency to increase is not sustained indefinitely in the race any more than in the individual.

These are preliminary considerations. In order to exorcise once and for all the bogey of "overgrown populations," let us overcome its excusable repugnance to scientific examination and induce it to enter the biological theatre for dissection and analysis.

### The Mystery of Matter.

To explain recent wonderful discoveries in radio-activity, old hypotheses have had to be abandoned and replaced by new ones in accord with the truths arrived at by observation or experiment. It is suggested by modern physicists that there is nothing involved in the material universe save æther and energy. The material substances, which seem so real and substantial to us, are according to modern theories only patterns and textures woven out of the intangible æther.<sup>1</sup> Electricity, magnetism and motion are the physical trinity of the cosmos, the manifestations to our consciousness of the infinite Intelligence.

The universe has not been founded upon a blind series of accidents, although it may appear that in this way we have discovered something about it. It is, so far as our limited reason can pierce the veil surrounding the God-

<sup>1</sup> By introducing a new set of axioms of space and time, the latter being regarded as a fourth dimension, Einstein in his theory has cleared up certain difficulties residing in the retention of æther medium in our conception of matter, so that the latter need only be regarded as a manifestation of energy or intelligence.

Nature, the resultant of intelligent, purposeful and orderly evolution, the beginnings of which we are not able to trace to the source, nor are we permitted to foresee its destined end.

### The Phenomenon of Life.

Far back in the nebulous past, when the solar system had not condensed into a sun and planets, there was always manifested that affinity of one particle for another, the natural law of gravitation discovered by Newton, and comprehended in the statement that any two particles of matter are attracted in direct proportion to their mass and in inverse proportion to their distance squared.

By biologists this fundamental all-pervading physical law is believed to be the origin of all sensation—"asleep" in inorganic "life," "dreaming" in lowly organic, and in varying degrees moving and awake in the higher forms of life. There must be intelligence in what we know as inanimate matter, since intelligence has come out of it.

The process of millions of years by which intelligence has been actively manifested in ourselves is that of progression in evolution. By the older biologists it was thought that this progression was due to a compelling struggle for existence in a *hostile* environment, but it is now being realised that it is rather due to impulsion towards happiness in a *neutral* environment.

From the fundamental trinity of electricity, magnetism and motion there have grown during the past existence of the planet many elaborate diversifications. Electricity has been made manifest in the multitudinous forms of inorganic and organic life, magnetism in many affinities, including that of sex, and motion has been revealed in sensation of the unconscious sort, conscious instinct and the higher intelligences.

It is scientifically unassailable to say that there is no death or extinction of intelligence. The indestructibility of intelligence is as real as the indestructibility of matter. The phenomenon of wakeful activity is only one sector of a continual cycle like day and night. There is an alternation of activity and sleep, and each rest in the cycle refreshes, or should refresh, the transmitted "memory" of heredity. The

lengthening capacity due to progressive development in evolution is similar to the lengthening diurnal period which has taken place during the geological ages of the earth by reason of the tides.

All is life, there is no death: we awake again in the children of the race, and the intelligence of the dissolved individual falls "asleep" into the common fund of Nature.

#### The "Birth" and Growth of Crystals in an Environmenting Solution.

It is in the process of crystallisation in an environmenting solution that the principle of population is most simply illustrated, the crystal being the most perfect form of inorganic individuality.

Crystals grow by the deposition of fresh solid matter upon their surface, differing to this extent from all plasmic bodies, which, being semi-fluid, take new matter into their interior. But because the principle of growth is the same, following the same laws, biologists have employed crystals for the purpose of elucidating the growth of living organisms.

The limit of growth in the crystal is reached when the internal cohesive force of the building molecules is overcome by the force of gravity of the earth. The internal affinity and the external limiting action are in reality due to one and the same law of Nature, the law of gravitation.

