HOMO-CULTURE;

OR,

THE IMPROVEMENT OF OFFSPRING THROUGH WISER GENERATION.

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THE THEORETICAL BABY AT 18 MONTHS.

PREFACE.

During all ages since man came to himself, there have been enlightened ones seeking to improve the race. The methods proposed have been various, and in accordance with the knowledge and development of the time in which they have appeared. Some have believed that education and environment were all-sufficient; others that abstinence from intoxicating drinks would suffice. A very considerable number have held the idea that by prenatal culture alone the mother can mould her unborn child into any desired form. The disciples of Darwin, many of them, have held that natural and sexual selection have been the chief factors employed by nature to bring about race improvement.

No doubt all these factors have been more or less effectual, but the time has come for man to take special interest in his own evolution, to study and apply, so far as possible, all the factors that will in any way promote race improvement. In the past this has not been done. We are not yet able to do it perfectly, our knowledge is too deficient, lack of interest is too universal, but we can make a beginning; greater thoughtfulness may be given to

suitable marriages; improved environment may be secured; better hygienic conditions taken advantage of; food may be improved; the knowledge we have gained in improving animals and plants, so far as applicable, may aid us; air, exercise, water, employment, social conditions, wealth and poverty, prenatal conditions, all have an influence on offspring, and man should be able, to some extent, to make them all tell to the advantage of future generations.

Whatever the conditions of existence, man is able by his intellect to modify and improve them, and make them favorably serve unborn children.

Herbert Spencer says: "On observing what energies are expended by father and mother to attain worldly successes and fulfil social ambition, we are reminded how relatively small is the space occupied by their ambition to make their descendants physically, morally and intellectually superior. Yet this is the ambition which will replace those they now so eagerly pursue, and which, instead of perpetual disappointments, will bring permanent satisfactions."

If the chapters included in this volume should help to arouse in the minds of readers, and especially the younger portion of them, some healthy feelings relating to the improvement of offspring it will have fulfilled its aim.

Two of them have been given as lectures before societies. the main object of which was the discussion of subjects bearing on evolution and human progress, and they are included in this volume because they have a

close relation to the main subject, but the others were written especially for this work.

While there may appear in a few cases a slight amount of repetition, the author trusts the reader will not consider it as unpardonable.

With these few words I send the work on its mission hoping it will bear good fruit.

M. L. H.

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STIRPICULTURE.

Natural selection, which is the central doctrine of Darwinism, has been explained as the "survival of the fittest." On this process has depended the progress observable throughout organic nature to which the term evolution is applied; for, although there has been from time to time degradation, that is, a retrogression, this has had relation only to particular forms, organic life as a whole evidencing progress towards perfection. When man appeared as the culmination of evolution under terrestrial conditions, natural selection would seem almost to have finished its work, which was taken up, however, by man himself, who was able by "artificial" selection to secure results similar to those which Nature had attained. This is true especially in relation to animals, the domestication of which has always been practiced by man, even while in a state of nature. Domestication is primarily a psychical process, but it is attended with physical changes consequent on confinement and variation in food and habits. This alone would hardly account, however, for the great number of varieties among ani-

mals that have been long domesticated, and it is probable that actual "stirpiculture" has been practiced from very early times. This term is derived from the Latin *stirpis*, a stock or race, and *cultus*, culture or cultivation, and it means, therefore, the cultivation of a stock or race, although it has come to be used in the sense of the "breeding of offspring," and particularly of human offspring. It is evident, however, that in relation to man this is too restricted a sense, and it must be extended so as to embrace as well the rearing and training as the breeding of children, in fact, *cultivation* in its widest sense, in which is always implied the idea of improvement.

Stirpiculture in this extended sense was not unknown to the ancients, both in theory and in practice. As to the former, the most noted example is that of Plato, who, in his "Republic," proposed certain arrangements as to marriage and the bringing up of children which he thought would improve the race, and hence be beneficial to the State. The State was to Plato all in all, and he considered that it should form one great family. This idea could not be carried into effect, however, so long as independent families existed, and therefore those arrangements had for one of their chief aims the abolition of what we regard as family life. This Plato thought was the best for the State, and the advantage which was supposed to accrue to it by

the absence of separate families is expressed in a marginal note, which says: "There will be no private interests among them, and therefore no lawsuits or trials for assault or violence to elders."

PLATO'S RESTRICTIONS ON PARENTAGE.—The end would hardly seem to justify the means, in these days, at least, when violence to elders is an uncommon incident; but how was the community of wives and children by which it was sought to be attained to be brought about? It is said, "The best of either sex should be united with the best as often, and the inferior with the inferior as seldom, as possible." Thus the people were to be classified into "best" and "inferior," and while the former were to be brought together as often as possible, the latter were not to be united at all if it could be avoided. There was no question of marriage in either case. In the one, the union was for the purpose of obtaining children, and in the other for the simple gratification of the passions; for only the offspring of the union between the sexes in the "best" class were to be reared. The children of the inferior class were not to be reared, "if the flock is to be maintained in first-class condition." This infanticide would matter little to the parents, as they had no control over their coming together, nor concern with the rearing of their offspring. Lots were to be drawn by the "less worthy" on each occasion

of their being brought together. This was that they might accuse their ill-luck and not the rulers, in case their partners were not to their liking. The State was to provide not only what men and women were to be sexually united, but the ages within which this was to be permitted for the purpose of obtaining offspring. For a woman, the beginning of childbearing for the State was fixed at twenty years of age, and it was to continue until forty. For men, the period of procreation is said to be between twenty-five and fifty-five years of age. After the specified ages men and women were to be allowed to "range at will," except within certain prescribed degrees, but on the understanding that no children born to such unions were to be reared. It is evident that under such a system the actual relationship between the members of the State family could be known only to its rulers; but to provide against the union of persons too nearly related by blood, all those who were "begotten at the time their fathers and mothers came together" were regarded as brothers and sisters. But even brothers and sisters might be united "if the lot favors them, and they receive the sanction of the Pythian oracle." Thus far for the breeding of children laid down in Plato's "Republic." As to the rearing of them, we need only say that the children allowed to live were to be placed in the custody of guardians, to be appointed by the State from among the most worthy

of either sex, who were to bring them up in accordance with the principles of virtue.

The idea which formed the basis of the regulations as to marriage in the "Republic" was carried into practice by Lycurgus in his government of Sparta. We are told by Plutarch in his "Lives," that Lycurgus considered children not so much the property of their parents as of the State, "and therefore he could not have them begotten by ordinary persons, but by the best men in it." But he did not attempt to break up the private family, as was proposed by Plato. He sought rather to enlarge its boundaries by allowing the introduction of a fresh paternal element when this could be done with advantage to the State. Thus, he approved of a man in years introducing to his young wife a "handsome and honest" young man, that she might bear a child by him. Moreover, if a man of character became impassioned of a married woman on account of her honesty and beautiful children, he might treat with her husband for the loan of her, "that so planting in a beauty-bearing soil, he might produce excellent children, the congenial offspring of excellent parents." The principles which influenced Lycurgus were the same as those sought to be applied by Plato, although in a different way. Plutarch says, "He observed the vanity and absurdity of other nations, where people study to have their horses and dogs of the finest breed they can

procure, either by interest or money, and yet keep their wives shut up, that they may have children by none but themselves, though they may happen to be doting, decrepid or infirm." Hence Lycurgus sought to drive away the passion of jealousy "by making it quite as reputable to have children in common with persons of merit, as to avoid all offensive freedom in their own behaviour to their wives."

LYCURGAN LAWS.—According to Plutarch, the regulations enforced by Lycurgus, so far from encouraging licentiousness of the women, such as afterwards prevailed in Sparta, did just the reverse, as adultery was not known among them. That the system was beneficial to the State by tending to secure healthy offspring is probable; but Lycurgus took other means of bringing about this result. His requiring girls to dance naked in public was intended to teach them modesty. But we are told further: "He ordered the virgins to exercise themselves in running, wrestling and throwing quoits and darts, that their bodies being strong and vigorous, the children produced by them might be the same; and that, thus fortified by exercise, they might the better support the pangs of childbirth, and be delivered with safety." Moreover, he provided against the propagation of disease and deformation by directing that only such children

should be reared as passed examination by the most anoient men of the tribe. If a child were strong and well-proportioned, they gave orders for its education and assigned it one of the nine thousand shares of land. Thus infanticide was a recognized part of the Spartan system, as it was in that of Plato. The elders of the tribe were very careful about the nurses to whom the children were assigned. When seven years old, the children were enrolled in companies, where they were all kept under the same order and discipline, and had their exercises and recreations in common. The boy of best conduct and courage was made captain, and their whole education was one of obedience. As for learning, Plutarch says they had just what was absolutely necessary; and certainly it was not such as could be recommended for imitation in these days.

Xenophon, in his essay on "The Lacedemonian Republic," adds little to what Plutarch tells us with reference to the marriage regulations of Lycurgus. He remarks, however, that marriage was not allowed until the body was in full strength, as this was conducive "to the procreation of a robust and manly offspring." He affirms, also, that those who were allowed by arrangement to associate with other men's wives were men who had an aversion to living with a wife of their own!

PLUTARCH ON THE TRAINING OF CHILDREN.—In his "Morals," Plutarch gives a dissertation on the training of children, the first portion of which deals with stirpiculture in the limited sense of the term, but is very inadequate. Indeed, the only advice he gives is that a man should not keep company with harlots or concubines, because children by them are "blemished in their birth" by their base extraction; and that no man should "keep company with his wife for issue's sake but when he is sober," lest he beget a drunkard. The main portion of Plutarch's treatise is concerned with the education of children, which is the second part of stirpiculture as a system of complete cultivation. Introductory to the subject of education he speaks of nursing, to which he attaches much importance. Plutarch insists on the necessity of mothers nursing their own children; nature, by providing them with two breasts, showing them that they can nurse even twins. But if they cannot, they are to choose the best nurses they can get, and such as are bred after the Greek fashion. For, "as it is needful that the members of children should be shaped aright as soon as they are born, that they may not afterwards prove crooked and distorted, so it is no less expedient that their manners be well fashioned from the very beginning; for childhood is a tender thing, and easily wrought into any shape."

After referring to the importance of the choice of

good companions for a child, Plutarch proceeds to consider the question of education, which he speaks of as the matter of most concern. As to education in general, he points out that a concurrence of three things is necessary to the "completing of virtue in practice," which is the aim of that process, that is: Nature, reason or learning, and use or exercise; For, "if nature be not improved by instruction, it is blind; if instruction be not assisted by nature, it is maimed; and if exercise fail of the assistance of both, it is imperfect as to the attainment of its end." There cannot be "instruction"—a term which is here used as equivalent to "education," although the latter has a wider signification than the former, and being equivalent to mental cultivation,—without a teacher, and Plutarch says well, "we are to look after such masters for our children as are blameless in their lives, not justly reprovable for their manners, and of the best experience in teaching. For the very spring and root of honesty and virtue lies in the felicity of lighting on good education." He is, indeed, so much impressed with its value that he affirms: "The one chief thing in this matter—which compriseth the beginning, middle and end of all—is good education and regular instruction." These two "afford great help and assistance towards the attainment of virtue and felicity." He adds: "Learning alone, of all things in our possession, is immortal and divine."

Plutarch dwells on various other matters connected with education better fitted for his times than ours, but he refers to the importance of example in words that are deserving of careful consideration. He says: "The chiefest thing that fathers are to look to is, that they themselves become effectual examples to their children, by doing all those things which belong to them, and avoiding all vicious practices, that in their lives, as in a glass, their children may see enough to give them an aversion to all ill words and actions. For those that chide children for such faults as they themselves fall into unconsciously accuse themselves, under their children's names. And if they are altogether vicious in their own lives, they lose the right of reprehending their very servants, and much more do they forfeit it to their sons. . . . . Wherefore we are to apply our minds to all such practices as may conduce to the good breeding of our children."

It is not improbable that the marriage regulations ascribed to Lycurgus were based on institutions already in existence among the Spartans. From the statement of Polybius, that the brothers of a house often had one wife between them, it has been inferred that in Sparta the Tibetan form of polyandry was practiced. According to Plutarch, another curious marriage custom prevailed, showing that the Spartans, who differed in various re-

spects from other Greeks, had retained primitive habits. Thus, the bridegroom carried off the bride by violence, and for some time after this "marriage by capture" he visited her "with great caution and apprehension of being discovered by the rest of the family; the bride at the same time exerted all her art to contrive convenient opportunities for their private meetings. And this they did, not for a short time only, but some of them even had children before they had an interview with their wives in the daytime! This custom had much in common with the *sadica* marriages of the early Arabs, who, as we are told by Professor Robertson Smith, allowed a woman, while she remained with her own tribe, to receive the clandestine visits of a lover. Her offspring were recognized as legitimate and became members of the tribe. The incident of "capture" could not occur, as it was a general custom in ancient Arabia for a husband to live among his wife's kinsfolk.

Infanticide Among the Greeks.—The practice of infanticide, which was the only mode by which Lycurgus, or even Plato in his imaginary republic, could really insure the existence of a healthy and vigorous population, was undoubtedly a survival from primitive times. The sacredness of infant life is the result of the high moral tone which has accompanied the spread of Christianity; and it may

be said to be almost unknown outside of the Christian era. Various reasons are assigned by different peoples for the practice of infanticide; but one cause universally operative is the objection to rearing malformed or unhealthy offspring. Savages adopt various modes of improving, according to their ideas, the physical appearance of their children. Giving the proper form to the nose is considered a very important matter by the native Australian mother and by the Polynesian Islanders; as, indeed, it was by the ancient Persians, among whom the molding of the nose to the proper curve was essential, especially in the royal family. The flat head of the American Indian of the northwest coast was at one time considered a beauty, and was restricted to the members of the tribe, slaves not being allowed to undergo the necessary head compression. The small artificial foot of the Chinese lady is another case in point. But however much the physical appearance might be altered, no effect could thus be made in the general physique of the race. The most easy way of keeping this up to a proper standard is to destroy all the infants that possess physical defects; and such a course is adopted by many savages, although it is by no means the most influential cause of infanticide.

GROUP MARRIAGE.—A remarkable system of relationships, with which is combined a series of reg-

ulations framed with the object of pointing out what persons are entitled to enter into the marital relation, is found to be prevalent in nearly all uncivilized peoples. The members of a tribe are divided into two or more groups, each of which consists of persons who are nearly related by blood, and who are forbidden, therefore, to intermarry. One of the tribes of Central Australia, the Dieyerie, has a legend which explains the marriage system common to them and to all the other tribes, as being intended to prevent the evil effects of intermarriage between persons very near of kin. The story is valuable as showing the opinion entertained by savages as to the effect on the race of breeding in and in—a subject to which we may have occasion to make further reference. Dr. J. F. McLennan and other writers on primitive marriage refer to the practice among certain *civilized* peoples of antiquity of what we regard as incestuous marriage, in support of the view that in the early history of mankind intercourse between the sexes was promiscuous.* Such an explanation is entirely uncalled for, however, as the custom was intended to secure purity of blood, that is, blood of a par-

* Mr. Darwin accepted this view at first; but in a note to the second edition of his "Descent of Man" he says: "C. Staniland Wake argues strongly against the views held by these three writers on the former prevalence of almost promiscuous intercourse." See "Development of Kinship and Marriage." Redway, London. 1888.

ticular line of ancestors. Such marriages were known only to a few peoples, and they were evidently of comparatively late origin. Whether the purity of blood was attended with improvement of the stock may be doubted; as, whatever may have been the actual origin of the marriage regulations of the numerous peoples among whom the classificatory system of relationship is established, they are intended, without question, to prevent the intermarriage of persons who are regarded as near blood relations, the general disapproval of which must have had some sufficient reason, or, at all events, must have originated in ideas supposed to furnish good grounds for it.

MAKING CHILDREN THE PROPERTY OF THE STATE.—The principles which were embodied in the scheme proposed by Plato, in his "Republic," to bring about an improvement in the race are mainly two: First, restriction on the formation of procreative unions; second, infanticide. The breaking up of private or separate families necessarily resulted from the operation of his "marriage" regulations, and was intended to emphasize the idea which Plato, like Lycurgus, insisted on, that the children belonged to the State. Lycurgus sought to enforce the same idea by allowing wives to have intercourse with other men than their husbands, thus making children "common" in some sense, while retaining

the separate family intact. Thus he introduced, or rather it should be said, established a modified form of polyandrous marriage; Plato's system, on the other hand, being one of mere pairing, as in the breeding of animals. In either case the union of very near relations was not permitted, that is, between brother and sister, or parent and child. Yet Lycurgus allowed marriage between a half-brother and sister by the same mother. Curiously enough, this was forbidden by the Athenian law, which permitted a brother and sister by the same father only to intermarry. The Greek rule, as laid down in Smith's "Dictionary of Greek and Roman Antiquities," was that "proximity of blood or consanguinity was not, with some few exceptions, a bar to marriage," although direct lineal descent was so. Moreover, there was no attempt to enforce consanguineous marriages, so as to ensure purity of blood, such as was customary among the Incas of Peru, the laws of which required that the oldest son and daughter of the sovereign should intermarry because the Incas were descended from the Sun, and the Sun had married his sister the Moon, and had united in marriage his two first children! A more practical reason was found in the rule that the kingdom should be inherited through both parents. Hence it was not permitted to mix the blood of the Sun, or rather of those who claimed solar descent, with that of men.

GRECIAN METHODS NOT SUITABLE TO OUR TIME.—It is evident that the principles which governed the ancients in their endeavors to improve the race are not capable of application at the present day, under the conditions of modern civilization. Instead of placing further restrictions on marriage, the tendency now is to loosen those which have hitherto existed, although certain regulations, such as relate to age, consent, etc., are recognized as necessary for the interests of the State. Moreover, greater facilities are given than were formerly allowed for dissolving ill-assorted unions, thus getting rid of the excuse for the formation of irregular connections. Nevertheless, the interests of neither society at large nor of individuals will permit of the introduction of the temporary or occasional pairing system, which is a return to an animal state, and, therefore, not worthy of the dignity implied in the term, marriage, and which is inconsistent with true family life. It would be liable to all kinds of abuse, and would become, in most cases, a legalized system of prostitution, thus dragging society down to a lower level instead of raising it, and tending to the deterioration, instead of the improvement, of the race, if not to its extinction. As to infanticide, this certainly would not be tolerated by public opinion, although it is now largely resorted to under the guise of abortion. To legalize child-killing under any circumstances

would be to offer a premium for murder, even if it were permitted only with the express sanction in every case of the officials of the State. There is now no justification for such a course, as the education of those who appear to be on a mental level with the animals has been carried so far that the term "idiot" may soon have to be dropped from our vocabulary.

It must be affirmed, however, that the whole subject of the improvement of the race was dealt with by Plato, and, indeed, by the ancients generally, in a very crude and superficial manner. This has been well pointed out by Professor B. Jowett in the Introduction to his translation of Plato's "Republic." Professor Jowett objects generally that the great error in the speculations of Plato and others on the improvement of the race is, "that the difference between men and the animals is forgotten in them. The human being is regarded with the eye of a dog or bird fancier, or at best of a slave owner; the higher or human qualities are left out. The breeder of animals aims chiefly at size or speed or strength; in a few cases, at courage and temper; most often the fitness of the animal for food is the greatest desideratum. But mankind are not bred to be eaten, nor yet for their superiority in fighting or in running or in drawing carts. Nor does the improvement of the human race consist merely in the increase of the bones and

flesh, but in the growth and enlightenment of the mind. Hence there must be a marriage of true minds as well as of bodies; of imagination and reason as well as of lusts and instincts. Men and women without feeling or imagination are justly called brutes; yet Plato takes away these qualities and puts nothing in their place, not even the desire of a noble offspring, since parents are not to know their own children. The most important transaction of social life he who is the idealist philosopher converts into the most brutal. For the pair are to have no relation to each other but at the hymeneal festival; their children are not theirs, but the State's; nor is any tie of affection to unite them. Yet the analogy of the animals might have saved Plato from a gigantic error if he had not lost sight of his own illustration! For the "nobler sort of birds and beasts" nourish and protect their offspring and are faithful to one another! It is certainly surprising, as Jowett says, that the greatest of ancient philosophers should, in his marriage regulations, have fallen into the error of separating body and mind. He did so probably through a false notion of the antagonism between the family and the State, and hence, as Lycurgus did not aim at destroying family life he escaped that error.

And yet there is nothing to show that the marriage regulations of Lycurgus had any real effect on the children of the State. That the early Spar-

tans were a hardy and courageous people is undoubtedly true; but apart from the practice of infanticide, which would necessarily get rid of the weak, their character and conduct can be explained by reference merely to the system of training, both of youth and maidens, which Lycurgus rigidly enforced. Lacedemon was essentially a military republic, and its rulers aimed to breed soldiers, rather than men in the noble sense in which the term "man" is now used. Indeed, there is nothing to show that any compulsory attempt to improve the race has ever been successful, apart from the effect which the destruction of feeble and deformed offspring may have, and the influence of the severe training of those who are allowed to survive.

Nevertheless, the human race has vastly improved since its first appearance on the earth, if the teachings of the doctrine of evolution are true and applicable to man as well as to the inferior animals. The passage from the native Australian to the European is a long one, and yet they are supposed to represent a common primitive stock. The steps by which the European has been gradually developed, with his special characteristics, cannot now be traced; but one of the chief agencies to which the result is due is that to which Darwin applied the term, "sexual selection." As natural selection has relation to *adaptation*, and its aim is "the survival of the fittest," so sexual selection

has reference to *beauty*, and its object is the perpetuation of the most beautiful, according to the taste of the peoples practicing it. Darwin was the first to point out the importance of sexual selection for certain purposes which, as stated by Professor G. J. Romanes, in his "Darwin and after Darwin,"* "have no reference to utility or the preservation of life." The latter writer in treating of the subject affirms it is universally admitted that the higher animals do not pair indiscriminately, the members of either sex preferring "those individuals of the opposite sex which are to them most attractive." Many birds and certain mammals clearly display the esthetic sense, which is shown by the former particularly in the adorning of their nests with colored objects; and it is reflected in the personal appearance of the animals themselves. During the pairing season, birds take on their most brilliant plumage, and the males take great pains to exhibit their charms before the females, actively competing with one another in so doing. There is similar rivalry among song birds, who strive to see which can best please the females by their singing.

SEXUAL SELECTION.—Professor Romanes, after referring to those facts, which are considered in de-

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* The Open Court Publishing Company, Chicago. 1892.

tail by his great predecessor, states the theory of sexual selection as follows: "There can be no question that the courtship of birds is a highly elaborate business, in which the males do their best to surpass one another in charming the females. Obviously the inference is that the males do not take all this trouble for nothing; but that the females give their consent to pair with the males whose personal appearance, or whose voice, proves to be the most attractive. But, if so, the young of the male bird who is thus *selected* will inherit his superior beauty; and thus, in successive generations, a continuous advance will be made in the beauty of plumage or of song, as the case may be,—both the origin and development of beauty in the animal world being thus supposed due to the esthetic taste of the animals themselves."

It is not necessary to refer particularly to the evidence in support of the theory of sexual selection. There can be no doubt that it is a most important factor in the perpetuation and increase of certain characters, those which come within the category of "beautiful," the very existence of which proves them to be beneficial to the stock to which the animals exhibiting them belong. The fundamental fact is that they have "the effect of charming the females into a performance of the sexual act;" an opinion which is supported by the more general fact that "both among quadrupeds

and birds, individuals of the one sex are capable of feeling a strong antipathy against, or a strong preference for, certain individuals of the opposite sex."

These statements are applicable also to man, with whom the principle of sexual selection must have been influential to at least the same degree as among the lower animals. It may be expected, indeed, to be more influential, as the esthetic taste with which it is associated becomes more highly developed with man than with any member of the animal kingdom. Even here it is not a question of mere coloration. The theory of sexual selection as framed by Darwin is concerned, as Romanes points out, not so much with color itself as with the particular disposition of color in the form of ornamental patterns. These have a kind of *structural* value, and certain birds, moreover, possess actual structural peculiarities, such as ornamental appendages to the beak, the only use of which would appear to be to charm the female during courtship. We may suppose, therefore, that sexual selection has affected not merely what may be termed the superficial characters of man, but to some extent, at least, those which have a structural value.

The principle of sexual selection is applicable primarily to the characteristics of the male; but Darwin supposes them to have been transferred to the other sex, and through them transmitted to the

race generally. In his "Descent of Man," he remarks of the actual influence over the race of that principle: "The nervous system not only regulates most of the existing functions of the body, but has indirectly influenced the progressive development of various bodily structures and of certain mental qualities. Courage, pugnacity, perseverance, size and strength of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colours and ornamental appendages have all been indirectly gained by the one sex or the other, through the exertion of choice, the influence of love and jealousy, and the appropriation of the beautiful in sound, colour or form; and these powers of the mind manifestly depend on the development of the brain."

That sexual selection has actually resulted in modification of human physical structure, Darwin thinks can be shown by reference to the ancient Persians, whose type was greatly improved by intermarriage with the beautiful Georgian and Circassian women. He refers to several similar cases, and particularly to the Jollofs of West Africa, whose handsome appearance is said to be due to their retaining for wives only their most beautiful slaves, the others being sold.

Sexual selection may be operative for the improvement of the race through the action of either man or woman, and the conditions of its activity

are different in either case. As to the action of man, Darwin says in relation to primitive peoples: "The strongest and most vigorous men—those who could best defend and hunt for their families, who were provided with the best weapons and possessed the most property, such as a large number of dogs or other animals—would succeed in rearing a greater average number of offspring than the weaker and poorer members of the same tribe. There can, also, be no doubt that such men would generally be able to select the more attractive women. At present, the chiefs of nearly every tribe throughout the world succeed in obtaining more than one wife."

With reference to selection by the women, Darwin shows that among savages they have much more to say in their marriages than is usually supposed. He remarks: "They can tempt the men they prefer, and can sometimes reject those whom they dislike, either before or after their marriage. Preference on the part of the women, steadily acting in any one direction, would ultimately affect the character of the tribe, for the women would generally choose, not merely the handsomest men, according to their standard of taste, but those who were at the same time best able to defend and support them. Such well-endowed pairs would commonly rear a larger number of offspring than the less favored." Darwin adds: "The same result would obviously follow in a still more marked man-

ner if there were selection on both sides, that is, if the more attractive, and at the same time more powerful men were to prefer, and were preferred by, the more attractive women. And this double form of selection seems actually to have occurred, especially during the earlier periods of our long history."

The investigations of Darwin as to the operation of sexual selection had reference chiefly to the modification of physical characters. He did not altogether lose sight, however, of its possible influence in affecting for the better the mental characteristics of the race. He concludes his enquiry by the remark that "Man might by selection do something, not only for the bodily constitution and frame of his offspring, but for their intellectual and moral qualities. Both sexes ought to refrain from marriage if they are in any marked degree inferior in body or mind; but such hopes are Utopian, and will never be even partially realized until the laws of inheritance are thoroughly known. Every one does good service who aids towards this end."

