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ARTICLE II.

HEREDITY AND SOCIAL PROGRESS.

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To ministers of the gospel and all others who work heartily for the spiritual welfare of mankind, the subject of heredity must necessarily be of great and permanent interest. It meets them in the Sacred Scriptures in the passages which declare that God visits the sins of the fathers upon the children unto the third and fourth generation; in the question of the prophet Ezekiel, when he asked what the Israelites meant by their use of the proverb, "The fathers have eaten sour grapes, and the children's teeth are set on edge" (Ezek. xviii. 2); in the genealogies, as shown by Fuller's quaint comment, "Lord, I find the genealogy of my Saviour strangely checkered with four remarkable changes in four immediate generations: (1) Rehoboam begat Abia, i.e., a bad father begat a bad son; (2) Abia begat Asa, i.e., a bad father begat a good son; (3) Asa begat Josaphat, i.e., a good father begat a good son; (4) Josaphat begat Joram, i. e., a good father begat a bad son. I see, Lord, from hence, that my father's piety cannot be entailed; that is bad news for me. But I see, also, that actual impiety is not always hereditary; that is good news for my son." Further, linked with heredity, is the doctrine of original sin, deduced by Calvinistic theologians from the writings of St. Paul, that as Adam and Eve were the root of all mankind, in consequence of their sin, they transmitted a radically corrupt nature to all descending from them by ordinary generation. Lastly, and

most important, there are the words of the Lord Jesus: "And his disciples asked him, saying, Rabbi, who did sin, this man, or his parents, that he should be born blind? Jesus answered, Neither did this man sin, nor his parents" that he should be born blind (John ix. 2-3).

But it is in the exercise of the pastoral side of the ministerial profession, in efforts to help those who have been defeated in the battle of life, that the problems of heredity are most keenly felt. What is it that makes moral and religious progress so slow and toilsome, that seems to hinder, almost to frustrate, the gracious purposes of God for mankind? Is life so confined within the meshes of heredity, function, and environment, as to afford no good escape when these are unfavorable? Or is it possible by observance of the rules of eugenics, the elimination of unhealthful occupations, the improvement and enrichment of the environment, and by educational, moral, and spiritual influences, so to elevate the character and condition of the individual, and eventually of society, as to justify the confident hope that the establishment of the kingdom of God upon this earth is not a far-off dream, but can be realized sooner than is commonly expected, if men will unitedly work and pray for it? These are the questions now to be considered.

In the first place, Does man inherit the whole of his complex nature — body, soul, and spirit — from his parents? Obviously his body is derived immediately from them, and science traces the remote origin of man to lower forms of life. Over the origin of his higher nature, there has been unending speculation. Primitive peoples believe in a simple transmigration of souls. With the advance of civilization, as among the ancient Egyptians and Greeks, the conception persists and becomes more ethical, the condition of the soul in one existence being conditioned by its moral conduct in the life preceding.

At the present time this doctrine confronts the Christian missionary in the great religions of Brahmanism and Buddhism, as the practical belief of millions of people. Among the Jews the cabalists hold it, and claim to find authority for doing so in their Jewish scriptures. In the early church so influential a theologian as Origen was inclined to it, as he thought human souls are fallen angels who become incarnate in this world for discipline and purification. Coming to modern poets and philosophers, the conception of the preëxistence of souls meets us in the familiar lines of Wordsworth:—

“Our birth is but a sleep and a forgetting;
The soul that rises with us, our life's star,
Hath had elsewhere its setting,
And cometh from afar;
Not in entire forgetfulness,
And not in utter nakedness,
But trailing clouds of glory do we come
From God, who is our home.”

In philosophy, there is the hypothesis of Pluralism, that all souls are eternally preëxistent; God is incomparably wise and powerful, but is not their Creator. In non-theistic Idealism the hypothesis is extended so as to exclude the idea of God.

The doctrine of the transmigration of souls when the reincarnation is considered as taking place through the soul of a dead person animating the body of an infant of its own kindred or descent, is somewhat plausible even from the scientific point of view, as it seems to account in a natural way for the likeness between parents and children, and for the peculiarities of atavism, or reversion. Otherwise it renders the relation between parents and children so tenuous and unreal, as to make the subject of heredity hardly worth consideration.

According to the theory of Creationism, God immediately creates out of nothing a soul for each individual, which at

birth unites with the body produced by ordinary generation. In the main, this has been the doctrine of the Christian church. But it does not explain why the child resembles the parents, and often remoter ancestors, in spirit as well as in body, and it leaves the universal and ineradicable sinfulness of the race a hopelessly inexplicable problem.

Competing with Creationism is the Traducian doctrine, first advanced by Tertullian, that souls are generated from souls, in the same way, and at the same time, as bodies from bodies.

