and which, for such patients, is the best asylum of the kind I have seen. But for the large body of the middle class I find there exists in Sussex—and this remark applies equally to the neighbouring counties of Kent and Hants—no asylum accommodation whatever. I have, therefore, come here to-night to ask you, as the most influential body of medical men in Sussex, to consider with me the means whereby this daily want in our practice may best be supplied. I have stated my regret that the remedy which I conceive best fitted to supply the same—a legal power to mortgage the security of the rates for the repayment in thirty years of the building, as suggested to the select committee of 1859 by Lord Shaftesbury—has not been sanctioned by the legislature. I have farther stated my doubt of the wisdom of applying to the voluntary system for aid, as also (which is, perhaps, more to the point) my certainty as to the failure of such an appeal. Lastly, I have suggested a plan rendered practicable by the Limited Liability Act, by which I believe that this acknowledged want of a middle class asylum in Sussex may be supplied, and at the same time a good dividend on the capital thus raised secured; and should my statements have carried conviction with them, I can hardly doubt that in this wealthy town of Brighton a large share of the capital required will soon be forthcoming, nor that the members of the Brighton and Sussex Medico-Chirurgical Society will be backward in aiding the work by their counsel and support.

Considerations with regard to Hereditary Influence. By HENRY MAUDSLEY, M.D. Lond.

"The fathers have eaten sour grapes, and the children's teeth are set on edge."—*A Proverb in Israel.*

"Fortes creantur fortibus et bonis
Est in juvencis, est in equis patrum
Virtus, nec imbellem feroces
Progenerant aquilæ columbam."—*Horace.*

"Τὸ τῆς Ἀνάγκης ἔστ' ἀδήριτον σθένος."—*Æschylus.*

ALTHOUGH the axiom *ex nihilo nihil fit* may unquestionably in strict logic be pronounced to be a pure assumption, forasmuch as it is not impossible that an enlarged experience may sometime furnish us with an *instantia contradictoria,* yet it is plainly necessary within the compass of human knowledge to consider it an established truth. Within human ken there is, indeed, no beginning, no end; the past is developed in the present, and the present in the prediction of the

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future; cause produces effect, and effect in its turn becomes cause. Dust is man, and to dust he returns; the individual passes away, but that out of which he is created does not pass away. The decomposition of one compound is the production of another, and death is an entrance into a new being. This is no new truth, although modern science is now for the first time making good use of it; the earlier Grecian philosophers distinctly recognised it, and it has many times been plainly enunciated since their time. "All things," said Empedocles, "are but a *mingling and a separation of the mingled*, which are called birth and death by ignorant mortals." Plato expressed himself in like manner; and the plain statement of the truth was one of the heresies of the unfortunate Giordano Bruno. The imagination of Shakspeare, faithful to the scientific fact, traces the noble dust of Alexander till it is found stopping a bung-hole, and follows imperious Cæsar till he patches a hole to keep the wind away. The immortality of matter and of force is an evident necessity of human thought.

The doctrine of the conservation of force, which is the modern expression of the old truth—the doctrine which maintains that whatever disappears on one side must reappear on some other side, or, as it has been fancifully stated, that not a breath of air moves, not a wave splashes on the shore, without the movement palpitating through the universe—is now accepted as strictly applicable in physiological science, and is continually receiving new confirmation in the discoveries thereof. When Lavoisier proved that the products of combustion are heavier than the body which is burned, he commenced that exact method which, by means of well-devised instruments and careful experiments, has now resulted in the application, with so great advantage, of exact numerical determination to the phenomena of the animal body. Physiologists are now striving to demonstrate, from the data of observation and experiment, the equivalence of the quantity of force given off by the animal body, as heat and motion, to the quantity supplied in the nutrient material; and although complete success has not yet attended their efforts, they are justly confident of ultimate triumph.* As it seems to be an irresistible impulse of the human mind to make a system, it is not surprising that the more impulsive minds of the physiological school in Germany have rushed forward, and have plainly declared mental phenomena to be subject to the same method of investigation as other phenomena of the living organism. It will readily, however, be understood that they have done no more than proclaim the supposed fact—that they have not

* In confirmation of which it is only necessary to refer to the labours of Dulong and Despretz, Barral, Helmholtz, our own countryman Dr. E. Smith, and to the work of A. Fick, entitled 'Temperaturtopographie der Thiere.'

Most important of all, as signs of the times, are the recent investigations of Graham on the crystalloidal and colloidal conditions of matter.—'Philosoph. Transact.,' 1861.

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hitherto been able to do anything whatever towards demonstrating it. Their opinions cannot, therefore, be of any moment in an examination which is not concerned at all with the essential nature of mind, but only with such phenomena as are universally acknowledged to be determined by physiological causes. Though humbler and less ambitious, it is certainly more profitable to deal with phenomena, than it is to aid in the construction of any metaphysical or material Tower of Babel for scaling inaccessible heights.

As now it is well understood that by how much an organism, from its commencement as a germ, grows and developes, by so much does that which is not organism diminish, as in fact material is but transformed in nature and force re-embodied, and nothing new created, it is philosophically necessary, in the cognizable phenomena of any individual existence, to look for certain inevitable antecedents and certain subsequent conditions. There is required, as is well known, in all the higher spheres of animal life, the conjunction of two organisms to generate an organic individual; and in those cases in which the being is produced without the conjunction of parents, it almost invariably proceeds from a single parent of a like kind.* Every living creature has its living antecedent, from which it inherits its plan of being; for, whatever may have happened in primeval times, we have no sufficient evidence that transformation of species now takes place.†

Every little mortal, then, who enters the world, even if it be only the world of a workhouse ward, has necessarily an inheritance. In any case, under any circumstances, it inherits a destiny. It first of all receives and brings with it the plan of being according to which it is to develope; it, in fact, inherits its species. Our most careful observations do not furnish us with anything by which we can distinguish the ovum of a human being from that of a quadruped, and yet there manifestly exists some condition of the human ovum whereby it developes into all the glory and excellency of the human form, and into no other form. It follows a certain aim, and the aim is in itself. The plan is in the substance, as the quality is in the element; it is the law of its nature, according to which it must develope, and no plan exists objectively in nature apart from the particular case in which it is manifested. Plan apart from the particular is a subjective creation of the human mind. Much of the energy which has been wasted in the discussions about transformation of species, might perhaps have been spared if such consideration had been duly weighed; and certainly some physiologists, if they had kept it in

* We say "almost invariably," because in the remarkable case of "alternate generation" the offspring is completely different from its parents, and yet itself produces offspring which returns to their type.

† The experiments of Pasteur are generally believed to have disproved the notion of "spontaneous generation." Professor Wyman, of America, has not, however, obtained quite such decisive results from similar experiments.

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mind, would have avoided on certain occasions their extravagant expressions of admiration at the excellent accomplishment of some supposed design in organic nature. The design, as far as it existed, has been in their minds; and they might have done well to have avoided the mistake of transferring the crude, imperfect design of their imagination to the incomprehensible design of creation. The ovum of any individual, being an actual definite production of it, will contain the plan in the matter; for there is no substance conceivable without properties, as there is no property conceivable without substance. We are utterly unable to explain how it is that a certain combination of matter, which we call ovum, has the property of developing according to a certain definite plan, just as we are unable to explain how it is that one element has certain properties, or that any particular law of nature is as it is; but it would certainly be, if possible, less explicable and much more wonderful, if the descendant followed a different plan of development from the parent. The real matter of wonder is the introduction of the plan, the origin of the particular species. Given that, wonder must rightly cease and investigation begin, the problem being the analytical investigation of the complex processes which are connoted in the words, inheritance of species.

