Passive and Deformed? Did Aristotle Really Say This?

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Belief in the passivity of the female survives few honeymoons, and would appear to be largely confined to people of celibate life and retiring disposition who do not visit supermarkets and have little opportunity to note the skilled use of what the French appositely call *un chariot*. Aristotle was not long married — happily, it would seem — when he wrote his biological works, and if he says that in the act of reproduction 'the male is the active partner and the female *qua* female is the passive one'[1], he goes on to remark more discreetly that 'that which acts, is acted upon in return'. Indeed, 'sometimes the extent to which it gets acted upon is greater than that to which it acts'.[2] Quite so. *Horresco referens*, the male may on occasion be 'mastered'[3] and then a female is born, one, to boot, taking after her mother.[4] All of which suggests that Aristotle's beliefs are not to be summarised in the simple schema: 'female passive, male active'. The seemingly absolute assertion is attenuated when set in context.

The same applies to the much-cited statement 'the female is as it were a deformed male'.[5] One can appreciate the anger this phrase can cause when it is taken to encapsulate Aristotle's metaphysical and ethical understanding of Woman. Phrases, however, have contexts, and this phrase occurs in a work on biology. A little reading of this biology shows that Aristotle also says that that elegant and beautiful creature, the seal, is 'deformed'.[6] (He uses the exact word he uses of the female: *peperomenon*). The reader may wish to pause and wonder in what way the seal is 'deformed'. Because of its curious feet? Not at all. Aristotle knows about its feet, and simply remarks that they are stunted.[7] He thinks the seal is 'deformed' because it has no ears. Again the reader might wish to reflect: who, looking at seals, has ever thought "Poor deformed creatures! No ears!"? The puzzle deepens when Aristotle goes on to remark how clever Nature has been in producing this 'deformity', for the very lack of ears, he thinks, means that the seal's underwater hearing is all the more acute.[8] So a 'deformity' in Aristotle's biology can

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be both natural and advantageous. Obviously, the full meaning of *peperomenon* is not well conveyed by the English 'deformed'.

One's curiosity is further aroused when one finds that the word was not translated as 'deformed' by medieval scholars. Michael Scot (working from the Arabic) says *occasionatus*, which simply means 'indirectly caused'. (This was the version accepted by Albert the Great[9] and Thomas Aquinas.[10]) The greatest of the medieval translators, William of Moerbeke, writes *orbatus*,[11] which primarily means 'orphaned' and hence 'to lack'. For example, *orbatus oculis* means 'lacking sight'. A child born blind would scarcely be called 'deformed' or 'mutilated'.

If one looks more closely at the Greek, yet another if minor curiosity emerges. Aristotle commonly puts the female first, writing 'female and male' rather than 'male and female'. This may be no more significant than the fact that Dubliners breakfast on bacon and egg and Londoners on egg and bacon. Yet why, one wonders, do recent translators invert the order? 'The principles of generation', writes Aristotle, 'are the female and the male'.[12] 'The male and female principles', translates Platt, 'may be put down first and foremost as the principles of generation'. 'The sperm', writes Aristotle, 'comes from the female and the male'.[13] 'The semen itself', translates Peck, 'is secreted from the male and the female'. This shows a perhaps excessive respect for grammatical usage. Did not Wolsey lose his Chancellorship for writing *Ego et rex meus*? It is an inversion that Moerbeke does not make: *femella et masculus*, he writes.

But the main fact to note is that the phrase occurs in Aristotle's biological writings, and only in those writings. It does not come from his *Metaphysics*, the work in which he discusses general philosophical issues, nor from his *Ethics*, in which he discusses the relations between human beings, including the relations between husband and wife. It is a technical phrase used in a technical context, and to give it an overarching meaning is rather like arguing that when modern genetics speaks of 'dominance and recessivity', it is talking psychology or politics.

To understand the phrase correctly, account must be taken of Aristotle's biology, of his understanding of the Natural World. It is a world dissonant with modern physical science, yet consonant with our normal language when we speak of the world of living things. I am indebted to Herbert McCabe for the perceptive remark that if one asks today to be shown 'a thing', one will likely be shown a stone, but had one asked in medieval (and hence Aristotelean) times, one might well have been shown a horse.[14] For those in thrall to Descartes, the real

world is the world of atoms in senseless motion, a world therefore that is itself senseless. For Aristoteleans the angels keep their ancient places, turn but a stone and start a wing,[15] and living things are the most real entities that we encounter. For Descartes a living thing is nothing but a machine — if it is a human living thing, then a machine with a soul added. For Aristotle the lowliest living creature is more wondrous than the most complex of machines. 'Purpose and Beauty', he writes, 'are more fully present in the works of Nature than in the works of human hand'.[16] The Cartesian Pascal would say 'Le silence éternel de ces espaces infinis m'effraie'.[17] The Aristotelean Dante — famously he called him 'Il maestro di color che sanno'[18] — would write of 'L'amor che muove il sole e l'altre stelle'.[19]

Aristotle, in other words, sets the living above the physical, and that, surely, is consonant with our everyday feelings. He himself is deeply in love with the living world. One must quote at length from his magnificent protreptic with which he begins his account of this world:

> We must now speak of animals and their Nature. So far as in us lies, we will not leave out any one of them, be it ever so mean; for though there are animals which have no attractiveness for the senses, yet for the eye of science, for the student who is naturally of a philosophic spirit and can discern the causes of things, Nature which fashioned them provides joys which cannot be measured.... We must not betake ourselves to the consideration of the meaner animals with a bad grace, as though we were children; since in all natural things there is something of the marvellous. There is a story which tells how some visitors once wished to meet Heracleitus, and when they entered and saw him in the kitchen, warming himself at the stove, they hesitated; but Heracleitus said: 'Come in; don't be afraid; there are gods even here.' In like manner, we ought not to hesitate or be abashed, but boldly enter on our researches concerning animals of every sort and kind, knowing that in not one of them is Nature or Beauty lacking.[20]

This is not written by someone who believes that a full half of a species, animal or human, is 'deformed'.

