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ON THE

RELATIVE INFLUENCE

OF THE

MALE AND FEMALE PARENTS

IN THE

REPRODUCTION OF THE ANIMAL SPECIES.

BY

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THE RELATIVE INFLUENCE

OF THE

MALE AND FEMALE IN REPRODUCTION.

[READ BEFORE THE MEDICAL SOCIETY OF SOUTHAMPTON, JUNE 6, 1854.]

At a meeting of the Newcastle-upon-Tyne Farmer's Club, held on the 4th March last, Sir Matthew White Ridley, Bart., in the chair, Mr Orton of Sunderland read a paper on the "Physiology of Breeding," which excited great interest among the members present, and has since been published in the *Newcastle Chronicle* (March 10th).

The views therein set forth, supported as they are by a large body of evidence, seem well deserving the attention of the physiologist. Moreover, as they have important practical bearings in relation as well to our own species as to the lower animals, they possess a general interest, and concern not merely the physiologist and the farmer, but the physician also, the vital statist, the medical jurist, and others.

Mr Orton's argument is, that in the reproduction of the animal species there is no casual blending of the parts and qualities of the two parents, but that each parent contributes to the formation of certain structures and to the development of certain qualities. And advancing a step further, he maintains that the male parent chiefly determines the external characters, the general appearance, in fact, the outward structures and locomotive powers of the offspring (*e.g.*, the brain, nerves, organs of sense, and skin, and likewise the bones and muscles more particularly of the limbs), while the female parent chiefly determines the internal structures and the general size and quality, mainly furnishing the vital organs (*e.g.*, the heart, lungs, glands, and digestive organs), and giving tone and character to the vital functions of growth, nutrition, and secretion.

Not, however, that the male is wholly without influence on the internal organs and vital functions, or the female wholly without influence on the external organs and locomotive powers of their offspring. The law holds only "within certain restrictions." These may be said to constitute a secondary law—the law of limitations, equally important to be known as the fundamental law itself, and to be hereafter considered.

Such, according to Mr Orton, is a general fact or law of Nature. Claiming the merit of having worked it out by independent observations of his own, Mr Orton, nevertheless, gives the credit of its discovery to the late Mr Walker, and refers to this author's work on *Intermarriage*, as embodying views which, with certain qualifications, are identical with his own. It is scarcely necessary to remark, that this circumstance—of two independent observers in the same field of inquiry arriving unknown to each other at the same point—imparts to their common conclusion a strong *à priori* probability.

In proof and illustration of his general proposition, Mr Orton adduces a large collection of what appear to be strikingly apposite examples, taken from three several divisions of the animal kingdom, mammals, birds, and fishes.

Premising, what will afterwards more fully appear, that crosses or hybrids furnish the most remarkable examples of the proposition, and serve best to test it, we will now endeavour fairly to exhibit the kind and value of the evidence brought forward in support of it.

The *mule* is the produce of the male ass and the mare; the *hinny* (or as it is also called the *mute*), that of the horse and the she ass. Both hybrids are the progeny of the same set of animals. They differ widely, however, in their respective characters—the mule in all that relates to its external characters having the distinctive features of the ass,—the hinny, in the same respects, having all the distinctive features of the horse; while, in all that relates to the internal organs and vital qualities, the mule partakes of the characters of the horse, and the hinny of those of the ass.

"The mule, the produce of the male ass and mare, is essentially a *modified ass:* the ears are those of an ass somewhat shortened; the mane is that of the ass, erect; the tail is that of an ass; the skin and colour are those of an ass somewhat modified; the legs are slender and the hoofs high, narrow, and contracted like those of an ass. In fact, in all these respects it is an ass somewhat modified. The body and barrel (however) of the mule are round and full, in which it differs from the ass and resembles the mare.

"The hinny (or mute), on the other hand, the produce of the stallion and she ass, is essentially a *modified horse:* the ears are those of a horse somewhat lengthened; the mane flowing; the tail is bushy like that of the horse; the skin is finer like that of the horse, and the colour varies also like the horse; the legs are stronger, and the hoofs broad and expanded, like those of the horse. In fact, in all these respects, it is a horse somewhat modified. The body and barrel (however) of the hinny are flat and narrow, in which it differs from the horse and resembles its mother the ass."