Upon this whole subject, modern psychology can give us no more help than theology, as it confesses that while "personality" can be discerned in its "becoming," nothing is known of its origin. Probably if Traducianism were divested of its crude materialism, and kept apart from the doctrine of Original Sin, it might be generally acceptable; the more so if it were tempered with Creationism so far as to hold that we do not come into the world by chance, unheeded by Providence, but that each soul has been the object of God's particular foresight, the words spoken to the prophet Jeremiah being applicable to all, "Before I formed thee in the womb I knew thee" (Jer. i. 5).¹

¹For an interesting note on "The Origin and Constitution of Man," see Westcott's Commentary on the Epistle to the Hebrews, in which he maintains (p. 114) that there is an element in man which is not directly derived by descent, though it follows upon birth; but we are not to suppose that separate and creative acts for each individual call into existence this higher element. On the other hand, his friend and co-worker, Dr. Hort, referring to the materialist controversy, states that there are two ultimate positions not yet proven, but likely to be true. (1) Man with his whole mental and spiritual nature is derived through various steps from lower beings having no such nature, and these probably in turn from inorganic bodies; (2) Man's whole mental and spiritual nature is conditioned by his physical nature and its pathological states, no mental and spiritual movement taking place without a concomitant physical movement. (*The Way, the Truth, and the Life*, p. 187.)

Passing from theological and philosophical speculations over the origin of the soul to the practical beginnings of modern embryology in the seventeenth and eighteenth centuries, the Preformation theory of man's physical origin was widely held. As the future flower is contained in the bud, and with growth is gradually unfolded, so, it was thought, a homunculus, or miniature model of the adult, lay within the germ, awaiting development, and within this model there lay minuter models of the next generation, and within them others for the succeeding generations, and so on. This position was abandoned in favor of the opposing theory of Epigenesis as soon as embryology began to be studied scientifically; and it was seen, for example, that the growth of all the higher forms of life is a gradual "becoming," a visible development of the apparently simple into the obviously complex. There is a certain amount of truth, however, in the conception of Preformation; the organism is contained potentially in the germ-cell, and the potentiality of future generations also.

Granting that life has its beginnings in simple, embryonic forms, what is it that constitutes the link between one generation and the next, securing the resemblance of the child to its parents? Further, as this resemblance is never complete, what is it that causes the differences between them? How far do the resemblances and differences depend on bodily changes which have occurred in the parents, due to use, disuse, or injury, which are afterwards transmitted to their offspring? This last question is of great practical importance. As Herbert Spencer said, correct views of this subject underlie right beliefs not only in biology and psychology, but in education, ethics, and politics.

The writings of Lamarck on this particular point have profoundly influenced scientific thought, and to a considerable

extent theological thought also, as his interpretation of nature gives strong support to the "argument from desire." An evolutionist before Darwin, he held that the development of species was mainly due to the modification of his inheritance by the heir, and the transmission of the inheritance, so modified, to the next generation. He argued that considerable and sustained change in an animal's life produces change in its needs: change of needs involves new habits: new habits involve the use of undeveloped parts of the organism, or the different use, or disuse, of more developed parts; this results in the production of new organs, or the modification of old ones; such gains or losses are transmitted to descendants. According to this theory, to cite a familiar illustration, the giraffe has acquired its long neck because in each generation it has been stretched more and more by the efforts of the animal to eat the leaves of trees. The writings of Spencer and Haeckel also maintain the transmission of acquired characters, and the theory is essential to their system of philosophy. Few biologists now hold Lamarckism as originally stated; but it contains the truth that an animal is self-assertive, self-adaptive, to some extent at least, master of its fate.

Darwin partly agreed with Lamarck as to the transmission of acquired characters; and, to give a full explanation of heredity, he advanced the hypothesis of Pangenesis, i.e. that the cells of every part of the body are continually throwing off extremely minute particles, which he called "gemmules"; these gemmules collect in the reproductive cells; in the formation of the offspring, they multiply by self-division, those of like character unite and grow into cells like those from which they were originally derived, and so the varied structures of the body are formed. To account for reversion and allied phenomena, he assumed that some of the gemmules might re-

main latent, even for generations. As changes in the body have their representative gemmules, it follows that modifications may be transmitted. This hypothesis has not been verified, and few or none now hold it. Yet some biologists think that there may be a return in this direction sooner or later, as it has been recently discovered that there are specific substances, called "hormones," produced by the cells of the body, which pass into the blood stream, and play an important part in stimulating, or controlling, developmental and metabolic processes.

But the views held at present by Weismann and other eminent biologists are very different. It has been found that in certain lowly animals, at the initial stage in the life of the embryo, two kinds of cells may be distinguished — the somatic cells, and the reproductive cells. The somatic cells multiply and develop in manifold variety, and are built up into the different parts of the body. The reproductive cells take no part in the differentiation and growth of the body, their one, exclusive function being the continuation of the species. As the germ-cells of the offspring are thus continuous with the germ-cells of the parents, they will in turn give rise to similar organisms. In the development of higher forms of life the process is necessarily much longer, more complicated, and the whole of it cannot be experimentally observed; yet the evidence is considered sufficient for holding that there is the same distinction of somatic and germ-cells, and the same distribution of functions. Hence in human beings, as the somatic and the germ-cells have each their separate functions, and changes in the somatic cells do not affect the germ-cells, or the germ-plasm, and it is the germ-plasm which preserves intact all the hereditary qualities, and forms the only link between successive generations, it is clear there can be no transmission

of a somatic modification. So far not a single convincing case of such transmission has been produced. Therefore, to use metaphorical language, the parent is simply the wine-cup passing the wine of life received from ancestors on to his children, a holder or trustee rather than a producer, and the wine-cup imparts no new quality to the wine. If this theory is correct, (and the weight of biological opinion at the present time is certainly in its favor,) it must greatly modify many of our present schemes for the betterment of the race.¹

Granting the inheritance is confined to qualities actually or potentially present in the germ-plasm, the question arises, What are the relative contributions of parents and ancestors to the characters of their descendants? According to Galton's "Law of Ancestral Inheritance," the two parents between them contribute to their offspring one-half of each inherited faculty, each parent contributing one-quarter. The four grandparents contribute between them one-fourth, or each of them one-sixteenth, and so on in diminishing ratio as the ancestors are more remote. The individual's inheritance is therefore a mosaic of ancestral contributions; and as the totality of the fractions, however far back we go, is of course only equal to one, the contributions of our first parents to the inheritances of the children of the present generation is infinitesimally minute.

