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REVERSIVE ANOMALIES IN THE STUDY OF THE NEUROSES.

In studying the causes of nervous disease we cannot overlook neurotic inheritance and predisposition, and we are obliged to recognize the importance of reversive anomalies not only from a biological, but from a pathological, point of view. We often come across such terms as atavism, and teratology, in the more modern works that deal with the investigation of the nervous functions.

The subject of morphological and physiological retrogression not being well explained in any of the text-books that have come under my notice, it may be a sort of stumbling-block to some, as it was to me, until a short time since, when I sufficiently familiarized myself with enough of the details of the topic to prepare a systematic paper, lately printed in a standard medical publication.

Conservative heredity, displaying itself intermittently in the form and function of progenitor and progeny, has no doubt existed in all organic beings from time immemorial; but the idea does not seem to have taken verbal shape and embodiment until the botanist, Duchesne, created the word atavism to designate one of the proceedings of heredity. The tendency of living beings to reproduce in time a succession of individuals like their parents may manifest itself in a mediate, a *direct*, or a *collateral* form. This phenomenon has for its condition, first, variation; for, if living beings did not offer any variation in their type heredity would be necessarily and always immedi-

diate, and atavism would be confounded with it. But the typical forms modify: in some measure and for some cause, whatever it be, they may transmit these modifications to their descendants. This transmission operates either on the first generation or in subsequent generations; in the first case there is *immediate* heredity, in the second case *mediate* heredity, or atavism. In its turn atavism may crop out in a direct descendance or in a collateral descendance.

For fear that I am going too fast, and in order to make myself better understood, I must revert to some of the terms that establish the compass and extent of this singular law of intermittency which rules the greater part of the states of life.

Some writers consider it as a force distinct and antagonistic to heredity; others a particular case of heredity—the whole heritage of an anterior production; while others look upon heredity as a generic term of which atavism is a *modality*, that is, a difference in mode or form.

Another writer explains atavism as the reappearance in an individual, or in a group of individuals, of anatomo-physiological characters, positive or negative, which their immediate parents did not show, but which were present in their direct or collateral ancestors.

The "solution of continuity in the line of direct heredity," known as atavism, is derived from the Latin *atavus* (a great grandfather); and I would define it as the tendency in animal and in vegetable life to inherit biological preëxistences and to return to a primitive type progressively altered. It is by virtue of this tendency that living organisms inherit peculiarities from their remote ancestry which their immediate parents did not present.

Atavism is not to be confounded with ordinary

inheritance or heredity. In the latter the tendency of nature is to reproduce in the offspring certain peculiarities of the parental organization; under the influence of atavism, the offspring may take the traits and characters of the primitive forms with no resemblance either to father or grandfather, but to ancestors more remote. Atavism should be distinguished from the variations, teratological, pathological, or toxonomic, that interrupt the succession of hereditary phenomena. Nearly synonomous is the term *survival*, used by Tylor to signify a superstitious remainder or residuum of bygone ages, and the Darwinian expression *reversion* to indicate the occasional or individual appearance of traits accumulated by heredity and handed down from remote ancestry. Reversion is also used to signify the actual returning of a variety or species to such remotely descended traits. This is instanced in the tendency of animals long domesticated, when they become feral, to revert to the pristine form. As a case in point we may mention the wild horses of Montana, which are such a source of annoyance to stock raisers in enticing away tame horses that their slaughter is made an object of hunting parties. That the notion of atavism has prevailed for some time, it is only necessary to allude to the biblical version regarding the visitation of the sins of the father upon the children of the third and fourth generation. In the sixteenth century Montaigne noticed these strange transmissions, and wondered how the little drop of semen from which we are produced, bears not only the impression of the bodily form, but a likeness of thought and inclination through a progress so hap-hazard and so irregular that the great-grandson shall resemble the great-grandfather, and the nephew the uncle. Darwin, speaking of the in-

jurious characters that tend to reappear through reversion, mentions the blackness in sheep, and among mankind some of the worst dispositions which occasionally, without any assignable cause, make their appearance in families.