A crystal in the environmenting solution will not grow unless the solution is in a *super-saturated* condition, and when it reaches a definite size, determined by its chemical-molecular constitution, the solution yet remaining super-saturated, a number of small crystals appear upon the large one. They in turn proceed to grow and develop until the limit of size is reached.

When the solution is reduced to the condition of *saturation*, no further multiplication takes place. The tendency in a solution which is slowly evaporating is for the growth of quantity of crystals so to advance as to balance exactly, and to keep the solution at saturation-point.

Crystals are not "born" when they are not wanted, and a condition of "overpopulation" of crystals, *unless the environmenting solution is interfered with*, is a physical impossibility. The crystals themselves cannot multiply so as to



outrun subsistence, and if the solution be diluted artificially to a condition of under-saturation, crystals only dissolve until saturation-point is reached. That is to say, either the crystals are completely dissolved or a few are. Thus, although temporary poverty may occur, a state of interminable poverty cannot be produced. In the nature of things, poverty is a *transient* condition, and this is contrary to the Malthusian doctrine.

#### **The Growth and Multiplication of Organisms.**

The chief characteristic of organic life is what is known as metabolism, the process causing the conversion of food into plasm. Metabolism is determined by the vital force by which new living matter is formed. By this means the nutrition and growth of the living being is effected, and also its reproduction, similar to the transgressive growth of crystals.

The principle of growth in the living organism shows only diversification in the progression by evolution. It is, "The limit of individual size is determined for each species by two factors—the inner constitution of the plasm, which is inherited, and the dependence on the outer environment, which controls adaptation." (Häckel.) That is to say, the growth of a moneron or of any cell is restricted in a similar manner to the growth of the crystal. The growth of the quantity of cells is likewise only an extension of the growth of the individual, restricted by gravitational considerations, remaining stationary in quantity in an environment saturated with subsistence. When, in the case of the bacterium, the supply of food equals the demand of an existing number of cells, a condition of quiescence is assumed, and no further cleavage takes place. The cells cannot increase so as to outrun subsistence, and only resume multiplication when they exist in an environment super-saturated with food.

#### **Associated Communities of Cells.**

Any animal or plant is composed of millions of cells, the affinity of which is due to unconscious impulsion on their part to co-operate for happiness and preservation, to the ultimate happiness and preservation of the community of cells forming the highly organised individual. In ourselves

some cells fulfil the function of the skin, others that of the supporting bony structure, the internal organs and so forth, while others yet again circulate and serve the whole community of cells, as the blood and lymphatics.

So long as our outer environment is natural, i.e. within the scope of our inherited constitutional power of adaptation established by countless ages of associated "memory" in evolution, the cells of our bodies obediently respond, without necessity of conscious interference on our part, voluntarily carrying out their several duties in the division of labour. Indeed, any interference or self-abuse is manifested in injury followed by disease.

#### **Youth, Maturity and Dissolution.**

The cells of the association which we call our body are continually being used up or dissimilated, and concurrently built up or assimilated. In youth, assimilation gains upon dissimilation until maturity is reached, when the income and expenditure of cells balance one another. In old age, a reversal takes place, and dissimilation increases in the cyclical process until it constantly gains upon assimilation and the dissolution of the individual ultimately ensues.

The period of youth in the human animal is about twenty years, and since in the order of primates the total period of life averages five times that of the period of youth, a man normally should live until he is a hundred. This he should do in full possession of his faculties, the brain being the last organ of the body to mature and the last to deteriorate.

Just as new crystals appear when the limit of size is attained in the existing crystals, so likewise, as the limit of size of the human individual is reached, there is transgressive growth or reproduction, which is regulated in normal circumstances by the complex differentiation maintaining the happiness of the parents.

#### **Nutrition and Reproduction.**

Nutrition and reproduction are the two basic instincts inherent in the inner constitution of the plasmic cells which compose our bodies.