In connection with these examples, Mr Orton refers to a special feature seen equally in the two instances, and which seems at first sight a departure from the principle laid down by him. It is this: Both hybrids, the mule and the hinny, take after the male parents in all their external characters, save one, which is *size*. In this respect they both follow the female parents, the mule being in all respects a larger and finer animal than its sire the ass; the hinny in all respects a smaller and inferior animal to its sire the horse; the

body and barrel of the mule being large and round; the body and barrel of the hinny flat and narrow; both animals being in these particulars the reverse of their respective sires, but both resembling their female parents.

In explanation of this seeming exception, Mr Orton adduces a well-known principle in physiology. The principle is, that the whole osseous framework is moulded in adaptation to the softer structures immediately related to it, to the muscles covering it in the case of the limbs, and to the viscera in that of the great cavities which it assists in forming. Accordingly, in perfect harmony with Mr Orton's views, the *general* size and form which must be mainly that of the *trunk*, will be determined by the size and character of the viscera of the chest and abdomen, and will therefore accord with that of the female parents by whom the viscera in question are chiefly furnished.

On the important but difficult subject of the restrictions within which the general law holds, or what may be called the *law of limitations*, Mr Orton makes some judicious observations :—

"I do not mean it to be inferred" he says, "that either parent gives either set of organs uninfluenced by the other parent; but merely that the leading characteristics and qualities of both sets of organs are due to the male on the one side and the female on the other, the opposite parent modifying them only. Thus, I do not infer that the ass has alone been the agent in conferring the external characteristics of the mule, but merely that he has principally conferred the developments, while the mare has been in regard to the external organs a secondary agent, an instrument not of conferring, but only of modifying those organs. It is just the reverse, however, with the vital organs. The female is the agent in conferring them, the male only an agent in modifying them. Hence I conceive that though the male and female parents in all cases give—the former the external, and the latter the internal organs, yet they each mutually exercise an influence in modifying to a greater or lesser extent the organs given by the other."

The instances given are in fact a proof of this. The mule, though essentially a modified ass, and the hinny, though essentially a modified horse, are neither of them anything else. In neither hybrid have we the perfect head and limbs of the ass or the horse grafted as it were on the proper body and barrel of the horse or the ass. The animals are both of them *composite*, though so specifically distinct the one from the other, and taking each of them to such an extent after their respective sires as to warrant the distinctive appellations given them by Mr Orton.

It was formerly remarked that crosses or hybrids serve best both to test and illustrate Mr Orton's law. It will now appear that in the first instance the law in question can only be satisfactorily investigated by observations confined to animals of this sort. For, if even in crosses or hybrids there is more or less of a blending, in every part, of the organs and qualities of the two parents, it is plain that in animals the produce of parents of the same species and of the same breed or variety, this blending, although not necessarily

greater than in crosses, must yet be such as often effectually to obscure to the ordinary observer the distinctive features of either parent. It is owing, doubtless, to this, that there is such diversity of opinion even among practical men on the subject, as any one will find by looking into any of the many treatises on cattle. The law, however, once clearly established in the way suggested, and the conditions or limits within which it holds ascertained, may afterwards be more easily and confidently applied to all cases.

Besides the influence which either parent exerts on the parts or qualities furnished by the other, and which may be regarded as innate and essential, various other influences control and modify the general law. One of these, and that on which Mr Orton chiefly dwells is, the effect on the breeding powers of the female produced by the male that *first* had *fruitful* intercourse with her, as seen in the impress of that male on the progeny she may subsequently have by other males. Of this we have a notable instance in Lord Morton's Arabian mare, which, after having a hybrid by a Quagga, bore successively three foals, every one of which had distinct traces of the Quagga. Having formerly[1] given a large collection of cases

[1] "Monthly Journal of Medical Science" for October 1849, and September 1850; and pamphlet by the author "On a Remarkable Effect of Cross-breeding," 1851. As supplementary to the examples of this influence there given, the following additional examples of it are extracted from Mr Orton's paper.