If it is certain that a new being derives its plan from its parents, and so far imitates them, it is none the less certain, also, that it deviates from them, and displays variety within the type. Nature not only repeats, but invents; and each succeeding individuality is a proclamation of her fertility in invention. We have every reason to suppose that each new individual is different in something from any individual who has previously existed or now exists—that two beings exactly alike never have lived upon the earth; and if this be so, it is plain that nature is even more fertile in realisations of individuality than the most ingenious and active mind can be in conceptions thereof. And yet the individuality is the result of a combination of parental elements, and must, therefore, contain—latent or more or less manifest—the influence of its physiological causes; it is under the tyranny of the natural law of evolution of the antecedents of which it is the immediate consequent. Parental peculiarities may be very evidently and largely repeated in the offspring, or they may be but indistinctly traceable, or they may not be detectable at all; but even in this last case we cannot but suppose them to have exercised their influence; and, therefore, in some way to be contained in the new individuality. A chemical compound, as sulphuric acid, does not resemble in properties its constituent elements; and, although there can be no exact comparison between the complex vital production of a new individuality, and the comparatively simple formation of a chemical compound, yet it is evident that vital combinations must rather resemble chemical than me-

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chanical compounds. And an example from a science which is lower in the order of complexity, may serve to assist the conception of something, if it prove nothing, in the more complex science. When we find, accordingly, that in chemistry we are utterly unable to predict the properties of a compound from the known properties of its constituents, it is no wonder that in the infinitely more complex process of vital production, we sometimes fail altogether to perceive the evidence of parental characters in the result. As the ovum or germ contains in some obscure manner the plan of the species, or, more justly, the plan of the individual of the species from whom it proceeds, the offspring into which it develops must inherit that which really constitutes the nature of the particular germ. Furthermore, as it is certain in our experience that out of nothing nothing comes, it is certain also that something cannot become nothing; and, accordingly, whether we can detect them or not, the necessities of our thought compel us to assume the existence of the parental elements of individuality in the offspring.

It seems to have been more or less generally assumed that hereditary influence was to be recognised only in visible manifestations of parental characters in the offspring; that the effect in a vital production was, as in a mechanical compound of causes, the sum of the acting forces. But such a supposition, if it exist, is manifestly very false. When we cannot discover any imitation of the parents in the new being, there is none the less a necessity to acknowledge the variety or invention to be determined by some mysterious combination of the parental elements. Suppose that a certain inherent evil of a particular kind taints the character of one or both parents, and that, nevertheless, there exists no evidence of any such evil in the child, are we therefore to say that the parental evil has had no effect upon the child—has been, as regards it, as good as non-existent? Are we not rather bound to suppose that the evil in one of the causes has been happily modified, counteracted, or neutralised by the influence of other causes co-operating in the formation of the embryo, or by the force of circumstances affecting its development after birth? And if this be so, the happy elimination of the evil is the result of so much force expended in counteracting a positive viciousness, and really testifies to the influence of the antecedent condition upon the result. On some such supposition only is it possible to explain the phenomenon of Atavism, in which some bodily peculiarity or disease is seen to skip one generation and to reappear in the next. The peculiarity or disease must have been somehow latent in the generation in which it did not appear. As the compound in chemistry is formed by the combination of certain definite proportions of the elements which unite to form it; as, therefore, not a single atom of these elements but is of essential consequence to the definite result; so, in the much more

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complex compound, which a new individuality is, the combining elements cannot be conceived to unite capriciously and under no definite laws. Every effect or defect in the parent must be subject to the fixed laws of individual production, whatever they are; and, in considering the nature of any defect or effect in the offspring, we may accept with certainty the proposition of Polonius, that "the effect defective comes by cause!" "How shall a man," asks Emerson, "escape from his ancestors, or draw off from his veins the black drop which he drew from his father's or his mother's life?"

It is a conclusion which, in a purely physiological sense, can scarce be avoided, that the embryo is indebted to its progenitors for all that is contained in its corporeal nature; it is the necessary organic consequent of certain organic antecedents. The parental peculiarity which it may seem to want, and the individual peculiarity which seems an entirely new production, are explicable on the same supposition of an obscure and complex combination of elements for the formation of a new product, which does not resemble its constituents in properties, which is not the reproduction of them in a mixture, but the new distribution or development of them in a compound. Though parents thus enjoy a sort of immortality in their offspring, it is, as with all earthly immortality, under a new combination of matter and a correlative metamorphosis of force. The parental forces are combined, ere their dissipation through decay and death, into a new individuality, and thus the human past is continued into the future. The law of causality is true of organic as of inorganic existence. "Though his father die," says the son of Sirach, "yet he is as though he were not dead; for he hath left one behind him that is like himself. While he lived he saw and rejoiced in him; and when he died he was not sorrowful. He left behind him an avenger against his enemies, and one that shall requite kindness to his friends."

Having so far pointed out how the necessities of human thought seem to demand the recognition of a large play of hereditary influence in human development, it may be added, that men have, as might be supposed, in all ages more or less distinctly acknowledged it. The belief has affected in an important manner systems of religion and philosophy; but nowhere, perhaps, has it been more plainly enunciated than in the ancient books of the Hindoos. To it the institution of caste unquestionably owes its origin; and the feeling of a destiny made for a man by his ancestors, inspired the philosophy of that sect of the Hindoos which taught the perpetual rebirth of mortals, and the development in this existence of the deeds done by them in a former state of being. "The antecedent life of a being," it was said, "is his destiny." Where castes existed, the hereditary descent of professions was obligatory;

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but this prevailed also in Greece, where it was not obligatory. Plato openly maintains that the wicked owe their wickedness to their organization and to a vicious education, so that their fathers and instructors ought really to be blamed. The Levitical code prohibits marriage within certain kinship; and Solomon deems it one of the merits of a good man that he leaves an inheritance to his children's children. On the other hand, the sins of the wicked are visited upon the children unto the third and fourth generations; and it was not a matter of wonder that those whose fathers stoned the prophets should reject Him who was sent unto them—"Ye are the children of those who stoned the prophets." Though an institution of castes is not recognised in England, something very like it, nevertheless, does exist. What but the belief in the hereditary influence upholds the esteem for ancestral blood, and dictates the common saying, which is the generalisation of common experience, that it takes three generations to make a gentleman? "Bless not thyself only," says the author of the 'Religio Medici,' "that thou wert born in Athens; but, among thy multiplied acknowledgments, lift up one hand to heaven, that thou wert born of honest parents, that modesty, humility, patience and veracity lay in the same egg, and came into the world with thee. From such foundations thou may'st be happy in a virtuous precocity, and make an early and long walk in goodness; so may'st thou more naturally feel the contrariety of vice unto nature, and resist some by the antidote of thy temper."

In almost every nation which possesses a history, families might be selected that have been remarkable for special characteristics. The Claudian genus was noted at Rome for its pride, cruelty, and ferocity. Of it came the morose and cruel Tiberius, and so also Claudius, Caligula, and Nero, in whom this mighty curse of humanity ended. "The Apii," says Voltaire, "were always haughty and inflexible, the Catos always severe!" The Guises were as specially remarkable in France as the Napiers have been in England. The Jews and the Gipsies have both preserved their mental and bodily characteristics in a notable manner.

It has been the custom in some countries to expose to certain death, or at once to destroy, weakly and deformed children, lest their infirmities should descend through generations and deteriorate the race. And measures even still more energetic have been adopted to prevent the injurious operation of hereditary influence. "Heretofore, in Scotland," says Hector Boethius, "if men were visited with the falling sickness, madness, gout, leprosy, or any such dangerous disease, which was likely to be propagated from the father to the son, he was instantly gelded; a woman kept from all company of men; and if, by chance, having some such disease she was found to be with child, she with her brood were buried alive."

The astrologer, conscious of a fate in human life, gazed curiously

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into the heavens, and deemed that by a knowledge of the stars in the ascendant at the time of a mortal's birth, he might predict a mortal's destiny. But the astrologer failed to find in the heavens the cause of a fact which he had not failed to perceive; his predictions were not verified by results; and one fact, which has refuted the extreme advocate of hereditary influence, might have sufficed to refute him—it is the fact of different moral dispositions in double monsters. The celebrated twins, Rita and Christina, were so fused together that they had only two legs between them; they had two legs, four arms, and two heads; and yet they were quite different in disposition. Two twin sisters in Hungary, who were united by the bottom of the back, lived twenty-two years. They were, says Barthez, of extremely different temperament, and yet their blood was the same; for, after death, the blood-vessels were found to communicate by an extremely large opening. Other such cases are on record; and they plainly prove that hereditary influence is not a mere matter of repetition or imitation, but that it operates, in accordance with unknown laws of vital combination, in producing new compounds or inventions.

That dread inexorable destiny, which plays so great and grand a part in Grecian tragedy, and which Grecian heroes with a praiseworthy inconsistency so often struggled against, while they believed in it, was seemingly a generalisation from that feeling which every reflecting individual has, of the inevitable dependence of the present self on its antecedents in the past. Strive as diligently and ingeniously as philosophy may, to demonstrate the dignity of the human will, man feels at the end of all that, whether strong-willed or weak-willed, free or a slave, he is inevitably what he is. It is the law of causality manifesting itself in human consciousness. "There is," says Schelling, "in every man a certain feeling that he has been what he is from all eternity, and by no means became such in time." We feel instinctively the line of causation which runs through existence, the claim of necessity "wherewith we're darkly bound." And the persevering way in which we uphold our power of self-determination, as Laiis of old resisted the oracle which all the while he believed, is a scarce less decisive proof of this feeling of dependence than a direct acknowledgment would be. As authors often write against the imperfections which they feel in themselves, so humanity struggles against the necessity within which it moves, and constructs out of its frailty a helpful philosophy. Surely it is meritorious thus to strive upwards, if we regard ourselves only as beings with present duties to do; but it is much more so if we regard ourselves as causes occupied in making a future. So far, unhappily, it is only in the highest human art that we find human aspirations realised; for hitherto mankind has not been able to live its art. It is much easier, indeed, like Romeo, heartily to wish to "hang up"

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philosophy than to live it, when the great afflictions of life demand it and supply the exact conditions of its applicability.