It is in the application of the principle of sexual selection to the mental characteristics of man, that any real improvement of the race, viewed as consisting of human beings and not of mere animals, must be brought about. Beauty of physical form and feature is of importance in human relations only so far as it is associated with beauty of mind

and character, that is, with high intellectual and moral attainments. That these often go together is true, but it is not always the case. Grant Allen says: "To be sound in wind and limb; to be healthy of body and mind; to be educated; to be emancipated; to be free, to be beautiful—these things are ends towards which all should strive, and by attaining which all are happier in themselves, and more useful to others." But physical and intellectual perfection are not always found together, as was observed by Darwin, when he mentioned among the causes which interfere with the physical action of sexual selection the fact that men are largely attracted by the mental charms of women. Professor Jowett affirms truly that "Many of the noblest specimens of the human race have been among the weakest physically. Tyrtæns or Æsop, or our own Newton, would have been destroyed at Sparta, and some of the fairest and strongest men and women have been among the wickedest and worst." Hence, he properly infers that "Not by the Platonic device of uniting the strong and the fair with the strong and the fair, regardless of sentiment and morality, nor yet by his other device of combining dissimilar natures, have mankind gradually passed from the brutality and licentiousness of primitive marriage to marriage Christian and civilized."

The truth of this inference cannot be denied, be-

cause to leave out of view considerations of sentiment and morality would fatally vitiate any scheme for the improvement of the human race. But Professor Jowett affirms that, "We do not know how by artificial means any improvement in the breed can be effected." The problem is no doubt a complex one. As he points out, a child has usually thirty progenitors only four steps back, and whatever truth there may be in the inheritance of special physical characters, "We have a difficulty in distinguishing what is a true inheritance of genius or other qualities, and what is mere imitation or the result of similar circumstances. *Great men and great women have rarely had great fathers and mothers.*" Professor Jowett thinks, indeed, that too much importance may be ascribed to heredity. He says: "The doctrine of heredity may seem to take out of our hands the conduct of our lives, but it is the idea, not the fact, which is really terrible to us. For what we have received from our ancestors is only a fraction of what we are or may become. The knowledge that drunkenness or insanity has been prevalent in a family may be the best safeguard against their recurrence in a future generation. The parent will be most awake to the vices or diseases in his child of which he is most sensible within himself. The whole of life may be directed to their prevention or cure. The traces of corruption may become fainter, or be wholly ef-

faced; the inherited tendency to vice and crime may be eradicated. And so heredity, from being a curse, may become a blessing. We acknowledge that in the matter of our birth, as in our nature generally, there are previous circumstances which affect us. But on this platform of circumstances, or within this wall of necessity, we have still the power of creating a life for availment by the reforming energy of the human will."

There is much truth in these remarks of Professor Jowett, but they do not affect the argument in favor of the possibility of bringing about an improvement in the race if the proper means are adopted. It would not be any wiser for the strong and healthy to marry with the sick and weak, because the latter happen to be highly intellectual or moral, than to marry with the strong and healthy if these physical characters are united with mental weakness or immorality. There is a consensus of opinion at the present day, that what should be aimed at is the union of physical perfection with that of intellect and character, in the persuasion that steps towards this end will ultimately lead to the general improvement of the human race.

Difficulties in the Way.—The difficulty is to devise and carry out some scheme for the purpose which shall be both feasible and agreeable to public sentiment. The latter consideration would pre-

vent any attempt at active stirpiculture under State direction, although the State might indirectly affect the result by subsidiary regulations as to marriage and training of children. There is nothing, however, to prevent the systematic efforts of private individuals, and in such cases the causes which Darwin cites as interfering with the physical action of sexual selection would not operate. The most systematic experiment in stirpiculture of modern times was that originated by John Humphrey Noyes at the Oneida Community, in central New York, from 1868 to 1879. A paper on this experiment was read by Anita Newcomb McGee before the American Science Association in August, 1891, which was published in "The American Anthropologist," 1891, and the following facts are taken from that paper.

AN EXPERIMENT IN STIRPICULTURE.—Noyes was the founder of a religious sect, the members of which, owing to their desire for freedom from sin, were called Perfectionists. Holiness was the first principle of their creed, and Noyes thought to transmit that condition from one generation to another by a process of stirpiculture. To overcome the "selfishness" of monogamic marriage he devised a "system of regulated promiscuity, beginning at earliest puberty, and by a method of his own invention he separated the amative from the

propagative functions." Its first principle was that of a judicious in and in breeding, with occasional mingling of foreign blood, as in stock-raising. The second principle adopted was that of "careful selection of individuals for breeding purposes. Genealogies were studied and medical histories compiled." A committee, headed by Noyes, selected the holiest members who were free from physical defects, intellectual and other considerations being given less weight at first, although in later years they received more consideration. The parents were of all ages, but the father was always older than the mother. Some sympathy between the persons mated was always required; and if a proposition for union came from two individuals it was allowed if no objections were found. Noyes held that uncle and niece are as much related as father and daughter, because brothers have identical blood, and that cousins are in the same relation to each other as half brothers. In the Oneida Community uncles and nieces twice paired, and it is noticeable that a considerable proportion of the children had Noyes' blood on one or both sides. The founder himself had nine children in the Community, to which belonged also his brother, his two sisters and their children. As to the care of the children, this belonged exclusively to the mothers for the first nine months, after which for a further nine months they took charge of their off-

spring at night only. When eighteen months old, the children were transferred to a separate department which was managed by those who had shown themselves specially fitted for the work.

Let us see what was the result of Noyes' experiment. Of the sixty* children born, five died at or near childbirth from unforeseen causes depending upon the mother. All the others were alive at the date of Mrs. McGee's communication, except a boy who was reared in spite of weakness, and died from a trifling malady when about sixteen years of age. All the children were strong and healthy, the boys being tall—several over six feet—broad-shouldered and finely proportioned ; the girls robust and well-built. It is remarkable, that among the children between five and nine years of age, thirteen were boys and six only were girls. With reference to their intellectual ability, it is stated by Mrs. McGee that, of the oldest sixteen boys, ten were in business, chiefly employed as clerks, foremen, etc., in the manufactories of the joint stock company. The eleventh was a musician of repute ; another a medical student ; one passed through college and studied law ; one was a college senior, and one entered college after winning State and local scholarships, and gave great mathematical promise. The sixteenth boy was a mechanic, and the

* It should be sixty-one.

only one employed in manual labor. Of the six girls between eighteen and twenty-two years, three are said by Mrs. McGee to be especially intellectual. The mothers of these children usually belonged to the classes employed in manual labor, while the fathers, with the exception of the Noyes family and half a dozen lawyers, doctors and clergymen, were all farmers and mechanics. It is noteworthy that, as a rule, the fathers were the intellectual superiors of their mates, "and enquiry develops the fact, known in the Community, that in these cases the children are markedly superior to the maternal stock."

When this system of complex marriage had been in operation twenty years, the desire to return to the old system of monogamy arose, and it became so strong in the Community that its founder retired from it, and on August 26, 1879, complex marriage was renounced, although nominally "in deference to public sentiment." Twenty-five couples who had been married before entering the Community again became husband and wife, and twenty marriages between other individuals took place within four months after the abandonment of the stirpicultural experiment. There were then in the Community two hundred and sixteen adults and eighty-three children under twenty years of age.

So far as the real object which the founder of the Oneida Community had in view in his marriage

system, it was undoubtedly a failure, as of the offspring, in spite of their early doctrinal training, only a very few are church members, and but one is a Perfectionist. This is the son of an uncle and a niece, both of Noyes' blood. From a physical and intellectual standpoint the experiment would seem to have given promise of success, but it continued too short a time to be of much scientific value. The result may be stated in the words of Mrs. McGee, who says that the complete failure to perpetuate the church through stirpiculture "would seem to indicate that, while our race would doubtless be greatly benefited by more attention to laws of breeding, yet to attempt promulgation of a belief by this means alone is only to court defeat. In spite of the energy and magnetism of so remarkable a man as Noyes, in spite of his long-continued efforts, and just when success seemed within his grasp, his one misjudgment of human nature bore fruit, the neglected instinct of monogamy arose in its might and crushed to nothing the whole structure, and he, the builder, went last of all. With the close of his life, April 13, 1886, ended a unique and interesting history."

INTERMARRIAGE.—We have seen that the founder of the Oneida Community permitted the intermarriage of uncle and niece, although he considered them related as nearly as father and daughter.

This question of the intermarriage of near blood relations is an important one in its bearing on the question of stirpiculture, and as already mentioned, it has engaged the attention of nearly all the lower races of mankind. It has, indeed, been provided against by the marriage restrictions of most uncultured peoples, and their systems of relationship clearly point out what persons are within the permitted limits of marriage. It appears to be the general rule that the children of two brothers or of two sisters, whether own or tribal, cannot intermarry, but that the children of a brother and those of a sister may be thus united, although sometimes this is not allowed where own brother and sister are concerned.*

The question of the effect on offspring of consanguineous marriages was some time ago particularly enquired into by Mr. A. H. Huth, who, after a consideration of all the information available, came, in his work, "The Marriage of Near Kin," to the following conclusions:

"1—That any deterioration through the marriage of near kin, *per se*, even if there be such a thing in the lower animals, is impossible in man, owing to the slow propagation of the species.

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*See Lorimer Fison, in "The Journal of the Anthropological Institute," May, 1895, page 361. The whole subject is exhaustively treated by C. Staniland Wake, in his "Development of Kinship and Marriage."

"2—That any deterioration through the chance accumulation of an idiosyncrasy, though more likely to occur in families where the marriage of blood relations was habitual, practically does not occur oftener than in other marriages, or it would be more easily demonstrated.

"3—That, seeing the doubt, to say the least of it, which exists concerning the effect for harm of marriages between near kin, and on the other hand the certainty that whenever and wherever marriage is impeded a direct and proportionate impulse is given to the practice of immorality, it is advisable not to extend the prohibition against marriage beyond the third collateral degree, and to permit all marriages of affinity excepting those in the direct ascending or descending line."

There appears to be no doubt that what are regarded among Christian peoples as incestuous marriages are not desirable. How far marriage unions between first cousins are advisable depends, as appears from Mr. Huth's remarks, on considerations which affect the question generally. If there are any serious physical, intellectual or moral defects on either side, no marriage should take place.

WOMAN'S SELECTIVE ACTION.—Apart from the question of consanguinity, the principles which should govern all marriages is that of sexual selection, which should have reference, however, not

merely to physical characters, but also to mental and moral characteristics. In applying this principle, it must be remembered that while man, like the male of all animals, does the courting, woman, like all females, makes the selection; at least this is the general rule among the most cultured peoples. Thus it is evident that woman possesses the power of largely influencing the improvement of the human race, and in this fact we may see the possibility of this being effected by the operation of general social causes, without having recourse to individual experiments, such as that undertaken by Noyes, which are necessarily limited in their action, and may, after all, have like practical result. *If all women could be induced to combine for that end they could probably bring about the desired improvement by their own efforts.*

On this subject the well-known naturalist, Mr. A. R. Wallace, has some judicious remarks in an article on "Human Progress, Past and Future," in *The Arena* for January, 1892. Mr. Wallace, who accepts the views of Weismann as to the non-inheritance of acquired characters, thinks that the physical and moral evils and degradation attendant on the conditions of modern city life will have no permanent effects, when a more rational and elevating system of social organization is brought about. The most important agency in this social regeneration will be the selective action of woman,

under the influence of her newly acquired freedom and higher education. Says Mr. Wallace: "When such social changes have been effected that no woman will be compelled, either by hunger, isolation or social compulsion, to sell herself, whether in or out of wedlock, and when all women alike shall feel the refining influence of a true harmonizing education, of beautiful and elevating surroundings, and of a public opinion which shall be founded on the highest aspirations of their age and country, the result will be a form of human selection which will bring about a continuous advance in the average status of the race. Under such conditions, all who are deformed either in body or mind, though they may be able to lead happy and contented lives, will, as a rule, leave no children to inherit their deformity. Even now we find many women who do not marry because they have never found the man of their ideal. When no woman will be compelled to marry for a bare living or for a comfortable home, those who remain unmarried from their own free choice will certainly increase in number, while many others, having no inducement to an early marriage, will wait until they meet with a partner who is really congenial to them. In such a reformed society the vicious man, the man of degraded taste or of feeble intellect, will have little chance of finding a wife, and his bad qualities will die out with himself. The most perfect and beau-

tiful in body and mind will, on the other hand, be most sought and therefore be most likely to marry early, the less highly endowed later, and the least gifted in any way the latest of all; and this will be the case with both sexes. From this varying age of marriage, as Mr. Galton has shown, there will result a more rapid increase of the former than of the latter, and this cause continuing at work for successive generations will at length bring the average man to be the equal of those who are now among the more advanced of the race."

We have here the application of the principle of sexual selection in its highest sense, although limited in action to women, and it is undoubtedly the phase of stirpiculture which will become operative when the "emancipation of women" is completed. There is one feature of modern society which may retard its operation, and which was referred to by Darwin as interfering with the physical effect of sexual selection in the past. Wealth is now, more than ever before, an important factor in society, and not only man's but woman's choice in matrimony is often governed by money considerations. The possession of wealth may be evidence of mental astuteness, but not necessarily of high morality, and until it ceases to be sought after in marriage it will seriously interfere with the improvement of the race on its higher planes.

The sexual selection which Mr. Wallace so ably

advocates is to be exercised by woman, and hence its efficiency will depend on the fitness of woman, not only to choose proper partners in marriage, but to communicate the highest physical and mental characters to her offspring. She can transmit only what she herself possesses, and she will choose that which is in sympathy with her own feelings and desires, so that if she is to affect the race beneficially, she must seek first her own perfection. Hence the great importance of the woman's movement of the present day, the basis of which is the better development of her physical, mental and moral faculties, without which she cannot expect to have the increased social privileges to which she may aspire. The greatest social privilege women can have is to be the chief agent in the improvement of the race, and through it the regeneration of society itself. Lady May Jeune, in reply to those who think that the present relations between mothers and daughters threaten family disruption, observes, "That woman was created for the purpose of being the wife and mother of mankind no one can deny, and that none of the discoveries of science or any attempt to solve the mysteries of life have brought her one bit nearer the knowledge of how to unburden herself of these responsibilities, is also a fact." This must be true if the race is to be continued; for without wives there can be no mothers. Being possible mothers, therefore, it is

necessary, if the race and society are to be improved, that women shall acquire the highest physical, intellectual and moral education they are capable of, and if they require the same qualities in their husbands, the problem we are considering will be solved.

MAN'S AND WOMAN'S CO-OPERATION.—We have here the central idea of the New Hedonism advocated by Mr. Grant Allen, whose views necessitate the active agency of man as well as of woman. This is only reasonable, seeing that offspring depend on the co-operation of two factors, and that if either of them is defective the offspring must share in the defect. "Self-development is an aim of all," says Mr. Grant Allen, "an aim which will make all stronger and braver, and wiser, and better. It will make each in the end more helpful to humanity. To be sound in wind and limb; to be healthy of body and mind; to be educated, to be emancipated, to be free, to be beautiful—these things are ends towards which all should strive, and by attaining which all are happier in themselves, and more useful to others." Hence the New Hedonism teaches that "to prepare ourselves for the duties of paternity and maternity, by making ourselves as vigorous and healthful as we can be is a duty we owe to all our children unborn and to one another." This applies as well to "the body

spiritual, intellectual and esthetic" as to the physical body. Mr. Grant Allen thinks the theory he advocates will introduce a new system, which "will not include the selling of self into loveless union for a night or for a lifetime; the bearing of children by a mother to a man she despises or loathes or shrinks from; the production by force, sanctified by law, of hereditary drunkards, hereditary epileptics, hereditary consumptives, hereditary criminals. We shall expect in the future a purer and truer relation between father and mother, parent and child. We shall expect some sanctity to attach to the idea of paternity, some thought and care to be given beforehand to the duties of motherhood. We will not admit that the chance union of two unfit persons, who ought never to have made themselves parents at all, or ought never to have made themselves parents with one another, can be rendered holy and harmless by the hands of a priest extended to bless a bought love, or a bargain of impure marriage. In one word, for the first time in the history of the race, we shall evolve the totally new idea of responsibility in parentage. *And as part of this responsibility we shall include the two antithetical, but correlative, doctrines of a moral abstinence from fatherhood and motherhood on the part of the unfit, and a moral obligation to fatherhood and motherhood on the part of the noblest,*

the purest, the sanest, the healthiest, the most able among us. We will not doom to forced celibacy half our finest mothers."

THE INDIVIDUAL'S RIGHTS.—From the racial standpoint these views are just and cannot be controverted, but something must be allowed to the individual. The relative position and rights of the race and the individual are in a dispute, which has become intensified since the development of the theory of evolution. *But the individual is the beginning of the race and he should be its end.* Therefore, in seeking to improve the race, violence must not be done to the highest sentiments of the individual. It is a fact that many highly cultured individuals have a repugnance to certain aspects of married life, and this repugnance appears to be justified by the further fact that a high state of refinement is often attended with loss of physical productiveness. One of the most curious results of Galton's enquiries into heredity was that wealthy families have a tendency to die out in heiresses, which is partly, but not wholly, dependent on the fact that childbearing is more often the accompaniment of poverty than of luxurious living.

The personal disinclination to marry attendant on intellectual refinement is still more likely to be possessed by those of high spirituality. This is quite natural, notwithstanding the statement of

Mr. Grant Allen, which is undoubtedly true, that the origin and basis of all that is best and highest within us is to be found in the sex-instinct. Love may have begotten "all higher arts and all higher customs," and yet love may in the process itself become sexless, as it is when it assumes the noblest form, that of divine charity for our fellowmen. As well might we continue to perpetuate in our highest actions the nature of the ape-man because we are descendants of this creature, as let the idea of sex always rule our thoughts. With the individual the physical influence of sex is weakened and finally ceases, although it ever remains constant in the race, and hence the influence of the idea of sex over the mind of the individual should be similarly affected. "In Heaven," said the founder of Christianity, "there is neither marrying nor giving in marriage," and in that highest mental condition, which is heaven on earth, the sense of sex has ceased to be operative, having given place to the spiritual sense which is the noblest attribute of man because the last to be developed.

We have here, however, a question between the individual and the race, and it does not affect the main contention that the improvement of the race, which includes that of the individual, is to be found in the application of the principle of selection. This must necessarily be chiefly in the hands of women, although both men and women must co-

operate to bring about the best results, by seeking first of all to improve their own natures by physical, intellectual and moral culture. The statement of the case according to that principle, and the aim to be attained, exhibit the dignity and importance of the subject of stirpiculture. Theoretically this is admitted on all hands, and as soon as the conditions of the subject are clearly understood there will be no practical difficulty in carrying the principle into effect, so that it may have its legitimate consequences.

What parents have to realize is the necessity of so training and instructing their children that they may become capable of being the parents of perfect offspring. The good tree only can bear good fruit. But this is not the real starting point of stirpiculture. An essential factor, and one that is seldom thought of, is the spirit in which the inception of offspring is undertaken. Marriage was to the ancients a sacred state, because it was associated with the religion of the domestic altar, and because the perpetuation of the family, which was its aim, was required by the necessity of having a son to perform the sacred rites at that altar after the death of his father. The perpetuation of the family was thus a sacred duty, and the consummation of marriage partook of this character. According to the ancient Persian religion, the union of man and woman is the act most agreeable to God, and the

act of consummation is directed to be sanctified, and a prayer directed to God that He would bless it. Marriage must be conducted in this spirit, rather than as a means of gratifying the passions, if the happiest results are to be obtained from the application of the principle of sexual selection.

Spiritual Sympathy in Marriage.—That supposes, however, the existence of spiritual sympathy between those who are united in marriage, and this sympathy must form the true basis of all improvements in the race. It was the neglect of this feature, the want of which must render any attempt to carry out Plato's ideas on the subject of marriage futile, that put a stop to the experiments undertaken by his latest imitator, Noyes. His adherents simply made a return to the monogamy which is the heritage of all the Aryan peoples, and which is based on the union of two hearts, and not merely of two persons. This is the first application of the principle of sexual selection above the animal plane, and it must be continued notwithstanding that the range of selection is extended so as to embrace also the intellectual and moral planes.

How far the State may ultimately be called on to aid in the improvement of the race, in accordance with the ideas we have been considering, is doubtful. It can aid very materially in placing restraints on too early marriage, and by insisting on

the attainment of a proper standard of physical training and of mental culture before marriage is entered on. There is no reason, moreover, why the State should not interfere to prevent the marriage of those who are too near of kin, or who by reason of physical or mental ailment, or by their moral defects are not fit subjects for the propagation of the race. The objection to this interference with personal liberty is so strong, however, that even so rational a procedure as preventing the spread, through marriage alliances, of disease and crime cannot yet obtain the sanction of public opinion. This will be educated with the general improvement of the race that must gradually take place through other agencies, and then the State will have merely to carry into effect the decrees of the people, which will be expressed in no uncertain language when woman has attained to the influence to which her own perfected condition will entitle her.

PRENATAL CULTURE.

In the last preceding chapter we have considered the subject of the improvement of the race, especially through the action of sexual selection, or, as it may be expressed, selective action in the pairing of individuals, whether brought about compulsorily by the controlling influence of the State or some other external authority, or by the actual choice of one or both of the individuals immediately concerned. We have now to deal with the subject of the influence over offspring of affections of the individual organisms from whose union such offspring is derived.

JACOB'S FLOCKS.—The story of Jacob dealing with the flocks of Laban, given in Genesis xxx, is usually alluded to in corroboration of the belief that offspring may be physically affected before birth, by anything which strongly influences the imagination of the mother. Jacob is represented as making an agreement with Laban, his father-in-law, that Jacob should receive as his hire all the ring-streaked and spotted he-goats and all the black she-goats, and also those that were speckled and spot-

ted. When this arrangement had been made, Laban sought to benefit by it by removing from the flock all the goats that answered to that description, and giving them into the care of his sons, leaving the rest of the flock in Jacob's charge. This was undoubtedly an attempt on the part of Laban to cheat his son-in-law out of his wages, but the latter was not to be so cheated, and he adopted a plan which gave him the pick of the flock, leaving the feeble goats to his less wily parent.

In describing this operation, the Bible story says: "And Jacob took him rods of fresh poplar [or storax tree] and of the almond and of the plane tree, and peeled white streaks in them, and made the white appear which was in the rods. And he set the rods which he had peeled over against the flocks in the gutters in the watering troughs where the flocks came to drink; and they conceived when they came to drink. And the flocks conceived before the rods, and the flocks brought forth ringstreaked, speckled and spotted. And Jacob separated the lambs, and set the faces of the flocks toward the ringstreaked and all the black in the flock of Laban; and he put his own droves apart, and put them not unto Laban's flock. And it came to pass, whensoever the stronger of the flock did conceive, that Jacob laid the rods before the eyes of the flock in the gutters, that they might con-

ceive among the rods; but when the flock were feeble, he put them not in: so the feebler were Laban's, and the stronger Jacob's."

Whether or not this incident actually occurred as stated we do not know. According to the subsequent part of the narrative, the effect of setting up the peeled rods was ascribed to God's interference in his behalf; but it is not improbable that we have in the story a reference to ancient shepherd lore, based on the superstitious notions still so common in the East. In the earlier part of the same chapter is a story relating to mandrakes, which were supposed to have influence on human generation. Jacob is said to have used three kinds of rods, those of the poplar or storax tree, the almond, and the plane tree, which produced ring-streaked, speckled and spotted lambs.

The influence exerted by Jacob's rods was of a different character from that which is supposed to give rise to the marking of offspring before birth, which is not uncommon if we are to accept as true all the cases mentioned in books referring to the subject. What occurred took place *before* conception, and not subsequent to it, as in these cases. Nevertheless, both classes of phenomena are recognized by so competent an authority as M. Th. Ribot, who, in his "Heredity,"* when criticising Dr.

* "Heredity." By Th. Ribot (New York: D. Appleton & Co., 1875). p. 201.

Lucas' explanation of the origin of the numerous exceptions to the law of heredity, as being due to the operation of the law of spontaneity, affirms that there is no law of spontaneity, but that all such exceptions may be explained by reference to certain causes of diversity. M. Ribot gives three causes of diversity, which are: 1—Antagonistic heredities of two parents; 2—Accidental causes in action at the moment of generation; 3—External and internal influences subsequent to conception. He assigns but little importance to causes acting after birth, such as diet, climate, circumstances, education, physical and moral influences, because, though they may produce serious effects, these are not radical. Possibly, however, since the advance made in the education of those who are born with defects of the sensory apparatus, M. Ribot would somewhat modify his opinion on that point. As to the causes which operate at the period of conception, or subsequent thereto and before birth, he says, in relation to the latter class, they "are all the physical and moral disturbances of uterine existence—all those influences which can act through the mother upon the fetus during the period of gestation; impressions, emotions, defective nutrition, effects of imagination." He adds: "These causes are very real, despite the objections of Lucas, who attacks them in order to establish his law of spontaneity. We see from examples that between con-

siderable causes and their effects there exists an amazing disproportion."

The causes of diversity which operate at the instant of conception depend, says Ribot, "less upon the physical and moral natures of the parents than on the particular state in which they are at the moment of procreation." This fact is referred to by M. de Quatrefages as fully proving the universality of the law of heredity, and M. Ribot adds, "It enables us to understand that those transitory states which exist at the moment of conception may exert a decisive influence on the nature of the being procreated, so that often, where now we see only spontaneity, a more perfect knowledge of the causes at work would show us heredity."

Professor E. D. Cope, the well-known author of "The Origin of the Fittest," would seem to doubt the truth of the stories of birthmarks on the ground that "the effect of temporary impressions on the mother is not strong enough to counterbalance the molecular structure established by impressions oftener repeated throughout much longer periods of time."* And yet there is no doubt that birthmarks do occasionally occur, although it is very difficult to obtain properly authenticated cases of them.

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* "The Origin of the Fittest." By E. D. Cope (D. Appleton & Co., New York). Page 408.

AN ILLUSTRATIVE CASE.—How great is the influence on unborn offspring of the mother's mental condition, as well as the effect over them of pleasant surroundings, is shown by the following case. A young girl attracted attention by her beauty and by the superiority of the type she exhibited over that of either of her parents, and on her mother being spoken to on the subject she remarked:

"In my early married life my husband and I learned how to live in holy relations, after God's ordinance. My husband lovingly consented to let me live apart from him during the time I carried this little daughter under my heart, and also while I was nursing her. Those were the happiest days of my life. Every day before my child was born, I could have hugged myself with delight at the prospect of becoming a mother. My husband and I were never so tenderly, so harmoniously, or so happily related to each other, and I never loved him more deeply than during those blessed months. I was surrounded by all beautiful things, and one picture of a lovely face was especially in my thought. My daughter looks more like that picture than she does like either of us. From the time she was born she was like an exquisite rosebud—the flower of pure, sanctified, happy love. She never cried at night, was never fretful or nervous, but was all smiles and winning baby ways, filling our hearts and home with perpetual gladness. To this day, and

she is now fourteen years old, I have never had the slightest difficulty in bringing her up. She turns naturally to the right, and I never knew her to be cross or impatient or hard to manage. She has given me only comfort; and I realize from an experience of just the opposite nature that the reason of all this is because my little girl had her birthright."

The future experience of this lady was, however, of a very different nature. She added:

"A few years later I was again about to become a mother, but with what different feelings! My husband had become contaminated with the popular idea that even more and frequent relations were permissible during pregnancy. I was powerless against this wicked sophistry, and was obliged to yield to his constant desires. But how I suffered and cried; how wretched I was; how nervous and almost despairing! Worst of all, I felt my love and trusting faith turning to dread and repulsion.