The inheritance is also, to some extent, subject to Mendelian law.² It has been found that in plants and animals there

¹For a clear and judicial exposition of the whole subject, see J. Arthur Thomson's *Heredity* (1908); *Darwinism and Human Life* (1910); and his other works, from which the present writer has freely drawn; also art. "Heredity and the Direct Action of Environment," by Sir E. Ray Lancaster, *Nineteenth Century*, September, 1910.

²Mendelism, by R. C. Punnet (1910). It should be stated that

are certain heritable qualities or characters, termed "unit characters," which may be handed on intact from generation to generation, or dropped out completely, (when the negative character becomes Mendelian,) independently of other qualities or parts. The horned or hornless state of cattle, the tallness or dwarfness of peas, the immunity or susceptibility of wheat to "rust," are instances of unit characters arranged in allelomorphic pairs. Now when two pure strains each possessing one of a pair of allelomorphic characters are crossed, the opposing characters do not blend or compromise in the offspring, but remain distinct. The character which is the more assertive, is called the dominant character, the other, the recessive. The appearance of these characters in the offspring is subject to known laws. If tall peas and dwarf peas are crossed, the plants of the first generation all show the dominant character of tallness. But when this hybrid generation is "selfed," i.e. inbred or self-fertilized, some of the offspring show the dominant character, others the recessive, there being, on the average, three of the former to one of the latter. The recessives are pure, bearing only the recessive characters; and so, when selfed, they produce recessives only. One-third of the dominants are also pure, producing only dominants when selfed. The remaining dominants are impure, carrying both characters, as in the first generation; when selfed, they produce offspring in the same definite ratio as in the second generation — one pure dominant, two impure dominants, and one pure recessive. Breeding may be continued on these lines for any number of generations. Hence by the interbreeding of hybrids of the same strains, offspring may be extracted

the conclusions of the Mendellians are still being disputed. See Poulton's *Essays on Evolution* (1908); Reid's *Laws of Heredity* (1910).

which will breed true to the types of the original parents used in that cross. From the breeder's point of view, therefore, Job's question, "Who can bring a clean thing out of an unclean?" may be answered in the affirmative. Further, a breeder with full knowledge of the pedigree of the plants or animals he is dealing with, may proceed with speed and certainty to build up synthetically, character by character, the plant or animal he desires.¹

The extent to which Mendelian phenomena occur in man is not known with absolute certainty, but of late there has been a rapid accumulation of evidence to show that such characters as the following are Mendelian: the color of the eyes; night-blindness; albinism; fiery red hair; the musical sense; brachydactyly, a peculiar condition of the hands, each finger having only two phalanges instead of three; deaf-mutism; certain forms of imbecility; resistance to disease. If man is indeed subject to Mendelian law to a great extent, it is of very serious import; for "Mendelism enormously enhances the power of the hereditary factor in determining evolution; it leads us to realize more strongly the power of persistence that definite characters may have even when there is intercrossing. Definite characters for good or ill, whether dominant or recessive, do not disappear in Mendelian inheritance; they persistently reappear in their original purity." And the definite characters for ill cannot be eradicated from the inheritance by education or an improved environment. The unfortunate possessor of them may possibly be improved; but if he marries, his children are likely to receive the same

¹ It has already been possible in a few generations to build up and fix wheats combining the desirable characters of several varieties, results which must greatly influence the agricultural outlook of every country.

defective inheritance. From this point of view it may be admitted that "as our knowledge of heredity clears, and the mists of superstition are dispelled, there grows upon us with an overwhelming and relentless force the conviction that the creature is not made but born."

The operation of these laws secures the resemblance of parents and children, but the resemblance is never complete; there is always difference between them. When the difference is of germinal origin, the expression of a subtle change in the germ-plasm, it is a *variation*. This change may be due to a variety of causes: the blending of diverse inheritances, each with contributions from many ancestors; the possible struggle between the constituents of the germ-plasm for expression; the bathmic, inherent growth-force which compels forms of life to vary progressively in a definite manner through successive generations; the plasticity of the organism which enables it to make effective response to the stimuli from an ever-changing environment, and other factors. As variations may be transmitted from generation to generation, the tendency to variation is the condition of progress. It is this which has raised man above the lower animals. Hence there is good reason for the Hebrew thanksgiving: "Blessed art thou, O Lord, who variest the creatures."

Changes impressed on the organism after it has once come into being, inclusive of the period of prenatal life, are either congenital peculiarities, accommodations, or modifications.

Congenital peculiarities are generally due to disease or imperfect nurture of the mother during her pregnancy; e.g. children born during war-time in besieged, famine-stricken cities are said to show a larger proportion of abnormalities than children born in times of peace and plenty; chronic

poisoning of the mother with alcohol or other poisons will, of course, affect the general health of her unborn child.