Friar. "I'll give thee armour to keep off that word,
Adversity's sweet milk, philosophy,
To comfort thee, though thou art banished.

Romeo. "Yet banished! Hang up philosophy;
Unless philosophy can make a Juliet,
Displant a town, reverse a prince's doom:
It helps not, it prevails not: talk no more."

Even when our greatest teachers utter with placid decision maxims which should inspire humanity to great efforts in self-development, it is but too evident that they are speaking from the philosophical platform; and a backward look into their lives, or the observation of unguarded moments, and of that which, in the moments of great affliction, is the genuine utterance of their nature, reveals very clearly the difference which there is between man making art and man making life. Gœthe, for example, in one part of his writings, compares a man entering on life to a sculptor who is placed with chisel and mallet before a block of marble; he may make what figure he pleases; and in like manner man should determine circumstances and make his own destiny. It is excellent philosophy; but let us not forget what comfort Gœthe on one occasion is obliged to take to himself when recalling in age the bitter recollection of a gloomy period in youth when he cruelly forsook one, who in her great love had very great claims upon him. A man, he thinks, must declare once for all that that is right for him which is conformable to his nature, to the law of his existence: a much more comforting philosophy for poor, erring human nature! There is, indeed, no help for it; no mortal can transcend his nature; and his present nature is by no means a present production; it has descended from the past through regular laws of development. And while much is unquestionably done in individual formation by means of education and circumstance, the foundation on which all rests is not acquired but inherited. The destiny of an individual is innate in him.

Not only, then, does the recognition of hereditary influence, when closely considered, seem to be a necessity of human thought, but it is found to be more or less distinctly manifest in all the records of human thought. Moreover, the actual condition of mankind on the different parts of the earth's surface testifies to the existence of a law of hereditary transmission.

Whether it be true that mankind have spread over the earth from a common centre, or, as some ethnologists would maintain, from a few centres, the fact must in either case be accepted as evidence of the hereditary transmission of qualities. To place an inhabitant of the tropical regions in the extreme north would be to ensure him a speedy death; and the inhabitants of the north who pass to hot

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climates, decay and die out in a few generations. And yet men do live in the torrid climes of the tropics, and in the frozen regions of the north. The diffusion of mankind over the earth must then have been accomplished in a very gradual way, in ever-widening circles, which followed one another after intervals of generations. Thus the race which had left its old country for adjacent lands, having adapted itself to the different conditions of the new climate, would transmit to the next generation an innate adaptability thereto; and some from this generation again or from its successor, wandering still farther away to a climate that differed perhaps but little from that which they had just left, although considerably from that which their forefathers left, go through a similar process of naturalisation, and similarly transmit their acquired nature. And so, like the widening undulations on the surface of water, mankind have spread from the centre, until the uttermost parts of the earth have been reached, and the dark places thereof peopled. It is on this power which organisms have of accommodating themselves to changed circumstances by respondent nutritive changes, which are then inherited by the offspring as natural endowments, that two important arguments rest—the argument for the unity of origin of mankind, and the argument for the transformation of species.

The cause of the hereditary character of our social and political regulations has been sought for in hereditary influence as a natural fact. "It is from the vital fact," says Dr. Lucas, "that the social fact proceeds." And as the latter is universal, it must be founded in nature, "for the generating principle of any convention that is universal and permanent is nature."* A man transmits to his children an inheritance of organic qualities by a law over which he has no control; but he consciously imitates nature in that over which he has control, and leaves by testament his acquired property to his children. And should he fail to make such provision, the law ordains that his children shall inherit. The social fact is the expression in human consciousness of the natural fact.

The organic adaptation to a change in external circumstances, which has taken place amongst mankind, is continually taking place also amongst the lower animals. The peculiarities of conformation by which domesticated animals are distinguished from wild ones of the same species, and the instincts which they have acquired, have all been gradually developed in them, and have arrived at their present condition by the action of hereditary influence through many generations. They are the harmonious adaptations of organic nature to new circumstances—a phrase of that correlation between organic life and external nature by reason of which organic life is possible.

* 'Traité Philosophique et Physiologique de l'Heredité naturelle,' par le Dr. Prosper Lucas, vols. ii:—Full of information; for it contains almost everything that has ever been written on the subject.

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And if the favorable conditions of domestication are removed, the same influence gradually undoes the work which it had done. Pritchard observes that when a flock of sheep is neglected, and no attention paid to the breed in selecting rams and ewes of the finest breed for propagation, the fine wool gives place to much coarser growth intermixed with strong hairs. "The breed seems gradually to degenerate towards the character of the Argali or wild sheep of Siberia, which has generally been supposed to be the original stock whence all the varieties of domesticated sheep are derived."* It has been observed, also, that when horses return to the savage state, modifications are after a time produced in the capacity of the cranium, and that the head becomes stronger and much more irregular. Blumenbach had remarked similar differences between the wild and the domestic hog; and Dr. Roulin confirmed his observations on hogs that had become savage in the new world. It is to be presumed that if the Bosjesman, the Chinaman, the native Australian and the European were placed under exactly the same conditions of existence, they would in the end assimilate to a common type. Thus hereditary influence may continue onwards the development of a race or may continue the degeneration of it; indifferent to consequences, it helps to make a variety or to eradicate it. But whichever part it play, it is plainly a law of the utmost importance in the economy of nature.

It may probably seem strange, after the foregoing remarks, that any one should deny positively the reality of hereditary influence. And yet, strangest of all, that has been done by a learned and thoughtful writer, who was engaged, when overtaken by an untimely death at Damascus, in writing the 'History of Civilization.' With a remarkable inconsistency, the author of a 'History of Civilization' denied the reality of that by which alone civilization seems to be possible; for it is a question that may very well be asked, as to whether there would have been any civilization if there had not been hereditary influence. And whatever may be the answer to the general question, it may be very distinctly acknowledged, from the results of experience, that there is no hope of cultivation for the native Australian or the Bosjesman save from the operation of hereditary influence through many generations. Certainly it appears but a very small and uncertain hope, when we reflect that another law may intervene to prevent the beneficial action of hereditary influence—the law by which, in the struggle for existence, the stronger variety ever crushes out the weaker.

On a cursory reflection, it might appear to be anything but creditable to physiological science that what has been so long and

* 'Physical History of Mankind,' vol. i, p. 363. It may be well to state here, that in this general paper, devoted mainly to the statement of the difficulties of the subject, no attempt will be made to give every reference.

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so generally acknowledged should still be so little understood. History cannot direct us to any nation in which the reality of hereditary influence has not been accepted; and yet there is not a single law of its action known at the present day. But can this justly be made a reproach to physiology? It is unquestionably true, as Comte observes, that 'the discovery of gravitation—the first great acquisition of positive physics—was contemporaneous with the discovery of the circulation of the blood—the first fact which rendered positive biology possible; and that there has been an immense inequality in the progress of the two sciences since that time;' it is true that the astronomer can predict the events of heaven and foretel the existence of unseen worlds, while the physiologist can predict little more than his error if he ventures to predict; it is true even that physics is a science, while biology is yet very far from justifying its name; but when all has been said that can be said in praise of one and to the discredit of the other, the matter stands exactly as it should do, as it inevitably must do. Physiology must, from its nature, wait for the development of the other sciences; for it can be rightly built up only on a knowledge of the laws which prevail and of the forces which are at work in every other part of nature. The forces which are concerned with molecules, the attraction of cohesion and the repulsion of heat, the forces which produce undulations whether of sound or of light, the forces of polarity, electric and magnetic, the chemical forces, and perhaps even, what is still a matter of dispute, other special forces, are supposed by and engaged in the living organism; so that the sciences of material bodies (physics) and of chemical bodies (chemistry) are presupposed by biology or the science of living bodies. The order of development of the sciences must correspond with the order of development of the natural objects wherewith they deal; and as man is the compendium of nature, a full knowledge of his organism necessarily supposes an inductive advance through nature.