Referring to Lord Morton's mare, and to the influence exerted on her reproductive powers by the Quagga, Mr Orton says :—

"I myself made an experiment in illustration of it. Having procured a white bull-and-terrier bitch, which had previously been breeding with coloured dogs, I caused her to breed with a bull-and-terrier as like herself as well could be, and also pure white, reasoning that if this male influence existed, then the bitch, although breeding with a white dog and herself white, should throw coloured puppies. In her first litter of nine, there was not one which was not more or less coloured. In her second also of nine, four were white and five coloured. In her third (also to the same dog) all were white. The bitch had evidently been influenced by the previous impregnation, and it was also evident that by continuation of the influence of the white dog, the *stain*, if we may so call it, was gradually obliterated. Her fourth litter were all pure white. It was my intention to have carried her back to the coloured dog, reasoning that she would then breed one or two litters of white dogs; but unfortunately she ceased to breed, although lined by a coloured dog. I regret this the more, as I shall be years in bringing another animal to the same condition for experiment.

"I have, however, tried the same with pigs, breeding from a white sow and an Essex boar, and with the same result. The white sow had three litters from the Essex boar, and was then served by a white boar; three out of seven of the litter were coloured.

"About two years since I engaged to take two pigs from a litter. The boar and sow were of the improved Essex breed, and had both carried premiums. I of course looked for good bred pigs from them; but on going to make my selection I found the largest and best of the litter with more or less white on the feet and fetlocks. I protested against the purity of the breed, but being assured of it, it occurred to me that this might be a case of influence from previous impregnation. I asked the question without stating my reason for

of this sort, and endeavoured to show that the influence thus exerted by the male on the reproductive powers of the female is a *constitutional* one, and that it is brought about by the *fœtus in utero* INOCULATING the mother's system with the constitutional qualities of its sire inherent in it by necessary derivation from him, it may suffice to observe under this head, that among the lower animals, by reason of the promiscuous intercourse that obtains, the agency of the cause in question in modifying Mr Orton's law must be frequently in operation, and a source of error in conducting observations as to that law.

it; and at once it was admitted that previously to the owner procuring his Essex boar, the sow had been breeding with a white boar.

"Mr Storey of Hartwarren, had a brown mare which for its first foal was put to what he called a 'large, long-legged, Cleveland horse.' The produce was a brown foal. The mare was next twice served by a *black, short-legged* horse, and had two foals to him, both of which were bay, and, in Mr Storey's own words, 'large, tall, long-legged, Cleveland-looking horses.'

"Having myself a mare which I prized, I determined on breeding from her. She was grey, and was put to Wizzard, a grey horse, the produce was a brown colt. She was next served by Sheffield, a bay horse; the produce was a grey filly. She was then served by Clinty, a grey horse, and the produce was a bay colt. It is curious to observe that though grey herself, and twice served by grey horses, she only once threw the grey, and, moreover, that her foals never were the colour of the horse by which it was got, but always of the one which preceded him.

"It is remarkable that though the knowledge of this curious influence has only lately dawned upon Europe, the Asiatic seems to have been in possession of it. In Abdel Kader's celebrated letter on the Arab horse, the principle is touched upon. He states that a mare having bred with the ass is no longer fit to breed from—why, he does not say, perhaps does not himself know, but we can now easily see the reason."

In two former papers in this Journal (*ut supra*) "On the Fœtus in Utero as Inoculating the Maternal with the Peculiarities of the Paternal Organism," the author suggested whether the male parent, if tainted with the syphilitic poison, might not, through the fœtus, contaminate the female. This suggestion seems to accord with the experience of both M. Ricord and Dr Tyler Smith. M. Ricord admits that a mother may give birth to a syphilitic child without herself becoming subject to the disease; but his experience goes to prove that in the case of a woman pregnant of a child whose blood is contaminated with syphilis acquired from the father, this child may, and often actually does, contaminate the mother's system.—(See Mr Acton's work on *Syphilis*, p. 632.) And at a recent meeting of the Royal Medical and Chirurgical Society, Dr Tyler Smith is reported to have expressed himself as follows:—"With regard to the mode in which women became affected with syphilitic uterine disorder, he (Dr T. Smith) believed the most common was that in which the fœtus was the medium of communication. It often happened that men, presenting perhaps at marriage syphilitic sore throat or eruptions, impregnated healthy women, the result being a tainted ovum, which infected the mother. In some of these cases, the woman presented secondary uterine symptoms during pregnancy; in others, not until after delivery. The mildest symptoms in the father might be followed by very severe symptoms in the mother. He had observed in such cases, that at *each pregnancy* a *fresh dose* of the syphilitic poison was imparted to the mother, unless in the meantime the husband had been the subject of anti-syphilitic treatment."—See *Association Medical Journal* for July 14, 1854.