Accommodations are temporary adjustments of the organism to changes in the environment; as, the sunburn of those who visit the tropics.

Modifications are changes which last the lifetime; such as those produced by the circumcision of Jewish boys and the footbinding of Chinese girls. As there is no proof that congenital peculiarities, accommodations, or modifications ever affect the germ-cells, it cannot be said they are transmissible from generation to generation.

Variations may be small, continuous fluctuations of the organism, or the sudden, discontinuous variations, large or small, known as transilient variations, mutations, or sports. More importance is attached to mutations now than formerly as furnishing the raw material for the evolution of species. Darwin believed that evolution depended almost wholly on the small, continuous variations, and that mutations were rare, and liable to be swamped by intercrossing. But many instances are now known of discontinuous variations among animals and even more among plants; there is good evidence of these variations breeding true, and in the laws of Mendelian inheritance there is the reason why a mutation which has once arrived should persist. This means that in the production of variations the autonomy of the organism itself plays a larger part than was formerly supposed. Man himself may have started as a "mutation."

Heredity secures the unity; variation the diversity. But the tendency to variation has its limits. When the peculiarities of large populations throughout a series of generations are noted, there is seen to be regular regression which brings the offspring of extraordinary parents, alike of the meanest

and of the highest capacity, in a definite ratio nearer the average stock. In this law of Filial Regression, science gives us the conception of each nation as a vast fraternity with an average of physical and mental gifts to which all tend to conform. The offspring of the extraordinarily gifted lose by sinking to the average, but the vast number of those under the average tend as surely to rise.

Another important factor of heredity is the tendency to retrogressive variation, i.e. when the offspring tends to throw back to remote ancestors; or, to express it differently, where ancestral characters emerge after a long period of latency. Sometimes regression seems to mean degeneration, often so perhaps in the moral world; but physically, it may indicate the return of the organism to a position of greater stability.

A brief account may now be given of the influence of these laws on the individual and social well-being.

1. If acquired characters are not transmitted, then *acquired diseases*, particularly infectious diseases, *are not inherited*. This is indeed good news, if the statement of a well-known scientist be true, that the nightmare of the specific inheritance of acquired diseases has overloaded the spontaneity of life, paralyzed the will, and hampered all public and private effort to improve the environment. The evidence and arguments in favor of the view that disease itself is not hereditary, (though the tendency to it may be, and innate abnormalities, as pointed out in connection with Mendelism, are also hereditary,) cannot be given at length in a paper of this kind; suffice to say that if tuberculosis, for example, were inheritable, it means that the vegetable micro-organisms which are the cause of the disease, must be within the germ-cells at the time of fusion, which is a physical improbability. Even if this did happen, still the germ-cells would only be the accidental car-

riers of the bacilli; no indissoluble union would ever be formed between such incongruous forms of life. Hence if persons now afflicted with infectious disease were prevented from conveying the infection to others, and if all external sources of infection were destroyed or rendered innocuous, as they can be, then infectious diseases of every kind — typhoid fever, influenza, diphtheria, small-pox, scarlet fever, bubonic plague, tuberculosis, syphilis, malaria, yellow fever, and all other wide-spread scourges of the human race — could all be banished from the earth in the course of two or three generations. As these diseases destroy millions of human beings every year, a terrible weight of sickness, sorrow, and pain will be lifted from the race when they disappear, and there will be much less temptation for men to doubt the love or the power of God. Even as things are, nature seems to give almost every child a good physical start in the world. In no single instance has it been proved that ill-nourished or unhealthy babies are more frequent at the time of birth among the poor than among the rich, or that so-called hereditary diseases affect the newly born children of the rich and poor unequally. The poorest and most ill-nourished women bring forth as hale and strong-looking babies as those in the very best conditions. In fact, it almost appears as though the unborn child fights strenuously for its own health at the expense of the mother, and arrives in the world with a full chance of living a normal physical existence.¹ Surprising as it may be, this seems to be also true of the children of alcoholics.²

¹ Report of the English Privy Council upon Physical Deterioration, *The Lancet*, September, 1904.

² To ascertain whether the children of alcoholics presented any appreciable inferiority to the children of sober people, in respect either of physical development, of intellectual activity, or of acuteness of sense-perception, 3604 children of Manchester and Edin-

2. If acquired characters are not inherited, then *acquired vices are not inherited*. No doubt a child receives its moral and temperamental traits as a part of its ancestral inheritance, and therefore may have the same moral bent. It is also true that the social and other consequences of the parents' sins are often visited upon the children unto the third and fourth generation, and even beyond. But a person who acquires a vice to which his parents and ancestors were strangers, cannot fasten that particular vice upon his children. "The son shall not bear the iniquity of the father. The soul that sinneth it shall die" (Ezek. xviii. 20). As a matter of fact, as Fuller observed in the biblical genealogies, a bad man may have a very good child. Abijam who "walked in all the sins of his father, which he had done before him," begat Asa who "did that which was good and right in the eyes of the Lord his God."