There is really no fair comparison between the discovery of the law of gravitation and the discovery of the circulation of the blood; for while the former may be justly called the starting point of positive physics, the latter occupies no such position in physiology. The law in physiology which will correspond to the law of gravitation in physics, but which has not yet been discovered, is the law of life. And when the chemist or physiologist has succeeded in analysing the relations of the complex combination of physical and chemical forces out of which it is now the fashion to suppose life to result, and synthetically combining them again so as to produce life, it may then be confidently expected that there will quickly be as rapid an advance in physiology as there has been in physics since the discovery of the law of gravitation.

It requires, then, but little consideration to see that it lies mainly

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in the nature of the subject, as involving a knowledge of life, that little or nothing should be known of the laws of hereditary influence. When the simplest manifestation of life presents an insoluble problem to the investigator, the more complex vital phenomena will certainly not admit of explanation. There are, moreover, great difficulties in the way of observation of those facts of hereditary influence which do lie within the sphere of human cognition. The observations, to be of real service, should be patiently continued and carefully recorded through many generations; and men are for the most part far too careful about the present, far too anxious about the fame which comes to the successful generaliser, far too little alive to the humble purpose of individual life, diligently and conscientiously to gather facts from which they receive no honour, laboriously to plant that which shall not bear fruit for many generations, if it ever bear fruit at all. And even in these observations that are made it is impossible to discriminate between the many circumstances, and to assign to each its due weight of influence in determining the way of hereditary action. Accordingly, we constantly find that imperfect observation misleads to false conclusions; so that no sooner is a theory set up by one investigator, than another eagerly hastens to repudiate and refute it. Linnæus, for example, held that in hybrid plants the interior, or the organs of fructification, resembled those of the female; the exterior, or organs of vegetation, those of the male; notwithstanding which, De Candolle maintained the opposite, and facts upset both theories. Similarly opposed theories have been upheld with regard to animal hybrids, and with a similarly unsatisfactory result. Dr. Pritchard endeavoured to develope this law as regards man—that all original or connate bodily peculiarities tend to become hereditary, while changes in the organic structure of the individual from external causes during life, end with him and do not affect the offspring—which, however, so far from being, as Sir Henry Holland supposed, a general law which "may be deemed highly probable if not proved," is in direct contradiction to daily observation, was denied positively by Müller, Burdach, G. St. Hilaire, and Flourens, and was ultimately abandoned by Pritchard himself. It results, in truth, from the manifold opposing theories which have prevailed, and still prevail, that an account of hereditary influence must be for the most part a statement of the difficulties inherent in the subject, and a discussion of the circumstances and conditions which there is reason to believe are more or less operative, and interfere with the acquisition of exact knowledge thereupon.

It will not be without interest to detail some of the circumstances which are connoted in the comprehensive term, hereditary influence. And, in the first place, it is evident that there are manifold causes in the condition of the parents, previous to the act of procreation, which

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must greatly affect the destiny of the progeny. The complete history of an individual should begin with what has happened, not only before he was born, but even before he was begotten.

It is observed in the production of hybrids, that there is a greater potency in one species than there is in the other; and that, in accordance therewith, the offspring has more of the characters of the more potent species. The "potency of the species" is, therefore, recognised as a fact in hereditary influence under such circumstances. But a similar difference has been observed in the potency of different varieties of the human race. According to Rush, the Danes, intermarrying with women of the East, produce children of a European type, whilst the converse does not take place when Danish women intermarry with men of the East.* The Dane, then, has the greater potency in this case. There is, furthermore, a difference between the organic force, or potency, of individuals belonging to the same variety of the human race; there is, in fact, a "potency of the individual." It is evident, then, that, under the condition of perfect health in both parents, the nature of the offspring will be in greater degree determined by the more potent of the individuals concerned in its production. But while this takes place as a natural fact, it is further evident that the organic force or potency of the individual will itself be greatly modified by different conditions of age and health, and by the temporary circumstances, psychological and physiological, accompanying any particular act of procreation. As regards age, for example, Giron de Buzareingues concluded, as the result of his numerous observations and experiments upon animals, that the offspring of an old male and a young female resembled the father less than the mother, in proportion as the mother was more vigorous, and the father more decrepit; the reverse was true of an old female and a young male. He also found that, by putting very young rams to vigorous females, he obtained a preponderance of female lambs, while he could obtain a preponderance of male lambs by putting strong and vigorous rams to the ewes. The best result is said to be produced in the human kind when the male is a few years older than the female.

The state of health at the time will evidently influence to an important degree the individual potency. Where there is great physical exhaustion in one or both parents from disease, from licentious sensuality, or from any other cause, the organic product in an act of such intense vitality, must suffer seriously from want of force. There may, indeed, exist every degree of deficiency in procreative power down to actual impotence or sterility. When conception has taken place, abortion may terminate embryonic life at an early period, or

* Quoted by Burdach, in his 'Physiology,' also by Lucas. Indeed, the few facts which are known, may be found repeated in every book which treats upon the subject.

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miscarriage may do so at a later period; or again, the fœtus may with care arrive at birth, and then, by reason of its inherent deficiency, sooner or later perish in convulsions or otherwise; or, last and worst of all, the child lives on, visited with its father's or mother's sins, when its nature inherits their acquired infirmity, and perpetuates through time the effect of their vices. "My son," says the son of Sirach, "keep the flower of thine age sound, and give not thy strength to strangers. When thou hast gotten a fruitful possession through all the field, sow it with thine own seed, trusting in the goodness of thy stock. So thy race which thou leavest shall be magnified, having the confidence of their good descent."

Other causes, it is plain, besides physical disease and immoderate sensuality, may so diminish organic force as to interfere with the due accomplishment of the propagative function. As an individual only embodies so much force, and by no means has an unlimited supply thereof, it seems an unavoidable conclusion, that what he spends in one way, he is so much the loser by in another. So that, just as those who are given over to immoderate sensuality are notably incapacitated for great intellectual exercise, so those who use all available force in intellectual work will be deficient in or destitute of the force necessary for due procreation. It is a common observation, and it always has been so, that the intellectually great have very indifferent sons, for which Cardan assigned this reason, "Quoniam spiritus sapientium ob studium resolvuntur et in cerebrum feruntur á corde;" and Lemnius agrees, "Quod persolvant debitum languide et oscitanter, unde fœtus à parentum generositate desciscit." Whether the explanation be correct or not, it admits of no dispute, that great mental exercise, like great bodily exercise, diminishes sexual desire and lessens sexual power. The giants in mind, like the giants in body, appear to be often incapable of procreation. Moses interdicted sexual union during a time of war; and Bacon observes, that the greatest achievements in the world have been mostly effected by childless and unmarried men. Such is the compensation in nature, that what these great men gain in one direction they lose in another; and it appears as if nature were exceeding jealous of allowing to any individual an immortality both in his works and in his progeny.

Burdach came to the conclusion that great men have generally proceeded from simple parents, and have belonged to common, poor and unknown families; and Nehusius has shown by an account of the genealogy of the most celebrated persons of ancient times, how greatly the sons of the great have degenerated from their father's excellence. By what singular hap, he asks, could there proceed from the wise Pericles two brutes like Paralus and Xanthippus, a madman like Clinias? from the just Aristides an infamous Lysimachus? from the grave Thucydides a foolish Milesias, a stupid

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Stephanus; from the temperate Phocion a dissolute Phocus; from Sophocles, Aristarchus and Aristippus; from Themistocles and Socrates the vilest sons? The son of Cato was infamous for cowardice and immorality, the son of Cicero was a drunkard and a debauchee; Caligula was the son of Germanicus, Domitian the son of Vespasian, Commodus the son of Marcus Antoninus. It might verily seem, as Lucas says, that there is a fatality which prevents the sons of eminent men from being worthy, by their intelligence and virtue, of their fathers. The fatality, if it really exist, must be the fatality of natural law.