The foregoing comprises most at least of the general statements bearing on the subject referred to by Mr Orton. We may now proceed to the other illustrations given by him in support of his theory :—

(1). "The mule and hinny," says Mr Orton, "have been selected and placed first, because they afford the most conclusive evidence, and are the most familiar. Equally conclusive, though perhaps less striking instances may be drawn from other sources. Thus, it has been observed that when the ancona or other sheep are allowed to breed with common ewes, the cross is not a medium between the two breeds, but that the offspring retains in a great measure the short and twisted legs of the sire.

"Buffon made a cross between the male goat and ewe ; the resulting hybrid in all the instances, which were many, were strongly characteristic of the male parent, more particularly so in the hair and length of leg. Curious enough the number of teats in some of the cases corresponded with those of the goat.

"A cross between the male wolf and a bitch illustrates the same law ; the offspring having a markedly wolfish aspect ; skin, colour, ears, and tail. On the other hand, a cross between the dog and female wolf afforded animals much more dog-like in aspect—slouched ears and even pied in colour. If you look to the descriptions and illustrations of these two hybrids, you will perceive at a glance that the doubt arises to the mind in the case of the first, 'What genus of *wolf* is this ?' whereas in the case of the second, 'What a curious *mongrel dog !*'

(2.) "Amongst *birds* we have the same results, and they afford the like illustrations to our subject. Those who have had much to do with pigeons must have perceived that a cross between a *carrier* cock and *dragoon* hen is always a fine bird, and very nearly equal to the carrier ; whereas, a cross between a dragoon cock and carrier hen results in nothing better than a dragoon. Precisely the same may be observed in the cross between the *tumbler* and *pouter*.

"It is curious to observe, that the proposition I make regarding male influence should not only have been observed, but distinctly stated in so many words. Mr Lloyd says, 'The *capercailli* occasionally breed with the *black grouse*, and the produce are in Sweden called *racklehanen*. These partake of the leading characters of both parents, but their size and colour greatly depend upon whether they have been produced between the capercailli cock and grey hen, or *vice versa*.' (Yarrel, p. 298.) The hybrid between the pheasant and grouse is a striking illustration, showing so clearly its male parent : in almost all respects it is a pheasant, only the tail slightly shortened. It may be observed too, that the feathered feet of the grouse have disappeared in the offspring (Ibid. p. 309). Another instance of the same cross is given (p. 311), in which the general characteristics are those of the pheasant ; and this would have been still more striking if the tail had not been spread—a liberty, I suspect, either of the artist or the stuffer of the specimen. The legs in this instance are slightly feathered. Another hybrid is given (p. 313), between the *ptarmigan* and the grouse. Although the precise parentage of the bird is not stated, I am perfectly satisfied that in this case the grouse has been the male parent, and the tail indicated this, being somewhat forked and divergent. In your museum there is an interesting specimen illustrating the same law—a hybrid between the pheasant and grey hen. In this case the produce is pheasant-like in aspect, tail like the pheasant, but somewhat spread, no appearance of forking of the tail.

(3.) "Even in the breeding of *fish* the same law has been observed. Sir Anthony Carlisle produced mule fish by impregnating the spawn of the *salmon* by means of the male *trout*. The result I give in his own words :—'These mules partook of the character of the trout more than of salmon. They had bright red spots on their sides, but the black colour was shaded downward in

bars like those of the perch. The tails were not forked like those of the salmon, as I have seen them in the Thames *skeggers* (from which I infer the male salmon in that case to have been the impregnators.') We thus see in the case of fish, as in that of animals, the male parent giving the external characteristics ; those produced by the male trout had not forked tails. The skeggers, on the other hand, produced by the male salmon had forked tails."