As there has been much controversy over this matter, it may be well to elucidate it a little further. To come to a crucial point to which allusion has already been made, If a father is a drunkard, will not his children become drunkards also? Not necessarily, though a bad environment and the paternal example may tend to make them so. Unquestionably in certain families there runs a history of alcoholism, each generation furnishing its quota of victims. Even in these unfortunates, however, the love of alcohol, *per se*, was not a direct inheritance. What they did inherit was an incorrigible inborn weakness, some "strain of the stuff," some "warping past the burgh were examined. No marked relation was found between the intelligence, physique, or disease of the offspring and parental alcoholism in any of the categories investigated. On the whole, the balance turned as often in favor of the alcoholic as of the non-alcoholic parentage. (The Influence of Parental Alcoholism on the Physique and Ability of the Offspring, by Miss Elderton, Galton Research Scholar, University of London, and Professor Karl Pearson, F.R.S. (1910).)

aim," which made them the easy victims of this particular evil. In other members of the same stock, the inherited weakness probably showed itself in a different way. Thus, in the record of one degenerate family, the children in the order of birth were a ne'er-do-weel, a periodical lunatic, a dipsomaniacal daughter, deformed triplets who died at birth, a prostitute, a double monster born dead, a normal daughter, a paranoiac son. The deductions from the statistics of lunatic asylums as to the inheritance of drunken habits, and as to drunkenness being a cause of insanity, are often fallacious, because in degenerates drunkenness is not the cause but the expression of the mental weakness; such persons are diseased from the start.¹

The case is otherwise with the man of sound stock who becomes a drunkard. In him the bad habit is an acquisition, and he cannot plead ancestral weakness in extenuation; his father may have eaten sour grapes, but his own teeth were not set on edge until he frequented the vineyard himself. "Every man that eateth the sour grape, his teeth [and his only] shall be set on edge" (Jer. xxxi. 30). There is no hindrance to his reformation but his own acquired weakness or perversity; for he is not in the same pitiable plight as the born degenerate; the battle may be hard, but if he will, he can win his freedom.

3. If acquired characters are not hereditary, then *mental*

¹ One large English lunatic asylum reported in 1905 the admission of 494 new cases, and assigned intemperance as the cause of the insanity in 84 cases, or 17 per cent. On a more careful examination of these 84 cases, it was found that 13 of them were imbeciles; 5 were epileptics; 5 suffered from chronic delusional insanity; 5 from organic dementia; and 20 from primary dementia. More than one-half of them, therefore, were the subjects of an inborn tendency to mental disease. (Mott, art. "Alcohol and Insanity," British Medical Journal, September, 1907.)

and moral impressions made on ancestors do not affect the offspring. It has been argued that if the memory cells are the collected photographed impressions of experiences, and these cells in the process of photographing undergo some subtle change in physiological structure, then it is not difficult to understand how these negatives of impressions might be handed down from one generation to the next, and affect the mind of the descendant when the circumstances were sufficiently provocative; and this may account for the mysterious causeless fears which sometimes assail us, for the illusion of ghosts and kindred phenomena, and for the strange conviction which sometimes flashes through the mind, that what we are at the moment experiencing has been experienced before, the feeling to which Tennyson alludes in the lines:—

“Moreover, something is or seems,
That touches me with mystic gleams,
Like glimpses of forgotten dreams—
Of something felt, like something here;
Of something done I know not where,
Such as no language may declare.”

There is no proof whatever that sensory impressions made on the cerebral cells with which memory is physiologically correlated can at the same time so affect the reproductive elements as to cause the same impressions to be transferred later to the cerebral cells of descendants, or that the contents of the subconsciousness can be transmitted from one generation to the next. The same may be said of all intellectual, emotional, and volitional activities of the brain. Hence the recent statement by a prominent theologian that “man is a bundle of inherited tendencies, and will in turn transmit his nature, with its new marks of good and evil, to those who come after him,” can hardly be accepted. The average man in the period of adolescence and early maturity rarely has any

considerable stock of acquired goodness to bequeath; and if all new marks of evil are transmitted, it would seem that every generation should be worse than the preceding. On each individual would rest the accumulated burden of all the follies, sins, and crimes of his ancestors, and these in the course of time would become his own. Surely, if this doctrine were true, a race would be produced of devils in human form. He must be very pessimistic indeed who thinks human nature, despite all the influences of Christianity, is steadily and rapidly growing worse.

In this connection, mention may be made of maternal impressions, as they are popularly supposed capable of affecting the unborn child. Sir Walter Scott relates that the English King James I. could not bear the sight of a drawn sword, because of the impression made upon his mother and transmitted to him in the prenatal state, when Rizzio was murdered in her presence. It is an open question whether the murder did indeed give Mary, Queen of Scots, a profound and lasting shock. Apart from this doubt, in days when swords were freely used in warfare, duelling, and assassination, many others besides the king, especially of the gentler sex, assuredly had the same fear, though their mothers had never witnessed a tragic occurrence; just as to-day there are men and women who cannot bear the sight of a loaded revolver, although their mothers have never seen a person injured by fire-arms. The nervous apprehension of injury to one's self or to others is sufficient to create the fear. So with birth-marks and other physical deformities. Among the vast number of lasting impressions which a woman receives during several months, it is not difficult to find one which may be brought into relation with a birth-mark, and certainly in some

instances the coincidence is very striking.¹ Even though the relation was actually proven, still the birth-mark would be a congenital peculiarity, not an acquired character which has been transmitted. The general scientific verdict, however, is opposed to the theory of the transmission of maternal impressions, except in the very refined form that to whatever extent the mind is capable of influencing the state of a *part* of the body, to that same extent, or to a degree rather less, the mother's mind may possibly influence her unborn child.