He is as good as his word. His curiosity extends to the sexual congress of hedgehogs ('they must of necessity accomplish their copulation quickly'[21] — *c'est un amour piquant, quand même*) and to the entangled, if that is the word, love-life of the octopus — he discusses the possible hectocotylisation[22] of one of its arms. He often knows more than do contemporary critics. Platt translates him as saying 'mutilated parents produce mutilated offspring'[23] and comments that 'modern science simply denies the fact *in toto*'. Yet 'congenital amputation' is a

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recognised condition, common in pigs and cattle.[24] Ranke-Heinemann derides[25] his belief that environment plays a part in sex-determination, but it is now firmly established that in, say, the Mississippi alligator — an animal for which one might expect her to have a sisterly sympathy — the sex of offspring is determined by the temperature at which the eggs are incubated.[26] Environmental factors affect sex-determination in many lower species, and it is foolish to deride the idea that they operate in mammals.[27] We know so little.

To return to Aristotle. He loves Nature, and it is his most basic maxim that Nature acts for the best. In the works of Nature purpose and not accident is predominant.[28] Nature is a potter,[29] a painter,[30] a cook,[31] a housekeeper.[32] Nature does nothing which lacks purpose.[33] Nature does nothing which is superfluous.[34] These, he claims, are not a priori principles:

> The assumption we make—and it is an assumption founded upon what we observe—is that Nature does not make mistakes and does nothing idly.[35]

Purpose, we have already seen, is more fully present in the works of Nature than in the works of human hands.[36] It is however important to notice that for Aristotle biological purpose is not of the "Nature-made-grass-so-that-cattle-may-eat-it" variety so often attributed to him. His is, to quote the great Marshall, a 'doctrine of internal finality (that is to say, that each individual, or at any rate each species, is made for itself, that all its parts conspire for the greatest good of the whole, and are intelligently organised in view of that end, but without regard for other organisms or kinds of organisms)'.[37] Marshall goes on to say that the doctrine of external finality, according to which living beings are ordered in regard to one another, has never gained acceptance among scientific philosophers and that there is indeed no good evidence that Aristotle ever adopted it. (Which did not spare him much mockery at the hands of the villainous Bacon.).

It may be useful to cite an example of Aristotle's 'internal finality':

> Animals which use their mouths for feeding, respiration and speaking have rather narrow mouths, while those that use them for self-defence have wide and gaping mouths. All the saw-toothed creatures have these wide mouths, for their method of attack is biting, and so they find it an advantage to have a mouth that will open wide; for the wider it opens the greater the space the bite will enclose and the greater the number of teeth will be brought into action. Biting and carnivorous fishes have mouths of this sort; in the non-carnivorous ones, it is on a tapering snout, and this suits their habits, whereas a gaping mouth would be useless.[33]

This, of course, is the sort of material found in any modern text of biology under the name of 'adaptation'.

The fact that Nature acts for a purpose does not mean that mechanisms are not required to achieve that purpose. Even in so manifestly purposeful a process as the growth of an embryo, mechanisms are present: the growth of the embryo is like that of the wonder-puppets beloved of the Greeks, in which one part moved another and that the next and that the next...[39] In holding for final causes, Aristotle never doubts the need for efficient causes. Of this, more below.

Aristotle's understanding of efficient or mechanical causality leads to a distinction that is central to his biology. 'Everything which Nature does, it does either because it is necessary or else because it is *for the better* [i.e., for a purpose]'.[40] Mechanisms do indeed act to achieve purposes, but in so doing they often produce outcomes or effects which lack purpose. For instance, the process of digestion produces blood [i.e. nourishing substances] from food, but it also produces materials which lack purpose and are excreted from the body. The first line of action takes place 'on account of what is *better*, i.e., on account of the final cause (the Cause for the sake of which)'; the second takes places 'from necessity'.[41]

Now, to quote Peck, 'Aristotle is continually drawing our attention to the adroitness of Nature in employing the results of this latter sort of Necessity in order to serve her *purpose*, in order to achieve her *end*' .[42] For example, the eggs of fish grow of *necessity* because they contain yeast, but they also grow *for the sake of what is better*, since it is impossible for them to obtain all their growth in the uterus owing to the prolific habit of these animals.[43]

This is a line of thought which we today readily apply to the relations between parts of the Natural World. We note with interest how the waste products of cattle are the food of the dung-beetle, and how its work removes the cow-pats and allows the grass to grow again, now nourished by the leaching of the dung. Aristotle, peculiarly, is little interested in these external relationships, but highly interested in the internal relations within an individual animal or species. For instance:

> Serpents have this peculiarity: they can turn their heads backwards while the rest of the body remains still. The reason is that their body (like an insect's) can roll up: the vertebrae are cartilaginous and flexible. This then is the *necessary* cause why they have this ability; but it serves a *good purpose* too for it enables them to guard against attacks from the rear.[44]

All this indicates that for Aristotle a particular process may have produced something by necessity — we might say 'accidentally' or

'incidentally' — and so, narrowly seen, 'without purpose', when from a wider perspective one can see that *Nature* has produced it 'for a purpose'. He applies this principle specifically to the production of the male and female:

> As for the reason why a particular [embryo] comes to be formed, and is, male, and another female, (a) in so far as this is *from necessity* (*ek anagkes*), i.e., from the proximate motive cause and from what sort of matter, our argument as it proceeds must endeavour to explain; (b) in so far as this occurs *on account of what is better* (*dia to beltion*), i.e., on account of the final cause (the Cause 'for the sake of which'), the explanation is derived from the upper cosmos.[45]

This, Peck explains, means that both male and female derive via the 'heavens' from the Unmoved Mover. As we shall see later, the female may be produced *by necessity* so far as the proximate efficient cause (the male semen) is concerned, but this does not imply that the female is any less derived from 'the heavens', any less produced '*on account of what is better*' than is the male.