In the course of his paper, Mr Orton adduces some special evidence in support of that part of his argument which relates to the office of the female in the work of reproduction. Admitting, as he does, that on this side of the subject the evidence is not so certain or conclusive, he gives several instances bearing chiefly on the milking, and on the nutrient and fattening qualities of the offspring, which qualities, he alleges, pass chiefly on the side of the female parent. He dwells at some length on the history of the *Short-horns*, the origin of which he conceives furnishes evidence in this direction. He refers to Mr Bakewell's Dishley sheep, as deriving and maintaining their celebrity through the ewes. And he adduces an observation which, if well founded, is of great pathological importance, and of especial interest to members of the medical profession, as well as to the directors of associations for life assurance. It is this : that diseases of the vital organs (and it may be presumed, therefore, diseases primarily involving the vital functions of nutrition and secretion) are transmitted oftener, and in a more intense form and degree on the side of the mother than that of the father. And he adds, that in the matter of life assurance, he has long been in the habit of judging of the value of a life by the family history on the female side. In perfect accordance with this position, and if well founded in their degree confirmatory of it, two observations may be cited ; the *first*, that the daughters of a woman who has herself borne a large family, are often equally prolific as their mother ; a fact, if it be one, not without interest to those to whom an heir-male of their own body is an object ; the *second*, that the daughters of mothers that have borne twins oftener than other females give birth to twins.

In connection with this branch of his subject, Mr Orton draws a distinction between a part or organ, including its vital endowments, and the *quality* of the organ and its endowments. And, while maintaining that the "outer" structures are chiefly furnished by the male parent, he equally holds that the quality of these, as of all the organs, comes mainly of the female. By quality, he obviously means what the older physiologists included under the term *vis vitæ*, or what in ordinary language is called *stamina*. It is not, for example, the special endowments of the nervous and muscular systems, the powers of contractility and nervous agency, considered *per se*, which he says are given by the female, but the quality of these as now defined, and which may be either good or bad. This allegation he illustrates by a reference to the "Short-horns," and Mr Bakewell's breed of sheep. But it will perhaps be best understood by a reference to the horse. "The Arab," he says, "will let you have his

stallion; but his mare at no price. He cultivates *endurance* and *bottom*, and the female gives them. He does not know the law we are promulgating; but he acts as if he did, for experience has taught him. The English breeder, on the other hand, values the stallion. He cultivates *speed*, and he finds that the sire gives the locomotive organs; consequently his value, just the reverse of the Arab; his mare is easily got at, but his stallion is priceless."

This distinction, if a real one, properly comes within the law of limitations, formerly spoken of, and forms an additional article of it. It is plain that it will be an additional source of difficulty and embarrassment in conducting observations as to the main law, but a means also of explaining seeming anomalies or discrepancies. Declining to give an opinion regarding it, it may be remarked in passing, that while *talent* is notoriously often hereditary in the male line, it has often been observed of individuals that have risen to distinction among their fellow-men, either by their *power* of intellect or *force* of character, that they have owed their pre-eminence to their mother.

The foregoing is a tolerably full abstract, and it is hoped a fair representation of Mr Orton's views. It would have been desirable to compare them with Mr Walker's, and to conjoin a like abstract of the facts and arguments of the latter. This we are at present unable to do. Mr Orton's own paper, however, is so well fitted to direct attention to the subject, and to give a definite bearing to scientific inquiry into it, that we would fain believe that the account now given of that paper will be not unacceptable to the profession. And submitting for their consideration some further remarks on the general subject, we will only here observe, that whether Mr Walker and Mr Orton's theory of it be correct or not, the process which they have undertaken to explain, and every minute detail of it, must be regulated by fixed law, and that the discovery of this law, if at all possible, must be reached through such observations as those founded upon by Mr Orton.

Connected with the subject of Mr Orton's paper, there are some facts and considerations not referred to by him, but in entire harmony with his theory, and which may serve both to lend support to it, and to impart to it a deeper practical interest.

1. While the fœtus is developed from that part of the ovum called by physiologists the *germinal* membrane, this membrane itself consists of *two* layers, an outer and an inner, called respectively the *serous* and the *mucous*. Of these layers, each gives origin to a special set or system of organs; the outer (or serous) to the brain, nerves, organs of sense, and integuments, and likewise to the bones and muscles; the inner (or mucous) to the lungs, glands, digestive organs, etc.

That is to say, the outer layer gives rise to the whole set of organs concerned in the strictly *animal* functions, while the inner layer gives origin to those concerned in the strictly *vital* functions. It is

scarcely necessary to remark how the very keel and foundation (so to speak) of every animal is laid down by nature in a manner which very exactly tallies with Mr Orton's position; or how the observations of the pure physiologist and those of the mere naturalist coincide!