To come down to the present time, there are men among us to-day "who have come too late in a world too old"—men whose skulls are of an absolutely neanderthaloid type; men whose minds are struck with an immobility, an arrest of development, an intellectual atavism, a reversion to ancestral forms and prehistoric ideas as well-marked, for example, as the birth in a family of a red-headed child whose parents are not xantho-choroids, or the reappearance in a flock, at intervals, of the familiar black sheep. In the brain of such of our contemporaries, in consequence of the reappearance of an ancestral conformation, there appear the ideas of the middle ages, which make of this contemporary a living fossil, absolutely inaccessible to modern ideas. All of you can recall acquaintances of this description. Such people are found clinging to hoary-headed errors and old superstitions, not only in science but in all the walks of life, social, religious and political. Of what use is it to talk to such men about the reduction of the tariff, or the brotherhood of man, of association, of science? Such men, cerebrally speaking, are of the reactionary class, and though walking about under the mask of contemporary manners, belong to the middle ages just as much as though they wore sword and doublet.

It is no vague generality when we say that the characters transmitted by atavism are of all orders, normal, pathological, teratological, intellectual, and moral; and that they may be observed

in the two kingdoms, animal and vegetable, in domestic animals and in man.

The atavic influence has been well traced in the laws that determine the evolution and culture of a plant, and in its reversion to the wild or uncultivated state. This may be witnessed in many flowers and vegetables, and in fruit trees, but the mention of the experiments made with the little flower known as the *bluet*, or bluebottle, and with Indian corn, will suffice as illustrations. Broca continued these experiments for eight years. He found, among a bed of bluets sowed with seed collected from an open field, the greater part of the flowers to be blue, but some bore violet flowers, and even some a little reddish. The seeds of these reddish flowers were sowed and collected the following year. Of a hundred flowers, about two-thirds of them were a fine blue; others presented various shades, ranging from blue to violet, from violet to red, and even to rose. The lightest colored of these flowers were preserved and used the following year to sow another border. This time the number of flowers entirely blue was little less than half; the greater part being violet or red. There were many red, and some of a red so light as almost to pass for white. It thus appears probable that in making a methodical selection from each generation of the lightest-colored flowers, the conditions are favorable to obtain a fixed race of *bluets* quite *white*.

There are two varieties of Indian corn, the light and the brown. That they are more than varieties is shown by the fact that we can never obtain by culture intermediary shades. Artificial fecundation being easy upon this androgynous plant, permits us to obtain variegated ears, which bear at the same time light grains and brown ones, as we see in what is known as "pop-corn;" but each

grain belongs to one or the other race. A farmer, having accidentally discovered an ear of corn entirely brown, called the attention of Broca to this extraordinary circumstance. He considered it a natural variety, produced spontaneously, perhaps, under the influence of an atavism going back to a great number of generations. The grains of this ear having been planted, gave sixty-nine ears, thirty-five of which were light and thirty-four brown. Repeated experiments gave equal results. A fact worth noting on this point is that all the ears of the same stalk were of the same color.

Atavism is shown in the seminal principle that passes secretly through a generation, as is seen in certain insects, the wood-louse, for instance, where a single fecundation answers for nine generations of insects, all of whom are born prolific, and procreate without the help of the male. In this case the individual of the ninth generation has received his life, his form, and his instincts from an eighth grandfather, a long time disappeared. Another example of an anatomical order occurs in silk-worms of a white race who produce a certain number of yellow *cocoons*, although these have been carefully weeded out for more than a century.