"My little boy, on whom my husband set high hopes, was born after nine of the most unhappy, distressing months of my life, a sickly, nervous, fretting child—myself in miniature, and after five years of life that was predestined by all the circumstances to be just what it was, after giving us only anxiety and care, he died, leaving us sadder and wiser.

"I have demonstrated to my own abundant satis-

faction that there is but one right, God-given way to beget and rear children, and I know that I am only one of many who can corroborate this testimony."

The following case of prenatal culture appeared in *The Philosphical Journal* for October 5, 1895, above the signature of "John Allyn," who says:

"About forty years ago I was a neighbor of a young couple who had been recently married. They were of fair natural abilities, but not highly educated. The wife could play on the piano well and accompany it with her voice. The husband was a house-building contractor. Before their first child was born the wife was provided with instruments for drawing, and interested herself in their use and mathematical calculations connected with them. The child proved to be a boy, who took to architectural drawing as by instinct. With very little effort he became proficient, and is now employed at a high salary by the Southern Pacific Railroad as their architect.

"Some years later, before the second child was born, the mother interested herself with music with reference to the effect it would have on the unborn child. This child proved to be a girl, who is now an expert singer, finding ready employment in opera companies. Though not a star, she has a superior talent for music which enabled her to take advantages of musical training easily."

BELIEFS OF PRIMITIVE PEOPLES.—Whenever such cases happen, it is under the influence of some very strong emotion, during the period of gestation, arising from the action on the nervous system of the mother by an external object presented to the sight, the organ of which would seem to have an intimate association with the general muscular system. There is nothing to show that primitive peoples recognized the action of prenatal influence through the senses; but there is a very curious custom, which is so widespread at the present time that we may well suppose it to have been formerly almost universal, dependent upon the imagined effect of the eating of animal flesh. All primitive peoples believe that a man acquires physical or mental characteristics from animals of whose flesh he partakes. Cannibalism is closely connected with this notion, as the man who eats part of the body of a foe is thought to become endowed with the victim's courage, strength or other special quality. Probably the Mosaic regulations as to unclean animals, that is, animals unfit for food, was based on such an idea; and certainly the command to abstain from eating blood was thus connected; as we are told the blood is the life, and if so, then it must be the carrier of vital influences.

The custom above referred to, which is known to ethnologists as *la couvade*, or "hatching," supposes injurious action on the organism of the child

of food eaten by its parents, as appears from the facts brought together by Dr. E. B. Tylor in his "Researches into the Early History of Mankind." The couvade usually has reference to the period immediately following the birth of a child; but among the native tribes of South America, where it is more extensively prevalent than elsewhere, it is observed while the child is still unborn. Thus, in Brazil, according to Von Martius, "A strict regimen is preserved before the birth; the man and the woman refrain for a time from the flesh of certain animals, and live chiefly on fish and fruits." The peculiarity of the couvade custom, and that which gives it its special interest, is the fact that it usually concerns the father and not the mother, as injury to the child is supposed to be due to the conduct of the former rather than of the latter. Thus, among the Land Dyaks of Borneo, "The husband, before the birth of his child, may do no work with a sharp instrument, except what is necessary for the farm; nor may he fire guns, nor strike animals, nor do any violent work, lest bad influences should affect the child; and after it is born the father is kept in seclusion indoors for several days, and dieted on rice and salt, to prevent not his own but his child's stomach from swelling."

Here food abstinence takes place after the birth of the child, but, according to Brett, in Guinea

"Some of the Acawois and Caribi nations, when they have reason to expect an increase of their families consider themselves bound to abstain from certain kinds of meat, lest the expected child should, in some mysterious way, be injured by the partaking of it. The acouri (or agouti) is thus tabooed, lest, like that little animal, the child should be meager; the haimara, also, lest it should be blind—the outer coating of the eye of the fish suggesting film or cataract; the labba, lest the infant's mouth should protrude like the labba's, or lest it be spotted like the labba, which spots would ultimately become sores."

Another related case, of more recent observation, is that of the Motumotu of New Guinea, who say that after conception the *mother* must not eat sweet potato or taro, lest the head of the child grow out of proportion, and the *father* must not eat crocodile or several kinds of fish, lest the child's legs grow out of proportion. At Suan, a husband shuts himself up for some days after the birth of his first child, and will eat nothing.*

Various explanations of the custom of couvade have been offered, and probably C. Staniland Wake is right when he states that it is connected with the idea that the father is the real source of the child's

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* "Pioneering in New Guinea." By James Chalmers. 1887. Page 165.

life.* As he points out, on the authority of M. Girard-Teulon, among the European Basques, even at the present day, a husband enters his wife's abode only "for the purpose of reproduction, and to work for the benefit of his wife." Mr. Wake remarks that, "With some of the Brazilian tribes, when a man becomes a father he goes to bed instead of his wife, and all the women of the village come to console him "for the pain and suffering he has had in making this child." This agrees with the idea entertained by so many peoples that the child is derived from the father only, the mother being merely its nourisher. When such an idea is held, it is not surprising if, as among the Abipones, the belief is formed that "the father's carelessness influences the new-born offspring, from a natural bond and sympathy of both," or if the father abstains, either before or after the child's birth, from eating any food, or performing any actions which are thought capable of doing it harm. Still more so, if the child is regarded, as is sometimes the case, as the reincarnation of the father, a notion which is supported by the fact, pointed out by Mr. Gerald Massey, that in the couvade the parent identifies himself with the infant child, into which he has been typically transformed.

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* "Development of Kinship and Marriage." Page 264.

That conclusion agrees with the opinion expressed by Mr. Tylor, that the couvade "implicitly denies that physical separation of 'individuals' which a civilized man would probably set down as a first principle common by nature to all mankind. . . . It shows us a number of distinct and distant tribes deliberately holding the opinion that the connection between father and child is not only, as we think, a mere relation of parentage, affection, duty, but that their very bodies are joined by a physical bond, so that what is done to the one acts directly upon the other."* The couvade custom is thus closely connected with the question of the special relationship of a child to one or other of its parents. Curious notions on this subject have been formed from time to time; but the ancients almost universally entertained the idea held by the Greeks that "the father, as endowed with creative power, was clothed with the divine character, but not the mother, who was only the bearer and nourisher of the child." Professor Hearn accepts this view in his work, "The Aryan Household," and suggests as the Aryan thought on the subject: "A male was the first founder of the house. His descendants have 'the nature of the same blood' as he. They, in common, possess the same mysterious

* "Researches into the Early History of Mankind." Page 292.

principle of life. The life spark, so to speak, has been once kindled, and its identity, in all its transmissions, must be preserved. But the father is the life-giver. He alone transmits the life spark, which from his father he received. The daughter receives, indeed, the principle of life, but she cannot transmit it."

M. Ribot, who, as we have seen, endorses the popular belief as to the possibility of the fetus being affected, during uterine existence, through the organism of the mother, reduces all the obscure causes of deviation from heredity to two classes. Of these, the first is the disproportion of effects to causes, already mentioned; and the second is the transformation of heredity. As to the first of these causes, he lays it down as a general truth that "the more complicated the mechanism, the greater the disproportion between accidental causes and their effects." He supports this conclusion by reference to Geoffroy Saint-Hilaire's researches on the production of monsters, and he affirms that the disproportion between cause and effect cannot be foreseen by measuring, but is known only by experience, as "psychological laws are analogous now to mechanical and now to chemical laws," so that it is impossible to proceed by deduction from causes to effects. (Page 207.)

BIRTHMARKS RARE.—And yet the very fact that cases of birthmarks are comparatively rare, proves

the greatly preponderating influence of heredity over the constitution of the offspring, modified by the disposition of the parents at the time of procreation. Professor Cope has some explanatory remarks on that subject which deserve quotation. He says—after referring to the hypothesis that growth-force may be, through the motive force of the animal, directed to any locality, whether the commencement of an executive organ has begun or not—that "A difficulty in the way of this hypothesis is the frequently unyielding character of the structure of adult animals, and the difficulty of bringing sufficient pressure to bear on them without destroying life. But, in fact, the modifications must, in most instances, take place during the period of growth. It is well known that the mental characteristics of the father are transmitted through the spermatozoid, and that, therefore, the molecular movements which produce the mechanism of such mental characters must exist in the spermatozoid. But the material of the spermatozoid is combined with that of the ovum, and the embryo is compounded of the animal contents of both bodies. In a wonderful way the embryo develops into a being which resembles one or both parents in minute details. This result is evidently determined by the molecular and dynamic character of the original reproductive cells which necessarily communicate their properties to the embryo

which is produced by their subdivisions." Professor Cope goes on to say, "Richard Hering has identified this property of the original cells with the faculty of memory. This is a brilliant thought, and, under restriction, probably correct. The sensations of persons who have suffered amputation show that their sensorium maintained a picture or map of the body so far as regards the location of all its sensitive regions. This simulcrum is invested with consciousness whenever the proper stimulus is applied, and the character of the stimulus is fixed by it. This picture probably resides in many of the cells, both sensory and motor, and it probably does so in the few cells of simple and low forms of life. The spermatozoid is such a cell, and, how or why we know not, also contains such an arrangement of its contents, and contains and communicates such a type of force. It is probable that in the brain-cell this is the condition of memory of locality. If, now, an intense and long-continued pressure of stimulus produces an unconscious picture of some organ of the body in the mind, there is reason to suppose that the energies communicated to the embryo by the spermatozoid and ovum will partake of the memory thus created. The only reason why the oft-repeated stories of birthmarks are so often untrue, is because the effect of temporary impressions on the mother is not strong enough to counterbalance the molecular structure

established by impressions often repeated throughout much larger periods of time."*

WHY CHILDREN RESEMBLE PARENTS.—That children reproduce the general and physical and mental characteristics of their parents in combination is unquestionable truth, although the particular mode in which they are communicated is yet undetermined, notwithstanding the fact mentioned by Professor Cope that they are somehow conveyed by the microscopic sperm and germ in the union of which the new being has its beginning. Thus every individual must possess the general characteristics of the primitive human family from which through a vast number of ancestors he has descended. And yet at every stage of descent the organism may have obtained fresh characters, or at least have undergone some modification. As remarked by Dr. G. H. Th. Eimer, "Every character which must have been formed through the activity of the organism is an acquired character. All characters, therefore, which have been developed by exertion are acquired, and these characters are inherited from generation to generation. The same holds for all organs atrophied through disease—the degree of atrophy is acquired and inherited. In the first class we see especially the

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*Cope's "Origin of the Fittest." (Redway, London. 1889.) Page 407.

action of direct adaptation; in the second, the results of the cessation of the action. A third class of acquired characters is to be traced simply to the immediate action of the environment on the organism, and, originally, at the commencement of their appearance, all characters must have belonged to this class."* We have here a general argument in opposition to the theory propounded by Professor Weismann, that acquired characters are not transmissible. Elsewhere (page 382) Dr. Eimer observes: "Phyletic growth, or the evolution of the organic world ever into higher and more complex forms, or at least into forms of different structure, is, as I have said, merely the sum of the processes of growth of the ancestors—together with the result of external influences on the forms during their development and their existence. This additional modification which the individuals as such undergo is—together with the influence of crossing—the very cause of the constantly progressing evolution. All that the members of a series of individuals directly connected by descent acquire constitutes together the material for the formation of a new species."

LIFE'S EXPERIENCES AFFECTING CHILD.—Unless characteristics acquired by an individual, that is,

* "Organic Evolution." Translated by J. T. Cunningham, M. A. (London, Macmillan & Co., 1890.) Page 86.

the modifications of the organism due to his own life experiences, are capable of being handed down to his offspring, it is difficult to see how any progress could be made in the development of the race. Weismann's declaration that acquired characters are not transmissible was a surprise to the scientific world when first made, but it has been accepted by many Darwinians. His conclusion is dependent on his doctrine of heredity, which differs from that propounded by Darwin, but is by no means new; as its leading ideas, as pointed out by Professor G. J. Romanes,* are largely a reproduction of those of Mr. Francis Galton, whose work on heredity attracted much attention when first published. The views of Darwin, Galton and Weismann on that subject have been compared by Professor Romanes, who explains the distinction between them. He says (page 133), after referring to the supposed continuity of the germ-plasm, common to the theories of Galton and Weismann, but not required by that of Darwin, "The three theories may be ranked thus—The particulate elements of heredity all proceed centripetally from somatic-cells to germ-cells (gemmules): the inheritance of acquired characters is therefore habitual.

"These particulate elements proceed for the most

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* "Examination of Weismannism." The Open Court Publishing Co., Chicago. 1893.

part, though not exclusively, from germ-cells to somatic-cells (stirp): the inheritance of acquired characters is therefore but occasional.

"The elements in question proceed exclusively in the centrifugal direction last mentioned (germ-plasm): the inheritance of acquired characters is therefore impossible."

The first of these theories is that of Darwin, and the last that of Weismann, whose notion of the continuity of germ-plasm supposes that no part of an organism generates any of the formative material which goes to make up its offspring. This material is regarded in much the same light as the sperm which the male parent confides to the keeping of the female, according to the notion of the ancient world above referred to. For, as Romanes states (page 26): "In each generation a small portion of this substance [germ-plasm] is told off to develop a new body to lodge and nourish the ever-growing and never-dying germ-plasm—this new body, therefore, resembling its so-called parent body simply because it has been developed from one and the same mass of formative material; and, lastly, that this formative material, or germ-plasm, has been continuous through all generations of successively perishing bodies, which therefore stand to it in much the same relation as annual shoots to a perennial stem: the shoots resemble one another

simply because they are all grown from one and the same stock."

Although Professor Weismann denies that acquired characters, that is, individual peculiarities arising as the result of personal experience, are transmitted, he admits that congenital characters, that is, peculiarities with which an individual is born, are transmitted to offspring. As congenital characters must, originally, have been individual, it is not easy at first sight to perceive Weismann's real meaning. It is necessary, therefore, to enter more particularly into a consideration of his theory, which he regards as in general accord with Darwin's theory of pangenesis. Darwin supposes that all the cells of the body continually give off great numbers of *gemmules*, which are conveyed by the blood and deposited in the germ-cells of the organism. These cells are thus endowed with the power of developing a new organism of the same kind, each gemmule reproducing the cell from which it was derived. These ultimate vital units are called by Weismann *biophors*, but he supposes them not to be the ultimate "bearers of vitality." They are said to be arranged in groups to which the term *determinants* is applied, and these groups are combined so as to form ancestral *ids* or germ-plasms. Each determinant, which is made up of perfectly definite numbers and combinations of biophors, is the primary constituent of a particular cell, or of

a group of cells, such as a blood corpuscle. The determinants thus "control the cell by breaking up into biophors, which migrate into the cell body through the nuclear membrane, multiply there, arrange themselves according to the forces within them, and determine the histological structure of the cell," impressing upon it its inherited specific character. The structure of the cell, and of every subsequent stage, exists therefore potentially in the inherited structure of the id, and the determination of its character "depends on the biophors which the corresponding determinant contains, and which it transmits to the cell."

GERM-PLASM.—While Weismann regarded germ-plasm as absolutely stable, the only mode by which congenital variation could be brought about was that of *amphimixis*, or intermingling of individuals in the process of generation. As modified, however, by his latest work, "The Germ-plasm, a Theory of Heredity," published in 1892, his theory now allows the plasm to be capable of modification, and he ascribes that variation to the direct effects of external influences on the biophors and determinants of the germ-plasm. The instability of this substance is so slight, however, that congenital variations cannot be acted on and perpetuated by natural selection, and the influence of amphimixis is thus required for the purpose. Mr. Herbert

Spencer, however, in criticising Weismann's theory, declares that "functionally produced modifications of structure are transmissible," and he refers in support of his contention to the remarkable effect of arrested nutrition on the structure and habits of wasps and bees. It especially affects the reproductive organs, and hence there is no occasion to call in the aid of amphimixis to perpetuate the variations produced, its office being the blending of the elements on which the characteristics of offspring depend.

If it be asked how modifications are actually transmitted, we may say that it can be only by an affection of the germ-cell. This probably takes place by deviations in the structure of what Weismann calls determinants, or of groups of determinants, through rearrangement of their primary units. The modification would be preceded, however, by a corresponding change in the nerve centers concerned in the use or disuse of the organs affected. Mr. Spencer shows that under certain conditions changes take place in the conduct of certain insects, and that "the maternal activities and instincts undergo analogous changes,"* facts which point to a loss of nervous energy and to an intimate connection between the nervous system and the reproductive function. Use or disuse first increases or diminishes the activity of certain nerve

* *The Contemporary Review*, September, 1893.

centers, and this leads to a modification of the corresponding germ-cells. If so, the determinants, instead of being first affected, as proposed by Weismann, and thus determining the variations, are in reality modified as the result of the functional changes, and are thus capable of transmitting these changes to succeeding generations.

In a subsequent article, published in *The Contemporary Review* for October, 1894, Mr. Spencer recapitulates his argument in favor of the transmission of acquired characters, and refers to observations made by Professor Hertwig and others, which he regards as "showing, firstly, that all the multiplying cells of the developing embryo are alike; and, secondly, that the soma-cells of the adult severally retain, in a latent form, all the powers of the original embryo-cell," facts which he rightly considers disproves Weismann's hypothesis of *panmixia*. If this is surrendered, then, says Mr. Spencer, "all that evidence collected by Mr. Darwin and others, regarded by them as proof of the inheritance of acquired characters, which was cavalierly set aside on the strength of this alleged process of panmixia is reinstated. And this reinstated evidence, joined with much evidence since furnished, suffices to establish the repudiated interpretation."

Great stress was laid by Professor Weismann, as evidence in support of his theory, on the supposed

fact that the inheritance of injuries sustained during life has not been proved. Particular attention has been paid to this point by Dr. Eimer, in relation to which he remarks: "That injuries incurred during life are but seldom transmitted to the offspring does not appear to me wonderful: the inheritance of the complete form and complete activities of the organism, which took root such enormously long periods of time ago, and has been strengthened at each generation, will, as a rule, counterbalance in the offspring any such injuries incurred only once and not repeated." * This is the same argument as was used, as quoted above, by Professor Cope, to disprove the occurrence of birthmarks, and Dr. Eimer goes on to state that there are injuries which are not transmitted to offspring, although they are constantly repeated, as an instance of which he refers to the rupture of the hymen. He adds, however: "In such cases we must presume a specially effective power of correlative activity, directed to the part affected and residing in the whole organism—the same compensating power which leads in lower animals, during the life of the individual, to the regeneration of parts which have been lost or artificially removed. But these cases do not prove the general proposition that injuries are not

* "Organic Evolution." Translated by J. T. Cunningham, M. A. Page 13.

inherited; they do not prove that even injuries which have been repeated during a considerable period are not inherited. Hitherto little importance has been attached to the demonstration of the inheritance of injuries. Yet single cases of the inheritance of injuries only once incurred seem to me to be thoroughly authentic."

CONGENITAL DEFORMITIES.—Professor Weismann, in replying to the criticisms of Professor Virchow, admitted the existence of a number of congenital deformities, birthmarks and other individual peculiarities, which are inherited, but he affirms that we do not know from what causes they first appeared, and that a great proportion of them proceed from the germ itself, and are due, therefore, to alteration of the germinal substance. There is no proof of this, however, according to Dr. Eimer,* who appeals to various facts in support of his contention that injuries and diseases are inherited. He thinks the degeneration of the tail in the higher mammals is a case in point, although it has required great periods of time to complete. Among other instances of inherited injuries mentioned by Dr. Eimer is one in which a scar over the left ear and temple, caused to a girl by being thrown from a carriage, was transmitted to her son and grandson, the son of the latter also showing absence of

* "Organic Evolution," page 176.

hair on the injured spot, although the defect gradually disappeared with him, nearly a hundred years after the accident. The case of Dr. Nosseler, who inherited from his mother a crushed finger joint, caused by an accident which happened two years before his birth, would seem to be conclusive proof that injuries are transmissible. Dr. Eimer refers also to the breeding of short-tailed pointers from dogs whose tails had been artificially shortened; and also to Brown-Sequard's experiments with guinea pigs, in which epilepsy was inherited by their offspring, who showed also the loss of certain phalanges, or even whole toes of the hind feet, the parents having suffered a similar loss owing to the division of the sciatic nerve. He adds that numerous other instances of the inheritance of injuries have been recorded, as "inheritance of the artificially shortened tail of the bull, of artificially produced hornlessness in cattle, many cases of inheritance in man of curvature in a finger, caused by injury, inheritance of the absence of one eye which had been lost by the father during life or by disease, etc."

The question of the inheritance of deformities and diseases, and the causes of the germ-variations on which it depends, have been considered by Zeigler, whose conclusions, as quoted by Dr. Eimer (page 186), are too important to be omitted. The causes which Zeigler assigns for the origin of such

germ-variations are of three kinds. These are : 1—Union of sexual nuclei which are not adapted for copulation ; 2—Disturbance of the copulatory process itself ; 3—Injurious influences which affect the sexual nuclei or the fertilized ovum at a time when separation of the sexual cells from the body cells has not yet occurred. "If the embryo is injuriously affected at a later period," says Zeigler, "either a malformation or a constitutional anomaly arises, which is not inherited, or only the sexual cells are injured, in which case the body-cells develop normally, and a disturbance shows itself only in the development of the next generation." The union of sexual nuclei not adapted for copulation appears, however, to be "the most frequent and most important cause of hereditary local malformations as well as of hereditary morbid tendencies, or of a defect in any system of the whole organism." If the nuclei are altogether unadapted to each other, sterility occurs, as in the sexual nuclei of distinct species.

Psychical Diseases.—Zeigler's conclusions are supported by reference to the enquiries of the distinguished psychiatrist, D. Von Kraft-Ebings, who has considered the heredity of psychical diseases, and in connection therewith mentions three "essential facts" which it is necessary to keep in view when dealing with that subject. The first of these facts

is Atavism, by which "the bodily and mental organization and character can be transmitted from the first to the third generation, without any necessity that the second and intermediate one should exhibit the peculiarities of the first—thus the condition of the life and health of the grandparents are of interest for us." Secondly, "Only in rare cases is the actual disease transmitted in procreation (congenital insanity, hereditary syphilis), as a rule only the disposition thereto. Actual disease only occurs when accessory injurious influences produce an effect based upon that disposition. . . . We must, therefore, consider also the state of health of the relatives (uncles, cousins, aunts), and since here also the law of atavism holds good, the possible diseases of great-uncles and great-aunts." Thirdly, Dr. Von Krafft-Ebings says, "Only exceptionally does the same disease develop in ascendant as in descendant lines, in consequence of the transmission of morbid dispositions. On the contrary, there exists a remarkable variability in the forms of disease which may almost claim the value of a law (the law of polymorphism or transmutation)."

This law is referred to by M. Ribot as one of the causes of deviation from heredity, and he speaks of it as "transformation." As examples of transformation of heredity, Ribot refers to fixed ideas in the progenitor, which may become in the descendants "melancholy, taste for meditation, apti-

tude for the exact sciences, energy of will, etc.;" the mania of progenitors may be changed in the descendants into "aptitude for the arts, liveliness of imagination, quickness of mind, inconsistency in desires, sudden and variable will. "Just as real insanity," says Moreau of Tours, "may be hereditarily reproduced only under the form of eccentricity, may be transmitted from progenitors to descendants only in modified form, and in more or less mitigated character, so a state of simple eccentricity in the parent—a state which is no more than a peculiarity or a strangeness of character—may in the children be the origin of true insanity. Thus in transformations of heredity we sometimes have the germ attaining its maximum intensity; and again, a maximum of activity may revert to the minimum." *

It should be borne in mind, as mentioned by Von Krafft-Ebings,† that everything which debilitates the nervous system and the generative powers of the parents, "be it immaturity or too advanced old age, previous debilitating diseases (typhus, syphilis), mercurial treatment, alcoholic and sexual excesses, overwork, etc., may give rise to neuropathic constitutions, and thereby indirectly to every possible nervous disease in the descendants."

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* "Organic Evolution," page 211.

† Op. cit., page 201.

TELEGONY.—There is one remarkable phenomenon, spoken of by various writers as *telegony*, which has an important bearing on the subject of the transmission of acquired characters, and shows the action of prenatal influence in an unexpected form. It is referred to by Professor Romanes, when he says, "It has not unfrequently been observed, at any rate in mammals, that when a female has borne progeny to a male of one variety, and subsequently bears progeny to a male of another variety, the younger progeny presents a more or less unmistakable resemblance to the father of the older one." * This curious fact was considered, in relation to plants especially, by Darwin, who affirms, as quoted by Romanes, that it is of the highest theoretical importance, as "The male element not only affects, in accordance with its proper function, the germ, but at the same time various parts of the mother-plant, in the same manner as it affects the same parts in the seminal offspring from the same two parents. We thus learn that an ovule is not indispensable for the reception of the influence of the male element."

The curious phenomenon of telegony is not limited, however, to plants. Mr. Herbert Spencer drew attention, in *The Contemporary Review* for March, 1893, to a case which has long been known to horse-

* "Examination of Weismannism," page 77.

breeders, and which may be said to have become classic. The facts were brought, by the Earl of Morton, to the attention of the Royal Society of Great Britain, as long ago as the year 1820. The Earl, who possessed a male quagga, said, in a letter to the President: "I tried to breed from the male quagga and a young chestnut mare of seven-eighths Arabian blood, and which had never been bred from; the result was the production of a female hybrid, now five years old, and bearing, both in her form and in her colour, very decided indications of her mixed origin. I subsequently parted with the seven-eighths Arabian mare to Sir Gore Ouseley, who has bred from her by a very fine black Arabian horse. I yesterday morning examined the produce, namely, a two-year-old filly and a one-year-old colt. They have the character of the Arabian breed as decidedly as can be expected, where fifteen-sixteenths of the blood are Arabian; and they are fine specimens of that breed; but both in their colour and in the hair of their manes they have a striking resemblance to the quagga. Their colour is bay, marked more or less like the quagga in a darker tint. Both are distinguished by the dark line along the ridge of the back, the dark stripes across the forehead, and the dark bars across the back part of the legs." Mr. Spencer refers to an analogous case of the influence of a wild boar over the subsequent progeny of a domestic

sow, and it now appears that such effects are not so uncommon as the scientific world has supposed.

Professor Romanes made particular enquiries on this subject of professional and amateur breeders of animals, and he says most of his correspondents "are quite persuaded that it is of frequent occurrence, many of them regard it as a general rule, while some of them go so far as to make a point of always putting a mare, bitch, etc., to a good pedigree male in her first season, so that her subsequent progenies may be benefited by his influence, even though they be engendered by inferior sires."* His own more modest conclusion is that the evidence he obtained "is enough to prove the fact of a previous sire asserting his influence on a subsequent progeny, although this fact is one of comparatively rare occurrence."