With regard to the heart and blood-vessels, they would appear either to be the joint production of the two layers or to originate in an intermediate layer subsequently developed and called the *vascular* layer. But, however this may be, it may be remarked that the whole vascular system stands in the same relation to the vital organs and their functions that the osseous does to the muscular and to the locomotive powers,—that is, is *subordinate* to them. The vessels are mere carriers of the nutrient fluid, the blood,—mere channels of irrigation to the vital organs; not taking any other or more direct share in the vital processes,—the activity and whole character of which are determined by their own organs and the specific endowments of these.

2. It is now clearly made out as a matter of fact, by the researches of Wagner, Bischoff, and others, that in the impregnation of the mature female ovum, the essential element of the male semen (a spermatozoon) is brought into actual *contact* with the ovum; and there can be no reasonable doubt that such contact is an indispensable condition in the process.

But there is another fact of even greater importance in relation to our present subject, for which we are indebted to the late Mr Newport. The spermatozoon is not simply brought into contact with the ovum, but into the closest possible *union* and *incorporation* with it. When that contact occurs, according to Mr Newport, the spermatozoon embraces the ovum (ovule) on every side, grasping it firmly, but quickly undergoes solution and disappears; being, in fact, either absorbed by or becoming intimately blended with some part of the ovum.

Further than this, we cannot at present go. We are still ignorant of the relation which, in this act of union, obtains between the spermatozoon and the two layers of the germinal membrane that are subsequently evolved. And as the spermatozoon so quickly disappears by solution, it seems impossible that we shall ever be able to determine as to this. But as the spermatozoon comes first into contact with the *exterior* of the ovum and disappears while lying there, it seems not unreasonable to suppose that its influence while extending to the outer layer may be in a great measure confined to it. And Mr Orton's law (if a real one) would go far to establish this supposition. That layer gives origin to the "outer" structures of the animal, *i.e.*, to the nervous, osseous, and muscular systems; while, according to Mr Orton, it is the male parent that chiefly furnishes these.

So much for the facts. The following considerations seem not

unconnected both with those now stated and those adduced by Mr Orton.

First, Of the several parts composing the animal body, and of the several functions performed by it, those called by physiologists the *animal* in contradistinction to the organic or vital, are all that can properly be regarded as essential to any animal and distinctive of it. The vital organs and their functions have no other objects in the economy than the preservation and maintenance of the animal organs; their growth in the first instance, and, contingent on the tear and wear which their exercise involves (and that in a very peculiar degree), their renewal during the whole period of life. But for this, there would be no need of the vital organs and their functions —which do not differ, it may be added, in their essential nature from those of vegetables.

In short, brain, nerves, and organs of sense, bones, and muscles,—the organs and instruments of a *sentient* being, and bestowed for the purpose of establishing the relations of this being to external objects, and of investing it with more or less of voluntary power over the surrounding world—are all that properly enter into our idea of an animal. And possibly in our future state of being, in which, as Scripture teaches, we shall hunger no more, nor thirst any more, in which there will be no decay, neither disease, nor death, and in which likewise there will be neither marrying nor giving in marriage, the "incorruptible" and "glorified" body, suitably modified doubtless in adaptation as well to the absence of parts no longer needed as to the enlarged capacities and powers of its immaterial inhabitant, may consist of nothing more.

Secondly, Keeping in view what has been already said as to the origin of the external structures in the outer layer of the germinal membrane, and likewise as to these being the structures which are specifically distinctive of the animal; it may next be observed, that of each species of animal, the *male* must be regarded as the proper representative. Our great progenitor, *Adam*, was not only formed first, but lived sometime—longer perhaps than we are wont to imagine, single and alone, the sole and only representative of our race. "The head of the woman is the man;" "neither was the man created for the woman, but the woman for the man." In the reproduction of the species, accordingly, it might *à priori* be expected that the male parent should impart of his own qualities precisely those which are characteristic as well of the animal in general as of the species to which he belongs; that is, his bones and muscles, his brain and nerves, and it may be added, his own mental peculiarities.