The same law that governs the vital continuity in the foregoing instances applies to the lower animals and to mankind. Atavism in pigeons is well known; and nearly every one has noticed the stripes on certain horses, which are a reversion to their common ancestor, the zebra. According to Quatrefages, it is in vain that they kill each year, in the flock of black sheep in Andalusia, every lamb that bears the least trace of white wool; each year there are born still some individuals that have the proscribed tint. In domes-

ticated animals atavism plays a considerable rôle in all races that have been formed by breeders. With dog-fanciers and stock-raisers it is a matter of so much concern that they have need to exercise great care in the multiplication of these animals, and to choose as reproducers only those whose grandfathers have no transmissible defect. On this point the experiment mentioned by Darwin may be cited: The Earl of Powis caused some domesticated hump-backed cattle to be crossed by the wild species of India, with the result not of producing a medium grade of characteristics, but of a marked reversion to the ancient. If the time allowed, I might adduce numerous other instances of remote atavism, such as that of the numerous muscles appearing abnormally in man which are normal to the lower animals, notably the monkey. Other facts of the same order have reference to the teeth; the persistence of the molar and the metopic sutures and of the semi-lunar fold in the eye, double mammaries or uterus; and other sleeping conformations, that are sometimes recalled into existence.

It is in virtue of atavism that man, like other animals, often reproduces the traits of his grandparents. Characters occasionally make their reappearance in him which we have reason to believe were possessed by his early progenitors. Unhappily for man, atavistic antecedents are not taken into account in the matter of union of the sexes. People marry and the offspring frequently resemble the grandparents, not only morphologically, but in temperament, diathesis, and even their diseases.

It is well known that portrait galleries and the monuments of churches in Europe help to trace the source from which some long-lost type of feature has been derived; and the reappearance of

the Bourbon nose in France is a matter of common knowledge.

Less vague facts of this order are those occurring in the cases of crossing of the colored races. Martin de Moussy has observed families in which at the end of several generations there were a series of children having much more than their father or mother the signs of an African mixture going back at least to a fifth anterior generation. He cites also a woman whose father was a quadroon and whose mother offered traces of African blood, married to an Englishman of pure race. She had nineteen children, who all offered unequivocal traces of this sixteenth of African blood.[1] On the other hand, two sisters of this woman, married also to Europeans, had children who bore no trace of the paternal mixture. (*Bulletin de la Soc. d'Anthropologie*, 1865, p. 288.)

The occasional appearance of a child covered with hair is regarded by many as a fact of very old atavism. The hairy men of Japan, the Aïnos, are also believed to be reversions to some ancestral form, and it is argued by some that the anthropoid apes may be the descendants of ape-like men. Persons who have lately visited the Paris Hippodrome may remember a pilose Russian, whose peculiarities are believed to be a phenomenal reversion to the characters of a very ancient lost race. Other examples of teratological pilosism might also be cited. It is thought by those who have given the matter attention that many races of men have lived before the present ones without sending representatives of their types down to us; but they have not disappeared without the blood of several among them

[1] It has been noticed among the motley population of the West Indies that after successive generations of mulattos the children revert to the negro race.

being transmitted, by infinitesimal dilutions, down to the present races.

An attempt to point out with precision the laws of atavism results in the statement that every organized being is the product of two forces, one of which is the resultant of his complete genealogical tree, from the first origin of the organic branch from which he springs, and the other is furnished by all the circumstances that have acted upon the individual himself during all the duration of his development. It is further asserted that when men or animals manifest impulses of an excitable character, and exhibit pleasures and sympathies that seem to be out of relation to their culture and personal experience, or to the culture of the family or the race, whether in dreams or in waking, the source of these must be found in long past or ancestral memories produced according to the law of reversion.

Perhaps not the least curious of the modes of atavism is its influence in the province of the mind. Philogenic heritage manifests itself in connection with memory. According to Galton, the celebrated Hellenist, Dr. Porson, whose memory was surprising for its extent and fidelity, transmitted this peculiarity to one of his grandchildren, and Lady Hester Stanhope claims to have inherited her grandfather's memory. Assuming that certain ancestral synesies have been ancestrally realized in time and place, the reversion to them may become the starting point of a new evolution. The capacity of reproduction or a new develoment of the transmitted antecedent synesies or substrata is ancestral memory. The faculties that preside over the representative signs of ideas, it is said, are also subject to the law of correlative evolution and reversion which