If, however, it is the common opinion that great men have foolish sons, the opinion also commonly prevails that great men have had clever mothers. The proposition is of extremely doubtful worth, and rests rather on the popular wish to have it so, and on the evidence of a few notable cases, than on the careful observation of well-considered instances; but even if it be true, it does not diminish the value of what has been before said. The maternal cleverness in such case will be found to have been of that quiet, self-contained, self-denying kind, which was concerned mainly in promoting the welfare of the family, and not of that description which bursts out into literary inflorescence or any other such demonstrative dissipation of force. When great power is thus restrained within a definite application, the children receive the benefit of it; but when it is dissipated abroad, the universe may have the benefit of it, but the children have not. It is surely only reasonable to suppose that, whilst a new life is being formed and developed within her life, a woman needs all her force at home, and has none to spare for philanthropic enlightenment of humanity. Are not our intellectual women commonly unmarried or barren? And is not the mother of genius the self-sacrificing woman, whose best energies have been absorbed in her family? It is probable that an attentive observation of the families in which a great man has appeared might not unfrequently show also that there was a really great, if not famous, father or grandfather, in whom there was a vast amount of undisplayed force. But though undisplayed to the world, not on that account inoperative. The flowering progeny has received the benefit of it, and expends it. Still, for his brilliant display he owes a large debt of gratitude to that silent, self-reliant, self-contained, self-denying father or grandfather, who has quietly done his duty without thought of the world's applause, and fashioned the vigorous stock which now blossoms, in so goodly a manner, to the admiration of the world.

It is not, if the foregoing remarks are correct, an argument against the reality of hereditary influence because the son of an eminent man is a notable fool. The eminent man has given all the best of himself to the world, and his son has inherited what was left; he has been a friend of humanity, and humanity must now

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befriend his son. Perhaps he might have been actually as great, though not so eminent and prominent, a man, if he had not made his existence known to the world; but in him the time of blossoming of the family tree arrived, either in due natural course or accelerated by the forcing influence of opportunity; and he blossomed accordingly and bore fruit, which has been taken up by nature, and will follow its course there. But the family, after such a display, must rest through a long obscurity, if it does not become extinct. A French writer, Benoiston de Châteauneuf, who has studied the subject, professes himself astonished at the rapidity with which illustrious families die out.* Scarcely any of them survive the third generation, and yet "as short a time as they last, almost all survive the glory of their name." The family of Boileau hardly lasted two hundred years, notwithstanding thirteen male children; that of Racine did not continue beyond three generations; Moliére died without leaving any children; Corneille was never married; Bailly, Lavoisier, Condorcet, left only daughters behind them. And where, it may be asked, are the families of Shakespeare, of Milton, and of Cromwell? There was no child to perpetuate the title of Baron Verulam, and Newton was never married. When a family can trace its genealogy up to the time of William the Conqueror, it is presumptive evidence that it has never produced a true man of genius.

If we consider the fundamental relations of the instinct for propagation, we may, perhaps, more clearly perceive the antagonistic relation which must exist between the exercise of the function and great intellectual exercise. It is customary to say that there is implanted in the organism an instinct or impulse for self-conservation, by virtue of which it appropriates material and grows, and, after it is full-grown, maintains its state. Whether there be any such instinct or not, the term happily describes a series of actual phenomena. Now, at that period when the organism has nearly attained to its full growth, and when, therefore, there is a superabundance of force which is not required for the purposes of the individual, another instinct or impulse appears, the aim of which is not the conservation of the individual already provided for, but the conservation of the species. Its mission accordingly is, not to appropriate material and force, but to dissipate them, to give back to nature in definite form something of that which has been withdrawn from it. It is the instinct of propagation, by the prompting of which the individual is moved to act for the continuation of his kind, which is in a certain sense the propagation of himself, through time. Obviously this instinct might be logically resolved into a special mode of manifestation of the self-conservative instinct; for it is certain that a man

* 'Annales d'Hygiène publique et de Méd. Lég.,' "Mémoire sur la durée des familles nobles en France."

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does not proceed to the sexual act with the design of begetting children, but simply with the object of gratifying himself. Nevertheless it is convenient, on account of the speciality of its phenomena, to consider the propagative impulse separately. In man, then, both these instincts must necessarily appear in consciousness, and display themselves there in their highest developments. The instinct of self-conservation, in consciousness or out of consciousness, prompts the acquisition of that which is pleasing and the avoidance of that which is painful; it is, in fact, that self-feeling which lies at the root of all our emotions, and, indeed, of our conscious individuality. It necessarily goes on alone for some time, acquiring power and laying up stores in development, inasmuch as the propagative or distributive instinct does not make its appearance until growth is nearly completed. The youth gains knowledge, strives for what is pleasing to himself, avoids what is disagreeable, is markedly selfish, and, indeed, acts consciously, as the self-conservative force of his organism does unconsciously. But in due time the propagative impulse manifests itself in the organism, and it must necessarily appear about the same time in consciousness. Accordingly, new ideas and feelings appear in the mind with the development of the sexual system; there is, as Goethe aptly expresses it, "an awakening of sensual impulses which clothe themselves in mental forms, of mental necessities which clothe themselves in sensual images." This new budding forth of beautiful ideas, like the expansion of the flower which foretells fructification, marks the appearance of the propagative instinct in consciousness; and the youth, in all likelihood, begins secretly to write poetry, or in other indefinite ways to satisfy his mental longings, being moved to communicate himself by an impulse which he cannot explain. It is certain that the instinct to communicate their ideas is, in those who have any, as natural as the instinct to continue their kind; and as the latter effects the conservation of the species, so the former, by preventing knowledge from dying with the individual, perpetuates the mental gains of the species. If, then, the individual organism is capable only of developing a definite quantity of force, which it acquires in accordance with the self-conservative law of its existence, there exists a sufficient reason why those who, in accordance with the distributive law of propagation, are displaying excessive force in intellectual exercise, should lack procreative power; and, on the other hand, why those who are sensually abandoned to the gratification of the sexual desire should be incapable of mental exercise, and even fail in mental power. An instinct is not inexhaustible, and if the force of it is drawn off in one direction it is not available for use in another.

So far, certain causes have been specified which seem likely to be of influence in diminishing procreative force; but there are other causes which may seemingly produce qualitative modifications in it

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or in the specific material which is its necessary substratum.* Mental conditions exercise an effect upon the seminal secretion as plainly as on any other secretion of the organism. Indeed, if it be allowable in these days of positive science to speak of its vitality, it may be described as more vital than any other secretion, and as having the closest connections with that which is the culmination of vitality, namely, mind. Certain ideas of a lascivious character largely increase its quantity, and probably modify its quality; and an appearance of new ideas and feelings in the mind corresponds with the appearance of spermatozoa in the testicles. But if we suppose, as physiologists now generally desire, that its physiological functions stand in the most intimate causative relation to its chemical constitution, it is necessary to add that its chemical constitution is of so complex a character that, often as it has been investigated, very little is known with certainty thereupon. A very interesting discovery of Kölliker is that the semen contains a substance resembling a brain fat, the so-called "myelin," of Virchow; it is not yet quite certain, however, that myelin is a simple fat. It will be of no less importance if a statement by Gobley be confirmed, that the semen of fishes contains a compound of glycerine and phosphoric acid, which may also be obtained from brain. Such results of positive investigation irresistibly call to mind the expression of Alcmæon, an ancient writer upon medical subjects, who, on account of its vast importance, called a drop of semen a drop of brain. What is plainly certain with regard to it is that it has a very complex chemical constitution, as its physiological functions would lead us to expect; that it is, so to speak, of the highest chemical dignity. While some secretions are produced only to be excreted, and have been examined with considerable precision as to their chemical nature, as, for example, the urine; and while others are secreted for chemical use in nutrition, and have also been satisfactorily investigated; the spermatic fluid has a constitution which is at present inscrutable, and a function which appears almost miraculous. But the very complexity of its composition, in connection with what we know of its close relation with mental phenomena, justifies us in assuming that it will be more affected in quality by disturbing mental causes than a secretion which is more simple in composition and less important in function.

Recent experiments in physiology, especially those of Ludwig and Bernard, have proved that the nerves exercise a direct power over

* In using the term "procreative force" it is obviously not intended to designate a single distinct force; it is but a general term used provisionally to denote the many conditions which are concerned in generation. Science will some time be able to say whether these conditions are physical, chemical, or vital, or result from a combination of the three; but until that time comes, we need some term to express them.