The point must be stressed. The Unmoved Mover, the supreme and ultimate cause, equally produces male and female. Manifestly it does not produce what is defective, either female or male. That is what is 'metaphysically' important. The details of reproduction matter less.

One can take a modern illustration. So far as we know, it is a matter of chance whether on any particular occasion, a male child or a female child is conceived. That appears to be a biological fact. But this fact offers no grounds for the 'philosophical' assertion that human existence is the outcome of chance. Similarly, what Aristotle has to say about the biology of the conception of male and female affords no grounds for attributing to him 'philosophical' distinctions between them.

It may be useful to expand a little on Aristotle's theory of causes (or 'causal factors' or 'explanatory factors' or 'reasons' — one despairs of finding an exact translation). His work *The Generation of Animals* begins and ends with a discussion of this theory, which is thus manifestly important for all that lies between.

He writes:

> As we know, there are four basic causes: (1) that for the sake of which the thing exists, considered as its 'End'; (2) the *logos* of the thing's essence (really these first two should be taken as being almost one and the same); (3) the matter of the thing, and (4) that from which comes the principle of the thing's movement.[46]

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Peck provides the following illustration.[47] Suppose the thing to be explained is a dog: then these are the four causes:

> (1) The Motive Cause [the Efficient Cause]: the male parent which supplies the 'movement' that sets the process of development going.
> (2) The Material Cause: the menstrual fluid, the nourishment supplied by the mother, and other nourishment taken after birth.
> (3) The Formal Cause [the *logos*]: the embryo, and the puppy as it grew into a dog, following a process of development which had the special character proper to dogs.
> (4) The Final Cause: the end towards which the process was directed, that is, the perfect and full-grown dog. [Again, the *logos*.]

(The chronological order of the causes is different from their logical order).

Now for many today the important cause, indeed the only real cause, is the Motive or Efficient Cause. For Aristotle the important cause is the Final Cause. He writes:

> Anaxagoras asserts that it is the possession of hands that makes the human being the most intelligent of animals; but surely the reasonable point of view is that it is because he is the most intelligent animal that he has got hands. Hands are an instrument; and Nature, like a sensible human being, always assigns an organ to the animal that can use it ... thus Nature has provided that which is less, as an addition to that which is greater; not *vice versa*. We may conclude, then, that if this is the *better* way, and if Nature always does the *best* she can in the circumstances, it is not true to say that the human being is the most intelligent animal because he possesses hands, but he has hands because he is the most intelligent animal.[48]

This implies that a thing is to be evaluated in terms of what it is, or of what it has come to be — of its *logos* — not in terms of the mechanism that has produced it. Mushrooms are evaluated in terms of their taste and flavour, not in terms of the dung on which they grew, and a diner who returned them to the chef on learning of their origin would assuredly be adjudged squeamish. A maid however fair who rejects her swain's gift of flowers because they were grown on manured ground is likely to experience a dearth of suitors. (There can be a falseness in our ordinary language here. We speak of a *mongrel* dog, *cross-bred* cattle and *hybrid* plants, yet these are genetically the same. Geneticists rightly talk of hybrid vigour, and if a mongrel dog guards our children well, shall we despise it?)

One must particularly note Aristotle's assertion that a thing's *logos*

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or formal cause and its End, what it finally comes to be, are almost identical.[49] *Logos* is perhaps best translated in biology as 'what a thing is meant to be'. It is in terms of its *logos* that we adjudge a thing to be 'perfect' or 'imperfect', 'complete' or 'incomplete'. A cat is meant to hear, and we adjudge a kitten born deaf to be 'imperfect'. It is not meant to have horns, and one cannot return a purchased kitten to the vendor on the grounds that it hornless. Someone buying a parrot, John Cleese famously pointed out, expects it to be a living parrot. To be alive is part of the *logos* of a parrot.

It is within the context of these ideas — and only within that context — that we can seek to understand Aristotle's theory of animal reproduction. It is as distant from Platonism as can be imagined. After all, was Plato's horse a mare or stallion? Did it whinny when its mate approached? For Aristotle in contrast the world of procreating things is not a shadow but a full reality.

One must quote Peck:

> It may, I think, be justly claimed that in this treatise [*Generation of Animals*] Aristotle's thought is to be seen integrated as it is nowhere else; for in reproduction, as understood by Aristotle, not only the individual is concerned but the cosmos at large: it is a business in which the powers of the universe are concentrated and united; and it is the means whereby that eternity, with which, if he could have done it, God would have filled the whole creation from one end to the other, is attained so far as is possible by the creatures that are subject to decay; indeed, these very beings, animals and plants, have in Aristotle's view the best claim to the title of 'being' (*ousia*), a much better claim than the lifeless things out of which they are composed, or the objects made by human art; and therefore they merit to an exceptional degree the attention of the student of reality.[50]

(It is indeed curious that nowadays these writings little attract philosophers. Albert the Great, it may be noted, wrote an extended paraphrase of them,[51] and Aquinas, while he wrote no explicit commentary, cites them, by my reckoning, not fewer that 16 times, often giving chapter and verse.[52])