From these two primary instincts there have been extended during the course of the ages diversifications in

secondary instincts and in intelligence, which have spread into branching ramifications similar to those of the species themselves. The higher in the organic scale, the more advanced are these trunk and branch extensions of the primary instincts.

In the case of man, his activities form great kingdoms, the boundaries of which are of almost immeasurable extent. He is an animal, but, like the mythic earth-tree with its roots in the soil, the topmost branches of man's mental and spiritual nature may blossom in the heavens.

Man does not live by bread alone; mere subsistence is a minor factor in the equation of environment for which he is constitutionally adapted. "He braves the scorching heat of the desert and the icy blasts of the polar sea, but not for food; he watches all night, but it is to trace the circling stars. He adds toil to toil to gratify a hunger no animal has felt; to assuage a thirst no beast can know." (Henry George.)

Human thirst for knowledge is equalled by the human capacity manifested in transgressively growing far beyond the limits set by organic capacity. Power of locomotion is extended into machines, which travel at great speed over land and sea or fly through the air. To assist man in producing these inanimate parts of himself, he employs extended arms in a multitude of power and hand tools.

In personal adornment, in the dwellings and home surroundings to which we extend our affections, in the musical instruments with which we reinforce our vocal power, in the thousands of the brain's progeny, the instinct of reproduction is the elementary essence from which all spring. That is why we value most the things we construct with our own hands or purchase in exchange by the fruits of our services. Possessions to which we are justly entitled, individually or in co-operation, are in fact extensions of our organic organisation. "The sacred rights" of property, the product of human labour, is no mere figure of speech.

### **The Proportion of the Sexes.**

In the *Descent of Man* Darwin confesses: "I formerly thought that when a tendency to produce the two sexes in equal numbers was advantageous to the species, it would

follow from natural selection, but I now see that the whole problem is so intricate that it is safer to leave its solution for the future."

There is a very simple solution at hand in the theory of transgressive growth. That the sex quantities should be constant and equal is an unavoidable consequence of the growth principle, intermediate complexity only attending cases of sex-differentiation, illustrated in bees, wasps, ants and termites.

The quantities (not necessarily numbers) of each sex obviously form branchings of transgressive growth, bearing the same relationship to each other in any species as do the opposite poles of a steel magnet, of a crystal, of the earth, which is a large crystal, or of the universe itself. One cannot exist without the other.

In mankind there is a tendency to produce the sexes in equal numbers. It is idle controversy to compare sex values for the purpose of saying which is greater. Just as the south magnetic pole is as important as the north, but opposite in polarity, so the woman and the man are equal complements of each other. It is for this reason that female infanticide cannot cause a tendency to male-producing in the race, any more than amputating thumbs can perpetuate a thumbless tribe. It is also disclosed why any institution of polygamy or polyandry inevitably results in disaster, but it does not follow that against their will the individual of one sex should be bound irrevocably to the other in marriage.

#### **The Plant Kingdom and its Environing "Solution."**

The plant, by means of its chlorophyll granules under the influence of sunlight, is able to form by synthesis and reduction new plasm out of simple inorganic compounds as food.

These compounds are mainly (a) water evaporated from the sea, and rained down from the clouds; (b) carbon dioxide, a product of animal or other combustion, and always forming part of the atmosphere; (c) nitric acid and ammonia, formed by the action of atmospheric electricity and also a product of the dissimilation and decomposition of animals and plants; (d) mineral salts and iron from the

soil. Except for the latter, all the constituents taken from the "solution" of the plant kingdom are supplied by the atmosphere.

When surveying the vegetation of the country-side, it is interesting to bear in mind the fact that, except for a proportion averaging about 1 per cent., plant life, including the forest trees, comes not from the soil but from the air.

Plant life cannot increase so as to outrun subsistence. Carbon dioxide in the atmosphere never falls below a certain percentage anywhere, that is, the "solution" is always "saturated." There are seasonable variations, which the plant kingdom is adapted to bridge over, but anything approaching sustained poverty in the Malthusian sense is utterly impossible.