And that the female should furnish the vital organs and give tone and character to the vital functions,—the feeding and fattening powers of the offspring, its secreting powers (*e. g.* in respect of milk), and likewise its general quality in so far as influenced or determined by the nutrient powers, we may reasonably enough suppose. Such a notion would be in keeping with what is obviously the subordinate

character of these functions, subordinate not certainly in the eye of the breeder, but in relation to the order of nature in the animal economy. Moreover, it would harmonize with what is palpably the part assigned to the female in the rearing and tending of her offspring.

Thirdly, We read in Scripture of *Levi*, yet unbegotten, being "*in the loins*" of his father. We speak of a father being *reproduced* in his son. And it is the boast of some of our nobility and old families, that they have passed through a long course of ages, in the *direct male* line.

Formerly, when the whole influence exerted by the male in the act of reproduction was supposed to be nothing more than a mere "*vivifying*" of the female ovum; when the whole virtue of the seminal fluid was thought to be a mere "*aura*," the ideas in question had no proper value. The female was presumed to bear the chief part and the essential part in the production of the offspring. In the facts before us, however, those ideas have their full significancy given to them. The male not only takes a direct share in the production of his offspring, but actually contributes that part which constitutes his own proper self; stamping his offspring at the same time with his own proper image and superscription.

What gives special value to the notion of descent in the male line is, that though the daughter equally with the son represents their common father, her children do not. Her brother's children do. But her's must be looked upon as representing mainly her husband's house and line, whose name accordingly they bear. Yet in "leaving" her father's house and "joining" herself to another, while she is but following the order and appointment of nature, she has her reward. Not only are her interests identified with her husband's and her affections transferred to him, but she becomes "bone of his bone, and flesh of his flesh,"—the two being "no more twain but one flesh."

And what if these expressions have a deeper meaning than at first appears? What if they be physiologically as well as figuratively true? For, according to Mr M'Gillavray,[1] through the offspring, and by them while *in utero*, the woman comes to be *inoculated* with those of her husband's qualities that are inherent in them, and were imparted to them in the act of impregnation,—so inoculated, that is to say, with those qualities as to be able herself to impart them to offspring she may subsequently have by another husband; while, according to Mr Orton, the qualities which the husband thus imparts, are his locomotive, *i. e.* his *bones* and his *flesh*. And to carry this speculation only one step further,—what if, as unquestionably he can to his offspring, what if the husband can thus and through them impart to his better-self of his own *mental* attributes, and thus there be engendered a blending of heart and mind, in a sense altogether

[1] See papers by the author, in the "Monthly Journal of Medical Science" for Oct. 1849, and September 1850, "On the Fœtus in Utero, as inoculating the maternal with the peculiarities of the paternal organism."

special and in a way otherwise impossible? It is a common observation at least, that husband and wife come to resemble each other not only in face and feature, but in sentiment and feeling.

As for these speculations, however, *valeant quantum valeant.* If they cannot be received as established truths, they may, peradventure, be taken as "guesses at truth;"—bearing in mind as we ever ought, that "there are more things in heaven and earth" than either our microscopes, or our balances, or our re-agents can give account of,—or even than is yet "dreamt of in our philosophy."

SOUTHAMPTON, July 1854.

APPENDIX.

WHILST this reprint is passing through the press, the author has received, and is kindly permitted to publish, the following interesting communication from Dr GEORGE WILSON, M.D., F.R.S.E, Lecturer on Chemistry, Edinburgh, and author of the "Life of Dr John Reid," and of the "Life and Works of the Hon. Henry Cavendish," etc. etc.

"Edinburgh, August 7, 1854.

"DEAR SIR,—I make no apology for troubling you with a note in reference to the very curious subject on which you have a paper in the last number of the *Monthly Medical Journal.* It has struck me that the following facts might be interesting to you and to Mr Orton, as well as my old pupil, Mr M'Gillavray.

"You are probably aware that there exists in the Isle of Man a breed of cats, now becoming scarce, characterized by the absence of a tail. In compensation for this they have much longer hind-legs than ordinary cats, in accordance with the law pointed out by Geoffroy St Hilaire, or some other of the foreign so-called transcendental anatomists, viz., that there is a balance or equipoise of organs in every species, so that if an aberrant variety wants one characteristic organ of the species from which it has strayed, some other organ or organs are over-developed to atone for this. In the 'Manx' cats the missing tail appears in the long hind-legs; and the general appearance of the creature is like that of the hare or rabbit. They are never very large, but they are abundantly active, excellent runners and leapers, and though far from handsome, as cats are counted handsome, amusing companions, from their odd

motions and the singular postures they assume when at rest. For such inquiries as you are pursuing, they seem peculiarly suited, and I shall now mention some points connected with their breeding which may be of interest to you.