Reproduction is important to Aristotle because it fulfils the purposes of the heavens by maintaining species in existence. Individual animals die, and reproduction is necessary so that the species may survive. This is indeed akin to our own concern that species may not 'die out'. On the other hand, he sees the individual living creature as the End of reproduction, not reproduction as the End of the individual. It is not as

with Samuel Butler where 'a hen is Nature's way of producing another egg'. Even though

> plants have no other evident function than to make one another like themselves...and similarly in certain animals too one can grasp no other function besides generation...As soon as sensation is added their lives differ both in regard to mating, because of the pleasure, and in regard to the birth and rearing of the young.[53]

But while he thinks that the existence of male and female is due to the heavens, he has no *a priori* commitment to the view that all reproduction depends on the interaction of male and female. He is aware that in many species reproduction is asexual,[54] and even for groups, such as fishes, which normally reproduce sexually, he is undisturbed by the knowledge that some reproduce asexually.[55] He is much taken with reproduction in bees, and concludes that what he calls 'masters' and we call 'queens' produce, without copulation, both themselves and the drones, while the 'honey-bees' (the 'workers') reproduce themselves alone.[56] He has no *a priori* commitment to the belief that reproduction requires active and passive partners. If it often does involve such partners, that is a matter of fact, not a matter of metaphysical necessity. His approach is highly empirical. What he says of bees, expresses his general attitude:

> The facts have not been sufficiently ascertained; and if, at any future time they are ascertained, then credence must be given to the direct evidence of the senses more than to theories — and also to theories provided that the results which they show agree with what is observed.[57]

His theory of reproduction, it should now be clear, is not derived from a metaphysics of 'the active' and 'the passive', but from what he has observed.

He has however no appreciation of the biological reasons for sexual reproduction — for that it was necessary to wait for Darwin. He sees that in plants there is a beginning of sexuality, in that parts are found which are called male and female 'by way of similarity and analogy'.[58] He believes that the sexual parts are found, one set in one individual, one in another, (that is, there are separate sexes) in animals that have sensation and can move around, and he seems to think that this is to allow them to have a fuller experience of life.[59] In other words, he seems to think that the males and females are separate so that they can escape from sex and get on with other things. That is certainly the interpretation of Aquinas, who argues that God made the male and

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female to be distinct so that both, Man *and* Woman, might devote themselves primarily to the life of the mind.[60] They do indeed come together for the purpose of reproduction, but one must add that for both Aristotle[61] and Aquinas the coming together of husband and wife is not merely for that purpose. It is rather meant to be what Aquinas calls a *socialis coniunctio*[62] in which there should reign the most complete friendship.[63]

He is however aware of the questions that have to be dealt with in any serious theory of sexual reproduction: (1) why offspring resemble their parents; (2) why they are not replicas of them; (3) why males and females are produced; and (4) why some offspring, though few, are congenitally abnormal.[64]

He begins by defining male and female: 'by a male animal we mean one which generates in another, by female, one which generates in itself'. Moreover — a supremely important remark — each has a *logos*, that is to say, each is something which it is meant to be. They differ in their *logos*, because the male is that which has the power to generate in another, while the female is that which has the power to generate in itself.[65] Each, it should be noted, has a power: Aristotle does *not* think that only the male has the power of generation.

Yet since male and female have distinct powers, it is necessary that for purposes of copulation and creation, there should be certain parts — 'the uterus, the regions about the testes and the penis' — in respect of which the female will differ from the male.[66] Nevertheless he stresses that 'even if "male" and "female" are used as epithets, a thing is not male or female in respect of the whole of itself, but only in respect of a particular faculty and a particular part'[67]. In other words, male and female are basically identical, and differ only in a particular respect.

Now if the the organs have been determined, what is the reproductive substance? It is the semen (*sperma*) — a term he often applies equally to the male and female reproductive substances:

> Although the things that are formed in the course of Nature no doubt take their rise out of the semen, we must not fail to notice how the semen itself is formed from the female and the male, since it is because this part is secreted from the female and the male, and because its secretion takes place in them [the female] and out of them [the male], that the female and the male are the principles of generation.[68]

Aristotle later goes on to distinguish between the female and male semen: this should not conceal the fact that they are basically the same.

It had been held by some of his predecessors that the semen has

generative power because it contains a *homunculus* — a miniature replica of an adult. (This, it may be noted, was a view that was still held by some in the 18th century.) Aristotle argues rather that the semen is condensed or concentrated blood, and this for the following reasons. All the parts of the body of an adult were, when it was in the embryonic stage, produced from blood,[69] and in adult life they continue to be sustained and nourished by blood. Blood, therefore, contains the entire body potentially, and concentrated blood contains the body in a way that is closer to actuality. (To take an illustration: the ingredients in the recipe, contain a cake potentially; the cake-mix still contains it only potentially, but is closer to the actuality or reality.) This condensation of the blood yields, in the male, the semen in narrow sense, and in the female, an especially pure form of blood found amidst the other blood which will later be released as menses.[70]

The only difference between the semen and this special blood is that the former is more condensed. The special blood, no less than the semen, 'contains all of the parts of the body potentially, though none in actuality; and "all" includes those parts which distinguish the two sexes'.[71] In other words, the female element contains everything that is needed to produce a male body. (One begins to see why Aristotle's theory of conception attracted Aquinas when he was dealing with the Incarnation of the Word.[72] On Aristotle's theory, a woman accepts no physical contribution from a man when she becomes a mother. The fact therefore that Jesus had no physical father did not make him less human. In a sense, for Aristotle no one has a physical father, that is, one whose substance comes to form part of the child's substance.)