#### **The Animal Kingdom and its Environing "Solution."**

The animal kingdom, either directly or indirectly, subsists upon the plant kingdom, which is its environing "solution." It may be generally said that the plant kingdom is the agent of assimilation, while in the animal kingdom, on the contrary, dissimilation preponderates, the plant plasm being resolved by oxidation in a complex process of analysis, in which albumin assimilation for growth and reproduction of the organism is produced and energy manifested in animal heat and motion.

That is to say, the plant kingdom stores up energy supplied by the sun, and the animal kingdom dissipates it by consuming plant material as fuel, not being able to utilise the primary inorganic compounds direct.

The products of combustion are all returned in a suitable form for re-assimilation by the environing vegetation. The organic world as we know it depends for its existence and progress upon this mutually advantageous cycle, in which exchange is made continually between the synthetic activities of the plant and the analytic activities of the animal.

If vegetation were to die out, animal life would entirely cease, while if animals were to vanish vegetation would persist, but the shrinkage would be enormous, because only the very lowest forms of plant life would be able to survive. Animals, far from impoverishing their "solution," enrich it by the fertilisation and distribution of seeds. They are

the unconscious agents of "peaceful penetration," carrying plant culture into every part of the globe. The vast, seemingly wasteful scattering of seeds and fruits, which used to be regarded as evidence of intense struggle for existence; from the correct point of view is evidence of Nature's profusion, and a complete refutation of alleged niggardliness on her part.

In the biological sense animals are not the parasites of the plant kingdom. True parasites are distinguished for degenerate development, and gradually lose their organ of sense, means of locomotion and digestion. They are the "slave-owners" in Nature's economy, taking, but giving nothing in return for services, and their punishment is inevitable extinction. Even the carnivora serve a useful purpose in evolutionary progress, stimulating the development of activities in the herbivora and incidentally in themselves.

If carnivorous species of animals tended to increase at a greater rate than subsistence, represented by the species upon which they prey, then they would certainly die out; and if in general animals tended to increase in numbers so as to outrun subsistence, represented by herbage and foliage, the earth would inevitably become a lifeless planet. Overpopulation in the Malthusian sense is a biological impossibility: the "mother solution" of the animal kingdom is inexhaustible.

#### **Man's Capacity and his Limitation.**

What has been said with regard to the animal kingdom applies in a special way to man. The apex order of the primates, he alone within the final limits of air, water and sunshine can modify and extend his enviroing "solution" beyond anything imagined in the most Utopian dreams.

So far as food alone is concerned, chemistry in agricultural practice demonstrates that the most unpromising inorganic matter, as, for example, basic slag, lime, sulphate of ammonia and the nitrates, can be converted into food-stuffs under suitable conditions, so that an almost limitless population could be fed. The whole population of the world is already fed, clothed and housed by the labour of a small percentage of mankind, and it could very well con-

tinue being so supplied with these requisites, if all the lengthy, twisted line which connects a man with his food were short-circuited. Not only is the present efficiency extremely low, the proportion of unemployed at each end of the social scale being high, but the toiling masses are to an unrealised extent engaged in useless or harmful occupations.

The surface of the earth has only been touched in a few places, and it is, in fact, crowded with inexhaustible possibilities. The barren rivers of New Zealand were turned into an angler's paradise by the importation of a few boxes of English trout spawn. Newfoundland fishermen were provided with an abundance of flesh food by the introduction of the American hare. Following the example of Dr. Jackson in Alaska, Dr. Grenfell in 1908 took reindeer over from Finland to Labrador, which saved the Eskimos from rickets, scrofula and tubercle, because they were thus provided with milk, cream and butter. If famine can be exchanged into plenty in hard climates and in sparsely populated mountainous countries, it can be surely so in fertile lands possessing good climates and inhabited by plentiful industrious people, who have all the advantages of close intercourse and co-operation.