is manifested both in health and disease. Scriptory atavism is witnessed in the reversion to ancestral styles of writing; and in the speech it is noticed in the reversion to ancestral or racial pronunciation of letters and words. In aphasia the patient often reverts to the language of childhood, which is his only language, and like some races of savages, he is unable to pronounce labials. A further pathological reversion is seen in dreams, which in fact are nothing more nor less than abnormal reminiscenses and reproductions. Even the pleasures and pains of memory may be transmitted as substrata from remote ancestors. States of consciousness, owing to ancestral reversion, are shown by various facts. It has been noticed that in a menagerie the straw for bedding lions and tigers could not be used for horses, because the odor terrified them when brought into the stable. Yet many generations of horses have passed away since they were troubled by these beasts. Sir Daniel Brewster's fear of drowning, which haunted the minds of more than one of his descendants, is also cited as an instance.

Reversion to synesies is shown during special conditions of the brain tissue, such as characterize sleep and dreaming, somnambulism and insanity. Certain vain pleasurable and painful states are likewise due to ancestral reversions. The keen pleasure afforded by the sight of mountains and hills; many prejudices, antipathies, and æsthetic sentiments are due to ancestral substrata.

In no other way can I account for these conditions as observed in myself while strolling about the streets of Edinburgh, or in listening to the bagpipes, in climbing the heathery Scotch hills, or the misty hills of Alaska—sights and sounds that doubtless afforded similar pleasure to my Caledonian ancestry.

Emotional reversion is noticed in those cases of cerebral disease in which the semeiotic or sign-making tissues are involved, and speech or the other modes of expression are affected. Immoral dreaming among persons whose life is above reproach during waking hours, is cited as a further instance of morbid emotional reversion.

There are also reversions owing to defective evolution and nutrition that can be traced beyond immediate ancestors to the substrata of the race acquired during savage or primitive life in long distant ages. An instance of this occurs where the conduct is that of uncivilized man. In theroid idiotic, or imbecile reversion to brute-like character of form, there are no signs of morphological reversion, but the dominant aberrations are theroid. The permanence of a substratum of savage life is seen in our large cities among the vicious classes, who are to all intents and purposes savages in everything but speech, dress and name.

Of psychological interest at the present time are the reversions to ancestral modes of thought in France, where there is a reversion to the ancient doctrines of metempsychosis, and of the evolution and transmission of souls.

In human pathology the reappearance of morbid traits existing in ancestors, but not in immediate parents, can be maintained by cited cases; and the influence of atavism in the hereditary transmission of disease can be traced for four, five, seven, or in fact, an unlimited number of generations.

Alternate heredity of anomalies have been noticed in such conditions as polydactylism, hare-lip, gibbosity, and the like. Most physicians have under their own eyes some examples of diatheses that jump one or more generations. The principal diseases and defects in which the influence of

atavism has been traced are color-blindness, the hæmorrhagic diathesis, pseudo-hypertrophic paralysis with its allied diseases, and a large number of the neuroses. Lucas cites numerous facts of atavism for ocular infirmities. Pliny relates that in a family three persons were born with eyes covered with a membrane, and that this vice of conformation always skipped one generation (lib. vij, ch. xij).

Among the old and well-known cases of color-blindness is that reported by Dr. Earle, in which in addition to the usual limitation by atavism to alternate generations there was evidence of transmission from a great-grandfather to two great-grandsons, without the development of the peculiarity in the intermediate transmitters of the defect. There is another and more recently recorded case of the same kind in which two generations were skipped over, the transmission being effected through two females in the second generation, and thence onwards through three females in the third generation, to seven great-grandsons in the fourth generation.