The English Darwinian met with only one case in which the offspring of a woman by a second husband, who was a white man, showed the influence of her first husband, who was a negro. Mr. Herbert Spencer would seem to have been more successful. In *The Contemporary Review* for May, 1893, Mr. Spencer gives the result of his own enquiries as to the effect on a white woman's subsequent progeny of a previous union with a negro, and he quotes the opinion of a "distinguished cor-

* "Examination of Weismannism," page 22.

respondent," that information given to him many years ago was to the effect that "the children of white women by a white father had been *repeatedly* observed to show traces of black blood, in cases where the woman had previous connexion with [i. e., a child by] a negro." Mr. Spencer refers also to Professor Marsh as authority for such a case, and to the opinion of several medical professors who assured him, through Dr. W. J. Youmans, that the alleged result "is generally accepted as a fact." He gives as authoritative testimony the following statement by Dr. Austin Flint, taken from his "Text-book of Human Physiology:" "A peculiar and, it seems to me, an inexplicable fact is, that previous pregnancies had an influence upon offspring. This is well known to breeders of animals. If pure blooded mares or bitches have been once covered by an inferior male, in subsequent fecundations the young are likely to partake of the character of the first male, even if they be bred with males of unimpeachable pedigree. What the mechanism of the influence of the first conception is, it is impossible to say; but the fact is incontestable. The same influence is observed in the human subject. A woman may have, by a second husband, children who resemble a former husband, and this is particularly well marked in certain instances by the color of the hair and eyes. A white woman who has had children by a negro may sub-

sequently bear children to a white man, these children presenting some of the unmistakable peculiarities of the negro race."

This phenomenon would alone seem to answer the question of the transmission of acquired characters in the affirmative, for its explanation is to be found in the facts brought out by Darwin, as to the action of foreign pollen on the structure of the mother plant; in relation to which Professor Romanes remarks: "When one variety fertilizes the ovules of another not unfrequently the influence extends beyond the ovules to the ovarium, and even to the calyx and flower-stalk, of the mother plant. This influence, which may affect the shape, size, colour, and texture of the somatic tissues of the mother, has been observed in a large number of plants belonging to many different orders."* May we not have here the explanation of the fact, which has frequently been pointed out, that husband and wife show a tendency to grow like each other, both physically and mentally, the resemblance after a long married life being sometimes very striking?

Power of Heredity.—The most important fact brought out in the discussion of the possibility of the transmission of acquired characters is the power of heredity. If organisms did not reproduce their

* "Examination of Weismannism," page 79.

own special characteristics, there could be no fixity of form and no order in organic nature. Nevertheless, if there were no change by individual modification or divergence, in whatever way this may be rendered permanent in the race, there could be no evolution. Hence we can say, with Dr. Eimer, "Any one who thus completely renders allegiance to the supremacy of the principles of the unity of the organic world, who rejects everything which contradicts that principle, cannot help admitting that in truth, as I assert, the ultimate origin of the various kinships in the animal and vegetable kingdom is to be traced to individual differences, and that the difference between the former, like the latter, must be essentially determined by external conditions, by the modification of organic growth."

The causes of diversity which interfere with the action of heredity may operate, as we have seen, at the moment of conception, or subsequent to conception. The former class of causes is of great importance, in accordance with the principle, laid down by M. Ribot, of the disproportion of effects to causes, and it is essential, therefore, if children are to be well-born, that their parents should be careful that at the moment of procreation they are fitted for the performance of so serious an act. Mr. J. F. Nisbet in his "Marriage and Heredity" (page 126), well observes, "Twins usually bear a closer resemblance to each other than to their brothers

and sisters born at a different period; and the reason generally assigned is that they are conceived under precisely similar conditions. If so, it follows that the difference existing between ordinary members of a family is due to their being born at considerable intervals of time and therefore under changed conditions on the part of their parents."

SOBRIETY IN THE FATHER.—Especially does it concern the father, who is the most active agent in reproduction, to see that he is then in a fit condition. This is quite apart from the question of the diseased condition of the organism treated of by Dr. Von Krafft-Ebings, and refers to temporary rather than to continuing causes. Sobriety is in this connection of great importance, and, as appears from a passage, already quoted, in Xenophon, was insisted on at the time of procreation, by the ancients.

Zeigler points out, as quoted by Dr. Eimer, that "substances taken up from without, as, for example, poisons, are brought by the blood to the sexual cells, and others produced in the body are conveyed to the sexual organs."* It is suggested that alcohol has such an effect, and there can be no doubt that a tendency to the drinking habit may be implanted in a child by a parent intoxicated at the

* "Organic Evolution," page 187.

time of procreation, with the possibility of its leading to other evils in succeeding generations, ending in the early extinction of the family. Nisbet refers to several cases of this character, and remarks (page 112) that, "There is a limit to the transmission of abnormal characters, either in an original or in a disguised form. Always striving after perfection, or rather uniformity of type, Nature either purifies a race of its physical and moral defects, or, if the type be too vicious, exterminates it, as in the case of the Cæsars, the Stuarts, and many other historical families." Doutrebente came to the conclusion, however, that insanity—and doubtless it is true of other conditions—may be worked out of a family by the infusion of healthy blood, except where both parents were insane, in which case their offspring will become extinct.

The law of Leviticus (chap. x, verse 9) provides, under penalty of death, that the priests should not drink wine or strong drink before going into the tent of meeting. The more stringent regulations provided by this law in relation to intercourse between Jehovah and His people require physical and moral perfection in those who approach the deity, and they may be studied with advantage at the present day by those who wish to aid in the perfecting of the race. The man who had a blemish was not allowed to go near the altar of sacrifice, that the sanctuary might not be profaned; and the

sanctuary of the human organism should no less be preserved from profanation.

Sacredness of Parentage.—It would be well if the sacred act of procreation were performed more often in the spirit of the ancients, who regarded marriage as a sacred institution, designed not only for the perpetuation of the race, but also for the carrying on of the religion of the domestic hearth. The first-born child especially was considered to have been sent by the gods, and care was taken, therefore, that it should be well-born. Prayer and offerings were made to the spirits before the nuptial bed was approached, and everything was done to ensure the gift they were asked for should be in every respect worthy of them. Among the ancient Hebrews the first-born of "all that openeth the womb" was dedicated to Jehovah (Exodus xxxiv, 19), and hence the rights of the eldest son could not be defeated by his father: "for he is the beginning of his strength" (Deut. xxi, 17).

The disturbance of uterine existence between conception and birth is that which has engaged most attention, and the fact that such disturbances can take place requires that the expectant mother should be protected from anything that can so act on her own organism as to prevent the due operation of the law of heredity. The precautions taken by primitive peoples in relation to food may have

some foundation in fact, and any food should be avoided by the enceinte woman which will injuriously influence the system, or give rise to organic disturbances that may affect the blood by which the embryo is nourished. Emotional disturbances are to be no less avoided, as through the nervous system they act on the blood itself. How far the action of the emotions can influence the physical organism has become a moot question with psychologists, who now seem inclined to think that "movements are not caused by the emotions, but are aroused reflexly by the object." Thus, if the sight of a disagreeable object affects by reflex action the muscular system of the mother, it will arouse in her a concomitant emotion, which being transmitted to the embryo may act on its muscular system, leaving the impression as a birthmark, which may be regarded as a reflection from the cerebral nerve center of the mother, whether emotion is the cause or effect of muscular movement.

If the unborn child can be affected injuriously by disturbances of the mother's environment, it is reasonable to suppose that the child can be influenced in the opposite direction by making that environment as conducive to the normal activity of the material organism as possible. The story of Jacob and Laban, referred to at the beginning of this chapter, affords an important lesson as to the surroundings with which the wife should be

provided. The bedchamber itself may become a means of influencing offspring for good or evil, and hence it should contain only what is agreeable to the senses, and capable of giving rise to pleasant imaginings. Especially should this be the case where a woman is of a highly sensitive nature. Impressions received from without depend largely for their force and influence, however, on the condition of the receptive mind, and beautiful surroundings cannot make up for the want of inward harmony. A happy and contented mind is the best guarantee that the due action of the law of heredity will not be disturbed at the time of conception or afterwards. Thus, bickerings between husband and wife must have a disturbing effect, especially if carried into the bedchamber. The sage of old said: "Let not the sun go down upon thy wrath," and parents should make it a point of duty, for the sake of their future offspring, never to let the disputes of the daytime—if unfortunately they occur—be carried into the night. The bedchamber is the place for mental as well as physical repose.

The surest guarantee against the occurrence of conditions which may injuriously affect the future offspring, either at the time of procreation, or during the subsequent period of gestation, is to be found in the general life of the parents. This will give the general impress which affects the disposition of the child as a whole, and it will show

what are the conditions of the family life under the influence of which it was born. The nature of the "home" is thus an important factor in determining that of the offspring, and it will necessarily be a reflection of the general character of those on whom it depends. A noble life in the parent will bear fruit in the physical, intellectual and moral character of the child, and although this is true in relation to the father as well as to the mother, it is doubly true as to the latter, seeing that the mother alone is the bearer and nourisher of offspring during the period of gestation. During this period the child acquires probably many of the characters which it inherits from its mother, and the maternal influence may thus be extended to the period of lactation. The importance attached to fosterage, where this practice became an established custom, as with the early Irish and Arabs, would seem to prove that the characteristics of the nurse were to some extent transmitted to the child with the milk. The early Arabs regarded the milk-tie as constituting a real unity of flesh and blood between the foster mother and the foster child, and between foster children, so much so as to be a bar to marriage.

SELF-CONTROL.—One very serious matter which should be kept in mind by an expectant mother is the duty of exercising self-control. The influence

of this principle in relation to the general life and conduct has been repeatedly pointed out, and it is referred to by Jennie Chandler in *The Journal of Hygiene* for August, 1895, where we are told: "The power of self-mastery is believed by scientists to be the last one acquired by the human race in the process of evolution, and the last powers acquired are not so firmly fixed in our natures as some which have been longer in our possession. The result is, it becomes deranged more readily than more fixed forces. In many cases, self-control has never been acquired at all, and so the person can only partly master himself. As a rule, children have little of this power. They are like animals. Little by little, as they grow older, it grows, and in some it becomes so well developed that it is almost perfect. In others, like music in those who never acquire it, or any other faculty, it never becomes a potent factor in life."

Dr. Chandler adds, "Woman as well as man needs to learn self-mastery. With a large amount of feeling in her nature, it is very hard for her to do it, but she should try. Too many of us go through life never making any effort to be our own masters. We give way to caprices, whims, feelings, follies, far more than is good for our health. Hysteria gives us a good example of the loss of self-control. Any uncontrolled passion gives an equally vivid example. Men and women often say

they can't govern themselves; that is admitting they have defects of character which are their masters. They ought to make effort and see if they are not mistaken. The worst effect of lack of self-control are on the health. It allows every kind of bad habit in eating, drinking, dressing, sleeping, to gain possession of the person, and the result is a weak instead of a strong character."

Considering the effect which the organic disposition of the mother has on the future offspring, it is evident that whether a child shall have the power of self-control depends very largely on the mother herself, and it is all-important, therefore, that she should have and exercise that power herself. As Dr. Chandler remarks, "No matter how much you have been to school, how many college degrees you have, you are not educated till you have a reasonable control of your own nature, and can direct your own lives rather than have them directed for you by your feelings and emotions." This truth obtains fresh significance when we consider that a woman's conduct affects the direction not only of her own life, but the lives of her future children, and possibly of succeeding generations.

Although much has yet to be done to prove the actual effects on offspring of the conduct of its parents, enough is known to establish the fact that both the general disposition and the particular conduct of father or mother may interfere with the or-

derly action of the law of heredity. This law ensures the inheritance of race and individual characters; but when these are good, a noble life will cause the tendencies towards good to be still further strengthened in offspring, and if they are evil, then the disposition will receive an inclination in the opposite direction, or, at least, the further development of evil will be arrested. On the other hand, a degrading life will produce bad effects on offspring, causing deterioration of the organic disposition and strengthening the tendency to evil it may have inherited, or weakening its tendencies towards the good.

HEREDITY AND EDUCATION.

A Lecture delivered before the Brooklyn Ethical Association.

In presenting the subject of heredity and its relation to education, it seems to me best to consider first what is meant by the term, and after this the views held on the subject by our leading evolutionists, when its relation to education will be easier and, I hope, more satisfactory.

In common parlance, heredity is the transmission of any trait or peculiarity from the parent to the offspring, as the color of the hair, the form of the nose, the tones of the voice; or any disease, or any special character that may exist in either parent.

If a horse has a star on its forehead like one of its ancestors, we say it is due to heredity. If an ox has color marks on its body like its parent, it is a case of heredity. If a human being has a disease which his ancestors had, very often he declares he inherited it from them, even if it be only a common catarrh. But this is a narrow view of the subject, and does not include all that a biologist means when he uses this word.

By heredity he understands the production from a fertilized ovum of an individual, with all the general characteristics of structure and function of body and brain of the species to which it belongs. It means that the offspring, however much they may vary in general characters, will always be of the same species as the parents. The offspring of dogs will be dogs; of wolves, wolves; of negroes, negroes, and of white men, white men. Anything less is not heredity in its full sense.

Darwin, whom we all love and honor, says: "The whole subject of inheritance is wonderful," and in this he but voices the universal sentiment of those who have given any serious consideration to it. Let me try to show you how wonderful it is by an illustration. From very ancient times the horse has been the constant companion of man. This animal, with his splendid muscular system, the most perfect, perhaps, of any creature, has for his food and shelter, and not always the best of these, rendered mankind almost infinite service. Now, every horse that has ever been born into the world began life as a minute ovum, which under the microscope presents no appearance of a horse, or any other animal, and, strange to say, this ovum is, to all appearance, like the ovum of other animals, and no amount of study, without knowing its origin, can decide whether it will develop as a dog, an ox, a horse or a man. After, however, it has

gone through the process of gestation, this apparently simple egg becomes an animal of a very complex nature, with heart, lungs, brain, eyes, ears, mouth, stomach, and blood vessels, all where they should be and ready to perform their functions; with mental traits of a peculiar kind which adapt him to the service which man requires. Nay more: In the process of the evolution of the horse, little by little he has changed in various ways, and many, if not all of these changes in his bodily constitution and in his mental characteristics, which have been found useful or made him more serviceable to man, his greater docility, his increased size, his enormous strength and speed, his wonderful beauty, through a wise selection and the weeding out of the unfit on the part of the breeder, have been transmitted through heredity to his offspring, so that today only a paleontologist can tell us if he finds the remains of a primitive horse, that it belongs to the same class of animals as the horse of our time.

THEORIES.—Our theories of heredity will depend on the extent of our knowledge, and especially our knowledge of embryology. In the last century knowledge on this subject was very meagre, especially that part of embryology which could only be studied with the microscope; consequently the views of scientists and others of that time were exceedingly crude. The most important was that

of Malphigi and Bonnet, who maintained that the miniature animal existed in the egg; that fertilization by the male element simply furnished it with food for growth, and that this was added to and stored up in its interstices. Cuvier, Haller and Leibnitz adopted substantially these views. The latter found them to support his opinion that everything was the result of growth from monads, and that there was no such thing in all nature as generation.

Such a theory was very simple, but it explained nothing except the bare production of offspring. It gave no clue to their endless variations, nor to the fact that they often resembled the father more than the mother. According to this theory the offspring should resemble the mother, as the complete individual is formed by her and should be in her image.

Leeuwenhock, one of the early microscopists, by the aid of his lenses, opened a new world to mankind, and discovered the sperm cells to be active, living, moving elements, and he gave a death-blow to the belief that the perfect organism exists in the ovum; but he went to the opposite extreme, and maintained that it exists in the male cell and that it is only fed and developed by the female. Even today we find in a vague way both these theories held by educated persons.

We are indebted to Harvey in the early part of the eighteenth century for advocating the view held

by Aristotle, now known as *Epigenesis*, and combatting the view of growth from a miniature, but already perfectly formed animal, to a visible one. Epigenesis consists in the successive differentiation from the relatively homogeneous elements as found in the egg, to the complicated parts and structure as seen in the offspring.

According to Huxley, this work of Harvey alone would have entitled him to recognition as one of the founders of biological science, had he not immortalized himself as the discoverer of the circulation of the blood.

Not long after Harvey's publication, Casper Frederick Wolf established the theory of epigenesis upon a firm foundation, where it still remains.

The doctrine of *epigenesis* has very much complicated the whole question of heredity. No wonder even so great a mind as that of Darwin exclaimed, "The whole subject is wonderful." How can an egg, which in structure is comparatively simple, an aggregation of cells, not one of which bears the slightest resemblance to any organ in the body, develop into the perfect individual? How can this egg, formed in special organs, devolop other organs than those like the ones in which it was formed? How can sexual cells develop brain cells, with their wonderful modes of action?

We cannot explain the philosophy of heredity without being able to answer these questions; but

difficult as is the problem, our biologists have made various attempts at an explanation. I cannot go over all the various speculations, but only those most intimately connected with the subject will be mentioned.

The first is Darwin's own attempt at an explanation by the theory of *pangenesis*, or genesis from every part. He saw the necessity of having in the sexual cells some power or force to represent the other organs and functions of the body, else how could these organs be formed in the embryo? Pangenesis was supposed to be accomplished as follows: Every organ through its cells gives off *gemmules*. These are inconceivably small, too small for any microscopical vision; also inconceivably great in numbers, and with great power of growth and multiplication. They pass from the various organs in which they are formed to the special sex organs for generating the sexual cells; some of them are stored up as representatives of the various organs from which they have been given off. The consequence is that every egg has in it something from every organ in the body of both parents which is able, during gestation, to develop into that organ.

According to this theory, for instance, if no gemmules are given off from the brain, then no brain can be developed from the egg, and so of other organs. As in a representative government, all parts of the

country send representatives to the capitol to do the bidding of the people, so every organ of the body sends representatives to the sexual cells to form their respective organs; without them these organs would not be formed.

There are many objections to pangenesis, but they need not be named here. It occurred to Galton, whose studies in heredity have been more prolific of good than those of any other man, to test it by practical experiment. If these gemmules are circulating in the blood of animals before being stored up in the sexual cells, by transfusing blood from one variety of any species to another it ought to affect the offspring of this other. For his test cases he chose eighteen silvergrey rabbits which breed true, and into their bodies he transfused the blood of other different varieties, in several cases replacing one-half of this fluid. There were eighty-six offspring bred at once from these silvergrey rabbits, and all true silvergreys. The theory did not work. But if it did not work in practice, it certainly worked on the intellects of biologists everywhere, exactly what Darwin wished; it set them to thinking. It acted as a ferment, so to say, and brought forth a rich harvest in speculation if not in actual knowledge.*

* Darwin did not regard this experiment as settling this question. He had great affection, so to speak, for this poor, despised theory, and believed it would finally be established as in the main true.

CONTINUITY OF THE GERM-PLASM.—The only other theory which I shall mention is that of Weismann, which has been before the public for more than a decade, and it is safe to say it has produced a more profound impression upon biologists than all others. It has its basis in what he calls *continuity of the germ-plasm.* By the germ-plasm is meant that part of the germ cell containing all the chemical and physical properties, including the molecular structure, which enables it to become, under appropriate conditions, a new individual of the same species as the parents. In it lies hidden all the characteristics both of the species and of the future individual. In it lies all the phenomena of heredity. It is the product of the coalescence of the male and female elements requisite for reproduction. Only, however, in the nuclear substance is to be found the hereditary tendencies. Now, this germ-plasm is *continuous*, that is to say, it contains not only material from both parents, but from grandparents and greatgrandparents, and so on indefinitely. This germ-plasm is exceedingly minute in quantity, but has great power of growth. Not all is used up in the production of any individual, but some is left over and stored up for the next generation. The germ-plasm might be represented as a long creeping root, from which arise at intervals all the individuals of successive generations. The amount of ancestral germ-plasm in each fertilized ovum is

calculated in the same way that stock breeders calculate the amount of blood of any ancestor running in any individual. For instance: The germ-plasm contributed by the father and mother is each one-half; each grandparent one fourth, and so on. Ten generations back each ancestor contributes only one part in one thousand and twenty-four parts. This continuity has by some been called the immortality of the germ-plasm. Theoretically, the original Adam and Eve have contributed an infinitesimal part. This probably explains why there is so much of the original Adam in most of us. By it we are able to explain that wonderful fact of *atavism*, or the appearance of characters from a remote ancestor in offspring. Some of the germ-plasm from this ancestor by some means has had an opportunity to grow rapidly and contribute more than its share in the production of the individual in which it appears.

It also enables us to explain the fact that no two individuals are quite alike, but that there is constant variation. Each person is the product of a multitude of ancestors, and the germ-plasm which produced them is never mixed, in quite the same proportion, nor do the different parts grow with quite the same vigor.

It was on this theory of the continuity of the germ-plasm that Weismann built his doctrine of the non-transmission of acquired characters. On this

subject he says: "Hence it follows that the transmission of acquired characters is an impossibility, for if the germ-plasm is not formed anew in each individual, but is derived from that which preceded it, its structure, and above all, its molecular constitution, cannot depend upon the individual in which it happens to occur, but such an individual only forms, as it were, the nutritive soil at the expense of which it grows, while the latter possessed its character from the beginning, that is, before the commencement of growth." Of this, however, I will speak later.

A RATIONAL VIEW OF HEREDITY.—I might continue giving other theories of heredity—Heckel's, for instance—or the metaphysical theory, but it is hardly necessary. I do not accept in full any of them. Their authors, it seems to me, have not worked along the lines of evolution, but have gone further than was necessary into the fields of speculation. Darwin, in his theory of Pangenesis, admitted this frankly, and yet he clung to the idea with great tenacity. If we take the unicellular organisms which multiply by division, we may see that heredity is simple. One unicellular individual growing larger than is convenient, divides into two. Each is like the other. It could hardly be different. Reproduction by spores or buds is practically the same thing. The spores or buds are minute parti-

cles of the parent organism. When it comes to the coalescence of the germ and sperm elements from two organisms, the phenomena become more complicated, and it is still more so as the animal rises in the scale of creation; but I believe the processes of organic evolution have gone on so slowly that the sexual cells have acquired the power to transmit the whole organism without the necessity of the germ-plasm being continued from parent to offspring indefinitely, and also without the aid of pangenesis.

The egg has acquired a tendency to develop in a certain direction. Just how we cannot tell, further than to say that it was probably the result of variation first and natural selection selecting out those variations most suitable. It is this tendency to vary that gives rise to many of the phenomena of heredity. The subject is, for the present, beyond our power to settle satisfactorily, and so hypotheses must be resorted to. The sexual cells, comparatively simple in anatomical structure, must be highly complex in their molecular structure; and the more highly evolved the organism, the more complex becomes this molecular structure. If it were possible to study this molecular structure we should be able to understand the whole subject far better than is possible now. But this is not possible, and there is little hope that we shall ever be able to accomplish it.

HEREDITY AND THE EDUCATION OF CHILDREN.—The next question which comes up for consideration is that of the education of children and its relation to heredity. This brings us at once to the problem as to whether acquired characters are transmitted to offspring or not. If acquired characters are transmitted, the relation of heredity to education must be very close and important. If acquired characters are not inherited, then heredity and education have a very different relation. That acquired characters are transmitted has long been believed. It was the belief of Lamarck. He tried to explain the structure of the organism by this principle. The illustration of the long neck of the giraffe is familiar to every one. It originated by the constant stretching of this part to obtain food from the trees. In times of scarcity, he had to exert himself in this way still more to reach the higher branches. The young of the giraffe had longer necks than their parents because of the efforts of the latter in this way. So the keen sight of birds, it was argued, was acquired in the same manner. The hawk had to exercise his eyes most vigorously to discern his prey at a distance, and his offspring inherited this keenness of sight acquired by the exercise of his ancestors.

Darwin believed that the effects of the exercise of any part were transmitted. He says: "We may feel assured that the inherited effects of the

use and disuse of parts will have done much in the same direction with natural selection in modifying man's structure of body."

We may say that this belief has been held by the common people, uneducated in science. They not unfrequently get at truths in a rude way long before the scientists do. Many parents tell us their children are strongly influenced by some particular occupation of the mother during pregnancy. So strong is this belief, that many mothers are in our times trying to influence the character of their unborn children by special modes of life, by cultivating music or art, or science, in order to give the child a love for these pursuits.

It is by Herbert Spencer that this has been most ably presented. Indeed, he holds that there is no explanation of evolution without the transmision of the effects of the use and disuse of parts. His words are: "If there has been no transmission of acquired character there has been no evolution."

He also says: "If we go back to the genesis of the human type from some lower type of primates, we see that while the little toe has ceased to be of any use for climbing purposes, it has not come into any considerable use for walking or running. It is manifest that the great toes have been immensely developed since there took place the change from arboreal to terrestrial habits. A study of the mechanism of walking shows why this has hap-

pened. Stability requires that the line of direction —the vertical line, let fall from the center of gravity—shall fall within the base, and the walking shall be brought at each step within the area of support, or so near that any tendency to fall may be checked at the next step. A necessary result is that *if* at each step the chief stress of support is thrown on the outer side of the foot, the body must be swayed so that the line of direction may fall within the outside of the foot, or close to it; and when the next step is taken it must be similarly swayed in an opposite direction, so that the outer side of the foot may bear the weight. That is to say, the body must oscillate from side to side, or waddle. The movement of the duck when walking shows what happens when the points of support are far apart. This kind of movement conflicts with efficient locomotion. There is a waste of muscular energy in making these lateral movements, and they are at variance with the forward movement. We may infer, then, that the developing man profited by throwing the stress as much as possible on the inner side of the feet, and was especially led to do this when going fast, which enabled him to abridge the oscillations, as indeed we see it now in the drunken man. Then there was thrown a continually increasing stress upon the inner digits as they progressively developed from the efforts of use, until now the inner digits, so large compared with

the outer, bear the greater part of the weight, and being relatively near one another render needless any swaying of the body from side to side in walking. But what has meanwhile happened to the outer digits? Evidently as fast as the great toes have come more and more into play and the small ones have gone more and more out of play, dwindling for—how long shall we say?—perhaps 100,000 years." In other and simpler words, the great toe of man has wonderfully developed since he began to walk upright. This has been from greater use, and the transmission of the effects of this use to offspring. The small toe has decreased in size proportionately. This we can reasonably infer has been the result of disuse, the effects of which were also transmitted to offspring.

A still more remarkable illustration of the effects of use and disuse is seen in the sense of touch in different parts of the body. Prof. Weber, in his laboratory for experimental psychology, has worked out this difference most minutely. He finds that by taking a pair of compasses, the points of which are less than one-twelfth of an inch apart, the end of the forefinger is not able to distinguish more than one point. Going to the middle of the back we have the least discriminating power in the skin, for the points must be separated two and one half inches before the nerves can decide that there are two. Any one may test this on himself. Between

these extremes we have many differences. The end of the nose has four times as great power of discrimination as the forehead. When we come to the tip of the tongue, we find it far excels any part of the body in its power of tactual discrimination, it being twice that of the forefinger. In every case we find there is greatest delicacy of touch in those parts where this sense has been most exercised. The tongue is being constantly exercised on our food, on the roof of the mouth, the teeth, etc. It is rarely idle. There is in man no advantage for his survival, Mr. Spencer asserts, by having such a sensitive tongue. He could get on just as well without it. He regards it as a case where the exercise of a function has exalted it remarkably, and this exaltation has been transmitted to offspring. Natural selection, he thinks, is not sufficient to account for it. Natural selection only preserves those characters which will give their possessor some advantage in the struggle for existence.

Still another argument is drawn from the whale. This monster once lived, it is believed, partly on land, probably on low land near water, and must have been smaller than now. It had hind legs; but since it has lived continuously in the water its tail has so developed as to make a far better organ of locomotion, and the legs have dwindled from disuse, so that now there is only a remnant

left, and this is hidden beneath the skin. The tail has become more efficient from use, and this has been transmitted so that all whales are born with well developed tails. The legs have dwindled for want of use until they have almost disappeared; and this effect of disuse has also been transmitted to offspring.