"Here is the difference between the animal and the man. Both the jay-hawk and man eat chickens, but the more jay-hawks, the fewer chickens, while the more men, the more chickens. Both the seal and man eat salmon, but when a seal takes a salmon there is a salmon the less, and were seals to increase past a certain point, salmon must diminish; while by placing the spawn of the salmon under favourable conditions man can so increase the number of salmon as to more than make up for all he may take, and thus, no matter how much men may increase, their increase need never outrun the supply of salmon." (Henry George.)

#### **The Indestructibility of Matter.**

Throughout vast æons of time the earth's surface has been progressively modified by the action of slow forces of upheaval and disintegration. The rocks have been crumbled under alternate expansions and contractions in the course of unnumbered diurnal and seasonable cycles, assisted by the agency of water and glacial action.

Lands have been sunk beneath the sea, and corresponding elevations have taken place during the "breathings" of the crust, and this out of all proportion to the erosion by the oceans and rivers.

Organic life, since it made its appearance, has had an increasingly important part in the "softening" process, in preparation for and the making possible human existence. Man himself is producing not inconsiderable changes, always extending his multifarious activities.

Nevertheless, during all these changes, in which matter has been used over and over again as coin for the exchange of energy, not an atom has been added to or taken away from the surface of the globe by its denizens, plant or animal, present or past. They themselves were and are merely of the earth, presenting in their material manifestation phases in the cycle of growth, maturity and decay.

Coal, taken from the tomb of buried primeval forests, forms part of a reservoir of solar light and heat given to the earth hundreds of thousands of years ago. Untouched, unmeasured fields of it lie beneath the surface in many parts of the globe, especially in China, Russia and the United States of America. Although it may one day be consumed, it will not then be destroyed. The gases of combustion will simply be used up in the economy of Nature. The increasing vegetation which would result if the coal were all used up would replace the coal.

Civilisation and happiness are in no sense dependent ultimately upon coal or mineral oil, and the welfare of the human race will not be cataclysmically affected by their exhaustion. As well fear that the fishes may drink the sea dry, as that man may exhaust all natural resources.

#### **The Extinction of Races and Species.**

The normal extinction of a race or species is determined, when the progression by evolution in environment outruns sufficiently far the progression by evolution in heredity of the individuals composing it.

The individual bears the same relationship to the race that the cell does to the individual.

When some one or more factors are modified or eliminated in the equation of environment, to which the hereditary



power of adaptation cannot respond, falling short ever so slightly, it is enough to upset the delicate balance between the inner constitutional productive power and the normal dissimilation of the individuals. The latter constantly gaining upon the assimilation of individuals, the whole race disappears.

Man, in common with all other species, *ceteris paribus*, will doubtless one day succumb, but this consummation is a remote one; nevertheless, premature dissolution of a portion of a race is not impossible, any more than that the individual may injure himself owing to evil living and bad habits.

The possession of intelligence carries with it the power of achieving great happiness if directed into right directions, but if perverted, then the misery is in inverse ratio. We see this every day in the case of individuals, but we are only just beginning to realise that communities as a whole may "live dangerously" or survive happily by learning wisdom.

It is from this point of view that we see a reasonable explanation for the alternations of civilisations. Civilisations go to pieces because there grows up some superstition which creates artificial conditions beyond the natural power of adaptation of the individuals to withstand. A great struggle for existence takes place, but if the superstition remains the culture grows in upon itself, withers away, or collapses in anarchy.

The shrinkage of population, generally assisted by agencies like the Black Death, may be so great that former populous countries may be rendered desolate. It is this fact which has given rise to the erroneous belief that a civilisation or culture is an inherent property of a race, in spite of the obvious absurdity of such a supposition. The duration of life of a race must be counted in hundreds of thousands of years, whilst civilisations have risen and decayed within the space of a few hundred years.