Now the male semen is manifestly smaller in volume than the uterine blood. Aristotle concludes that the semen is more condensed than is this blood. Since the work of concentration requires heat — this is not temperature but what we would call metabolic energy — Aristotle concludes that the male has more 'heat' than the female. It should be noted that Aristotle does not begin from the supposition that the male has more 'heat' than the female: he concludes to it from the empirical fact that the male reproductive substance is of lower volume than the female substance.

The question now arises of the mode of action between the male and female substances. One might think of mixture, but Aristotle has little time for mixtures, which only postpone the problem of what happens when the twain are mixed. Rather, he thinks that the action of the semen is like that of what today we call an enzyme — a word the use of which will be shortly justified.

> The action of the semen of the male in 'setting' the female's secretion in the uterus is similar to that of rennet upon milk. Rennet is milk which contains vital heat, as semen does, and this integrates the homogeneous substance and makes it 'set'. As the nature of milk and the menstrual fluid is one and the same, the action of the semen upon the substance of the menstrual fluid is that of rennet upon milk. Thus when the 'setting', is effected, i.e., when the bulky portion 'sets', the fluid portion comes off; and as the earthy portion solidifies, membranes form all around its outer surface.[73]

Now while the semen acts upon the menstrual fluid and 'sets' it, it does not become part of the embryo:

> It is plain that there is no need for any substance to pass from the male; and if it does pass, this does not mean that the offspring is formed from it as from something situated within itself during the process, but as from that which has imparted movement to it, or that which is its 'form'.[74]

Once the semen has acted, a complex process begins within the *conceptum*:

> The semen has within itself the movement which the generator sets going. It is possible that A should move B, and B move C, and that the process should be like that of the miraculous automatic puppets; the parts of these automata, even while at rest, have in them somehow or other a *potentiality*, and when some external agency sets the first part in movement, then immediately the adjacent part comes to be in *actuality*.[75]

Needham in his *History of Embryology* writes that 'these remarkable passages contain the first reference to enzyme action ever made in a discussion in embryology'[76] and since Needham was by training a biochemist, and an FRS to boot, he writes on enzymes with authority. For an enzyme precipitates a chemical process without itself becoming part of the output of that process. This, in essence, is what, on Aristotle's theory, the semen does.

Aristotle expresses the relation between the male and female elements in a number of ways. He talks of form and matter: 'the female always provides the material, the male provides that which fashions the material into shape'.[77] By matter, of course, Aristotle does not understand primitive and unformed matter, like putty or plasticine. Matter and form are relative terms, and what is matter in one relationship may be form in another:

> For animals the matter of them is their parts: the nonuniform parts [e.g., the eye] are the matter for the animal as a whole in each case; the uniform parts [e.g., the blood] are the matter for the non-uniform parts; and the corporeal elements [e.g., earth] are the matter for the uniform parts.[78]

The matter contributed by the female is not any matter: it is highly formed matter, it is the result of a process of concentration of blood. It is structured as are the wonder-puppets — more wonderfully indeed than they are, for Nature, it will be recalled, surpasses Art. As we have seen, it already contains all the parts of the body potentially, including the parts that distinguish the sexes.

Not only that. Since the *conceptum*

> is already an animal potentially, though an imperfect one, it must get its nourishment from elsewhere; and that is why it makes use of the uterus, i.e. of the mother, in order to get its nourishment from elsewhere...That is why too Nature produces first of all the two blood vessels that run from the heart [of the *conceptum*]; and attached to these are some small blood vessels which run to the uterus, forming what is known as the umbilicus.[79]

Thus the mother supplies blood to the heart of the embryo, and from the blood produced by *its* heart, the other parts of the body are formed.

So it is true that Aristotle sees the male matter as active and the female matter as passive in the act of fertilisation [male viewpoint] or conception [female viewpoint], but this is not to say that he sees the female as passive in the entire process of reproduction. In any case, he is not talking about the interaction between the male and the female as wholes (as animals, as people), but about the interaction between the male and female productive materials. Aristotle is simply saying that the male impregnates the female, and while this may express things from the male rather than the female standpoint, there is no more to it that. He has no doubt of the importance of the female contribution, and indeed page after page is filled with his account of the development of the embryo.[80]

It may be asked how the male and female materials differ. The male semen, it has been seen, is more condensed or concentrated than the female material. Yet this latter, even before it receives the semen, is alive: he instances unfertilised eggs, which are not on a par with wood and stone, because they go bad, yet are not the same as fertilised eggs. He concludes that they have the first level of life, nutritive life, which means (roughly) vegetative or plant life. An animal possesses sense-perception and sentient Soul. This, he thinks, is contained in the male

semen and is communicated to the female material.[81]

Aristotle does not see conception as a purely physical process. Ultimately it is caused by the 'heavens' and semen contains a 'substance analogous to the element which belongs to the stars'.[82] When it comes to human conception the question is even more difficult:

> It is a very great puzzle to answer another question, concerning Reason. At what moment, and in what manner, do these creatures which have the principle of Reason acquire their share in it, and where does it come from?[83]

He answers:

> Reason enters in as an additional factor from outside, because physical activity has nothing whatever to do with the activity of Reason.[84]

(One may note that Aristotle makes no distinction here between male and female.)

So much for reproduction in general. We must now turn to the likenesses and unlikenesses between parents and children, and to the likeness and unlikeness that lie in being male or female.