Another illustration is furnished by Havelock Charles, an English surgeon, who has spent much time among the Punjab tribes in India, and studied them anthropologically. His account is given in "The Journal of Anatomy," in a paper on the structure of the skeletons of these people. It appears they have facets on the bones, fitting them for the sitting posture. These do not develop after birth, but are seen in the fetus. It seems hardly possible that these facets could have any other origin except by transmission after being acquired by ages of use of sitting posture.

Another argument is drawn from the coadaptation of parts. We know that the male sheep, likewise the goat, the stag, and the males of many other animals, have large horns. They are supposed to be useful in fighting with rivals in order to secure as large a number of females as possible. Now these large horns require at the same time a greater development of the bones of the head to hold them, also larger and stronger vertebræ of the neck and back, and larger muscles of

these parts to maintain and use them effectively. In other words, there must be coadaptation of all the parts, otherwise these larger horns would be an incumbrance and useless. Now, if we accept the theory of the inheritance of acquired characters, this is all simple. The use of the head in butting against other males exercises all these parts simultaneously, and they develop equally and at the same time. If, however, inheritance has no part in the matter, then we must fall back on variation in the germ-plasm and natural selection for an explanation; but it is difficult or, as Spencer says, impossible to conceive of variation producing large and heavy horns on these animals and at the same time coadaptation of all the other parts to hold and use them. Sometimes coadaptation does not take place, as in the common brook crab, familiar to every country boy. Its foreclaws or fingers are out of all proportion to the rest of the leg, and its awkwardness is well known. The lobster is another case. Even in human beings we have instances of non-coadaptation, as where the head and brain are out of proportion to the size of the body, or the reverse. I need not multiply instances.

Now, if acquired characters are transmitted, any system of training which exists for a considerable time must necessarily appear in the structure of the body and in the character. If the training is

not in accord with the laws of evolution, it causes the race to deviate from the true line of progress, and by just so much hinder advancement. If, on the other hand, our systems of education conform to correct principles, progress is advanced by them.

Quite recently an entirely new theory has grown up, opposed to Lamarckianism, and the theory of the transmission of acquired characters. It has been before the world little more than a decade and has made remarkable progress, though it is too soon to say it has been established beyond dispute. Prof. Weismann, its author, is well equipped as a biologist to maintain and defend it. I have already stated briefly his theory of heredity, namely, that the germ-plasm is continuous from parent to offspring. This necessitates a remodeling of commonly accepted views, an entire giving up of the Lamarckian belief that use and disuse have their effect on progeny. If the germ-plasm continues from one generation to another, then it must already have been formed, or at least provided for, even before the birth of the parents. They may modify it, through growth and nutrition, but not through exercise of any function. Prof. Weismann went at the demonstration of his views in a thoroughly scientific way by the making of experiments on living animals and the collection of facts. From his experiments it is now pretty well established that wounds and injuries, which he

considers to be acquired characters, are not transmitted. No matter for how many generations you cut off the tails of dogs, cats, horses or sheep, the effects of this removal do not appear in the progeny. Most parents have some mark on the body, received in early life, some cut or bruise, some scratch, but their children do not inherit them. The famous experiment of cutting off the tails of mice, for generation after generation, and then breeding from them was one of Weismann's methods of substantiating the theory that acquired character is not inherited. The offspring of these mutilated mice had as long tails as if those of their parents had not been removed. The explanation is, the germ-plasm was not in any way affected by the bodily mutilation. The practice of the Flathead Indian is another case. The children of parents whose heads have been artificially flattened are not affected by it. The small feet of Chinese women, made so by binding them and preventing their growth, may also be mentioned.

INTELLECTUAL ACQUIREMENTS.—Not to depend on such evidence, however, he adduces that of a very different character, namely, the non-transmission of intellectual acquirements. Language is an example. Although human beings have been communicating their thoughts to each other from very ancient times by speech, yet every child has to

learn how to do this for itself. No matter how many languages the parents master, their children have to go over all the ground the parents did, make all the toil and effort to learn to speak. The children of the most gifted linguists, if brought up without coming in contact with those who can teach them to talk, will never learn a single word. There are, it is claimed, a few cases on record of children who never acquired their natural tongue because they had lived among animals and not among human beings. They learned to make the same vocal sounds the animals did, no more. The environment in this case was everything, the parental acquirements nothing.

Music, like language, is also an acquired character, and it is probably not transmitted. Our musical geniuses are not the children of great musicians, but in most cases the reverse. They seem to spring into existence from lowly sources, or at least from parents whose advantages for a musical education have been very limited, though generally they have had good health, and a climatic environment of a favorable kind. Great musical talent usually dies out in any family in a few generations, no matter how much it is cultivated, or, if it does not die out entirely, it becomes mediocre; and yet the opportunities of the children of great musicians, and the ambition of their parents for its culture, are usually very favorable.

INSTINCT.—In accepting the theory of the non-transmission of acquired characters, it becomes necessary to give up prevailing views of the origin of instinct. According to the old belief it was a gift of God, and not acquired by any effort on the part of its possessor. In speaking of the instinct of bees, Sidney Smith says: "*Providence has done it.* There are the bees, there is the comb, and the honey, get rid of it or find some other explanation if you can."

The early evolutionists changed all this, and made instinct the inheritance of an oft-repeated act. The young kitten, as soon as old enough, hunts for a mouse and catches it without any training. The sight of the mouse acts on its nervous system in such a way as to compel it to creep up softly, jump on it, toy and play with it, and finally kill and eat it. It would have required long practice on the part of its ancestors before so wonderful a character could have become fixed. The same is true of the setter dog.

The new view is, that instincts arise from variations in the germ-plasm. The union of the germ elements of two individuals causes it to vary more or less from either parent. These variations will be favorable and unfavorable. The unfavorable ones will produce offspring handicapped in the struggle for life and they will disappear. The favorable variations will produce descendants possess-

ing advantages for survival and leave numerous offspring.

It is not easy to accept this view, but I think there are some facts that support it. I will advance a few. The hive of the honey-bee contains three kinds of insects: the queen, the drones or males, and the workers. The queen makes her nuptial flight but once in a life-time, and does it from instinct. How can an instinct like this have been acquired by being performed but once? The drones are derived from unfertilized eggs; yet their instincts are those of the male, not of the female. As they have no male ancestors, it seems probable there was in the germ-plasm of some queen bee, at a time far back, some change which allowed unfertilized eggs to produce males.

The workers are all females, not fully developed sexually on account of a diet with too small a proportion of nitrogenous food and containing so large a proportion of the hydrocarbons. They inherit from the mother, or rather from the germ-plasm, the instinct to gather honey, yet neither their male nor female ancestors ever gathered any honey in their lives, nor have they for ages. Far back in antiquity the queen, no doubt, did gather honey, but the disuse of this instinct has not caused it to disappear in the working bee, as it should have done according to the Lamarckian theory of disuse causing decay of function. Is there any way to

account for this, except on the theory that the germ-plasm produces working bees as well as the other kinds, irrespective of the habits of the queen? Her character in this respect is fixed and does not change. Is it unreasonable to think that some time in the past, in some queen bee, was formed a germ-plasm capable of producing three varieties, and that there was such an advantage in it for survival, that it has been continued ever since by natural selection? Queens not able to do this have not been selected, left no offspring, and thus the perfection of the stock has been assured.

One more case. Some years ago, when interested in agricultural entomology, I made a study of the so-called seventeen-year locust. Noting the wonderful precision with which the female cuts into a soft twig of a tree and lays its eggs in two rows, the thought was suggested to me, how can an instinct, used only a few hours, once in seventeen years, be acquired by exercise and persist in the offspring seventeen years later? Weismann's theory of the origin of instinct from favorable variations in the germ-plasm offers, it seems to me, a rational explanation.

I do not need to extend illustrations which abound in the insect world, especially among the ants, which furnish cases of coadaptation that cannot be transmitted, as they do not propagate, so I will not mention them here.

Now, if acquired characters *are not* transmitted to offspring, how should these facts affect our methods of educating children?

One advantage will be evident, I think, to all. Erroneous systems of training, which do not injure the health, will not appear through heredity in the offspring of parents thus wrongly trained, except as a result of environment. That is to say, the injury does not become congenital—will not be in the blood—and, consequently, it will be less difficult to eradicate it and to introduce better systems. This may be considered an advantage. But it is not all. If heredity takes place only through the germ-plasm, then it seems to me that whatever promotes a knowledge of how to maintain it in a high degree of health, and how to favor more perfectly natural selection, are subjects with which our educators may busy themselves far more than they do. That is to say, the study of biology, of life—of the laws of human growth and development, and of evolution, will become, more and more, important factors in our school curriculum. We can hardly imagine how much our common every-day life has been aided by even the slight knowledge of mathematics gained by an acquaintance with addition, subtraction, multiplication and division. By it we are able to keep our little accounts correctly, and neither cheat our creditors nor be cheated by them. Could we not by a knowl-

edge of the laws of evolution, and also the laws of growth and development, keep our larger account with nature in a far better condition? Could we not keep ourselves from being cheated out of our health and happiness, and also do something to put an end to physical, intellectual and moral deterioration which threatens so many families and even races? It seems to me that the time is not far distant when these studies will be quite as much attended to as the not unimportant ones of arithmetic and grammar.

KNOWLEDGE OF HEREDITY.—Whatever doctrine of heredity prevails, however, one thing is certain, some knowledge of the subject will be very useful to those who have in care the training of children. To them, often more than to the parent, is entrusted the task of developing the character and the individuality of the child. Can he do this well if he knows nothing of what the bent of the child's genius from ancestral influence is? I doubt very much if any of us realize how important it is that this individuality should have its proper share of attention. As the evolution of society goes on, more and more must there be differentiation of our various activities. If every boy and every girl can be educated so that to a considerable extent they can follow the bent of their genius, *whenever that bent is a normal one,* will not the available

intellectual and moral energy of society be considerably augmented? If you educate a boy which nature intended for a blacksmith for a preacher, has not the world lost something? Educate another for a blacksmith who should have been a preacher, is there not also a great loss? There are a few children who will come out all right, no matter how much they are schooled, or whether they have any schooling, so well have they been born, but with the majority this is not the case. Now it seems to me that the teacher who knows the natures of his pupils, and something of their ancestors', can direct their energies more satisfactorily than the one who does not. If there are hereditary defects of intellect or morals, he can more easily correct them. If there are ancestral tendencies to disease through imperfections of certain organs, for instance, the lungs or the brain, he can often put the child on such a course of physical culture or mental training as to lift it above danger, so that it may go through life a useful person instead of a feeble one or a lunatic. Even the tendency to crime might be averted.

INDIVIDUALITY.—If we could educate the young so as to bring out more fully their normal individualities we should be able to cultivate in them more independence of character. On this subject Prof. Mills says: "With all its imperfections, I am

bound to say that the individuality of the pupils in the old log school-house was often more developed than in the city public schools of today, where for a boy to be himself frequently brings with it the ridicule of his fellows—a condition of things that has its effect afterward on the lad at college. I find that this fear of being considered odd,—out of harmony with what others may think,—one of the greatest drawbacks to the development of independent investigating students at college. The case is still worse for girls. When women begin to be really independent in thought, in feeling, in action, I shall be more hopeful of the progress of mankind. Happily, the dawn of this day is already begun."

We must not forget that there is also a spectre of heredity. It is seen under different forms. The physician is often reminded by his patients that they have inherited this or that disease from father or mother, or an ancestor farther back. Now, there are few diseases which come to us directly through inheritance. In a majority of cases they are not transmitted. Even consumption is not. If we accept the modern theory of its origin, as we must, this plague is the result of germs floating in the air being introduced into our bodies by respiration, or in food, or through contact with abraided surfaces. Those with weakened constitutions are more liable to it than the strong,

and a weakened constitution may be inherited, for in this case the germ-plasm will not be well nourished and will suffer; but those thus handicapped in the race of life will get on far better by endowing themselves with knowledge and obeying the laws of life than they can by living under the shadow of the great spectre of heredity, and casting anathemas at their ancestors for not having done more for them. No doubt most of them have done the best they could; and if life is worth living, as most of us believe, we owe them many thanks for having brought us into the world.

The Spectre of Heredity.—There is a spectre of heredity of a more serious nature. It is the spirit of the dead past, with its mighty hand on society, on institutions, on modes of life. Wendell Phillips used to tell a story, in his anti-slavery addresses, which illustrates the evil effect of this inherited spectre. It ran in this wise. In an Eastern temple, an idol, in the image of a god, stood calmly on its pedestal. It was sacrilege to touch it with human hands; but rats having no such feelings of awe in the presence of a deity, began to gnaw about it in various places, yet no one was bold enough to remove it to a place of safety; and so the rats gnawed on and on, and built their nests within the sacred image. In time they loosened it from its firm foundation, and one morning, when

the worshippers came in to pay their devotions, they found their god had fallen prostrate on the floor. So it is sometimes with our inherited beliefs. They hold us back from progress like a heavy weight. We fear to remove them, for they are sacred inheritances, idols, gods, and so our institutions decay, perish.

EVOLUTION'S HOPEFUL PROMISE FOR A HEALTHIER RACE.

Given before the Greenacre Conference of Evolutionists.

We have most of us in the past looked upon health as a matter of inheritance, or temperance and moderation in working, in eating and drinking; or as depending on climate; or exercise, or plenty of sleep, pure water and a morning bath, or some other secret, one or more of which is pretty sure to be in the possession of most persons who have lived long enough to have had some experience with those things that do them good or harm. All these agencies have great value; but I think few of us realize that nature, through the laws of evolution, has long been working to produce a brave and strong, healthy and hardy race of men and women by other methods than those health habits which most of us value so highly.

Nature has been doing this chiefly by two methods, and it seems necessary that I should say something about them in order to present my subject as I wish to present it. The methods to which I refer are those of sexual and natural selection. It is to these two processes that we are largely in-

debted for race improvements—more perfect bodies, more active brains, and the high degree of health which a considerable portion of the race enjoys.

SEXUAL SELECTION.—By sexual selection is meant that preference which the male or the female has for certain characteristics of the other sex. It also includes the advantages which the stronger and more capable male has over the weaker one in obtaining a choice, or, among polygamous animals, a larger number of females, thus allowing offspring to be generated by the most capable, and preventing the most incapable from procuring mates.

The first principle of sexual selection, that of preference, would imply a considerable development of the intellect, and some taste, but I do not think it has had great influence on the lower forms of life. It is difficult to study the preferences of insects, for instance; but I have studied the moth of the silkworm, and could never observe that either male or female had a choice for any particular mate. They always appear to take the first one that comes along. I think this is the conclusion come to by those entomologists who have had opportunities for studying other insects. The spider might perhaps be studied in this relation to advantage, as the female is ferocious, often eating her male suitors while they are trying to woo her. Nor do I believe that it is a very important matter

in many other animals. Certainly among the domestic ones—the sheep, the horse, the bull and the cow—a superior male and female will mate with inferior ones of the opposite sex, apparently without the slightest objection. I have sometimes thought I had observed in pigeons a preference, having occasionally seen a male leave his mate for a more attractive female; at least one that seemed more attractive to me.

When it comes to sexual selection through struggle, no doubt there has been great advantage, and it has produced important effects. This occurs among polygamous and also among non-polygamous animals, and the strong males are certain to secure the largest number of females and, consequently, leave the largest number of offspring. This would, no doubt, through the laws of inheritance, be beneficial in producing animals of greater vigor and more perfect health. But even in this case, the males seem to have little preference for any particular female; and so while the least vigorous ones would leave few, and many no offspring, the least vigorous females would leave nearly as many as the more vigorous ones. Still, through pure-blooded males alone, stockbreeders tell us, herds of cattle can be brought up to a high degree of perfection in three or four generations, even if the females, at the beginning of the experiment, are inferior. The first generation would

be half pure blood; the second three-fourths; the third, seven-eighths, and the fourth fifteen-sixteenths, or almost thoroughbred.

When it comes to man, however, the case is different. With him sexual selection is more important, and the preference shown by both sexes is very marked. Many women have strong prejudices against marrying men with certain characteristics, and nothing will induce them to such a union. So strong are the desires many of them have for mates with particular qualities, that they prefer to remain single rather than marry one not possessing these qualities. Through this preference, on the whole, the better and those most adapted mate with those most suited to them, and a considerably larger class of physically and mentally inferior ones do not mate at all, or, if they do, leave few offspring. The idiot would stand no chance of securing a mate, although, if left free, he would unite with another idiot, like an animal. Such things have happened, and the offspring were not idiots, as might have been expected; but they were not superior beings. The most deformed in body would, in most cases, unless they had mental traits of a high order to counterbalance them, rarely find mates. Thus, through this agency, some of the poorest specimens of both sexes do not produce offspring, and this raises the standard of the health and ability of the race.

There are many characters which have come into existence, it is believed, through sexual selection. One is beauty in women, greater beauty of form, of hair, of eyes, of grace, fidelity, chastity, power of love, etc. These all give pleasure to the opposite sex, and have an element of usefulness in them. Whenever these characters have appeared in women they have given the possessors a better chance to find a partner with superior characters. The same is true of men. Woman being debarred from the hardest labor through maternity has found it useful, even in early times, to choose men who were strong, brave, courageous and capable of defending and caring for her, so far as was possible, and thus by sexual selection she has indirectly promoted health and vigor in man, for these qualities are inseparable from it.

But the results of sexual selection are by no means perfect. The sexes are nearly equally divided, and as polygamy is not to any great extent practiced among human beings, with the exception of those already named, most men and women can find mates if they wish, even though they may have many serious imperfections of body and mind, and from them many children will be born physically and mentally incompetent.

There is no doubt that sexual selection is coming more and more into play, however. We have abundant evidence of this in the growing senti-

ment against the marriage of those with a tendency to any serious disease, as insanity, syphilis, etc. Only a little while ago was published an account of a suit for a breach of promise brought by a young woman in an English court against her suitor. He, having in view the value of a healthy wife, and also of children well endowed physically, asked her before the engagement if any of her near relatives had died of consumption, and she replied that none had, which he afterwards found was not true. On learning of it he refused to marry her. I am sorry to say that she won her suit. One of the questions asked in court was: "Is it possible that a lover would ask such questions of his sweetheart as would be asked of a candidate for life insurance?"

Courtship is such a delightful occupation for the young, that it seems a pity to mar it by bringing in questions of health. Yet men and women are often such deceivers, and frequently so ignorant, that some way must be devised to prevent deception if sexual selection is ever expected to have its full influence on race improvement.

Human Selection.—Under the head of human selection Galton and Wallace have made some interesting and valuable suggestions for improving the health and quality of man. Mr. Galton proposed a system of marks for family health, intel-

lect and morals, and those members of families having the highest number were to be encouraged to marry early by state endowments sufficient to enable them to make a good start in life, early marriages being favorable to large families. It was a bold suggestion, savoring too strongly of socialism or state control of marriage to suit many of us.

Professor Wallace's plan is that women shall, so far as possible, be made independent, so that they will not feel the necessity of marrying for a home. Her time might be occupied either in public duties or self-culture, or any occupation she might prefer. She should be educated to believe it degrading to marry for a home, without love and adaptation, and equally wrong to marry her inferior. This would compel men to be more manly, to leave off their bad habits and many vices, in order to obtain wives; and the idle, selfish, sickly and deformed would not easily get them. One difficulty in the way of carrying out this plan is the greater number of women in society as it exists today, owing to the larger mortality among boys. But by a better hygiene which is likely to result from the evolution of the race, this greater mortality of the masculine sex is certain in the future to be prevented, and there will then be an excess of men instead of women. This will be a real advantage, for a scarcity of women would give her a greater

influence in selection, and the result would be, the worst men would not be able to get wives.

Being in a minority, women would be held in higher esteem, be more sought for, and have a real choice in marriage by being able to reject unsatisfactory suitors, which is certainly not the case now to any considerable extent.

Mr. Wallace's plan would not require such early marriages as that of Mr. Galton's, and this would be a positive benefit to the physical vigor of the children, for we know that the progeny of too early marriages are more delicate, and reproduction before bodily maturity lowers the standard of health in parents as well as of their offspring. Marriage being delayed, and the culture of the mind being more attended to than is possible when it is early, would reduce the number of children in any family, and this would enable parents to bestow more care upon them. It would also prevent, to a limited extent, over-multiplication of the race, which is a real evil, for if every couple left three or four children the whole world would soon be full, and over-population would result in much disease.

Mr. Wallace's scheme has in view the prevention of marriage by the weak and worthless. He believes that if this can be done little more will be required, for the superior would be the only ones to procreate, and this would be quite sufficient in a few generations to produce a strong and healthy

race. He calls his plan that of "human selection," but it may be considered practically as a modification of sexual selection.

NATURAL SELECTION.—Natural selection is another process which takes place on an enormous scale and constantly among all organisms, whether animal or vegetable. Natural selection is the result of the operation of certain laws in the natural world which brings about the survival of those best fitted for their environment. It is a weeding-out system by the destruction of a certain portion, at least, if not all, of the weak and the bad, and it occurs because there is such a rapid increase of most organisms. We speak of it as the survival of the fittest, but it is also, at the same time, the destruction of the unfit.

Mr. Darwin says: "We have seen that man is variable in body and mind, and that the variations are induced either directly or indirectly by the same general causes, and obey the same general laws as with the lower animals. Man has spread widely over the face of the earth, and must have been exposed during his incessant migrations to the most diversified conditions. They must have passed through many climates and changed their habits many times before they reached their present homes. They must have been exposed to a struggle for existence and, consequently, to the

rigid law of natural selection. Beneficial variations of all kinds have been preserved and injurious ones eliminated. If, then, the progenitors of man, inhabiting any district, especially one undergoing some changed conditions, were divided into two equal bodies, the one-half including those with the best adapted powers for movement, for gaining a subsistence, for self-defence, would, on the average, have more offspring than the other and the less well endowed half."

We may have a good object lesson in the elimination of the unfit going on about us constantly. In New York City, for 1891, the deaths of children under five years of age was 18,112; for 1892 it was 17,577, or slightly less. This is more than one-third, but not quite one-half, of the total deaths at all ages for these years. A very large proportion of these deaths occurred in the tenement house districts, and a very natural question arises in the mind: Are the children of those who live in tenement houses more unfit to survive than those who live in houses in which only one family dwells. No doubt in most cases the children of those are most fit who are most able to provide them with hygienic surroundings, the better food and most suitable care; such are usually the prudent and the capable. The love of children is usually stronger in them. The intelligent affection of parents for their young is one of the incentives to their best

training. It certainly is not nearly so strong among the residents of the crowded quarters of a city as among the more prosperous. Any one may observe this by going with a company of mothers on the excursions of some fresh air society, which may be seen in most cities. It is hard to find one of these mothers who shows what we may call intelligent affection or intelligent care of her young. Some pathetic instances illustrating this might be mentioned.

When it comes to the question of their physical or mental inferiority, a cursory inspection is all that is required to show they are far below the average. There is a great want of symmetry of body and mind—evidence of degeneration. In order to test the strength of constitution, which is a good way to get at one form of physical fitness for survival, it seems to me, I made a study of the blood of a considerable number of these children and found the amount of protoplasm in the colorless blood corpuscles deficient. This shows that their power to resist disease is slight. It must be borne in mind, however, that a strong constitution alone is not evidence of fitness for survival. A strong person may not have prudence, foresight, keenness of perception, judgment, and many other qualities equally important. The characters just mentioned may constitute fitness when there is only a moderately vigorous body. Mr. Darwin

recognized this when he said: "We should bear in mind that an animal possessing great size, strength and ferocity, and which, like the gorilla, could defend itself from all enemies would not, perhaps, have become sufficiently social, and this would effectually have checked the acquirement of the higher mental qualities, such as the sympathy and love of his fellows. Hence, *it might have been of immense advantage to men to have sprung from some comparatively weak but social creature.*"

Fitness is a complicated condition and not a simple one. It depends upon so many external conditions. Fitness in one place would be unfitness in another. Still, other things being equal, strength of constitution is a very important factor, and must not be left out of consideration. With it there is a surplus of material in the body beyond what is required for digestion, assimilation, circulation and other bodily functions, to enable the parents not only to do hard labor, but also to endow their offspring with vigor equal to their own, often greater vigor. The feeble individuals will have a small amount of stored up material in their bodies which we may designate as physiological capital to give continous food, warmth and protection to their young; they will not be so well adjusted to their environment, and, consequently, natural selection will cause their non-survival—or their offspring, if not immediately, at no distant period.

This doctrine of natural selection has been designated as cruel, harsh, inexorable, and under the influence of the human feeling every effort is in our time being made to prevent this wholesome check upon the processes of nature from having its due influence upon evolution and race progress. Modern hygiene undertakes to put an end to disease, to save all who are born, to surround them with every influence which can favor their health and development. It would stamp out diphtheria, scarlet fever, summer complaint, consumption and a host of other diseases which now decimate the ranks of the unfit, and often, no doubt, of the comparatively fit. This would perpetuate a type of feeble, unhealthy persons. There would not be much hope of more perfect health for the race if our hygienists could carry out this daring scheme along the lines now working. There seems an antagonism between nature's methods of bettering the physical condition of the race and the efforts of man himself, acting under the guidance of his moral feelings, to prevent the action of natural law. Mr. Darwin recognized this, and referred to it in his great work, "The Descent of Man," where he says: "With savages, the weak in body and mind are soon eliminated, and those that survive commonly exhibit a vigorous state of health. We civilized men, on the other hand, do our utmost to check the process of elimination. We build asy-

lums for the imbeciles, the maimed and the sick; we institute poor laws; and our medical men exert their utmost skill to save the life of every one to the last moment."

"There is," says he, "reason to believe that vaccination has preserved thousands who from a weak constitution would have succumbed to smallpox. Thus the weak members of civilized communities propagate their kind. No one who has attended to the breeding of domestic animals will doubt but this must be highly injurious to the human race. Excepting in the case of man himself hardly any one is so ignorant as to allow his worst animals to breed."

Other evolutionists, in more recent times, have taken a still more somber view of this danger of race deterioration through the prevention of the full action of the law of natural selection.

Dr. John Berry Haycraft, in a recent work entitled "Darwinism and Race Progress," has sounded the alarm in no uncertain tones. He says: "Races, therefore, subject to epidemics of a particular fever, suffer selections in the hands of the microbes of that fever, and those living are survivals, cast in the most resisting mould. It may not be flattering to our national vanity to look upon ourselves as the product of the selection of the micro-organism of measles, scarlet fever, smallpox, etc.; but the reasonableness of the conclusion seems

to be forced upon us when we consider his immunity from these diseases as compared with the natives of the interior of Africa, or the wilds of America, whose races have never been so selected, and who, when attacked for the first time by these diseases, are ravaged almost to extinction. By exterminating these diseases we shall no doubt preserve countless lives to the community who will, in their turn, become race producers; but in as much as the individuals thus preserved will, in most cases, belong to the feebler and less resisting of the community, *the race will not become more robust.*"

The same author concludes in these words: "In the meantime we may view, and not without inquietude, the probability that our statistics, as far as they go, indicate that race deterioration has already begun as a consequence of that care for the individual which has characterized the efforts of modern society. The biologist, from quite another group of facts, has independently arrived at conclusions which render this view in the highest degree probable."