Such extension is still more frequently observed in cases of hæmatophilia or the hæmorrhagic diathesis. In fact, its most important mode of propagation is not so much by the bleeders themselves as by their non-bleeder brothers and sisters. In the literature of hæmatophilia there are numerous instances of its indirect transmission. The "Appleton-Brown bleeder family" is known to American physicians. Investigation shows the "Tenna bleeders," in Switzerland, to be descended from a remote ancestor named Walther. The influence of atavism is distinctly traced in the insanity and blindness of George III, to his remote ancestor, Duke William, eight centuries back. Cases of deaf-mutism have been known to descend

from male ancestors five generations back, and the atavistic transmission of a family defect to be handed down in a direct male line from a deaf-mute great-grandfather to a deaf-mute's great-grandson. Daly states that in 124 deaf-mutes in the Institution of deaf-mutes at Paris three cases of deafness proceeded from the grandfather. Venette and Puybonnieux cite analogous facts.

Dr. Matheson, of Ontario, who has examined the histories of 661 deaf-mute children, states that he is unable to find that any of the parents were, or are, deaf and dumb persons. A few of their grandparents, however, were mutes.

In the same manner that we may find numerous examples of alternating heredity of mental disposition where family traditions are preserved, so may the instability of insanity pass on through one or more generations without its being developed. A case is related where a man had two wives, and by each wife one child—a boy by one and a girl by the other—yet both these children were alike nervously unstable, the father's mother having been a lunatic.[2]

Many practitioners have noticed that gout, pulmonary tuberculosis, and scrofula may jump one or more generations. G. Seé has observed seven cases of the scrofulous diathesis which sprung from the grandparent had left the parents free. Other diseases, diathesis, neuroses, and even congenital and moral defects, the so-called criminality and forms of wickedness, may sometimes disappear for several generations, and crop out in a manner evidently owing to a reversive anomaly. This is instanced in the history of pros-

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[2] While preparing this paper I was called in consultation by Dr. Robert Edes, to see a case of circular insanity in a woman whose grandmother had been similarly affected.

titution, in the issues of courtesan mothers, and it is not necessary to refer to the Messalinas, Poppes, and Julias, of antiquity.

Hypospadians may be developed by what is termed "indirect atavism." On this point Dr. Lingard remarks that all breeders of cattle and other animals are familiar with this fact of the females throwing back, that is, reproducing, after impregnation by a second male, the peculiarities of some other male by whom they had previously been impregnated. That this is possible in the human female he thinks is proven by the following case: The third of six hypospadians died a few years after the birth of his three sons. His widow within eighteen months contracted a second marriage, the husband in this instance not being a hypospadian and having no history of any such defect in his family. By this marriage she had four sons, all hypospadians. Two of these hypospadic sons begat hypospadians in their turn; but one of these sons had three boys without any deficiency, although the eldest boy was a hypospadian. Sir Henry Holland mentions an instance in which four out of five of a family of children became blind at the age of 12; the only record of any preceding occurrence was an ancient tombstone, the figures and inscriptions on which showed that a mother and her children, members of two remote generations of the same family, had also been blind.

Facts like these merit confirmation by other facts rigorously observed; and it is to be regretted, in the interest of science, that families are averse from keeping a history of their diseases. It is to be hoped that Mr. Francis Galton's recent efforts in this direction may be successful in throwing further light on the manner in which these biological peculiarities, though interrupted or latent,

are transmitted and yet return to visit the children of other generations.

In medicine reversive anomalies are something more than simple objects of curiosity. They have both philosophical and pathological value; and in the same manner that pathological anatomy teaches us a great deal about physiology, so we may learn much from studying the development of the brain and nervous system both in a phylogenic and in an ontogenic or fœtal way.

That form of reversion found in microcephalic idiots is highly instructive, and according to Carl Vogt, is one of the finest examples of reversive character to be found in the whole range of teratology. Besides, a correct observance and methodical study of what takes place in the minds of idiots enables us to determine many of the anatomical and physiological conditions upon which are based the manifestations of their intelligence.

I wish I could dwell longer on the phenomena of these important subjects, more particularly for the reason that they are scarcely mentioned even by the standard classical writers on physiology. I can only dismiss them by saying that the questions of atavism and of teratology are almost entirely new, and that the future will assign to them a much more conspicuous place than we have any idea of at the present.

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