Since the male semen is active, Aristotle takes for granted that its natural tendency is to produce a child that is the replica of the father. Fire tends to make other things hot, ice to make them cold. As the scholastics would later say, *omne agens agit sibi simile* — everything that acts tends to make other things to be as it (the agent) is. In an 'ideal' world, the resulting similarity would be total. In the real world, this is not achieved. In an 'ideal' world cold water will reduce a bottle of wine to its own temperature, in the real world the wine will slightly heat the water, and the resulting temperature will be slightly higher than the original temperature of the water. As Aristotle says (and we have seen before), 'that which acts, is acted upon in return'. If one throws a drop of water on a hot electric plate, the water will indeed cool the plate, but will itself be turned into steam. 'Sometimes', writes Aristotle, 'the extent to which it gets acted upon is greater than that to which it acts'.[85] The difference between the ideal and the real world is, in Aristotelean thought, attributed to matter 'overcoming' form.

Now for these reasons, a child is never a replica of its father or mother. It may differ in sex, and it may differ in how far it resembles its parents. Aristotle has quite distinct accounts of what causes these (different) differences. He distinguishes between 'departing from type and changing over' (*eksistasthai kai metaballein*) and 'relapsing'

(*yesthai*). Peck describes the difference between these two processes as follows:

> The result of the former process is that the embryo acquires a characteristic opposite to that of the original movement...the result of the latter process is that the embryo acquires a characteristic which belonged to one of its ancestors.

In the first process the embryo 'passes not into any casual thing, but into its own opposite':[87] what was meant by the male semen to be a male embryo becomes a female embryo. It does not pass into any casual thing, something meaningless or accidental that is, because, as we have seen, the female has a *logos* — there is something it is meant to be. In the second process the offspring differs along a continuous scale from its father, and resembles its mother along a similarly continuous scale.

Aristotle accounts for the two processes as follows:

> The reason why relapsing occurs is that the agent in its turn gets acted upon by that on which it acts (e.g., a thing which cuts gets blunted by the thing which is cut, and a thing which heats gets cooled by the thing which is heated ... sometimes the extent to which it is acted upon is greater than that to which it is acting.[88]

He goes on:

> The reason why that which is acted upon departs from type rather than gets mastered is either (a) deficient potency in the heating and motive agent [the male semen], or (b) the bulk and coldness of that which is being heated and fashioned [the female material].[89]

So a female has 'departed from type', and that that departure is due to lack of heat in the male or an excess of cold in the female. Now this undoubtedly means that there is a failure or weakness in the process, and the outcome — the female — does lack something it would otherwise have: heat in the measure in which the male has it. It is a deviation (*anaperia*) so far as the proximate process of production is concerned.

Yet from a wider perspective, it is one 'one which occurs in the ordinary course of Nature'[90] and is intended by Nature, 'since the race of creatures which are separated into male and female has got to be kept in being'.[91] Now this returns us to the distinction between the efficient cause of a thing and its final cause.[92] The efficient cause of the female has a weakness, but the final cause intended by Nature has been achieved and the female itself has achieved its *logos*, — it is what it is meant to be.

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Moreover, seen in the wider context of Nature, the female proceeds via the 'heavens' from the Unmoved Mover. It is worth while repeating the crucial passage:

> As I have already said, the female and the male [his order] are the principles of generation, and I have also said what is their power [to generate in itself, to generate in another] and what is the *logos* of their essence. As for the reason why some are formed to be female and others male, (a) in so far as this results from necessity, our argument must endeavour to explain, (b) in so far as this occurs on account of what is *better*, i.e., on account of the Cause for the sake of which, the principle is derived from the heavens.[93]

Aquinas will put this later in the language of his Christian theology: an individual female is not what the male semen 'intends' to produce. but she is what Nature intends to produce, and hence she is what God intends to produce.[94]

It would be quite wrong however to conceal the following passage, which occurs when Aristotle is wondering why there are two sexes:

> The proximate motive cause [the male semen], to which belongs the *logos* and the Form is *better* and more divine in its nature than the matter, it is better that the superior one should be separate from the inferior one. That is why wherever possible and so far as possible the male is separate from the female, since it is something *better* and more divine it is the principle of movement for generated things, while the female serves as their matter.[95]

Equally 'the upper parts of the body have this pre-eminence over the lower parts, the male over the female, and the right side of the body over the left'.[96] Just what such a priority means the reader can decide. 'Every nation', he writes, 'reckons currency with reference to the standard most familiar to itself.'[97]

Moreover, it is one thing to say that the female is a departure from the male type and another to say it is a defective male. This brings us to consider the phrase which, for some, says just that.

The Greek word, it will be recalled, is, *peperomenon*, which has indeed the primary meaning of 'maimed'. Peck chooses 'deformed' and lists further attempts to bring out the meaning: 'imperfectly developed', 'underdeveloped', 'malformed', 'mutilated' and 'congenitally disabled'. An author is however his or her own best interpreter, and we must look at how Aristotle uses the word elsewhere in his biology.

Now we have already seen that he uses precisely the same word about the seal as he does about the female: it is, he writes, a

peperomenon quadruped,[98] and he explains why he uses the word:

> One viviparous animal, the seal, has no ears but only auditory passages; but this is because, though a quadruped, it is *peperomenon*.[99]

The point is that 'the quadrupeds generally have ears which stand out free from the head'[100] — but the seal doesn't. In Aristotle's language, it departs from type. But

> Nature has brought off a clever piece of work in the seal, too, which, although it is a viviparous quadruped, possesses no ears but passages merely. The reason is that it spends its life in a fluid medium. The ear is a part of the body which is an addition made to the passages in order to safeguard the movement of the air which comes from a distance and therefore is no use to the seal; indeed, it would actually be a hindrance rather than a help, because it would act as a receptacle for a large volume of water.[101]

So in being a *peperomenon* quadruped, the seal is not defective or deformed in any normal sense of the term. It 'departs from type', but it is what Nature intends it to be. The female is *peperomenon* in precisely the same sense: she 'departs from the male type', but she is not defective. She is what Nature intends her to be.