"Thus, the great English race, once so hardy, so powerful," says this modern writer, "by hygiene and better physical conditions, is becoming weaker and weaker."

This view of the case is growing largely in England and, perhaps, other European countries.

There is already some evidence of its truthfulness in statistics. The death rate for those in middle life is rather increasing than diminishing. This arises from the fact that the great number of children who formerly died in infancy have lived, but being of more feeble constitutions, they swell the death rate later on. It is felt, also, in many educational institutions in the larger number of youths who cannot stand the strain and stress of student life. They are, high medical authority says, the youth saved from early death by modern hygienic and medical care. Formerly, natural selection would have chosen them as unfit to survive, and there would have remained alive few besides the hardy ones with good constitutions, capable of great strain, with great powers of endurance.

It is also shown in the stress of modern competition, in which there are multitudes who cannot stand this strain. It is from these, in some degree, that we hear the cry for governmental aid. "We must make the conditions of life easier for them," say our social reformers, "or they will become 'a submerged class.'"

CONFLICT BETWEEN EVOLUTIONARY THEORIES AND OUR HUMANE SENTIMENTS.—And now I wish to consider another phase of my subject. Those who have followed closely what was said concerning natural selection will have seen that there appears

to be a conflict between evolutionary theories and the humane sentiment of the age—a want of correspondence between what is being done by natural law and what man is trying to do under the inspiration of his loving heart. Can we reconcile this want of correspondence? To some extent no doubt we can.

In the first place, the growth of the moral nature has always been held in high esteem by every nation and every race. Our moral giants stand higher in the scale of being than our great generals or statesmen, even in an age when moral culture is at a low ebb. We draw our moral inspiration from Buddha, Socrates and Christ rather than from Aristotle; their science may be, yes, is, faulty, but their spirit is lofty.

And the moral nature is cultivated in laboring for the good of others, in trying to save for a better life the poor, the weak, the distressed. All that is required is that we do this work wisely, not unwisely, under the guidance of reason, not feelings. We want to prevent these calamities rather than cure them.

Another satisfaction arises from the fact that in learning how to perfect the lives of the feeble so that they may live longer, we also learn how to perfect, in a still higher degree, the lives of the strong, or those we call the fit, so that they also will not only live longer, but be able to live with

much greater satisfaction the complex lives of our times.

The knowledge which helps the first may help the second even more than the first, for they have better opportunities and can take advantage of it. We may also comfort ourselves with the fact that a majority of those with feeble constitutions, whose lives have been for a time snatched from the operation of the laws of natural selection, will not, after all, contribute very extensively to the increase of the population. Great powers of generation and numerous offspring rarely go with physical weakness. If there are exceptions they are explainable. It is, I think, pretty certain that a great majority of such leave few, often no offspring. They find their way into places where work is light and the pay small, and they cannot afford to marry and care for families, and do not do it.

The law of natural selection will continue to work on them so long as its action is required, with little regard to the efforts of man to abrogate it. Nature works continuously for ages, and she works on every part of man, every organ, every function. We may almost say she is omnipotent; that she watches for every slight improvement; that she knows what to do under every circumstance. Foiled in one direction, she has other means, infinite means, for gaining her ends.

Man can no more put a stop to the operation of natural law than he can put a stop to the flow of Niagara. He may turn off a trifle of its water to whirl wheels and spindles, but the mighty river flows on until nature makes some changes in the watersheds, that make its flow impossible. Man, on the other hand, acts on his own body in a finite way. He works mainly for immediate, not remote, ends. He changes his methods as his needs change, or his knowledge increases. Today he works with limited knowledge of hygiene, inspired by old ideas of philanthropy. Tomorrow he may have a vastly extended knowledge of this subject and an entirely new social science which will enable him to do more good and less harm.

IDEAL OF HEALTH.—Let me now consider some of the things necessary to give us a greater hope for the future of human health, of ourselves and for our children.

The first thing necessary is to get a higher ideal of bodily or physical perfection than we have today. Sir James Paget, in a lecture on National Health, in 1884, put this in the following words:

"We want," says he, "more ambition for health. *I should like to see a personal ambition for health as keen as that for bravery, for beauty, or for success in our athletic games or field sports. I wish there was such an ambition for the most perfect*

national health as there is for national renown in war, in art or in commerce." Sir James then gives his own ideal. It is for man or woman to be so full of health as to be comparatively indifferent to the external conditions of life, and to make a ready self-adjustment to all its changes. He should not be deemed thoroughly healthy who is made better or worse, more fit or less fit, by every change of weather or food, or who is bound to observe exact rules of living. It is good to observe rules, and to some they are absolutely necessary; but it is better to need none but those of moderation, and, observing these, to be willing to live and work hard in the widest variations of food, air, climate, bathing and all other sustenances of life.

ADAPTATION TO ENVIRONMENT.—This sounds very much like saying that to be healthy one must be adjusted to his environment; and this is practically what Herbert Spencer long before said in his "Principles of Biology." Here are his words:

"As affording the simplest and most conclusive proof that the degree of life varies as the degree of correspondence, it remains to point out that perfect correspondence would be perfect life. Were there no changes in our environment but such as the organism had adapted changes to meet, and were it never to fail in the efficiency with which it met them, there would be eternal existence and uni-

versal knowledge. Death by natural decay occurs because in old age the relations between assimilation, oxidation, and the genesis of force going on in the body gradually fall out of correspondence with the relations between oxygen and the food and absorption of heat by the environment. Death from disease arises either when the organism is congenitally defective in its power to balance ordinary internal actions, or when there has taken place some unusual external action to which there was no answering internal action. Death by accident implies some neighboring mechanical changes of which the causes are either unobserved from inattention, or are so intricate their results cannot be foreseen, and, consequently, certain relations in the organism are not adjusted to the relations in the environment. Manifestly, if, to every outer coexistence and sequence by which it was ever in any degree affected, the organism presented an answering process or act, the simultaneous changes would be indefinitely numerous and complex, and the successive ones endless, the correspondence would be the greatest conceivable and the life the highest conceivable, both in degree and length."

KNOWLEDGE.—Another requirement to promote human health is a better knowledge of how the constitution of the body may be strengthened, and more certitude as to whether such improvements as

it may receive by hygienic training will be transmitted to offspring. That human health may be improved by right training of the body, a better supply of fresh air, greater moderation in living, there is not a shadow of doubt; but is the constitution itself thus strengthened, or only its original vigor conserved and made effective? I have been working on the problem for some time by a series of studies on the blood, and especially the amount of living matter in the colorless corpuscles, and have satisfied myself, from some observations on individual cases, that the original constitution of feeble persons can be strengthened in early life, but the extent of this strengthening seems somewhat limited. Much original research is still required to get at important facts in this direction. If some of the study now given to micro-organisms could be devoted to this subject it would be most useful. The work might be done in connection with our numerous schools of physical culture, now happily multiplying, and also in our physiological laboratories.

That any gain to the vigor of the constitution can be transmitted to the offspring is very probable. While education and training do not seem to affect the germ cells in any marked degree, nutrition does affect them. Whether acquired characters in the form of skill, music, language or other like things are transmitted or not may still be an open question.

Strengthening the constitution seems to be best accomplished by increasing the resources of the body beyond its outgo, so that there shall be some gain; and this brings up a very important subject, that of the importance of living within the bodily income.

In our fast age we are likely to use up the physiological resources in excessive work or dissipation, and so rob our children of their just inheritance.

Effects of Living at High Pressure.—One generation may, by living at high pressure and under specially unfavorable conditions, use up more than its share of the living matter of its bodies and draw a bill on posterity which the next generation cannot pay. Many of us now have the benefit of the calm, unexciting lives of our forefathers. They stored up physiological wealth for us ; we are using it. The question is, Can we, working at high pressure, keep this up during our lives (which, in that case, will be on an average rather short), and transmit to the coming generation a large supply of living matter for their needs?

How often has it happened in the history of the world that people who for generations have exhibited no special genius, have blazed out in bursts of national greatness for a time, and then almost died out! We ought to take care that this does not happen to us. How often we see a quiet country

family, whose members have for generations led calm, temperate lives, suddenly produce one or two great men and then relapse into obscurity. They had by their quiet, inexpensive living stored up energy for this purpose. On the other hand, how often have we seen the reverse—families whose energies have been used up in overwork or sensuality producing offspring below themselves in ability. The true rule, however, is neither to waste the bodily energy nor to keep too much of it lying idle and producing nothing.

Girls in Manufacturing Districts.—We need also a new departure in our manufacturing centers. Manufacturing as now conducted is a far less healthy occupation than agriculture and horticulture. The reason for this is that workmen and workwomen and even children in most mills and factories are exposed for hours at a time to an atmosphere which is loaded with dust and the debris of cotton, of wool, and often to that worst of all dust which comes from shoddy and rags. They are also, in many cases, kept away from light, and in cramped positions, and this, continued for years, slowly deteriorates the constitution; and if, in case of a war, we were obliged to enlist a large army, we should find a far less number of able bodied men among the factory workers than among the farmers. Let me give you a picture, perhaps one

of the very worst to be seen anywhere, of a visit to a New England paper mill.

"We left, with a company of ladies and gentlemen, the light of a mellow afternoon to climb some steep and dusty stairs under the courteous guidance of a superintendent. We had hoped to 'see it all,' 'but that was quite impossible,' said our guide, 'since the room where the rags are sorted is so dusty that the gowns of the ladies would be ruined.' So we contented ourselves with less dangerous rooms. But even about the stairway the dust cloud hung heavily, obscuring the sight and choking the breath. From the narrow landing the room, into which it was impossible to venture, was in full view. It was long and large. From end to end were ranged huge boxes, waist high. Fastened to each were two inverted swords on whose sharp blades the workers cut the piled-up masses of rags, shredding them for the bleaching boiler. All the floor was covered with rags, billows upon billows of soiled white pieces, in which the toilers stood, their feet buried deep beneath the dirty, tattered material.

"Not a word was spoken. Even where we stood speech was difficult, so completely did the thick dust fill eyes, mouth and nostrils, choking, blinding and exasperating. The effect of this perfect silence was oppressive. A certain solemnity hung over the place. Through the fog of dust the figures

loomed unnaturally large. All the workers were white and hollow-cheeked, with great sunken eyes, emphasized by the circles underneath. Each woman had bound upon her head some rag, larger or finer than the rest, to protect her hair, and the gray-white bands folded straight across the forehead showed weirdly in the dim half-light.

"As they stood there in long, silent rows, cutting, *cutting*, CUTTING, they looked like the priestesses of some ancient and frightful ceremonial. We were glad to escape, to exchange the dust, the grime, the wan faces, and the burning eyes for the breath of cool wind, the full glow of the sunlight, and the face of nature herself, so many of whose human children have no time to know or learn her ways.

"It gave a tragic significance to the memory of those silent workers to know that they have but a few years to live."

The same unfortunate condition of things is complained of in Manchester, England, one of the greatest manufacturing centers in the world. "The heated air of the mills, the dust, lack of light, the employment of children," says the London *Lancet*, "are causing vast deterioration and a most disastrous effect on the morals of the people. Football is popular, but all the players are imported from Scotland. The natives simply look on and shout. If they want men for policemen or constables, they go to Scotland or Ireland for them. The women and

girls are equally stunted and feeble." In the manufacturing towns the prospect for a strong, healthy race from such material is poor indeed.

CO-OPERATION: AN EXAMPLE.—It is difficult to see the remedy for this state of things. Probably the evolution of a higher standard of ethics, a higher sense of justice, and a more thorough belief that health is a duty, may do something. Meantime it is important that the working man should do all he can for himself; and perhaps I can do no better than to give here a picture of what some of them have done under the inspiration of co-operation, not only for their health but for their pockets.

It is a picture of a great manufacturing establishment of the Scottish Co-operative Wholesale Society, at Shieldhall, near Glasgow, on the Clyde. This society is a federation of all the retail societies of Scotland, 238 in number, with a membership of over 150,000 persons. The society began on a moderate scale many years ago, but its development has been marvelous. In 1887 it started out on a career which has since continued, owing to the indomitable energy of one of its members, himself a working man. The buildings stand in a very healthy locality, the health of the working force being considered of the first importance. They seem to have learned that sickness is loss—loss of time, of productive energy—and that it is a costly matter. As Mr. Beecher once

said, "it is the one burden that bends, almost breaks, the back of society."

These Scotchmen are realizing, just as far as is possible, the condition of a sound mind in a sound body. They recognize the rights of the laborer to health, and place him in a position while working, so that his body may not deteriorate any more than is natural for it to do as age advances. The living machine must not be harmed more than the dead machinery. The land consists of 12 acres, and cost $2,500 an acre; nearly all of it is covered with fine buildings, in which 19 different industries are carried on, many of them on a large scale. Every one of these buildings is constructed after modern methods, with every requirement, not only for convenience but for health. The workrooms are cosy and spacious, well ventilated, warmed in cold weather by steam, and lighted by electricity. The best sanitary arrangements known have been introduced, and the excellent health of the workmen and workwomen, of whom there are over 1,000 of each, tells the story of sanitation.

Two large dining-rooms, one for men and one for women, are provided; also two large reading-rooms with all necessary papers, periodicals, books and means of amusement. Its only lack is a gymnasium and a field for athletic sports, but these may in time be added. Food of the best quality is supplied for all who desire it at cost. A dish of oatmeal

and milk costs three cents; a large scone with tea or coffee, the same; Scotch broth or soup, two cents; stewed meat and potatoes, eight cents; roast beef or mutton, with potatoes, ten cents; a good and sufficient meal need not cost over twelve cents. Standard wages are paid, and two and one-half hours less time demanded than in private shops.

Men work fifty-three hours weekly, women forty-four. Most of the latter work in the shirt factory, but they do not need to sing Hood's *Song of the Shirt*. Sweating is unknown; every worker, from the youngest to the oldest, receives his or her share of the profits, which amount to about $15,000 yearly.

Here we have an almost ideal manufacturing establishment, and if all were such we should have higher hopes for human health in the immediate future for our workers in factories. It was the outgrowth, the effort of the Scotch, a highly intellectual race, to adjust itself to its environment. Necessity and competition acting on them forced them to new and better adjustments. Such a result could hardly have been achieved by a less hard-headed and practical people, a race on which evolution has for ages produced some of its best effects.

HYGIENE.—But I fancy you ask me, Is there any hope that in the future evolution, and with it adjustment to environment, will carry man so far that an ideal state of health will be the lot of all?

This is what hygiene promises. Is it a vain hope? If we look at what older sciences have done for man we find much to encourage us. In astronomy, by the aid of mathematics, we can calculate with certitude the date of future eclipses. In many other sciences we can make accurate predictions and accomplish results of the greatest importance. Indeed, science has become almost our only authority. Imperfect as it yet is, we trust it, perhaps, too implicitly. The science of hygiene is the youngest of all the sciences. Not that the Greeks, the Hebrews, the Hindoos and Chinese did not have some practical knowledge on the subject, but it was rude and empirical. With the discoveries of micro-organisms as the cause of a series of the worst diseases, we have begun to place hygiene alongside mathematics and chemistry.

We now know the origin of many diseases which formerly were enveloped in mystery. Can we remove them? That is the next task. Hygiene will in the future busy itself with this great question. It has, it is believed, already made many cities proof, or almost proof, against cholera and yellow fever. It will try to make them proof against other contagious diseases also, and it will without doubt succeed. But its work will not then have been accomplished. We may avoid the causes of disease and still be puny creatures. Our great task will be the building up of bodies equal to the needs

of our environment. This we have, in a small way, already begun to do—imitating the ancient Greeks—in our schools of physical culture, where the body can be trained up to its best, and also in our laboratories for psychological research, in which the relation of mind and body are being carefully investigated, where every subject connected with every function is being studied, even weariness, anger, hope, despair, drink, food, sleep, the weather, and their effects on function. The results of such knowledge will prove beyond a doubt that the health of the body, as well as of the mind, is of the highest importance for success in life, for happiness and usefulness, and that we can do much to secure both.

My own personal hope for the future of human health lies in the evolution and spread of this gospel of hygiene.

Hygiene interests itself in all that relates to human well-being. It may be defined as *the ethics of the body—the science of true living.* It promises health to all who obey its laws. It makes no such promise to those who disregard them. In the future, no doubt, a higher average of health will be the result of our ever-increasing knowledge; and whenever we are able and willing to apply this knowledge to our own bodily and mental conduct we shall be amply rewarded. This much we can safely promise, but no more. On the contrary, the

violators of hygienic laws will, with their offspring, suffer in the future as in the past, and that suffering will be in the form of pain, disease, degeneration, premature death.

This may seem hard to many who are sensitive to the pains and sorrows of the world, and some have gone so far as to attribute to the author of nature, the unknown cause of all things, a character anything but good. But this is a very erroneous way of looking at the subject. To discuss it fully we should have to consider the question of the mystery of evil, which cannot be done here. Suffice it to say, the creation, the evolution of the race, is by law. Causes produce their legitimate results. If it were not so, our sufferings might be far greater, and no progress would result. Let us be thankful that nature is as it is, and let us do our best to put our lives in harmony with it. By so doing, we may in the end attain all that we strive for.

THE GERM PLASM; ITS RELATION TO OFF-SPRING.

The germ plasm is a most interesting and remarkable substance. It must be interesting, for everything which relates to life and reproduction is interesting. It must be remarkable, for out of it, under proper conditions, remarkable results are produced. Although our knowledge of its nature is very imperfect, yet let us not on this account refuse to try to understand what little is known.

In the first place, the germ plasm of animals which reproduce sexually is composed of two germ plasms—that of the male, and that of the female. That of the male is called the *spermatozoon* (pronounced sper'ma-to-zoön). It is sometimes called spermatozoid; the plural is spermatozoa. It is exceedingly small, the smallest of any cell in the body, and has the power to move from place to place. These cells are produced in enormous numbers, and so far as they have been observed under the microscope they differ considerably in power of movement and in perfection of development. Considering their small size, they must make a

very long journey to find the ovum; and if they were only few in number, they would rarely succeed; but existing in large numbers, for there are millions of them produced in each sexual act of the male, some of them are pretty sure to do so, and, probably in most cases, it would be those most vigorous and capable of making the journey most direct and in the least time.

That of the female is called the *ovum*, or egg; plural, *ova*. Only a small number are produced, when compared with the number of the male spermatozoa, but there are quite enough for the ends they are to serve. They have not the same power of movement, though they do move somewhat as the amæba does. They are also very much larger than the male cells.

The eggs of all mammals look alike as they come from the ovaries, but take on some changes afterward. Hæckel says: "Every primitive egg being an entirely simple, somewhat round, moving, naked cell, possesses no membrane, and consists only of a nucleus and protoplasm. These two parts have long borne distinctive names: the protoplasm being called the *vitellus*, or yelk, and the nucleus the *germinal vesicle* (*vesicula germinativa*)." The same author also says: "The human egg cannot be distinguished from that of most other mammals, either in its immature or in its more complete condition. Its form, its size, its composition, are ap-

proximately the same in all. In its fully developed condition it has an average diameter of one-tenth of a line—about the one hundred and twentieth part of an inch. If the mammalian egg is properly isolated, and held on a plate of glass towards the light, it appears to the eye as a very fine point. The normal eggs of most of the higher mammals are of almost exactly the same size. They have the same spherical form; always the same characteristic covering; always the same clear, round germinal vescicle with its dark germinal spot. Even under the highest power of our best microscopes there *appears* to be no essential difference between the eggs of a human being and that of the ape, the dog, the cat or other animal. This similarity is one of appearance only. There is a difference, and of this I shall speak later. It may be asked if the egg of a bird is the same as the egg of a mammal. The mature bird's egg, as it is laid in the nest, differs materially from that of any mammal; but in its miniature form, as found in the hen's ovary, it is also the same. The egg of a bird after it leaves the ovary, and as it passes along the oviduct, takes on secretions in its passage which it converts into yelk, and afterwards a shell is added to give it protection in the external world, where it must undergo incubation before it can become a bird; but before it takes on its shell it has been fertilized, and this

also causes other changes. Hæckel says: "After the ripe egg of the bird has left the ovary, and has been fertilized in the oviduct, it surrounds itself with various coverings which are secreted from the inner surface of the oviduct. The thick layer of transparent albumen first forms round the yellow yelk; this is followed by the formation of the outer calcareous shell, within which is another envelope, or skin. All these coverings and additions which are gradually formed round the egg are of no importance to the development of the embryo; they are parts which have nothing to do with the simple egg cell. Even in the case of other animals we often find large eggs with thick coverings. For example, the shark's; but even in this case the egg is originally exactly similar to those of mammals when in its primitive condition as it comes from the ovary. In the case of the bird these additions serve only as food for the growing embryo, which, in the case of mammals, is furnished by a stream of the mother's blood, making 'stored-up' nutriment unnecessary."

Before, however, we can have *true germ plasm* the mother cell must be fertilized by the male cell. This is true of all the higher plants and animals. There are some low plants and animals in which fertilization by the male cell is not required. This has been called virginal generation. In no mammal is this possible.

How fertilization takes place and what it signifies are both important questions which have not been entirely settled, and it almost seems as if they could not be settled in some of their details, except in the lower forms of life. Nature has so protected the process from observation in the higher animals that it cannot be studied in detail; but in plants and the lowest animals it has been observed with some success, and we may infer that the process is very much the same in the higher animals.

Hæckel, in his great work on the Evolution of Man, tells us that "The process of fertilization in sexual generation depends essentially on the fact that two dissimilar cells meet and blend. In former times the strangest views prevailed with regard to this act. Men have always been disposed to regard it as thoroughly mystical, and the most widely different hypotheses have been framed to account for it. It is only within a few years that closer study has shown that the whole process of fertilization is extremely simple, and entirely without special mystery. Essentially, it consists merely in the fact that the male sperm-cell coalesces with the female egg-cell. Owing to its sinuous movements, the very mobile sperm-cell finds its way to the female egg-cell, penetrates the membrane of the latter by a perforating motion, and coalesces with its cell material.

"A poet might find in this circumstance a capital opportunity for painting in glowing colors the wonderful mystery of fertilization; he might describe the struggles of the 'seed animalcules' eagerly dancing round the egg-cell shut up in its many coverings, disputing the passage through the minute pore-canals of the chorion, and then of purpose burying themselves in the protoplasm of the yelk mass, where, in a spirit of self-sacrifice, they competely efface themselves in the better 'ego.' But the critical naturalist very prosaically conceives this poetical incident, this 'crown of love,' as the mere coalescence of two cells! The result of this is, that in the first place the egg-cell is rendered capable of further evolution, and, secondly, that the hereditary qualities of *both* parents can be transmitted to the child."

By coalescence is understood, growing together, not mingling as water and milk might when mixed. More recent observations indicate that during coalescence both the male and female cells throw off some portions of their substance. It is also considered that the important part of each cell is its nucleus. In it all hereditary characteristics are stored up. If the nucleus be absent in either cell these cells cannot reproduce. In unicellular, or one-celled, organisms, it has been found in multiplication by division, a part of the nucleus must go with each half, otherwise the half without a

part of it does not grow. In experiments in laboratories, artificial division of simple organisms may be made, and each fragment will become a perfect creature if only a very small piece of the nucleus goes with the separated portion; but if a part is cut off without any of the nucleus, then, while it may live on for a short time, it can not grow or propagate.

Possibly we have here an explanation of some hereditary phenomena in human beings. If there is an unequal division, and more of the male than of the female nucleus, the child might, as a result, inherit more of the father's than of the mother's characteristics, or the reverse.

What has been so far said about the germ plasm has been to enable the reader to possess a degree of intelligence on the nature of fertilization, so far as it is known; but from a practical standpoint the most important knowledge for those prospective parents who wish to practice intelligent stirpiculture is to understand that the health of the germ plasm or fertilized ovum depends on the health of the parents. By health, I mean the possession of a good constitution, to which will be added a strong hold on life, power to do and to endure, and quickly to recover from weariness. Disease will be easily warded off in such persons, so that there will be generally good health. Such a condition of body is usually inherited. It depends on

the possession of a large supply in the body of living matter—firm muscles, a good heart, lungs and digestive organs. Those who are feeble cannot endure much; whose heart, lungs and digestive organs are weak; whose hold on life is slight, can rarely endow their offspring with these high qualities. Their children may live if no great strain comes upon them; but if they must take an active part in the struggle and competition going on in the world they cannot endure it. Mr. Spencer puts the case very aptly in his work on Ethics where he says: "It results that where maternal vigor is great, and the surplus vitality consequently large, a long series of children may be borne before any deterioration in their quality becomes marked; while, on the other hand, a mother with but a small surplus may soon cease altogether to reproduce. Further, it results that variations in the state of health of parents which involves variations in the surplus vitality have their effects on the constitutions of offspring to the extent that offspring borne during greatly deranged maternal health are decidedly feebler. And then, lastly and chiefly, it results that after the constitutional vigor has culminated, and there has commenced that gradual decline which in some twenty years or so brings absolute infertility, there goes on a gradual decrease in that surplus vitality on which the production of offspring depends, and a consequent

deterioration in the quality of such offspring. This which is *a priori* conclusion is verified *a posteriori.*

"Mr. J. Mathews Duncan, in his work on Fecundity, Fertility, Sterility and allied topics, has given results of statistics which show that mothers of twenty-five bear the finest infants, and that from mothers whose ages at marriage range from twenty to twenty-five years there come infants which have a lower rate of mortality than those resulting from marriages consummated when the mothers' ages are smaller or greater. The apparent slight incongruity between these two statements being due to the fact that whereas marriages commenced before twenty and twenty-five cover the whole of the period of highest vigor, marriages commenced at five and twenty cover a period which lacks the years during which vigor is rising to its climax and includes only the years of decline from the climax."

This quotation from Mr. Spencer needs a qualifying remark. Mr. Galton, in his work on Hereditary Genius, found that the average age of mothers of men of the greatest ability was about thirty, and of their fathers thirty-five. In such cases, the physical and intellectual strength must have been above the average, and, consequently, it continued to a more advanced age. Besides, those of great ability mature later.

It may also be added that Duncan's statistics, quoted by Spencer, are average statistics gathered from tables of mortality, and include every class of persons. Now, average statistics do not apply to individual cases, and they would not apply to those highly endowed physically and intellectually.

Further, those who are well endowed at birth and whose lives are in accordance with hygienic law, that is, those who do not squander their physiological resources by sensuality, by intemperance, or by excesses of any sort retain their health to a greater age than those whose lives are the reverse. Such are of a youthful physiological age, which is not altogether determined by the actual number of years they have lived, but by very high physiological conditions.

From all this we conclude that a very important rule in the production of offspring, if we would have those offspring superior, is to maintain a high degree of health—a condition in which there is a surplus of physiological capital to produce children with endowments equal to, if not superior to, their parents.

Another subject requires treatment here. It is the effect of alcohol on offspring. We are yet lacking in statistics giving the facts we need to know on this subject; but the general observation of competent persons who have had good opportunities to study it may teach us something. Alco-

hol, in its circulation in the blood, penetrates every part; not even the germ plasm escapes. Demme studied ten families of drinkers and ten families of temperate persons. The direct posterity of the ten families of drinkers included fifty-seven children. Of these, twenty-five died in the first weeks and months of their lives; six were idiots; in five a striking backwardness of their longitudinal growth was observed; five were affected with epilepsy, and five with inborn diseases. Thus, of the fifty-seven children of drinkers only ten, or 17.5 per cent., had normal constitutions and healthful growth. The ten sober families had sixty-one children, five only dying in the first weeks; four were affected with curable diseases of the nervous system; two only had inborn defects. The remaining fifty, 81.9 per cent., were normal in their constitutions and development.