4. If acquired characters are not transmitted, then *the effects of use and disuse are not inherited*. No one denies that in the individual the disuse or misuse of faculties will be followed by their degeneracy; but most biologists deny the transmission of this degeneracy to the offspring. The blindness of fishes and crustaceans that live in dark caverns and subterranean waters, so often mentioned in sermons as examples of this hereditary degeneracy, may be otherwise explained than by attributing the blindness to the perverted habits of ancestors of good sight that preferred darkness to light, and were consequently deprived by nature of the powers they refused to use, their descendants suffering the same loss. Suppose that a long time ago a number of fish belonging to a certain species, some with good and some with bad sight — for many animals in the usual course of events are born with distorted or defective eyes — were carried underground by water into a dark cavern. Not at once but very gradually would the species adapt itself to the new conditions. After the lapse of generations, the survivors would have learned to live in complete darkness, and to distinguish and catch their prey without the aid of sight, owing to compensatory improvement in other organs, especially those of touch and smell.

¹ Weismann's *Essays, The Supposed Transmission of Mutilations*. Vol. LXVIII. No. 270. 3

During this long period whenever there was any chance of escape, those with good or fairly good eyes would follow the glimmer of light and eventually reach the outer air, leaving behind the congenitally weak-sighted and blind to perpetuate their kind, until at last there were only blind fish in the cave. It is obvious that this general blindness is not due to the transmission of acquired characters, but to natural selection acting on congenital fortuitous variations.¹ This interpretation, we venture to say, better illustrates the laws which prevail in the spiritual world. If a man chooses to dwell in moral darkness, he loses the power of spiritual vision; the light that is in him becomes darkness (Luke xi. 35). But the possibility of his children seeing heavenly visions is not thereby lost: the true light lighteth every man coming into the world (John i. 9).

5. Of course if evil acquisitions are not transmitted, then *good acquisitions are not transmitted*. Hence piety, learning, all the various graces and accomplishments we spend so much time and pains in acquiring, do not become a part of the in-born inheritance of the next generation. "I see, Lord, that my father's piety cannot be entailed; that is bad news for me," wrote Thomas Fuller, and many a clergyman's son has doubtless echoed the same regret. The loss in this respect is extremely great, but man is not like the lower animals, that are completely in the grip of their surroundings and mastered by them. He has a lasting external heritage of ideals, embodied in religious forms and organization, in church and cathedral, in school and university, in statue and painting, in prose and verse, in tradition and convention, in society itself. This heritage is capable of endless modification for the better, and may be so effectual in modifying individual character in every generation, that its results come almost to the same thing

¹Welsmann's *Essays, Retrogressive Development in Nature.*

as if acquired characters are transmitted. To turn to the familiar metaphor of the potter's wheel: the clay has certain qualities which remain practically unchanged; but the potter's hands and wheel which shape the clay into a vessel of honor or dishonor as the case may be, are the innumerable external influences which affect the physical and moral development of the child, and these are subject to human control. In the history of many families may be seen the powerful molding influence of a vocation or view of life, handed down with deliberate intention from generation to generation, so that military, legal, and other talents often seem to be hereditary, whereas the natural powers may have been of the ordinary kind with a bent in no particular direction. Family tradition rather than the blood of genius made the Medici great for three centuries. The Bachs were prominent in the musical world for eight generations, because the musical ability of every member of the family was carefully fostered, frequent meetings turning the family almost into a school of music. If it takes four generations to produce gentlemen, it is not because a long time is required to purify the blood or change its hue; but a long time is required to create the atmosphere of perfect social refinement which can press upon a child from its birth and eventually make a gentleman of him. Space will not permit illustrations of the power of the church, of society, and of the state, to create an environment favorable to human development, and to conserve the social gains of one generation for the benefit of the next. Suffice to say, it is this external heritage supported by the goodness and providence of God, rather than individual acquirements, which guarantees the continued progress of the race.

Judging by what has been said, it is evident that for all who come of good stock there is boundless hope and encourage-

ment. All they need is proper moral and physical training and a favorable environment. Unfortunately, all do not get this, but it is the work of the Christian church to obtain it for them. The program outlined at a recent clerical meeting in England, at which over a thousand clergymen were present, can surely be indorsed by every lover of his kind. "We are resolved," said the speaker, "to insist that a fair wage, a decent living, an even chance in life, and a respectable livelihood shall be the heritage of all who deserve them. Nothing that can in any degree contribute to the social betterment of the people can be ignored. We intend to do our utmost to permeate all possible forces in the work of social reform with the spirit and power of Christ's evangel." Such pronouncements herald the dawn of a more perfect day.

On the other hand, to the weakling, the unfit, to those who come of bad stock, the dissipants, the undesirables, the biologist is very stern. His judgment might almost be summed up in the words of the poet:—

"And as the son of Thetis said,
I hear thee saying now:
Greater by far than thou are dead,
Strive not: die also thou."