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secretion, independent of any charge which they may produce in the calibre of the vessels supplying the glandular organ. These direct observations have so far reference chiefly to the quantity of the secretion, but it admits of little doubt that the quality may be affected also. It is now acknowledged, on sufficient evidence, that nervous action may directly influence nutrition; and Bernard some time since discovered that injury to the floor of the fourth cerebral ventricle caused the immediate appearance of sugar in the urine. Popular opinion has always accepted the influence of mental states on the secretions. Emotion causes the tears to flow; fear diminishes the flow of saliva, so that the tongue cleaves to the roof of the mouth; and anger is said sometimes to vitiate it so that it becomes poisonous, like as it does under certain circumstances in the mad dog. Emotion is usually credited with an influence upon the biliary secretion, and instances are related in which maternal passion has so affected the milk that the infant has been instantly poisoned thereby. The very powerful effect of emotion on all the processes of organic life is amply attested by common observation; and Bichat's location of the passions in the organs of organic life, though not tenable as a theory, does no more than justice to the close relation which unquestionably exists between them. Having, then, such positive general evidence of the effect of nerve force on secretion and nutrition, is it not an inference which is almost unavoidable, that so highly endowed a product as the spermatic fluid cannot escape the influence of the mental conditions under which it is secreted? It carries in some mysterious manner the moral qualities of the parent into the offspring; a single spermatozoon may contain the potentiality of a Socrates or of an idiot, and it may well, therefore, contain also some effect of the mental state which existed during the time of its secretion. Temporary mental conditions of the parent will thus obtain a realisation in its nature, and, through it, in the nature of the new being which it may generate. Here, as everywhere else in nature, we are taught the eternity of action of any kind—that nothing perishes absolutely in the universe, not even a gust of passion.

What has been said of the sexual product of the male may be applied to that of the female. The ovum is in the female that which the spermatozoon is in the male; and, although it might at first sight appear that the former is a nutritive product, while the latter is a secretion, it must be remembered that secretion and nutrition are so closely allied that what can be shown of one may be confidently assumed of the other. The ovum might even be called the sexual secretion of the female, for it is produced in a Graafian vesicle, which is the homologue of the seminiferous tubule in which the spermatozoon is generated, and, when not impregnated, it is discharged as a useless excretion. With the first discharge of the

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ovum, as with the production of the spermatozoon, very important changes take place in physical and mental development; and mental disturbances interfere in a marked manner with the regular system according to which the ovum is matured and discharged in health. The connection between disturbed ovarian action and disturbed mental action is a most frequent observation in the pathology of insanity. If we accept the physiological proposition, that the functions of the structure are determined by its physical and chemical qualities, a very complex chemical constitution may be predicted for the ovum. Very little, indeed, is known with certainty as to its composition, except that it is very complex. It is known, however, that, like the semen, it contains a substance which, on decomposition, gives rise to the compound of glycerine and phosphoric acid. And it is necessary to assume of it, as of the spermatozoon, that the specific differences in the results of its development must be dependent on differences, quantitative or qualitative, in its constitution, although such are not at all detectable by our present means of investigation. It is by their results only that we recognise them. And it is furthermore a necessary conclusion, in view of the notable influence which mental emotions have upon the destiny of the ovum, that its constitution and, therefore, the character of that into which it may develop, must be influenced in some degree by the existing mental state of the individual during the time of its production.

The foregoing observations render it evident that, even if a particular spermatozoon and a particular ovum were given, and the problem were to determine the results of their vital combination under the simplest possible conditions, it would be completely insoluble. For, in the first place, we are ignorant of any single law of so-called vital combination; and, in the second place, we are utterly ignorant in the present case of the elements in the combining substances. There are, however, yet other causes which appear to have an effect upon fertilisation, and which further complicate the matter.

A cause of considerable power, in its interference with any simple law of evolution of the parental characters in the offspring, is sometimes met with in the strange effect which one conception may have on all succeeding conceptions. It is a remarkable and at present altogether inexplicable fact, that the influence of the male upon the female in one fruitful copulation may be such that, though he never come near her again, one or all her future conceptions by other males bear more or less plainly his stamp. A white woman who has borne a child to a negro, and is afterwards married to a white, may have children with more or less of the negro in them. The mare that was once covered by the quagga ever afterwards produced foals with the quagga marks upon them. So much alive are breeders to this fact, that an inferior horse is not

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permitted to cover a good brood mare, lest she be thereby spoiled for breeding; and so likewise is it with other well-bred animals. It appears wonderful that one small spermatozoon should contain the character of the creature producing it, but the wonder is greatly increased when we reflect that, though this minute body penetrates the ovum and disappears in the development of an embryo, which in time leaves the female body, its effect has nevertheless been such that the female has been more or less strongly impregnated with its character, and may henceforth communicate its influence to all the ova which she produces.* Strange, however, as the fact certainly seems, it is not, when we reflect, singular in its mystery. The marvellous effect which is produced upon the whole body by the introduction into it of an inappreciable quantity of a certain virus, as, for example, that of smallpox or syphilis, is not less inexplicable. As the virus of either of these diseases affects the whole body and determines certain special eruptions, so the spermatozoon seems similarly to affect the whole body and determines a special product. And one fact is as great a mystery to us as the other. It may readily be imagined, however, what a disturbing element such a mysterious action must be in any attempt to trace the way of hereditary influence. Children born to a second husband may have physical and mental traits of a first who is mouldering in his grave. And, in truth, such a disturbing cause has yet wider relations. The mental and physical condition of a male during the procreation of a first child may actually be supposed to affect the character of one or more of his children subsequently begotten; and as a certain influence may be thus left behind on the female body by every procreation, there is a sufficient reason for many varieties in the characters of children from the same parents, and no discernible limit to the possible complications of hereditary action.

It does not appear, and it is not likely, that any influence is received by the male from the female in an act of fruitful copulation which affects the children subsequently begotten by him. The circumstances, as regards him, are manifestly different; and although we may not accept the philosophy of the Hindoo code, it must be confessed that the part of the male appears to be an influence exercised and a force imparted, while that of the female is an influence received. The ancient code of the Hindoos regards the woman as the field and the male as the seed, and consequently assigns a much greater power to the action of the latter in propagation; for, it observes, whatever species of grain is cast into the prepared field at the suitable season, a plant of that species is always produced. But whatever be the relative influence of the two agents

* Some, it is true, have explained the fact by supposing that the imagination of the mother was dwelling, at the time of conception, on the former husband; but how could this improbable explanation apply to animals?

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in generation, and there are contradictory theories upon the subject, it is plain that in the subsequent organic connection of the fœtus with the mother there is a reason why she should be affected by its nature which does not exist in the father's case. Close, however, as is the connection between a mother and her fœtus, it by no means affords an indisputable explanation of its influence upon her, or entitles us to assume such an influence in every case; for how does it happen that, notwithstanding the intimate connection between them, the fœtus may have the smallpox and the mother be free from it? Acquiescence in ignorance is the most praiseworthy course where, from a great deficiency of facts, all attempt at explanation must end in unfruitful hypothesis.

Having specified in the preceding observations certain conditions which are of consequence to an individual before the act of his generation is accomplished; having pointed out, in fact, how that his fate is in some degree being fashioned for him before he is fashioned, it now remains to indicate the circumstance in the sexual act itself which may appear to affect the result. The existing state of body and the existing state of mind in the individuals concerned will plainly be of some importance; but as the mental cause must operate indirectly by the induction of material conditions, it will not be desirable to attempt to consider them separately. Assuming the body, then, to be in a fair state of health and of natural development, what accidental circumstances, may interfere with the due discharge of its function? "The advice which I am about to give," says Plutarch, "is, indeed, no other than what hath been given by those who have undertaken this argument before me. You will ask me what is that? It is this, that no man keep company with his wife for issue sake but when he is sober, as not having before either drunk any wine, or, at least, not to such a quantity as to distemper him, for they usually prove wine-bibbers and drunkards whose parents begot them when they were drunk; wherefore Diogenes said to a stripling somewhat crack-brained and half-witted, 'Surely, young man, thy father begot thee when he was drunk?'" Therein has Plutarch signalised a cause of unsuccessful procreation, which, as he says, was known and treated of before his time, and which has been largely exemplified since. Instances are related in which a father who, while in the habit of going to bed drunk, has begotten children idiotic or otherwise afflicted, has, after throwing off his evil habits, had very healthy children; and it is said that a temperate man with many sound children has had one idiotic child, the plainly traceable effect of a single act of drunkenness during which it was begotten. In his excellent report on the 'Causes of Idiocy,' Dr. Howe declares that out of 359 congenital idiots no less than 99 were the children of habitual drunkards. No doubt, in some of the numerous cases which are recorded as examples of the effect of the

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vice, the evidence is not quite conclusive; but the important fact of the ill effect of drunkenness on offspring begotten during its existence issues with certainty from experience, and is indisputable. An act which is of a very intense nature, which makes a full demand upon the best energies of the organism, and which has most important consequences in determining the destiny of that which is to come, requires undisturbed and healthy bodily function. It was an opinion of Goethe that the custom of rejoicing and making festivity on the occasion of a marriage is not commendable, inasmuch as an important and uncertain journey is then about to be commenced, which should rightly be entered upon, as an uncertain voyage in life would be, with sober, earnest, and serious consideration. Joy and festivity should follow success; and those who have well and helpfully borne the burden of existence together may, in the eventide of life, ere they lie down to rest, justly then rejoice with a sober gladness over the happily accomplished journey. The opinion may be an unwelcome one, but it has, perhaps, a stronger support even than the reason assigned for it. Those who enter on marriage are simply sealing their right to initiate the destinies of certain human beings, and to any but the most thoughtless of mortals it must surely be a fearful responsibility to be the means of introducing a single soul into this sin-laden earth. Marriage is plainly not a mere selfish affair of the present happiness of two individuals, but a solemn matter that concerns the future welfare of several individuals—a matter, therefore, for quiet accomplishment rather than for noisy demonstration. For it is a simple scientific truth that the nature of the offspring is in some degree influenced by the bodily condition of its parents at the time of its procreation.