In this statement we have a graphic object lesson of the evil effects of alcohol on the germ plasm. Natural selection had far more to do in removing those unfit to survive in the intemperate than in the temperate families.

A knowledge of the evil effects of alcohol on the unborn child was known to the ancients. The mother of Sampson was warned "not to drink any wine or strong drink nor to eat any unclean thing" because she was to conceive and bear a son who was to deliver Israel out of the hands of the Philistines.

Manoah was so interested in what the angel of the Lord had said to his wife that he sought an interview with him for further confirmation, and asked: "How shall we order the child, and how shall we do unto him?" evidently meaning, "How shall we train and educate him?" and the same advice was given as before. Whatever view the reader may hold as to the inspiration or non-inspiration of the Bible, certainly this advice was good. Other examples similar to it are to be found, not only in the same book, but in numerous historical works, and also abundant evidence in our own time of the evil effects of alcoholic drinks on unborn children giving them a tendency to insanity, idiocy and other nervous diseases. A whole book might be written on this branch of our subject.

To what extent food affects the germ plasm we remain somewhat in ignorance. We know that it is from it that the body is nourished, and from it also the stored up or surplus matter in our systems is obtained. The larger the surplus the more highly will the offspring be endowed with energy is a fact clearly set forth by Mr. Spencer. A surplus of fatty food stored up in the body, however, cannot be of much service and may prove injurious. A deficiency of nitrogenous food would also, it seems to me, be an evil. The germ plasm, or its most important part, is a highly nitrogenous substance, like all protoplasm, or living matter. The

highest form of germ plasm, that with a most complex molecular structure, would hardly be formed if there was a deficiency of nitrogenous matter in the blood.

Air is also food the same as bread is. The activities, the chemical changes in the body, are mainly, though not entirely, between the oxygen of the air and the carbon and hydrogen of our food. The body is quite as much injured by a deficiency of air inhaled into the lungs by exercise as by a deficiency of food, though the injury may be of a different nature. Physicians and others have long ago observed that the offspring of parents living much in the open air and sunlight are healthier and stronger than those of parents living in confined spaces, where air and light are deficient. Air which is impure, which is loaded with poisonous matter, if inhaled for a long time by the mother, lowers the standard of her health. In malarious regions, the vigor of the offspring is less, and the number who die in infancy greater, than in regions where the air and water are pure. Many years ago I remember reading in one of the journals devoted to sanitary science published in London, an account of a rural town where both air and water were of extraordinary purity, and in this town a very large percentage of the children born lived to grow to maturity. There is also an isolated region in France, bordering on the sea,

where both air, water and climate are unusually salubrious, and though intermarriage has been practiced for a long time among the several thousand inhabitants, the people are remarkably well formed and healthy. Similar facts have been observed in other places. They indicate to us that a healthful climate, with good air and water, are important factors in all true stirpiculture.

While all diseases which exhaust the physiological resources of the system are detrimental to the offspring, there are certain ones which are peculiarly so. Specific diseases or those resulting from a sensual life are the first to be mentioned. If the bodies of either father or mother become saturated with the poison, which is probably a germ, then the child born of such parents will certainly be infected and either die at birth or live only a short and feeble life. It is one of the penalties of an impure life—a very severe one, no doubt, but perhaps not too severe, that the offspring of the sensualist must suffer the penalties for its parent's physiological sins. Medical men have long been trying to discover a remedy which will make it safe for a man infected with specific disease to marry and become a father, but so far they have not had much success. It is doubtful if they ever will.

Epilepsy is another disease which is so often transmitted to children that any one of either sex

suffering from it had better abstain from parentage. If one parent is remarkably healthy, the children may escape the severest form of penalty; but even then they may suffer from nervousness and other diseases, and rarely enjoy robust health.

The question whether persons who have a consumptive tendency should become parents or not has frequently been discussed by sanitarians, but never settled. Such persons are frequently intellectual, and often of an unsually cheerful and hopeful disposition. They are, in most cases, quite prolific. In the female they generally make excellent wives and mothers; in the case of the male, they are not uncommonly good providers for their families, and also good fathers. Except in the worst cases, does the welfare of the race demand that they shall not marry and become parents. Probably not. But we must advise them to take the very best care of their imperfect bodies; to develop their chests by wise but not excessive physical training; to husband their physiological resources carefully; not to marry young, nor rear too many children. Excessive childbearing is a prolific cause in women of consumption, and excessive sexual indulgence is a frequent cause of it in both sexes.

These remarks should not be construed to mean that those who are already in the early stages of this disease, or whose families on both sides have

been deeply affected by it, may become parents. They should not. But in the present state of society, we cannot hold men and women up to an ideal standard. Some slight risks may be taken, but not too great ones. As the race progresses in knowledge, however, we may raise our standards, and finally make them so high that no one with a tendency to any serious disease which is likely to affect the offspring unfavorably shall have any right to contribute to the world's population.

I have mentioned only a few of the many diseases which affect the germ plasm unfavorably. It is hardly necessary to extend the list.

One other subject deserves consideration, when I will bring this chapter to a close. Every child born into the world is, to a certain extent, an experiment. That is to say, the parents cannot predict its sex, nor what its chief characteristics will be. These depend on what potentialities are stored up in the germ plasm. If this be formed by parents in good health, with a surplus of vital force, and a long line of ancestors with normal lives, we may believe that if the environment be favorable, the child will develop so as to show the same characteristics, perhaps in an even higher degree. Whatever variations there are will not be much below or above the average line of its ancestors. The congenital characters will tend to be transmitted. They are in the germ plasm, even in great detail.

Whether the acquired ones are transmitted may still be uncertain; but whether they are or not, normal right living will be sure to have good effects. Obey the laws of life and far better results will follow than if they are disobeyed.

FEWER AND BETTER CHILDREN.

In the present age suggestions on this subject may seem superfluous. The more highly educated and wealthy classes have already sufficiently reduced the number of children which they bring into the world. But are these offspring any better than they would have been had their parents given birth to a larger number?

Mr. Darwin did not think much could be done to improve the race by parents limiting the number of their offspring. He would trust to natural selection to weed out the unfit, and to sexual selection as an aid. He thus describes the probable manner of action of sexual selection among primeval men: "The strongest and most vigorous men—those who could best defend and hunt for their families; those who were provided with the best weapons and possessed the most property, such as a large number of dogs or other animals—would succeed in rearing a greater average number of offspring than the weaker and poorer members of the same tribes. Such men would doubtless generally be able to select the more attractive women.

. . . If, then, this be admitted, it would be an unexplainable circumstance if the selection of the more attractive women by the more powerful men of the tribes, who would rear on the average a greater number of children, did not, after the lapse of generations, *modify the character of the tribes.*"

The way in which the tribe would be modified would be by its producing better children. Of course among primitive men the richer and more powerful had several wives, but it is not likely that the number of children by each one was large.

Natural selection is, however, a painful process, necessary, no doubt, where ignorance prevails; but if the number of children of each pair could be limited and of a superior character, so far as vigor and adaptation to environment are concerned, would there not be less need for natural selection with all its evils? It seems to us that this would be so.

We have already quoted Grant Allen as favoring abstainence from parenthood on the part of the unfit and the duty on the part of the fit to become parents, and, theoretically, Mr. Allen is right; but except as both of these classes are swayed by duty we would make little progress in this way. A majority of mankind think they are the fit. Why should they crucify their desires for the benefit of the race? As mankind becomes more moral Mr. Allen's views may have a larger influence on

thought than now; but before that time little can be expected from them.

Mr. Spencer says: "We have fallen upon evil times, in which it has come to be an accepted doctrine that part of the responsibilities [of parenthood] are to be discharged, not by parents, but by the public—a part which is gradually becoming a larger part, and threatens to become the whole. Agitators and legislators have united in spreading a theory which, logically followed out, ends in the monstrous conclusion that it is for parents to beget children and for society to take care of them. The political ethics now in fashion makes the unhesitating assumption that while each man, as parent, is not responsible for the mental culture of his offspring he is, as a citizen along with other citizens, responsible for the mental culture of all other men's offspring! And this absurd doctrine has now become so well established that people raise their eyes in astonishment if you deny. But this ignoring of the truth, that only by due discharge of parental responsibilities has all life on the earth arisen, and that only through the better discharge of them have there gradually been made possible better types of life, is, in the long run, fatal. Breach of natural law will, in this case, as in all cases, be followed in due time by nature's revenge—a revenge which will be terrible in proportion as the breach has been great. A system

under which parental duties are performed wholesale by those who are not parents, under the plea that many parents cannot or will not perform their duties—a system which fosters the inferior children of inferior parents at the cost of superior parents and consequent injury of superior children—a system which thus helps incapables to multiply and hinders the multiplication of capables or diminishes their capability must bring decay and ultimate extinction, A society which persists in such a system must—other things equal—go to the wall in the competition with a society which does not commit this folly of nourishing its worst at the expense of its best."

We have evidence among primitive people that they understand the necessity of limiting offspring, and practice it in a perfectly healthful way. The natives of Uganda, a region in Central Africa, offers an illustration: "The women rarely have more than two or three children; the practice is that when a woman has borne a child she is to live apart from her husband for two years, at which age children are weaned."

Seaman, speaking of the Fijians, says: "After childbirth husband and wife keep apart three and even four years, so that no other baby may interfere with the time considered necessary for suckling children."

Some fifty years ago there lived in New York a

young couple, strong, healthy, ambitious to be rich, and both saving and industrious enough to become so under ordinary conditions. The husband was in a business which required constant attention; and in order to promote it and save the expense of help which he thought he could not afford, he labored nights, often up to the hours of twelve and sometimes one o'clock, and then arose early and went at it again. His wife sympathized with him in all his undertakings, helped him in every way possible, even to the sharing of his midnight toils. In no way did either of them spare themselves. They knew something of the evils of poverty, and were determined that it should not always be their lot. Fortune favored them, and their bank account grew larger and larger until they could count the value of their possessions as amounting to several million dollars. They lived in a fine country seat, and could gratify every wish, so far as food, clothing, books and travel were concerned. During their early married life, when the strain of work was the greatest, two children were born unto them, both boys, and they are alive today; but are they a comfort to their parents, and a help in their declining years? Instead of this they are both deformed and cripples, unable to help themselves or do any labor. Their family physician has told me that the overwork and privation of the parents at the time of their

birth and before, was undoubtedly the cause of the children's inferiority. A younger son born after the wife had ceased to toil like a slave, gives some promise of being a man of character.

We have here a typical case of strong, healthy parents, with a limited number of offspring, yet they were not superior. On the other hand, it would be easy to collect a large number of instances where the children in large families have had superior endowments. Take Benjamin Franklin as an example. He was the fifteenth child of his father, Josiah Franklin, and the eighth of the ten children of his mother.

It seems that superiority is a result of great vigor and perfection of body and mind and of abundant reproductive power. Where this is absent the children will hardly be superior. Yet in both cases a certain degree of limitation ought to be advantageous.

In conclusion, let me say what I have indirectly said already. Let the strong, the capable and the good rear as many children as they can without overburdening themselves in any way, and let the weak, the imperfect and the bad rear few or none, but devote their lives to perfecting their own characters. In this way the future race will be modified for good and not for evil.

A THEORETICAL BABY.

Reported by request of Dr. Holbrook.

It was our first baby. I was making a living as a doctor by writing articles on the general care of the health; and my wife before her marriage had been a kindergartner, a trainer of kindergartners, and a lecturer to mothers on the scientific and expert methods of rearing children aright. We believed in the theories we had taught, and our baby got nothing else from the start. According to the first applied theory, we made our temporary home before the boy began to be, in the Rocky Mountains of Colorado; and were a large part of the time either in our garden or on horseback, in this perfect outdoor climate. My wife was entirely in love with me, and I made each day count for nothing more certainly than to deserve and return that sentiment of hers. We lived simply but freely, and had next to no anxieties. My wife had practiced general gymnastics for years; but for months prior to the birth of her boy, she every day went through with a series of special maternal gymnastics, by which the muscles that aid in parturition can be made

strong and entirely to be relied upon. We were rewarded for this outlay of time in a delivery that was rapid and easy, without more than an ounce of hæmorrhage, and everything so perfectly controlled that—except for the inconvenience of it—the presence and aid of the physician (myself) might have been dispensed with. Recovery was rapid also. My wife made no haste to get up, keeping quiet most of the time for two weeks, to ensure good milk. But she did a family washing without effort after three weeks, and was on horseback again by the sixth week. The baby was not severed from his mother till ten minutes after birth (ensuring a better blood supply). Then he got no bath, no food, no dressing process; but was simply swathed in cotton batting and laid aside for six hours in a padded box-bed, surrounded by bottles of hot water, and covered with plenty of soft blankets, to sleep and get used to his new environment. On the second day we began rubbing him daily from head to foot with vaseline. His first bath, with a flannel cloth dipped in warm milk diluted with soft water and without soap, came when he was a week old, and was followed by the thorough rub with vaseline. This bath he has had nearly every day up to date. He has often cried, or crowed and begged for this bath; but never cried during its performance, except when his clothes were being replaced. On the contrary, he enjoys every moment of it.

Feeding began with a meal every hour of the twenty-four, for the first week. Then night feeding was reduced to two meals, and he was fed every two hours, from four or five o'clock in the morning till nine at night, till two months old. About then he began sleeping right through the nights; and until three months old was fed every three hours of the day time; then for a month he went four hours between his meals. At his fourth month began the present regime of four meals *per diem*. Now and then he has cried in the night from thirst, and a few spoonsful of cold water have sufficed to send him off to sleep again. All in all, I think I could count on my fingers the times that he has wakened us out of hours, and not once has anyone walked the floor with him. In fact, no diversions of this sort have ever been practiced on him. He has never been rocked to sleep; whenever cross or fretful in the day, we have known that sleep was all he needed, and into his little bed he has been promptly plumped, and covered with a loosely knit afghan, tented on a light framework, which we call "the extinguisher." Here shut away and entirely unnoticed he soon learned to give himself up to his own reflections, and then presently to sleep. Thus we have kept down the first great nuisance of ordinary infancy, namely, egoism and a habit of howling for attention when no attention is really needed. But social relations,

and those of the gayest, he has constantly with both his parents. We take up and make into play with him each idea of his own. We have shown him some finger-plays. In the main we leave him to originate his own amusements.

From the keeping of stomach and bowels absolutely healthy, by a regular and reasonable exercise of their all-important functions, not only has the boy been free from irritability, and spontaneously happy and self-amused, sometimes quiet, and sometimes jolly to overflowing. But the second great nuisance of those ordinarily attending baby-raising, namely, sour stomach followed by colic, was eliminated. A secondary result of this entire regularity of functioning at the upper end of the alimentary canal was that a like regularity set in at the other end. That is, at the thirteenth week he began to have but one daily passage of fæcal matter, and that soon after breakfast. Of the approach of this act he notified his mother without fail, and thereafter we had no soiled diapers. Movements were received on pieces of old cloth, and cloth and all tossed into a pan of ashes, or the fire, when we had one. When, at six months, we put him onto cow's milk, mixed with thin graham porridge, to supply the extra nourishment demanded by rapid growth, he went up to two movements per diem—morning and evening. Thus, the third great nuisance of of diaper washing was eliminated, in its more disa-

greeable feature. Eructation of curds, rashes, colic, diarrhœa—these common ailments of ordinary babyhood, we have never had a sight of. We believe it due solely to strict adherence to the four-meals-a-day plan. These consist of an early breakfast, a later breakfast, a dinner about one o'clock and a supper between six and seven. The bath comes at any convenient time. On pleasant days, even in winter, he is outdoors, well wrapped, in a chair, for hours. and often has a long nap there. He was provided, by my own needle and penknife, with an ample fur sleeping sack, into which he is securely buttoned every evening and laid in his box-bed, on a trunk. He never sleeps with his parents. According to the coolness or coldness of the nights, additional covering, in the shape of soft blankets and shawls, is laid in on the box, their weight supported by the edges of the box. He cannot uncover himself, but he can kick freely, and use his arms. We dressed him, from the first, in the "*Gertrude*" system of baby clothes, introduced by Dr. Grosvenor, of Chicago—all woolen princess garments, with shirring strings at the lower hems, by which they are made closed bags, ending just below the feet; warm, but allowing of kicking *ad libitum*. At five months—it being winter time—he went into short clothes, including solid suits of warm flannel underwear, shirts, drawers and long snug-fitting stockings. He has never had a cold.

His muscles, from the first (due to his mother's gymnastics), were firm and active, like those of an adult. At the fourth week he surprised us by suspending his entire weight from his hands and arms one morning. Legs, neck, back and hands particularly have developed steadily in power and quickness. There was never any fat deposited—that *avant courier* of so much infant mortality—yet he is, and has been all along, a rosy, plump, dimpled baby, or boy, rather, for babyhood very early lost its hold on him. Too often children seem finally to emerge from the miseries and ailments of a tedious infancy and to take on, at last, individuality and distinct character at the second or third year. This child, *per contra*, having never had a sensation of illness, or of pain, save honest hunger, has seemed to be a happy little boy almost from the first, alert or thoughtful, shouting or cooing, laughing and crowing, especially after his meals and movements, studying the world of things about him by the hour, keenly appreciative of colors and of music, and preferring some sorts to others, his face crossed by vivid changes of expression, wonder, merriment, surprise, reverie—all as perfect at six months as ordinarily seen at three years. He has good color from head to foot, is pale when hungry, but the moment a bit of food is down expands to his most genial flow of spirits. Immediately after his day-time naps his cheeks are regularly flushed and

rosy. His spirits become more pronounced toward each evening, reaching their high-point of talking, laughing, crowing and squealing at just about bed-time. He keeps it up for some time after being tucked away for the night, till sleep masters him; and begins where he left off early next morning. All this is good physiology. So happy day succeeds happy day, and we trust and hope that many good tendencies are getting a fair start in a harmonious and spontaneous beginning of this great work of growing up that we are fostering but not forcing.

At One Year Old.—Everything continues as begun. Teething at times causes slight transient fretfulness, and more cold water is drunk. The bowels remain absolutely regular. The all-night sleep (never "put to sleep,") and two day-time naps are unchanged, in all thirteen or fourteen hours of sleep *per diem*. On warm days he needs *and gets* plenty of cool water to drink, often two-thirds of a pint at a time. Talking, standing and creeping he has attained by his own unaided initiative (this on principle). As for amusements, he invents his own always, except when engaged in social exchange with his father and mother, and in these, too, we are careful that he makes at least half the advances.

On particular occasions he comes in need of mothering—and gets it. On all others he simply

lives with two big but highly sympathetic playfellows; and he has developed separate lines of play and talk for each. Often he chooses to alternate as between two poles of attraction, turning his face to his mother's for her sympathy between shouts to his father, or *vice versa*. From week to week we notice that the older plays are mostly dropped one by one, and fresh ones invented. All, however, are real and vivid to him.

In early prospect we have but two more points to compass. Perfect health in all respects he has intact. Self-control and self-sufficiency, both in amusing himself and in enduring lesser ills, such as bumps and mild degrees of hunger, he is getting as fast as growth permits. But obedience and responsibility will soon be needed in his repertoire. Negative obedience his mother is obtaining already in response to "No, no," and shakes of the head. Positive obedience will be the far more vital thing to secure—just as soon as he can help in little ways. Here we hope to make him responsible as far as can be for the welfare, safety and amusement of younger playfellows, whether brother or sister it is now too soon to say.

At Eighteen Months.—A cold douche has, for three months past, ended his morning bath, regularly given by his father after his sister arrived, and his weight became considerable. This douche, poured slowly from a dipper until redness set in,

has added markedly to his spirits, muscular activity and digestive capacity. It causes screaming at the moment, but an instant later, as three Turkish towels are wrapped closely about him, his exuberance is delightful to see. Coincidently he has taken up a selected diet of solid food, including chocolate and cooked fruits, and will have but one nap, though often that is a long one.

As the child is working out of babyhood, every day counting (as no day of half illness in childhood *can* count), and well into boyhood, the single principle already outlined, of leaving the little individuality to establish its own activities and socialities, seems sufficient, as the illustrations appended, I believe, prove. Doubtless a child that is not, day after day, enjoying, and often thrilled by health and life, as this little boy is, a child not brought up in an unbroken *camaraderie* with both parents, such as he has had, and particularly a child not having the send-off of trust and amiable impulse which he received before his birth, could not be left to blossom in such wild-flower style. Ugly, sulky or "streaky" conduct, jumping perversely out in place of good cheer, we have never had to deal with. In fact, we have never been able to detect the slightest resentment immediately after punishing him for taking forbidden articles, or for raising an outcry over being denied sundry things he wanted. His crying when punished is that of pure grief, and he

is ready at once to nestle down under the hand that had spatted disapproval, to be comforted, resuming good spirits two or three minutes later on. In the main, simply "No, no!" from either parent, has sufficed to stop him in the beginnings of mischief, sometimes resulting in cheerful desisting, and sometimes in a little of what we call the "grieved cry." But this, too, if it becomes loud or insistent, can be hushed by another "No, no," and enable him to regain control of himself. With this regained self-control has always come gratefulness for aid in the matter, as evinced by extra sweetness and brightness immediately after, and eager resumption of some one or other of his plays or calls with one or both of us. This may be what is known as discipline. It always brings a smile to our faces, however.

Without a break of more than a day or two at a time, we have been able to be equally near him all the while, and divide up about equally the matters of bathing, feeding, dressing and undressing him. The conventional estimate of those standing nearest to a child of,

1—Mother,
2—Nurse,
3—Teacher,
4—Servants and playmates,
5—Older brother or sister,
6—Father—the man behind the newspaper,

certainly does not apply here. When I am absent for from three to six hours his uneasiness sets in, and grows stronger and stronger, ending in repeated expeditions to a short distance along the road, where he stands and calls "Vager," "Vager," (Father, Father,) at first hopefully, then protestingly, and sometimes at last with indignation or tears. When I return—and he listens and catches the first distant sound of hoofs, or wheels, or whinny of the left-at-home colts, or voice, or opening gate—an eager, beaming face welcomes me from gate or doorway, or even several rods down the beaten snow on the road. Once back, things are all right in his little domain again, and he goes on, without special attention to me, in his series of occupations and plays.

I say "occupations." They are nothing else to him; serious matters that he goes about accomplishing. He is at his best when he can help his mother at her work—blowing the fire, bringing her kindling, handing her clothespins one by one as she needs them, shutting or opening doors on request, picking up articles from the floor. But there are many hours continuously when he is left to his own devices, which are numerous, though many of them he goes through daily, such as feeding the cat, visiting his little sister, emptying and refilling the wall-pockets, collecting his blocks, and fishing articles off the table with a long stick. He has learned, untaught, to get a cloth to open the stove door with

and save burned fingers; to get and bring clean diapers to his mother when he wishes a change; to stoop and lap water out of the pail; to stand by his bed and point up at it when wishing his mid-day nap; to retreat to a dark corner and drape his handkerchief over his head for a brief period towards the close of a day, in lieu of the discarded second nap; to scoop bread or biscuit out of a pail hung above his reach, with an iron spoon; to lasso peaches toward him with a cord, said peaches being in pan on the floor just beyond where he could reach from a little gate separating the kitchen and sitting-room. None of these things has been taught him. Nothing whatever has been taught him, and especially no words and no "tricks." He invents or does without, in all non-essential matters, in regular Spartan style. So, in pursuit of his own undertakings, he rarely asks for what he would have; just tries and tries, day after day, until he succeeds or is beaten. But as he is at some new act or plan much of the time when left to himself, he has, we are satisfied, independently attained to more of childish accomplishment than the most incessant teaching processes could have effected. In doing what he does do, for instance, in certain climbing feats, he has slowly worked up to, he is both cautious and sure; he rarely tumbles and never loses his confidence. Thus for the past two days he has achieved the feat of climbing up and

standing erect on a little box fourteen inches high, where he calls and shouts and roars to us his ecstacy over the matter for ten minutes at a time. Today only he has found out how to get down alone. Contrast is taken here with the frequent falls and wailings of children who are first persuaded into attempts of various sorts, but have not worked out a real personal mastery of given acts for themselves.

He has quite a vocabulary now of his own invention. The meanings of these terms we have learned mostly, and use them to him. Of our vocabulary he understands the meanings of a large number of the words for things in which he is interested, forty or fifty nouns, and a dozen verbs, perhaps. He sings to his mother, and now and then to me, rude imitations of the songs he has heard us sing, and his mother he roughly accompanies. His inflections of voice have developed to the point of entirely expressing many of his emotions; while his expressions of face are as much beyond these as the inflections are beyond his stock of English—about seven words, and those requiring some exigency to bring out.

All this pleases us, because we truly want him to become rich in his own life, to subsist and grow in his own home-made lines of feeling and thought; and not to learn words, parrot-like, before he has the thought formed, and searching, even struggling,

for a means by which to convey itself. It is dearth of internal life, emotion and unaided thought that is in need of replenishment in the average young person, not lack of English dictionary terms for things that can be *talked about*, but are evidently not intrinsic and personal.

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NOTES.

War and Parentage.

In the interests of unborn children we should, so far as possible, remove from the world those causes which, acting on the mother, either directly or indirectly, may injure them by lowering the standard of their health, or by altering and debasing their moral and intellectual natures. One of the most potent of the causes for harm is war. War has generally been regarded as one of the ennobling professions. If we look upon it in its most favorable light, all that we can say in its favor is that among primitive and barbarous races it has perhaps resulted in the preservation and spread of the most capable ones, and that it has at the same time welded them together into larger groups, and finally into nations, and habituated them to those restraints which are necessary to social existence; but we no longer require it for this purpose, and the industrial pursuits and the evolution of civilization are so disturbed by them that they should cease, and especially should they cease in the interest of our children, both born and unborn

How can war injure children? We have already shown in the chapter on Prenatal Culture that when the mother

is under the influence of any powerful mental emotion, such as fear, depression, anger and similar passions during the months in which the child is being developed in her womb, there is very great danger of permanent injury to it. Only the strongest mothers, those with the most robust health, or who have the most stable nerves, those who are rarely thrown off their balance, are capable of resisting the intense excitments to which they are subject during some of the phases of war.

As I mentioned in my early work on Marriage and Parentage, Esquirol, a French historian, gives details of a considerable number of cases of children born soon after some of the sieges of the French Revolution, which were weakly, nervous and idiotic, on account of the terrible strain to which their mothers had been subjected. In every war where a city is besieged, even if its women and children are sent away, they cannot be altogether free from anxieties and mental strains of a most unwholesome nature, and if some of them are soon to become mothers, the offspring not yet born must suffer. No one can estimate the vast number of children injured under such conditions in the ages past. They have been only incidentally referred to in history. The fame and glory of conquerors must not be dimmed by the relation of such occurrencies.

Joseph A. Allen, in *The Christian Register*, gives the results of some of his observations which bear on this subject. He says:

"So much is being said about war and its effects, that I am prompted to send you the result of my observations.

"I was in charge of the Massachusetts State Reform School for several years, when every inmate (there were between three and four hundred) was born before the Civil War—during the time of the great anti-slavery agitation, which did so much to educate the moral sense of the people.