One can see the same logic at work elsewhere in Aristotle. He writes of the crocodile:

> Among the factors which contribute to the deformity (*anaperia*) of the crocodile's tongue is the immobility of its lower jaw, to which the tongue is naturally joined. We must remember however that the crocodile's jaws are topsy-turvy; the bottom one is on top and the top one below ... The tongue is not fixed to the upper jaw (as one might expect it to be) because it would get in the way of the food as it entered the mouth, but to the lower one, which is really the upper one in the wrong place. Furthermore, although the crocodile is a land-animal, his manner of life is that of a fish, and this is another reason why he must have a tongue that is not distinctly articulated.[102]

Once again we have a 'deformity' — if one still wants to use that word — intended by Nature. Once again, it is a useful deformity. Examples could be multiplied: lobsters[103] and flat-fish,[104] for instance.

Aristotle in fact uses the sort of language we do when we say that the sloth walks 'upside down'. It does so relatively to other tree-dwellers, but, relatively to its own nature, it walks perfectly. Few things

distress the maternal heart of a sloth more than the sight of its baby tripping — slothfully, of course — along the top of a branch.

Now it is indeed the case that Aristotle once uses the word *peperomenon* in the sense of 'maimed', when he is talking of polypods which have lost feet through amputation.[105] We too use the word 'lost' in the distinct but related senses of 'departing from type' and 'maimed'. We say that someone 'lost' a leg in an accident, and also that fish which have lived for many millenia in underground caves have 'lost' their colour, or that the seal, originally a land-mammal, 'lost' its external ears in the course of its adaptation to marine life. The fish, we would say, 'lost' their colour because it serves no purpose in their present environment, and the seal's 'loss' of its ears has improved its adaptation to life in the sea. These are not true losses, much less are they deformities. They are in fact positive adaptations. Aristotle in fact speaks a language very close to that of contemporary biology.

The English word deformed does not carry Aristotle's true meaning. The example of the seal shows that, for the seal is *peperomenon*, but, manifestly, not deformed in our meaning of the word. Woman departs from the male type — and Nature intends she should. She departs in having less heat, and Nature turns this to good. Because she has less heat, the blood she concentrates is voluminous. Because this blood is voluminous, Nature provides a place where it may be stored — the uterus.[106] Because Woman has a uterus, she can 'generate in herself' — whereas the male can only 'generate in another'.[107] By being *peperomenon*, a woman can become a mother.

There is a further point. In the critical phrase Aristotle uses the word *hosper*, a word that limits or modifies an assertion.[108] So Aristotle does not say 'a female is a deformed male' but 'the female is as it were a deformed male' (Peck's translation). It is so in a limited or modified sense. Now Aristotle is thoroughly familiar with the concept of variation — that is, that offspring differ from their parents — and discusses it at great length.[109] Some of these variations are what we would now call 'congenital anomalies'.[110] They are, in a sense, contrary to Nature. Others, which happen often and habitually, are not so called: they are not really contrary to Nature.[111]

Now it is true that in Aristotle the truly mutilated and the female are produced by the same mechanism — more exactly, by a failing in a mechanism. Now in modern biology variations or mutations occur because of failures or in the process of reproduction. Most of these variations are for the worse, but some are for the better. Now which are which is not determined by how they are caused but by how they serve the adaptive purposes of the species. Whether a variation is adaptive or

maladaptive depends on other circumstances. In sooty 19th century England, a variation towards darkness was adaptive in a moth: it was better camouflaged against a dark background. In the cleaner England of today, a variation towards a lighter colour is adaptive.[112] A variation therefore is evaluated not in terms of how it has been caused, but of how it serves the animal, or if one prefers, the species.

Now being born earless is a variation, and would normally be a deformity in the true sense, for the earless rabbit animal is manifestly handicapped; but it is not a real deformity if it occurs in the seal, because in the seal being earless is adaptive and has been brought about by Nature. It is an adaptive variation. In just the same way, the female's lack of heat is a variation, but from the perspective of the species and the perspective of Nature, it is an adaptive variation. We are back to the basic Aristotelean principle that things are to be evaluated in terms of what they are and how they achieve their end, not in terms of how they have been produced.

It is curious that a single phrase should be used to damn Aristotle, for his writings show him to be the most human and understanding of men. Perhaps his biology is best criticised by those who have read it. He married happily, and — in a personal conceit — I wonder whether he may not on occasion have thought of the Heracleitan phrase and have murmured to his wife: 'there are gods even here'.

1 *GA* 1,20,729a27.
The following abbreviations are used:
GA de Generatione Animalium.
HA Historia Animalium.
PA de Partibus Animalium.
PrA de Progressu Animalium.
2 *GA* 4,3, 768 bl7.
3 *GA* 4,3,768a22. The Greek is *krateisthai*, which Peck translates as 'mastered'.
4 *GA* 4,3,768a35.
5 *GA* 2,3,737a25. A.L.Peck, Loeb Classical Library, Harvard University Press, 1942, repr.1990, gives 'deformed', and A.Platt in the Oxford translation gives 'mutilated'.
6 PA 2,12,657a24. Both Peck and Platt give 'deformed'.
7 *HA* 1, 1,487b24.
8 *GA* 5,2,781b23.
9 *de Animalibus* XVI.
10 *Summa Theologiae* 1,92,1 ,ad 1.
11 *Aristoteles Latinus*, XVII 2.v., ed.H.J. Drossaart Lulofs, Bruges-Paris, Desclée de Brouwer, 1966.
12 *GA* 1,2,716a5.
13 *GA* 1,2, 716 a10.
14 A remark made in his Agnes Cuming Lectures in University College Dublin in 1978.
15 Francis Thompson in *The Kingdom of God.*
16 PA 1,1,639b20.
17 'The eternal silence of these infinite spaces terrifies me.' *Pensées*, iii,206.