The ill effect which alcohol is acknowledged to have on the product of the sexual act may be more or less plainly produced by other substances, such as opium and tobacco, which disturb the natural functions of the organism, and injuriously affect an act so exacting in its demands on the whole energy thereof. There is, indeed, reason to believe that any circumstance which causes a temporary or lasting degeneration of the individual will, to the extent of its evil, be injurious to the offspring. The fructification of plants is notably determinable to a certain extent by external conditions; and that of animals cannot possibly escape the influence of the conditions under which it takes place. The degeneration of a race means the degeneration of the individuals forming it, and the degeneration of individuals is gradually accomplished by virtue of the law through which the acquired infirmities of the parent become the natural infirmities of the offspring. Though we may not accept in full the doctrine of Cardan when he says that if a man is over-full, dull, fearful, or perplexed in mind, his children will be much subject to madness and melancholy, we must, nevertheless, acknowledge a

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substratum of truth beneath it, and respect the recognition of causality in the reason which he gives:—"For if the spirits of the brain be fuzzled or misaffected by any such means at such a time, their children will be fuzzled in the brain; they will be dull, heavy, timorous, discontented all their lives."

It has been before said that it is not possible to discriminate between the influence of mental conditions and that of bodily conditions on the product of the sexual act. In a legitimately accomplished sexual conjunction, where there is a deep, sincere, and virtuous affection between the agents, where love blends the minds as passion blends the bodies, there is a more complete unity of individual mind and body, a greater oneness of the organism, than exists at any other time. There is a great tension of the whole force of the organism, mental and physical, and in the discharge of the force a new individual is spiritually as well as physically begotten. But where there is dislike or aversion between the agents, where there is passionate sensuality on one side and indifference on the other, or where any other disturbing cause prevents the due co-operation of the mind, the act is reduced to an animal level, and it cannot justly be a cause of wonder if something little above an animal is generated. Kind produces its kind; animals generate animals; idiots are impotent, or incapable of procreation; lunatics beget idiots, as drunkards are liable to do; and the being who makes himself a temporary animal, idiot, or lunatic, cannot rightly expect to escape the law of their propagation. He will produce his kind. It is not sufficient that man be physically generated, he must be spiritually generated also. And whosoever, therefore, abandons himself in drunken excitement to propagation as an act of sensual gratification commits an unpardonable sin against the dignity of human nature, and generates consequences which no repentance can ever undo, and no remorse ever atone for.

An opinion is entertained by many that bastards are often remarkable for great ability, and many examples might be adduced to show that some of the greatest achievements in the world have been the work of those who were illegitimate. It is naturally assumed that the explanation of the fact is to be found in the passionate circumstances of the sexual act. Shakespeare, who gives his bastards great ability, gives that reason for it, for he makes Edmund thus speak:

> "Why brand they us
> With base? with baseness? bastardy? base, base?
> Who in the lusty stealth of nature take
> More composition and fierce quality
> Than doth within a dull, stale, tired bed,
> Go to the creating a whole tribe of fops?"

Cardan, Vanini, and other writers, have held a similar opinion; and

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Vanini even goes so far as to exclaim thus: "O utinam! O utinam! extra legitimum ac connubialem thorum essem procreatus: ita enim progenitores mei in venerem incaluissent ardentius ac cumulatim affatimque generosa semina contulissent è quibus ego formæ blanditiem et elegantiam, robustas corporis vires, mentemque innubilem consecutus!"* On the other hand, Burdach thinks that the cause of the frequent vicious character of bastards lies in that which so greatly moves Vanini's enthusiasm. If it be admitted, however, that the great erotic tension in an illegitimate sexual act is likely to originate an energetic and stormy nature, it may be supposed that the circumstances in which he is afterwards placed will have much to do in determining whether the world shall have cause to applaud or to curse him. So that, if it be true, as Burdach assumes, that bastards are commonly vicious, a sufficient reason for the fact may exist in the unhappy circumstances in which they are generally placed, without appealing to the vice of the act in which they were unlawfully begotten. The world is not their friend, nor the world's laws; and when, like Edmund, they feel that their "dimensions are as well compact," their minds as generous, and their "shapes as true as honest madam's issue," it is not unnatural for them to rebel against customs which are established and laws which are made for the fortunate. When they are vicious and criminal, they are not generally feebly so; they are strikingly vicious and notable criminals.

It has been said, again, that the illegitimate become insane in greater numbers than the legitimate. It is easily conceivable; for when the mind is possessed with feelings which spring from the external circumstances, there cannot be that fulness of unity of it and the organism which has been declared to be necessary to the best propagation. Although the result may be genius when there is a complete self-abandonment and passionate union of the agents, it is possible that when there is not that complete forgetfulness of circumstances the result may be instability and madness. The fact, however, which comes forth, whatever the theories may be, is that genius, madness, and vice, are all three attributed in greater proportion to the illegitimate than to the legitimate. Now, it is a common observation that genius cannot at times be distinguished from madness, and that madness runs imperceptibly into vice, or vice into madness; that there is not, in point of fact, a single link wanting in the chain which binds the extreme of one with the extreme of another; and whilst it is still only conjecture that the cause of the greater frequency of their occurrence amongst those illegitimately born lies

* The reason for his wish he gives thus:—"Cujus mihi ratio ea videtur esse, quod omnia largè et effusè ex paternis lumbis ac visceribus sunt consecuti, nec in furtivo illo ac clandestino concubitu parcè, jejunè, tenuiter, sed affluenter naturæ numera illis infusa est. Cum enim uterque avidè," &c.

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in the character of the sexual act, it would plainly be the vainest of all attempts to endeavour to point out those conditions in the act of combination which might be supposed to determine the different degrees of instability of the resulting compound.

Another observation which has been made is that there is a greater number of female than of male children amongst illegitimate births. Is the explanation of this also to be sought for in the circumstances of the act of generation? The much-discussed, but yet obscure, question, of the causes which determine the sex of the offspring, seems to have arrived at the probability that the sex is determined at the same time as life. Burdach has accumulated proof of this proposition, and his proofs may be shortly summed up under three divisions.—1. The time of the appearance of the sexual organs is, as Meckel, Rathké, and Müller have shown, nearer the time of fecundation, the higher the being is in the scale of organization. In vegetables the sexual organs do not appear till the plant is fully developed; in the invertebrata and in fishes only after the hatching of the egg; in birds they appear early, in the chicken, for example, at the fifteenth day; and in man they are seen at the end of the fifteenth week. 2. There are manifestations of sexual character independently of sexual organs. According to Soemmering, the sexes in the human embryo have visibly different forms, and the genital organs are, as it were, the local expression of the sexual character which is determined with life. 3. The facts of hereditary influence certainly favour the supposition. How, then, is the sex determined in the act of generation?

As one kind of being produces offspring of the same kind, and every kind reproduces its kind throughout nature, so there is a tendency on the part of every individual to produce himself; the male tendency will be to form a male, and the female tendency to form a female. There is, then, a sort of conflict in generation as to which element is to prevail, and the result of the struggle will be here, as everywhere else, to the strongest. The sex of the offspring will be determined by the greater energy of the sexual element in one of the germs by the combination of which it is formed. Thus the preponderance of female births amongst primiparæ is by some attributed to the great sexual force of the female which enters into the first conception; and Burdach thinks that a like preponderance of female births amongst polygamists is to be explained by the rareness of sexual conjunction with the female. Both these causes will serve to explain the preponderance of girls amongst natural children; they are mostly first births, and it is probable that connection has rarely taken place. Obviously, however, there may in such cases be another reason for the preponderating sexual force of the female, when the great erotic tension drives her to break through all conventional restraints and to rush passionately on an amorous

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fate. On the other hand, the children of an old man and a vigorous woman are usually female, because age has diminished his sexual force, however great it might have been at one time. For it is evident that the sexual force of individuals will not only differ as a natural endowment, but that it will be subject to the variations produced by conditions of age and health, as well as to temporary exaltations and depressions from psychological and physiological causes.