"I was again in charge of the same institution *when every inmate was born during, or soon after the war, when the mothers were reading, talking and dreaming of battles, and of husbands, fathers or brothers who had gone to the war.*

"*I found as great a difference in the character of those inmates born before and after the Civil War as exists between a civiiized and a savage nation.*

"*Those under my care the second time were much more difficult to control, more quarrelsome and defiant, less willing to work or study. The crimes for which they were sentenced were as different as their characters.*

"It was not uncommon for them to be sentenced for breaking and entering with deadly weapons.

"This difference was not confined to inmates of reform schools, but it was manifest throughout all classes.

"After the war crimes increased rapidly. In Boston garroting was common, and was only checked by Judge Russell sentencing all such subjects to the full extent of the law.

"Before the close of the Civil War the State Prison at Charlestown, under Mr. Gideon Haynes, was, according to Dr. D. C. Wines, D. D., the model prison of the United

States. Since that time it has been almost impossible to maintain proper discipline, owing, no doubt, to the more desperate character of the inmates.

"Let us try to trace these effects back to their causes, and prove, if possible, that whatsoever a man (or nation) soweth, that shall it also reap."

But there are other ways in which war militates against the noblest motherhood. Camp life is a school for vice and prostitution. In Camp Chickamauga, which is a sample of them all, during the war with Spain on account of Cuba, the amount and baseness of the prostitution by the soldiers, with both black and white women, exceeded description. In a single day forty-one cases of specific disease applied to the physicians at the hospitals for treatment. These things were not reported in the daily papers; they were too vile. The place was a hot-bed of vice, rather than a school of virtue and patriotism. In all European armies it is the same. In times of peace, soldiers from the highest to the lowest in rank, insist that facility shall be allowed them for the gratification of their passional natures. The officers, not being permitted to marry unless they or their wives have a certain income, keep their mistresses, and not a female servant near a camp is safe. The immoral influences here generated spread throughout society, lower the standard of morals among both men and women in private life, and jeopardize the interests of children born or unborn, morally and intellectually, as well as physically.

But there is another view. "Great standing armies,"

says the Czar of Russia, in his note to the Powers, "*are transforming the armed power of our day into a crushing burden which the people have more and more difficulty in bearing.*"

That is to say, the tax imposed upon the individuals of any nation to support its army pauperizes or keeps on the verge of poverty a large portion of the race. It is war, far more than any other cause, which has created the burden of taxation. In some European countries almost every man carries a soldier or sailor on his back, that is, he must labor not only to support himself and family, but a soldier or sailor who devotes his life to a murderons profession. Is this not a grevious burden which cripples or paralyzes his life and reacts on his offspring?

Now, the poverty caused by this burden is a serious obstacle to the production and training of the young, and especially is this the case in the more populous countries—France, Spain and Italy are examples. These lands were once the most powerful in Europe; they are so no longer. They gloried in war, and spent immense sums of money upon their armies and burdened the people with taxes which should have been reserved for the use of fathers and mothers in educating and providing for the needs of their offspring. War has crushed out the best life of these countries, and other nations which follow in the same path will in the end come to a similar fate. They may hold out a long time, but not forever. "The mills of Gods grind slowly, but they grind exceeding small."

It is because war is an enemy to the highest mother-

hood that women should array themselves against it. It is one of the greatest foes to the development and welfare of the children they love so well. Women should insist that all governments should settle their differences by peaceful rather than by warlike means. The industrial age may have its difficulties, but they are not insurmountable. In it the fathers and mothers may have the time and the means to study and learn how to improve the race through a wiser parentage. I believe that thoughtful women, when they come to see the evils of war in their true light, as they have seen the evils of prostitution and intemperance, will be its greatest foes.

Cases of Prenatal Influences.

Alfred Russell Wallace gives in *Nature* a few cases of prenatal influences sent him by his correspondents. The first experience is from a mother residing in Australia. She writes:

"I can trace in the character of my first child, a girl now twenty-two years of age, a special aptitude for sewing, economical contriving and cutting out, which came to me as a new experience when living in the country among new surroundings, and strict economy being necessary, I began to try to sew for the coming baby and myself. I also trace her great love of history to my study of Froude during that period. Her other tastes for art and literature are distinctly hereditary.

"In the case of my second child, also a daughter, I having interested myself prior to her birth in literary pursuits, the result has been a much acuter form of intelligence, which at six years old enabled her to read and enjoy the ballads which Tennyson was then giving to the world, and which at the age of barely twenty years allowed her to take her degree as B. A. of the Sydney University.

"Before the third child, a boy, was born, the current of our lives had changed a little. Visits to my own family and a change of residence to a distant colony, which involved a long journey, as well as the work incidental to such changes, together with the care of my two older children, absorbed all my time and thoughts, and left little or no leisure for studious pursuits. My occupations were more mechanical than at any other time previous. This boy does not inherit the studious tastes of his sisters at all. He is intelligent and possesses most of the qualifications which will probably conduce to success in life, but he prefers any kind of out-door work or handicraft to study. Had I been as alive then as I am now to the importance of these theories, I should have endeavored to guard against this possibility; as it is, I always feel that it is, perhaps, my fault that one of the greatest pleasures of life has been debarred to him.

"But I must not weary you by so many personal details, and I trust you will not suspect me of vanity in thus bringing my own children under your notice. Suffice it to say that in every instance I can, and do, constantly trace what others might term coincidences, but which appear to

me nothing but cause and effect in their several developments."

Mr. Wallace then gives extracts from other correspondents as follows:

"Mrs. B—— says: "I can trace, nay, have traced (in secret amusement often), something in every child of mine. Before the birth of my eldest girl I took to ornithology, for work and amusement, and did a great deal in taxidermy, too. At the age of three years I found this youngster taking such insects and little animals as she could find, and puzzling me with hard questions as to what was inside of them. Later on she used to be seen with a small knife, working and dissecting cleverly and with much care and skill at their *insides*. One day she brought me the tiniest heart of the tiniest lizard you can imagine, so small that I had to examine it through a glass, though she saw it without any artificial aid. By some means she got a young wallaby, and made an apron with a pocket inside which she used to call her 'pouch.' This study of natural history is still of interest to her, though she lacks time and opportunities. Still, she always does a little dissecting if she gets a chance."

Another Case.—"I never noticed anything about P—— for some years. Three months before he was born a friend, whom I will call Smith, was badly hurt, and was brought to my house to be nursed. I turned out the nursery and he lay there for three months. I nursed him until I could do so no longer, and then took lodgings in town for my confinement. Now after all these years

I have discovered how this surgical nursing has left its mark. The boy is in his element when he can be of use in cases of accident, etc. He said to me quite lately: 'How I wish you had made a surgeon of me!' Then all at once it flashed in upon me, but, alas! it was too late to remedy the mistake.

"Before the birth of the third child I passed ten of the happiest months of my life. We had a nice house, one side of which was covered with cloth of gold roses and bougianvillea, a garden with plenty of flowers, and a vineyard. Here we lived an idyllic life, and did nothing but fish, catch butterflies and paint them. At least my husband painted them after I had caught them and mixed his colors. At the end of this time L—— was born. This child excels in artistic talent of many kinds; nothing comes amiss to her, and she draws remarkably well. She is of a bright gay disposition, finding much happiness in life, even though not always placed in the most fortunate surroundings.

"Before the birth of my next child, N——, a daughter, I had a bad time. My husband fell ill of fever, and I had to nurse him without help or assistance of any kind. We had also losses by floods. I don't know how I got through that year, but I had no time for reading. N—— is the most prudent, economical girl I know. She is a splendid housekeeper and a good cook, and will work till she drops; has no taste for reading, but seems to gain knowledge by suction." Such cases are so numerous that they should be collected and scientifically studied.

Luxury and Parentage.

In all ages of luxury, fine ladies try to avoid maternity. They detest it in theory only, for women are controlled by the instinct of the race. In the circles of which we are speaking, the instincts of the race for children have vanished. Life has lost its serious meaning. Responsibility of any kind is a mere nuisance, and the idea of bringing up a new life, with all its bonds and its charm, is as repellant as the idea of a new bonnet is enticing. For such women the world has no use. Beautiful, in the great sense, they are not. Incapable, in any great way, of either loving or being loved, they are at best the painted bubbles on the stream of life. Such women will always be far inferior as mothers, and less capable of bringing into the world noble offspring than those women in the humble walks of life who live naturally, who love the family ties and are fond of the young.

Great mothers must have a certain sort of hardihood which comes from a wise physical culture, not necessarily an artificial one,—a life in the open air, and the avoidance of all social dissipation.

Degeneracy of the Breasts and Motherhood.

A sign of degeneracy is pointed out by Hegar, who appeals to young men on behalf of posterity to choose for wives women with well-developed breasts; he quotes statistics to prove inability to nurse a child a sign of de-

generacy which produces degeneracy in the offspring. Among other facts he points out that in a district of his knowledge, which supplies a large number of wet nurses to the city, the percentage of men incapable of military service amounts to 30 per cent., while in the neighboring districts, where the mothers remain at home with their families, it is only 18 per cent. He remarks upon the surprising number of deformed nipples encountered in the hospitals. Fehling mentions "hollow nipples" as occurring in 6.7 of his obstetric cases. He warns mothers not to allow the clothing to constrict the growing breasts of their daughters, and urges general hygiene as the best method to develop them.

In this connection the question may be asked, Is it possible for women with defective breasts to become mothers of a virile race of men and strong women. In most cases it is not. A defect in this part of their nature is evidence of a weakened constitution. It may be said, that the breasts do not always develop before marriage and parentage. This is true, and if the health is robust, and the constitution and ancestry good, the mother will, in most cases, be able to nurse her child. If it is known in advance that such cannot be the case, and it may generally be known, then the responsibilities of motherhood should be undertaken with the greater precaution. In modern times we have far better means of bringing up children by hand than formerly. Still, a mother able to nurse her own children should always be preferred.

Location of Birth.

In Manchester, England, in 1892, 37,674 boys out of every 100,000 died before they reached their fifth year. In healthy districts only 17,314 out of 100,000 died, About the same condition prevails in other places. The lesson it teaches us is, that we should choose a healthy region in which to live if we would rear the healthiest offspring.

Evolution.

This word means progress and progress implies improvement, without which there could be no evolution; but improvement of the human race will not be further possible unless the marriage relation is regarded from a higher stand-point than that of sexual indulgence.

The practical superiority of man over animals consists in his knowledge of the *aim* of his conduct. Animals exercise the reproductive function instinctively at particular seasons, but man knowingly always; and thus, unless the latter subordinates his passion to reason he is worse than a brute, as he knows himself to be such.

The difference between the chaste marriage of affection and the unchaste marriage of passion, is analogous to that between education and instruction, as explained by Elder Evans of the Shaker Community. Instruction imparts knowledge, such as is associated in Eastern lore with the sexual passion, but education embraces the whole disposition, which is rendered more beautiful and spiritual

through a marriage of chastity, and as thus affected is transmitted to the offspring, who exhibit the disposition of their parents at the time of conception. Sexual excess not only tends to produce offspring of a weakly constitution, but it interferes with the organic growth of the parents. It is as wasteful as burning a candle at both ends at the same time.

Parents should bear in mind that the mental plan on which their children shall begin life, depends on the desire by which they are governed when they beget their offspring; and as desire depends on disposition, they should aim at requiring harmony of character and conduct.

If we think less of ourselves and more of the race to which we belong, we shall have a better chance of improving both ourselves and the race as represented in our offspring.

We are all members of a great organism, which is constituted by the whole of human kind, past, present and future, and it is our duty to act in such a manner that the whole shall be benefited by our conduct; which it cannot be if we are careless as to our own disposition or as to the character of our offspring.

Our Aryan ancestors were conscious of their duty towards the race, and probably to this fact was largely due the high physical development the white race attained. Only by acting in their spirit can we hope to maintain the race at its high level or prevent its deterioration and decay.

The important influence which the gratification of the sexual impulse has had over the development of the

aesthetic side of Nature has been often insisted on; and there is no reason why its gratification should not be attended also with the development of the highest mental qualities, if these are made use of in the formation and exercise of the marriage relations between the sexes. —C. Staniland Wake.

Too Little Fatherhood.

The modern child is threatened not with too much mother but with too little father, and this danger is heightened by the sudden release of womanhood from the ban of conventionality and of the domineering power of physical force. Let her not too readily accept as complimentary to herself the church's adoration of Mary. Woman is made of no purer stuff than man, her companion, man her father. She cannot transmit from her own veins or her companion's veins any purer life stuff, any finer impulse to her daughter than she does to her son. We need more fathers in the home, more men teachers in our public schools; and if our homes and schools are not organized so as to evoke and direct this masculine investment, then let them be reorganized. It is not true that mothers are peculiarly the divinely appointed teachers of children, that to them is especially entrusted the intellectual or spiritual destinies of the young. That argument is based upon the analogies of the past; it is a reversion to primitive conditions, an illustration of the law of atavism, like the return to six fingers and toes in some people, or the restoration in others of the

muscle that can move the ear. The highest reaches of evolution point to a double responsibility and a double potency. In the interest of the child, then, let us lift him out of a mother rule into a father and mother rule. Let the home be girdled with masculine order and justice as well as with feminine love and tenderness. Let there be strength as well as tenderness. Let there be in it mind as well as heart vigor as well as sympathy. All these are spiritual children which cannot be born except in the bi-sexual realm.—Rev. Jenkin Lloyd Jones.

The Flat-Head Indians and Heredity.

Amongst the round-head tribes woman holds a higher position, whereas amongst the flat-heads she is a mere drudge. In by-gone days it was common to see a tired-looking woman walking behind her husband carrying a heavy load, while he walked on before with nothing.

Again, the round-heads have a remarkable mythology, while the others have a poor affair.

Mr. Dean has informed me that the flat-head, which would be an acquired character, is never transmitted to offspring—another argument against the Lamarchian theory, that acquired characters are transmitted.

That whatever injures the physical or intellectual health of parents tends to degrade their offspring has long been evident. I think we have a good race illustration of this in the effects of flattening and deforming the skulls of children among the Flat-Head Indians, who for centuries

followed this precedent. Information has been furnished me by special request by Mr. James Dean, of Victoria, B. C., bearing on this point. He writes:

"Among the children the mortality seems to be greater with the tribes which flatten the heads of their children than in those who do not. I have long noticed that there is a very marked intellectual difference between them."

The Hidery tribes of Northern British Columbia and Southern Alaska, who never flattened their heads, have long been famous for their works of art, such as elaborate carvings in wood and stone.

Suggestion as an Aid in the Training of Children.

Within a few years an old subject, that of hypnotism, formerly called mesmerism, has received new attention under the name of suggestion, or, in medical language, "suggestive therapeutics." It was used in a rude way by Mesmer in the cure of disease. Later it was employed much more effectively by Braid and others for the same purpose, and especially for the prevention of pain in surgical operations. Want of space forbids our going into any extended historical detail as to its application for these purposes, but a few points will be considered, which bear on the subject.

It was found that when a person had contracted a bad habit, as, for instance, smoking or drinking, it could often be broken up by placing him in the mesmeric sleep, and

telling him he would no longer desire to continue the habit, but would even loathe them. The habit of sucking the thumb, a bad temper, lying, stealing, dullness and lack of ambition, etc., were amenable to this treatment. To illustrate: A boy fifteen years old, always at the foot of his class, was put into the hypnotic sleep, and told that he would be able to study harder and learn his lessons better, so as to go to the head. This was continued daily for several weeks, and, sure enough, he accepted the suggestion, and outstripped every scholar in his class, and kept at the head so long as these means were used; but, unfortunately, when they were discontinued he relapsed into his first state. The suggestions had not been sufficiently thorough to take deep root, and become a part of his nature, as might have been the case with a better knowledge as to how to use them. So long ago as in 1892 Dr. Bérillon, Editor of *The Revue de l' Hypnotism*, read a paper before the Second International Congress of Experimental Psychology, in which he stated that he had observed the beneficial effects of hypnotism in education in some 250 cases, including nervous insomnia, night terror, sleep-walking, kleptomania, stammering, idleness, filthy habits, cowardice and moral delinquency. He also stated that other observers had similar experience. My friend, Dr. R. Osgood Mason, of New York, working on the same lines, has had similar experiences. I will quote a few illustrative cases furnished by him. The first is of a schoolgirl fifteen years of age, a pupil in one of the grammar-

schools of New York—intelligent in many ways; a good reader of such books as interested her—history, biography, and the better class of novels; but for the routine of school studies she had no aptitude, and she was constantly being left behind in her classes. She could not concentrate her mind upon details which did not specially interest her. If she succeeded in learning a lesson she could not remember it, or if she remembered it until she arrived at the classroom, when she arose to recite, it was instantly gone; her mind became a perfect blank; she had not a word to say, and was obliged to sit down in disgrace. She could write a good composition, but could never stand up and read it before the class. Teachers had been engaged to give her special lessons, so as to enable her to pass her preliminary examination, which would allow her to come up for entrance to the Normal College. After months of effort they reported to the mother that it was utterly useless to go on; it was impossible for her to pass her preliminary examination, and they did not think it right to take her money without any such expectation. She was then brought to me to inquire if anything could be done to help her. I proposed hypnotic suggestion. It was then March 30; the first examination was in May. I commenced treatment at once. The patient went into a quiet, subjective condition, with closed eyes, but did not lose consciousness. I suggested that she would be able to concentrate her mind upon her studies; that her memory would be improved; that she would lose her excessive self-consciousness and timidity, and in their place she

would have full confidence in herself and be able to stand up before the class and recite. She was kept in the hypnotic condition one-half hour at each treatment, and the same or similar suggestions were quietly but very positively made and repeated at intervals during that time. She at once reported improvement in her ability both to study and recite. She had six treatments, and on May 25 she reported that, greatly to the surprise of her teachers, she had passed her preliminary examination with a percentage of 79, which entitled her to come up for the college examination. In June she passed her examination for entrance to the Normal College with a percentage of 88; entered the College and is at present doing well, though the suggestions have not been repeated since May."

Another case from the same author was that of a boy "so bad as to be perfectly unmanageable, and his temper so outrageous, that his mother begged me to come to the house and see if I could do anything with him.

"Having secured *carte blanche* for whatever course I chose to pursue, I went. He was in the back room, his grandmother urging him forward, he kicking and resisting. Without speaking, I went directly to him, seized him firmly by one wrist, and brought him topsy turvy through two intervening rooms, gave him a thorough shaking, and set him down violently in a chair. He smoothed down his bang, whimpered a little, and grufly remarked that I had rumpled his hair. I told him I had not intended to disturb his hair, but that as he had never

obeyed anybody I had come to the house for the express purpose of making him obey me, and I should most certainly do it. After a few moments I said, quietly, 'Now go and lie down on the bed in the next room.' He started, walking toward the bed, but when near it he set off on a full run past it and into the back room. I brought him back and again ordered him to lie down on the bed. He went toward it as if to obey, but suddenly sprang under it, and clung to the slats underneath with hands and feet, and hung there like a monkey. I dislodged him, pulled him out, gave him a spanking, and surprised him by tossing him vigorously upon the bed, with the command to lie there quietly until I gave him permission to move. He obeyed. Presently I ordered him to go into the front room and sit down again in the chair he had before occupied. Again he quietly obeyed. I said: 'All right; now you understand you will obey me. I don't want to hurt you. I want to be a good friend to you, only you must obey me.'

"I then in a pleasant way gave him a short lesson, picturing to him very plainly the course of a boy such as he was, and where it would be likely to end; and also showing what he might be if he would change his course. I told him I should be at the house again in a day or two, and I should expect him to meet me pleasantly, shake hands with me, and do whatever I directed him.

"Next day there came a telephone message begging me to come up; M. was outrageous again. I went. He was backward in greeting me, but at length came and shook

hands. I afterward learned that there had not been the slightest improvement in his behavior; and the cause of his mother's sending for me was his outrageous conduct at the table, when, in a fit of anger, he had thrown a plate at his grandmother. I talked to him pleasantly a moment, and then said very quietly, 'Now go and lie down on the bed.' He did so at once. I sat down beside him, and taking his two thumbs firmly in my hands, I said: 'Now, M., I want you to look steadily at that little stud in my shirt-front; keep your eyes very steadily fixed upon it.' He did so, and I never secured better or more concentrated attention from any patient.

"In five or six minutes his eyelids quivered and soon dropped. I closed them, suggesting sleep; and directly he was in the sound hypnotic sleep. I then presented the two pictures again—the bad and the good course—and suggested that they would always be present, distinct in in his mind, that he would dislike the *wrong* course and desire to avoid it, and choose the *good* one. I suggested definitely that he would be kind and considerate to his mother, and obey her as well as me. I repeated these suggestions very positively, let him sleep ten minutes, and repeated them again, and then awoke him by counting.

"The effect of this treatment was very marked; his whole manner at home was changed, and he became comparatively docile and manageable.

"He came to my office for his next treatment, which was perfectly successful. I have given him in all six treatments, and the improvement has been maintained

and increased. He is not yet by any means perfect, but his general behavior is changed, and I am suggesting such definite improvements in his conduct, and impressing such pictures upon his mind, as I think will help to develop his better nature and qualities. He is a lover of flowers, and on two occasions has brought some of his own choosing to me. He has lost none of his boyishness; he is full of life; is mischievous, playing tricks even upon his mother; but he is affectionate and generally obedient. His will is not broken, but he has self-control, and he is far more considerate of others than formerly. In short, he is a fair example of one of the educational uses of hypnotism and suggestion."

The only other case I will quote is one of night terrors.

"A little girl, five years of age, went soundly to sleep when first put to bed, but after two or three hours she awoke screaming and trembling with terror, on account of the hideous black man whom she saw in her dream. The impression of the dream was vivid and persistent, and her screams kept the household aroused and alarmed for hours every night, and this state of things had already continued for months. One day, when she was perfectly bright and happy, I placed her in her high chair in front of me; put my hands gently upon her shoulders, and asked her to look steadily at a trinket easily in her view, and quieted her with passes and soothing touches until her drooping eyelids denoted the subjective condition. I then commenced in a gentle, sing-song manner to suggest that she would go easily to sleep as usual at night, but

that she would have no frightful dreams; that she would see the dreadful black man no more, but would sleep quietly on the whole night through. It was repeated over and over in the same gentle manner.

"That was a year ago; she has not seen the black man since, and her sleep and health have been perfect. There was no repetition of the treatment."

From these few cases, and many not quoted, it appears evident that we have in hypnotism, or suggestion, an agent which, when fully understood, will be of great usefulness to parents in the early training of children. That it should be used wisely no one will deny.

The question will naturally arise, How is it that a suggestion to a child while passive or in the hypnotic sleep is more effective than when awake. The answer is not so easy to give; but it is possible that in this state the subliminal self, the higher self, or, perhaps, the spiritual nature is appealed to; and as the active, every-day nature, the conscious self, is now dormant, it receives this appeal more seriously. Perhaps a quotation from Prof. Frederic W. H. Myer, who has given the subject profound attention, will help to make the subject clearer. He says: "In waking consciousness I am like the proprietor of a factory whose machinery I do not understand. My foreman, my subliminal self, weaves for me so many yards of broadcloth per diem (my ordinary vital processes), as a matter of course. If I want any pattern more complex, I have to shout my orders in the din of the factory, where only two or three inferior workmen hear me, and they shift their

looms in a small and scattered way. Such are the confined and capricious results of the first, the more familiar stages of hypnotic suggestion.

"At certain intervals, indeed, the foreman stops most of the looms, and uses the freed power to stoke the engine and oil the machinery. This, in my metaphor, is sleep; and it will be effective hypnotic trance if I can get the foreman to stop still more of the looms, come out of his private room, and attend to my orders—my-self suggestions—for their repair and re-arrangment."

To make this a little plainer. The subliminal self, the foreman, is the one who manages the machinery of the nervous system, and turns out this or that sort of conduct or behavior in the child, or the man or woman, as he is told to turn out by the conscious self. But in the hypnotic trance this subliminal self can take orders, or suggestions, for other kinds of conduct or behavior; alter the action of the brain, so as to make another sort of creature; for he is not so occupied then but that he can receive these orders. As in the kaleidescope, the pictures presented depend entirely on the arrangement of the pieces of glass. So in daily conduct, character depends on the combination and activity of the brain cells. By suggestion in the hypnotic state we are able, to some extent at least, to alter this combination so that new conduct is presented.

The question now arises, How can the parent make use of this agent in altering the nature of a child from one that is not desirable to one that is? Probably the best way

to proceed would be to take it while sleeping, and make the suggestion then; for ordinary sleep is not different from hypnotic sleep, except in degree. As the child is in the act of going to sleep, let the mother, or whoever is to make the suggestion, sit by its side, take it by the hand and gently soothe it with pleasant words or music, in a firm but agreeable voice. Let her say slowly: Now you are going to sleep, sleep, sleep. You will soon be sleeping sweetly. How nice it is to sleep and rest our bodies so that we can feel well and strong on the coming day. This sleep is going to do you a great deal of good. You will not have bad dreams. You will not see ugly faces or wake up with a fright. Tomorrow you will wake up good-natured, full of life, and will be good boy (or girl, as the case may be), and do your best to make mother happy and proud of you. You will want to play and enjoy the fresh air and sunshine; relish your food; not eat too much, etc., etc., according to the needs of the child. If it is timid and fearful of thunder, or dogs, or horses, or other harmless things, you can say to it, Now, you will not be afraid any more of thunder but like to hear it. This, like all other suggestions, must be repeated several times, so as to make an impression. If afraid of strangers, say, now, you will not fear men, or persons you don't know; repeating it slowly over and over again. If the child uses bad language, say, Now you will not want to use bad words any more, and will be careful how you speak. If it has a cold, put the hand over the chest and say, Now your cold will get well quickly, and not grow worse. If it

has the unfortunate habit of wetting the bed at night, even this can be broken up, often by one suggestion, and surely by several repeated so as to take deep root in the mind. This latter is necessary to produce any effect. In case of disease, even serious disease, when a physician is necessary, suggestion may be used by the nurse or parents, or the physician, if he has learned the art, to advantage; but if the parents are anxious or weary, they had better leave it for those who are not weary or anxious; otherwise they may transfer their own condition instead of one of health. The state of mind and body of the operator should be a stable, equable and wholesome one.

The age at which suggestion may be of use is hardly yet known. Certainly so soon as the understanding has become developed it may be employed, though the language should be simplified for the childish understanding. Before this it is of doubtful utility; but some experiments which have been made intimate that good health may sometimes be transmitted from a healthy person to a very young sick child by thought transference.

Thought transference is the transference from one to another person of some feeling, sensation or idea. The person from whom the thought is transferred is the *active* agent, and the one who receives it is the *passive* one. Often this phenomenon takes place spontaneously, as when one is in trouble, or at the point of dying, a knowledge of it may sometimes be transferred to an intimate friend who is in sympathy. In the hypnotic state, thought transference can sometimes be induced artificially; and

the point here to be considered is the transference to the child of healthy normal sensations to replace the abnormal ones which may have taken possession of consciousness and caused trouble.

The important thing always to have in mind in using psychic forces on children is to instil natural, or normal, conditions, not unnatural or abnormal ones. To this end to produce the best results, the active agent should be a normally healthy person, having good common sense, and living a normal, natural life. Those with sickly, sentimental or fanciful notions, if they try to use suggestion may transfer these states to the child, which would do harm rather than good.

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