Often doomed to struggle with hostile forces too strong for them, it is these unfortunates who swell the ranks of the nervous wrecks, the insane, the suicides, and to a large extent the criminal class.¹ Their existence and propagation are a menace to the welfare, even to the very life of a nation. In England, for instance, during the years 1874-96, when food was

¹The famous Jukes family in seventy-five years produced, in round numbers, two hundred thieves and murderers, ninety prostitutes, two hundred and eighty invalids attacked by blindness, idioy, or consumption, and three hundred boys and girls who died during childhood. It is estimated that the family cost the state over a million dollars.

cheap and wages high, the ratio of defectives, including the deaf and dumb, lunatics, epileptics, paralytics, the crippled and deformed, debilitated and infirm, increased from 5.4 per thousand to 11.6 per thousand, or more than double. Similar statistics come from almost every highly civilized country, and, more ominous still, they are accompanied by figures showing a declining birth-rate in the families best fitted to survive. A declining birth-rate among the undesirables is no cause for disquietude; on the contrary, it is the unanimous opinion of sociologists and biologists that they ought not to be allowed to breed their kind. To some extent, nature weeds them out; what can society do in the same direction? Sympathy for the unfortunate, and the feeling of the solidarity of the race, will never sanction measures too Draconian. The following have been suggested as not too harsh or unreasonable:—

(1) Criminals of the worst kind should be incarcerated for life; or, as in Indiana, compelled to submit to vasectomy — a surgical operation not at all serious, which retains sexuality but insures sterility.

(2) Marriages should be prohibited by law between the insane, feeble-minded, epileptics, and others of the unmistakably degenerate class. This is already the law in several States. Possibly in the not distant future, before any marriage whatever is performed, the contracting parties will have to produce medical certificates of their mental and physical soundness.

(3) Celibacy might be enforced by separating and isolating the unfit of each sex — not in prison, but in island communities, where, in exchange for their sacrifice, they would be supported by the state.

By the enforcement of these measures, it is claimed much may be done to raise the physical, mental, and moral standard of the nation.

Not to paint the picture in colors too dark, it should be stated that many of the criminal class are not physically degenerate; they are people out of their appropriate time and place. The born tramp and others of most wayward life, for instance, hark back to the nomadic habits of far-off ancestors. These temperamental reversioners are unregenerate rather than degenerate. Turn their restless energies into proper channels, and they render invaluable service to mankind as geographical explorers, roving Christian missionaries,¹ and in other vocations and occupations.² Further, in many families which show a criminal history, the persistence of criminal tendencies is due not so much to heredity as to the difficulties which those belonging to a family with an evil reputation, however well inclined, encounter in finding an honest and sufficient livelihood. If beaten in the struggle they return to evil ways, the children inevitably walk in the father's footsteps, and thus furnish statistics for the

¹ Of David Livingstone, it is said: "We can see that he possessed (at first unconsciously) the real fever of geographical discovery which forces so many of our countrymen to explore strange countries under the guise of missionaries, naturalists, sportsmen, soldiers, and traders" (*Livingstone and the Exploration of Central Africa*, by H. H. Johnston, *The World's Explorers Series*).

² In an interesting article descriptive of the life and training of a naval officer, after complaining of the poor pay and other hardships of the profession, the writer says: "It is difficult to understand why it is followed by so many capable and well-educated men. The only reason the writer can give is that the men on the bridge belong to that class of men who have the curse of the gypsy blood in their veins; the blood of wanderers, practically untamed men who cannot brook a quiet life. The same type of men is to be found in America, among cowboys, woodsmen, and miners. The breed is the same the world over" (*Delaney*, art. "The Man on the Bridge," *Atlantic Monthly*, May, 1910).

supposed transmission of evil acquisitions. As a matter of fact, the strength of the criminal class is not as great as is commonly supposed. If normal children are prevented from joining it, as they can be by proper training; and if the weak-minded and morally irresponsible are kept apart from the evil of the world, as they ought to be, then its only recruits are adults who fall into criminal ways of their own free will and choice, and these are not very numerous. A writer who speaks with authority¹ contends that if only seventy known criminals in England were put out of harm's way (not seventy thousand, as some might be inclined to think), the whole organization of crime in that country would be dislocated, and ten years hence an immunity from crime would be enjoyed there that at present it seems utopian to expect.

As biology pronounces so stern a sentence upon those who come into the world incurably weak or defective, it may well be asked if a truly Christian society has no words of comfort and hope for them. Must all the bruised reeds be broken, and all the smoking flax be quenched? In reply, it may be pointed out that the social debt is not altogether on one side. Many of those not wholly normal have made notable contributions to the happiness and good of the race. In the development of religion among primitive peoples they played a very important part, and all through the course of religious history their names are constantly appearing; e.g. the founder of the great existing religion of Mohammedanism was an epileptic. As Professor James says: "Even more perhaps than other kinds of genius, religious leaders have been subject to abnormal psychical visitations. Invariably they have been creatures of exalted emotional sensibility. Often they have led a discord-

¹ Sir Robert Anderson, Chairman of the Criminal Investigation Committee of the English Parliament for many years.