With the law by which the sex of the offspring is determined, it seems probable that the law of the relative degree of transmission of the parental qualities to the offspring must be closely connected. The theories which asserted that the offspring received a certain part of its system from one parent, and a certain other part from the other parent, have been proved worthless. It is certain that every character, physical and moral, may be communicated at one time by the father and at another time by the mother, and may pass from mother to son, and from father to daughter. Moreover, there is not any certain connection between the inheritance of a characteristic of one parent and the inheritance of another characteristic of the same parent. Sir H. Holland, indeed, supposes that there is a general ratio between the resemblance of external features and that of internal parts of structure, but the supposition is not borne out by facts. A child may resemble its father in form and features, and not resemble him in internal structure and moral disposition; and the well-known instance of the cross between the dog and the wolf, in which one of the progeny resembled in disposition that one of the parents which it did not resemble in form, affords a striking example of the anomalies which may be met with in hereditary action. That which happens in the matter of colour when a European and a negro procreate may happen with any other characteristic, internal or external, and may be serviceable here as a helpful illustration. The usual result of the intercourse between a negro and a European is a mulatto, a being in whom the colours, so to speak, have been combined so as to produce an intermediate shade. But it sometimes happens that a child appears who is black with a white patch, or white with a black patch—pieballed, and the colours might then be said to be mixed, and not be combined. In one case, again, a negress had twins by a European; one was perfectly black, with short, woolly, curled hair; the other was light, with long hair. Here there was not even a mixture of the colours, but a simple repetition of them. In like manner it may be with any other parental characters. They may be simply repeated, so as to be plainly recognisable; or they may appear in a mixed form, so as to be partly recognisable; or they may be combined, so as not to be recognisable at all. But how it is that they are transmitted in such different ways, no man can say. That it is not the male or female nature which determines the character of the relative action of the father and mother

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upon the offspring is at any rate certain. It may be, as some suppose, that the result is dependent upon the individual organic force of each parent, upon the relative potentiality of the germs, apart from the sexual character.* The proposition, which at first appears so vague as to be valueless, may, perhaps, merit some consideration when we call to mind another proposition, which is this, that an individual is a unity formed of the association of an infinite number of individualities, and the so-called individual force of the whole organism the sum of a multitude of individual forces, to each of which the first proposition, if true, must be applicable. Clearly, however, when we have thus descended to the individual cells, very little is at present to be gained by the motion.

Every consideration, however, which can be justly entertained on a very obscure matter tends to prove the great importance of the act of fecundation itself. Nature proclaims the time of its advent with all the beauty of her colouring and all the harmony of her sounds; the flowers are the dress of love, and the spring melodies of birds are love songs. There is a transport throughout the living kingdoms of nature; the temperature of the plant is increased, and it is arrayed in all its glory; the plumage of the bird becomes gayer, and its joyous excitement thrills forth in lively melody; the animal functions everywhere reach a certain state of exaltation, an ecstasy of love. A dose of arsenic which would kill a frog at any other time appears to be without effect upon it when it is copulating. And so much is the vital force exalted during the rut, that a stag which has been very seriously wounded is then capable of efforts which it would have been quite unequal to at another time after such injury. Some animals may be greatly mutilated during copulation without seemingly feeling the injury. The snail is then, according to Haller, insensible; and if the frog be then mutilated, it still holds to the female; nay, if its paws be cut off, seizes her again with its bloody stumps. This erotic transport does not exist only where there is a consciousness of it and all the joys and gains which flow from such consciousness, but it pervades the organism; there is a love-tension throughout. The experiments of Pflüger show that, when the connection between the brain and spinal cord is severed in the male frog during copulation, it still clings to the female, and even seizes her again after its leg has been dragged away from her. It is manifestly an attraction as natural and involuntary as that of one chemical element for another, or of positive for negative electricity.

Of what use, it has been asked, would the state of heat in the animal be if reproduction were complete without it? Of what use the erotic transport if it were no wise essential to proper fecunda-

* Dr. Lucas has most largely discussed this question, but his results in the way of definite knowledge, it will almost be needless to add, are *nil*.

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tion? That it is essential may be inferred from the rareness of fecundation where coition does not take place under these circumstances. It is true that conception may take place during sleep, drunkenness, somnambulism, and syncope; but it is undoubtedly rare where there is not mutual self-abandonment. A forced copulation may be fertile amongst animals, but is by no means as certainly so as a voluntary one; and Parent-Duchatelet found only twenty-one infants born yearly out of 1000 prostitutes in Paris, the erotic transport being exceptional among them. Then, again, the degree of influence of the relative amount of the erotic orgasm of father and mother upon the offspring, which was admitted by Empedocles, Hippocrates, and Aristotle, and has been accepted by Hufeland, Spurzheim, Girou, Burdach, Lucas, and others, is decisive evidence as to its importance in successful generation. An absorption of the whole force of the organism in the act, amounting to an insensibility to surrounding objects, is evidently the normal state of the creature during fecundation.

Now, the intensity of the erotic orgasm, and the excellence, therefore, of the product thereof, will depend in a great degree on the mutual attraction which there is between the individuals concerned. Amongst animals, the female prefers the strongest male, for she looks quietly on until the battle for the possession of her person is ended, and then contentedly yields herself up to the victor. In that way the principle of natural selection takes effect, and the most vigorous procreation of the species is secured. It is said that a male which is deprived of its finest ornaments—a yellow-hammer, for example, with its tail-feathers pulled out—is rejected by the females; and Hunter observed that a bull would not copulate with a hermaphrodite cow although copulation was as practicable as with an ordinary cow. Nature seems to have opposed herself, again, to procreation between greatly different ages, by the aversion which there is to it among mankind, and by the difference of the time of rut at different ages amongst some animals. The rut of old stags, for example, is in the second half of September, while that of the middle-aged is in the first half of October and that of young stags towards the end of October. So it is effectually ordained that only those of nearly the same age can copulate. A similar difference in the time of heat has been observed in certain birds, as pheasants, and even in the time of spawning among certain fishes.* In man, however, other forces arise and overcome the aversion which nature has implanted in him to the copulation of haggard age and blooming youth. But the natural fact is not altered thereby—remains a reality, notwithstanding all the artificial motives which spring up in society to induce a neglect of it.

* Bloch, cited both by Burdach and Lucas.

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When interest in place of affection makes a marriage, and when indifference or repulsion prevails instead of attraction, there is not that harmonious co-operation of all the circumstances which is essential to the best propagation. Accordingly, as good an author as Burdach maintains that the beauty and ugliness of children are not so much dependent on the beauty and ugliness of their parents as upon the love and aversion which these have for one another. And to this opinion Lucas heartily subscribes. Where interest and not love makes matches, as too often happens in civilisation, bad results, he says, ensue on the health, soul, and beauty of the offspring—those gifts of heaven and of life, which engender love, and are born of it. Instead of that beautiful attraction, that elective affinity, by which two beings are drawn together, and combine in marriage like two elements in nature, the passions engendered by civilisation supply other forces for binding together those who cannot be combined. Thus, the wealth passion binds withering age to vigorous youth, joyous health to pining disease, delicate refinement to sensual grossness; and this ugly, unhallowed union of antipathies, which all appliances of wealthy civilisation cannot render grateful to human feeling, cannot but have consequences in the inexorable logic of natural law.

Nature, it is evident, in the propagation of life, puts forth all her beauty, and provides the utmost gratification for all the senses with which man has been endowed for communion with her. To the eye she appeals in a magnificence of floral beauty which Solomon in all his glory could not equal; the sense of smell is gratified with the richest perfumes of her countless varieties of flowers; the ear is delighted with the multitudinous melodies with which heaven's vault is then filled; and the touch is intensified and exalted into a state in which individuality is lost, and conscious man for a moment blends with unconscious nature. As if tense with life, nature bursts forth in generation into all her beauties, and declares the joy of birth in all her most glorious manifestations. But man, unhappily, is ever striving to sever himself from nature, and to destroy the great unity of the whole. It was an Oriental idea, which Plato has allegorically expressed, that a complete being had in primeval times been divided into two halves, which were seeking to join together and to reconstitute the divided unity. The desire and pursuit of this unity is love; it is accomplished in the union of the sexes, and realised in the individual which results therefrom. Is it not manifestly of the greatest importance that the natural attraction of love should unite the right halves? Then that which is beautiful in nature will be beautiful also among mankind.

(*To be continued.*)

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