18 'The teacher of those who understand.' *Inferno*,4,131.
19 'The love that moves the sun and the other stars' *Paradiso*, 33,145.
20 PA 1,5, 645 a10.
21 *GA* 1,5,717b30.
22 The use of one of its arms (legs) to funnel sperm.
23 *GA* 1,18,724 a5.
24 Cf. F.B. Hutt and B.J.Rasmussen, *Animal Genetics*, 2nd ed., Wiley, New York, 1982, p.514.
25 U.Ranke-Heinemann, *Eunuchs for Heaven*, trans. J. Brownjohn, Deutsch, London, 1990, p.165.
26 Cf. M.W.J. Ferguson and T. Joanen, 'Temperature-dependent sex determination in *Alligator mississippiensis*', in *Journal of Zoology* (London), 1983, 200, pp.143-177.
27 Cf. S.T.H. Chan and Wai-Sum O, *Environmental and Non-genetic Mechanisms in Sex Determination* in C.R.Austin and R.G.Edwards, *Mechanisms of Sex Differentiation in Animals and Men*, New York, Academic Press, 1981.
28 PA 1,5,645a24.
29 *GA* 2,6,743a20.
30 *GA* 2,6, 743 b23.
31 *GA* 2,6,743a37.
32 *GA* 2,6,744b16.
33 *GA* 2,5,741bS.
34 *GA* 2,4,739b20.
35 *GA* 5,8,788b20.
36 PA 1,1,639b20.
37 F.H.A. Marshall in the Foreword to A.L.Peck, *De partibus animalium*, Loeb Classical Library, p.3.
38 PA 3,1,662a30.
39 *GA* 2,1,734b10. Cf. *GA* 2,5,741b10.
40 *GA* 1 ,4,717a15.
41 *GA* 2,1,731b20.
42 Peck, o.c., p.xliii, where he cites no fewer than nine instances of this.
43 *GA* 3,4,755a25.
44 PA 4,1 1,692a5.
45 *GA* 2,1,731b20.
46 *GA* 1 ,1,715a5.
47 O.c., p.xxxviii.
48 PA 4,10,687a10.
49 *GA* 1,1,715a10.
50 O.c., p.v.
51 His *de Animalibus*.
52 E.g., *Summa Theologiae*, 1,99,2,ad1.
53 *HA* 7,1,588b24.
54 *GA* 1,1,715a25, *GA* 1,18,724b10.
55 *GA* 3,5,755b23.
56 *GA* 3,10,759a8.
57 *GA* 3,10,760b30.
58 *GA* 1,1,715b20.
59 *GA* 1,1,715b15.
60 *Summa Theologiae*, 1,92, 1,c.
61 *Ethica Nicomachea*, 8,12,1162a20.
62 *Summa Theologiae*, 1,92,3,c.
63 *Summa Contra Gentiles*, 3,123.
64 *GA* 4,3,769a1.

65 *GA* 1,2,716a20.
66 *GA* 1,2,716a32.
67 Ibid.
68 *GA* 1,2,716a14.
69 *GA* 3,2,753b20.
70 *GA* 2,4,739a10.
71 *GA* 2,3,737a25.
72 *In Sententias* 3,3,5, 1.
73 *GA* 2,4,739b19.
74 *GA* 1,21,729b19.
75 *GA* 2,1,734b10. Cf. *GA* 2,5,741b10.
76 J.Needham, *A History of Embryology*, 2nd ed, Cambridge, 1959, p.51.
77 *GA* 2,4,738b25.
78 *GA* 1,1,715a10.
79 *GA* 2,4,740a25.
80 *GA* 2,6,743a3 et seq.
81 *GA* 2,5,741a10.
82 *GA* 2,3,737a1.
83 *GA* 2,3,736b5.
84 *GA* 2,3,736b28.
85 *GA* 4,3,768b35.
86 *GA* 4,3,768a15, note *a*..
87 *GA* 4,3,768b15.
88 *GA* 4,3,768b15.
89 *GA* 4,3,768b25.
90 *GA* 4,6,775a16.
91 *GA* 4,3,767b9.
92 *GA* 1,1,715a10.
93 *GA* 2,1,731b24.
94 *SummaTheologiae*, 1,92,1,ad1.
95 *GA* 2,1,732a5.
96 PA 2,2,648a15.
97 *HA* 1 ,6,491a23.
98 *HA* 2,1,498a33.
99 *PA* 2,12,657a24.
100 *PA* 2,12,657a15.
101 *GA* 5,2,781b24.
102 *PA* 2,17,660b26.
103 *PA* 4,8,684a31.
104 *PrA* 17,714a6.
105 *PrA* 8,710b.
106 *GA* 1,18,725b5.
107 *GA* 1 ,2,716a20.
108 Cf. Liddell and Scott's *Greek-English Lexicon* s.v.
109 *GA* 4,3,769b10.
110 Cf. M. V. Barrow, *A Brief History of Teratology to the Early 20th Century*, *Teratology*, 4,119-130. Pp.119-122 have interesting comments on Aristotle.
111 *GA* 4,4,770b22.
112 Cf. C.Starr and R. Taggart, *Biology*, Wadsworth, Belmont, 4th ed, 1987, p.525.