ant inner life, and had melancholy [melancholia?] during a part of their career. They have known no measure, been liable to obsessions and fixed ideas; and frequently they have fallen into trances, heard voices, seen visions, and presented all sorts of peculiarities which are ordinarily classed as pathological. Often, moreover, these pathological features in their career have helped to give them their religious authority and influence." Perhaps such peculiarities must be accepted as pathological; for until man attains perfection he must ever be at strife with himself and surroundings, and so the saint's disposition, like sweet bells jangled, will often be out of tune and harsh; but among writers who regard physical law as the limit and norm of all truth, the inclination is much too great to depict everything in man that seeks God, or that answers to his seeking, as disease. This is seen in such a work as Lombroso's "Men of Genius," where nearly every possessor of a noble gift, since time began, is shown to have been more or less insane. Little or no allowance seems to be made for the fact that the intense, unremitting labor and thought, often required for the expression of genius, taxes the nervous system to the utmost, and at last searches out and exposes whatever innate weakness there may be. If it were possible to impose a similar strain on those who have no particular talent or genius, the result might be equally disastrous. It is a comforting reflection, and an antidote to envy, to know that the mental safety of most of us lies in our mediocrity. However, if all men of talent and genius are more or less insane, it strengthens the point we desire to make,—that for the sake of their great gifts, and because of their weakness, when the evidence is clear of their inability to stand the strain of common life, somehow or other, society should take special care

of them.¹ How much poorer the world would be in music, art, religion, philosophy — in every high department of human thought and life — if all the noted men classed by Lombroso as partially insane, had never lived! Again, how much more fruitful their genius might have been, how fully the gifts of God to them might have been developed and manifested, had they been guarded from strifes and worries which they were not able to bear! “Rabbi, who did sin, this man or his parents, that he was born blind? Jesus answered, Neither did this man nor his parents [that he should be born blind], but that the works of God should be made manifest.”

What of the undesirables so numerous in the slums of our large cities, the weak-minded, the “moral imbeciles,” the epileptics, incorrigible inebriates, deaf and dumb, paralytics, crippled and deformed, debilitated and infirm, hysterics, neurasthenics, and all other queer and helpless people, who have no special gifts, nothing whatever, to plead for them, except their misfortune and need? All have a claim to the aid of the state, especially the feeble-minded, when no other aid is forthcoming. It might be well for the race if all these poor strains were extinguished; but it is hard to see how this can be accomplished, even by the mild ways already indicated. Nature has always been saying to man, “You must die”;

¹“The old Arab tribes would gather in liveldest *gaudeamus*, and sing, and kindle bonfires, and wreath crowns of honor, and solemnly thank the gods that in their tribe too, a Poet had shown himself. As indeed they well might, for what usefuller, I say not nobler and heavenlier thing could the gods, doing their very kindest, send to any tribe or nation, in any time or circumstances? I declare to thee, my afflicted, quack-ridden brother, in spite of thy astonishment it is very lamentable. We English find a poet, as brave a man as has been made for a hundred years or so anywhere under the sun, and do we kindle bonfires and thank the gods? Not at all. We, taking due counsel of it, set the man to guage ale-barrels in the burgh of Dumfries, and pique ourselves on our ‘patronage of genius’” (Carlyle, Past and Present).

and he has always answered back resolutely, "I will live." Perhaps the resources of the state for dealing hopefully with undesirables are by no means exhausted, and the work of their redemption may not be quite so heavy as it seems. Many of the above-mentioned conditions are not inherited in the strict sense of the word (e.g. the crippled, deformed, paralytic, debilitated, infirm, and many of the deaf and dumb are the victims of acquired diseases, accidents, and old age); so the greater part of this disease and incapacity can be prevented in the future, if it cannot be remedied in the present. Further, recent medical and psychological research is proving that many mental disorders are caused, not primarily by structural changes in the brain, but by toxins circulating in the system, a condition much more amenable to treatment; also that other mental disorders are due to purely mental causes, such as irritating memories lurking in the subconsciousness, and these by appropriate treatment can be dispelled. Consequently, it does seem as if wholesome nurture, proper training, and a favorable environment, ought to accomplish wonders in reducing this mass of misery and helplessness, and perhaps enable many of these poor strains to acquire in the course of a few generations their normal tone and strength.¹ At all events, the individuals of the undesirable classes can be redeemed, as the work of the Salvation Army and other Christian organizations abundantly witnesses. Here and now, these defectives, unless hopelessly diseased, are being changed by the power and grace of God into useful, law-abiding citizens, who are no burden whatever to the community. Other laws

¹"To me it seems overwhelmingly probable that slum-dwellers, factory hands, and the like are physically inferior, not because they are as a class incapable of developing as well as the best sections of the community, but mainly, if not solely, because their surroundings are such that they have not the chance of developing as well

beside the purely physical control and mold the human mind and character, and the mind has a strong and lasting influence over the body for good as well as for evil. In these converts, great physical and mental improvement often accompanies the spiritual change. The survey of human history surely affords ample ground for encouragement in dealing with backward, defective people. We are too apt to forget the pit whence our primal ancestors were digged, and how painful and zigzag, and yet on the whole how sure, our progress has been. And if any are sore let and hindered in running the race that is set before them by the infirmities of the flesh, in the words of St. Paul, himself placed among the abnormal because of his visions, there is a great hope: "O wretched man that I am! who shall deliver me out of the body of this death? I thank God [there is deliverance] through Jesus Christ our Lord."

To conclude: Within the limits set by heredity, function, and environment, there is and should be freedom for every man to fulfil his high destiny. Heredity need not be an impediment or curse, for man's inheritance is capable of steady and continuous improvement: all the functions of his nature can be fully developed and so directed as to subserve his own good and the good of the state; his environment can be made to minister to his welfare and happiness. Let all efforts to accomplish these ends be influenced by the spirit of Christ, and the prophecies relating to the coming of a new earth will soon in large measure be fulfilled.

as they might. I think we have only to improve their surroundings sufficiently, and the deteriorations will vanish in the very next generation" (G. Archdall Reid, M.B., F.R.S.E., *The Laws of Heredity* (1910).