"Some years ago a friend brought me from Liverpool a female Manx cat. She was of small size, black, very gentle, sagacious, and docile, and soon became a great pet. I had her in my possession two or three years, during which time she had three litters of kittens. The male parents of these were doubtless cats of the ordinary breed; for, besides that there were no Manx tom-cats in my neighbourhood, all the kittens *had tails*. These were short, odd-looking appendages in most of the animals; in one the tail curled like a greyhound's, and in all it had the character of an imperfect organ, over which its possessor had little power. Some of the females of this semi-tailed breed grew up, and their kittens by tailed cats would not have been distinguished by an ordinary observer from those of the common cat.

"I regret that I did not pay more attention to the relative length of the limbs and other points in the configuration of those kittens. But I had no special motive for watching them, such as I should in similar circumstances feel now. However, the fact, you will perceive, was decisively ascertained, viz., that the female parent being tail-less, and the male parent tailed, the kittens all had tails, such as they were.

"Well; two years ago, I got a male Manx kitten, which has grown up to be a strong tom-cat, and is at present in my possession. He is red, rough-haired, a most successful mouser and bird-catcher, and when on his legs a very active though awkward looking fellow. His days are spent chiefly in sleeping; his nights in marauding through the neighbouring fields and gardens, and in gambolling or fighting with the cats about the adjoining houses.

"Two days ago I incidentally learned that a female cat in a garden adjoining mine, with which my cat had often been seen frisking, had recently had kittens, and on making inquiry regarding their appearance, I learned that the litter consisted of eight, *five* of which had no tails, and were in consequence (much to my annoyance) drowned incontinently; the other three are described as resembling their mother, who is a large, handsome, brindled cat, such as would be called a tortoiseshell if the colours (black and red) were mottled together, instead of being arranged in irregular stripes.

"I further learned that on a previous recent occasion, this cat had nine kittens, of which *eight* were tail-less; and on an earlier occasion six kittens, of which *four* were tail-less; so that altogether of twenty-three kittens, seventeen were without tails, and six had them. These have all been born since my cat came here about a year ago. Before his arrival their mother had had kittens, doubtless to a cat like herself, for they were fully equipped with tails. Unfortunately, my neighbours regarding cats without tails as very ugly

things, have uniformly drowned them without letting us know of their birth, so that I can give you far less information than I could wish on the matter.

"You will see, however, from the facts communicated, that where the Manx cat was the mother, the kittens had tails of a sort; where the Manx cat was the father, three-fourths of the kittens had no tails. I may add, that the mother of these is a larger and more powerful cat than the male, and has an ample tail. You will notice that she had kittens by a common cat, before having any by the Manx one; you will mark, also, with interest, that in her first litter by the latter there were two out of six kittens with tails, which, I suppose you, and Mr Orton, and Mr M'Gillavray, would be inclined to refer to the influence of the previous male parent; and this conclusion would be borne out by the condition of the second litter by the Manx cat, where of nine kittens only one had a tail: but in the third litter of eight, three had tails. It is, of course, quite possible that the female had intercourse with other cats than mine.

"Our neighbours have kept one of the tailed kittens of the last litter, and I shall examine it when fuller grown as to its resemblance to its parents. If you will indicate any points as of special importance I will look to them.[1] It has been promised also that if there be another litter of tail-less cats, some of them shall be kept.

"I should mention that there are, or were, Manx cats in our Zoological Gardens here. By writing Dr Dumbreck you might learn about their breeding something interesting.

"I got my last Manx cat from a clergyman near Montrose, who has a great assortment of cats. If you would like to communicate with him, I shall endeavour to procure his exact address.

"I remain, yours truly,

"GEORGE WILSON.

"ALEXANDER HARVEY, Esq., M.D."

[1] The main points may be said to be, 1. Colour; 2. Size and conformation, particularly in respect of the tail and hind-legs; and, 3. Mental peculiarities and habits.—A. H.