

# Book I

## 1

WE have now discussed the other parts of animals, both generally and with reference to the peculiarities of each kind, explaining how each part exists on account of such a cause, and I mean by this the final cause.

There are four causes underlying everything; first, the final cause, that for the sake of which a thing exists; secondly, the formal cause, the definition of its essence (and these two we may regard pretty much as one and the same); thirdly, the material; and fourthly, the moving principle or efficient cause.

We have then already discussed the other three causes, for the definition and the final cause are the same, and the material of animals is their parts of the whole animal the non-homogeneous parts, of these again the homogeneous, and of these last the so-called elements of all matter. It remains to speak of those parts which contribute to the generation of animals and of which nothing definite has yet been said, and to explain what is the moving or efficient cause. To inquire into this last and to inquire into the generation of each animal is in a way the same thing; and, therefore, my plan has united them together, arranging the discussion of these parts last, and the beginning of the question of generation next to them.

Now some animals come into being from the union of male and female, i.e. all those kinds of animal which possess the two sexes.

This is not the case with all of them; though in the sanguinea with few exceptions the creature, when its growth is complete, is either male or female, and though some bloodless animals have sexes so that they generate offspring of the same kind, yet other bloodless animals generate indeed, but not offspring of the same kind; such are all that come into being not from a union of the sexes, but from decaying earth and excrements. To speak generally, if we take all animals which change their locality, some by swimming, others by flying, others by walking, we find in these the two sexes, not only in the sanguinea but also in some of the bloodless animals; and this applies in the case of the latter sometimes to the whole class, as the cephalopoda and crustacea, but in the class of insects only to the majority. Of these, all which are produced by union of animals of the same kind generate also after their kind, but all which are not produced by animals, but from decaying matter, generate indeed, but produce another kind, and the offspring is neither male nor female; such are some of the insects. This is what might have been expected, for if those animals which are not produced by parents had themselves united and produced others, then their offspring must have been either like or unlike to themselves. If like, then their parents ought to have come into being in the same way; this is only a reasonable postulate to make, for it is plainly the case with other animals. If unlike, and yet able to copulate, then there would have come into being again from them another kind of creature and again another from these, and this would have gone on to infinity. But Nature flies from the infinite, for the infinite is unending or imperfect, and Nature ever seeks an end.

But all those creatures which do not move, as the testacea and animals that live by clinging to something else, inasmuch as their nature resembles that of plants, have no sex any more than plants have, but as applied to them the word is only used in virtue of a similarity and analogy. For there is a slight distinction of this sort, since even in plants we find in the same kind some trees which bear fruit and others which, while bearing none themselves, yet contribute to the

ripening of the fruits of those which do, as in the case of the fig-tree and caprifig.

The same holds good also in plants, some coming into being from seed and others, as it were, by the spontaneous action of Nature, arising either from decomposition of the earth or of some parts in other plants, for some are not formed by themselves separately but are produced upon other trees, as the mistletoe. Plants, however, must be investigated separately.

## 2

Of the generation of animals we must speak as various questions arise in order in the case of each, and we must connect our account with what has been said. For, as we said above, the male and female principles may be put down first and foremost as origins of generation, the former as containing the efficient cause of generation, the latter the material of it. The most conclusive proof of this is drawn from considering how and whence comes the semen; for there is no doubt that it is out of this that those creatures are formed which are produced in the ordinary course of Nature; but we must observe carefully the way in which this semen actually comes into being from the male and female. For it is just because the semen is secreted from the two sexes, the secretion taking place in them and from them, that they are first principles of generation. For by a male animal we mean that which generates in another, and by a female that which generates in itself; wherefore men apply these terms to the macrocosm also, naming Earth mother as being female, but addressing Heaven and the Sun and other like entities as fathers, as causing generation.

Male and female differ in their essence by each having a separate ability or faculty, and anatomically by certain parts; essentially the male is that which is able to generate in another, as said above; the female is that which is able to generate in itself and out of which comes into being the offspring previously existing in the parent. And since they are differentiated by an ability or faculty and by their

function, and since instruments or organs are needed for all functioning, and since the bodily parts are the instruments or organs to serve the faculties, it follows that certain parts must exist for union of parents and production of offspring. And these must differ from each other, so that consequently the male will differ from the female. (For even though we speak of the animal as a whole as male or female, yet really it is not male or female in virtue of the whole of itself, but only in virtue of a certain faculty and a certain part- just as with the part used for sight or locomotion- which part is also plain to sense-perception.)

Now as a matter of fact such parts are in the female the so-called uterus, in the male the testes and the penis, in all the sanguinea; for some of them have testes and others the corresponding passages. There are corresponding differences of male and female in all the bloodless animals also which have this division into opposite sexes. But if in the sanguinea it is the parts concerned in copulation that differ primarily in their forms, we must observe that a small change in a first principle is often attended by changes in other things depending on it. This is plain in the case of castrated animals, for, though only the generative part is disabled, yet pretty well the whole form of the animal changes in consequence so much that it seems to be female or not far short of it, and thus it is clear that an animal is not male or female in virtue of an isolated part or an isolated faculty. Clearly, then, the distinction of sex is a first principle; at any rate, when that which distinguishes male and female suffers change, many other changes accompany it, as would be the case if a first principle is changed.

### 3

The sanguinea are not all alike as regards testes and uterus. Taking the former first, we find that some of them have not testes at all, as the classes of fish and of serpents, but only two spermatic ducts. Others have testes indeed, but internally by the loin in the region of the kidneys, and from each of these a duct, as in the case of those an-

imals which have no testes at all, these ducts unite also as with those animals; this applies (among animals breathing air and having a lung) to all birds and oviparous quadrupeds. For all these have their testes internal near the loin, and two ducts from these in the same way as serpents; I mean the lizards and tortoises and all the scaly reptiles. But all the vivipara have their testes in front; some of them inside at the end of the abdomen, as the dolphin, not with ducts but with a penis projecting externally from them; others outside, either pendent as in man or towards the fundament as in swine. They have been discriminated more accurately in the Enquiries about Animals.

The uterus is always double, just as the testes are always two in the male. It is situated either near the pudendum (as in women, and all those animals which bring forth alive not only externally but also internally, and all fish that lay eggs externally) or up towards the hypozoma (as in all birds and in viviparous fishes). The uterus is also double in the crustacea and the cephalopoda, for the membranes which include their so-called eggs are of the nature of a uterus. It is particularly hard to distinguish in the case of the poulps, so that it seems to be single, but the reason of this is that the bulk of the body is everywhere similar.

It is double also in the larger insects; in the smaller the question is uncertain owing to the small size of the body.

Such is the description of the aforesaid parts of animals.

#### 4

With regard to the difference of the spermatic organs in males, if we are to investigate the causes of their existence, we must first grasp the final cause of the testes. Now if Nature makes everything either because it is necessary or because it is better so, this part also must be for one of these two reasons. But that it is not necessary for generation is plain; else had it been possessed by all creatures that generate, but as it is neither serpents have testes nor have fish; for they have been seen uniting and with their ducts full of milt. It remains then that it must be because it is somehow better so. Now it is true

that the business of most animals is, you may say, nothing else than to produce young, as the business of a plant is to produce seed and fruit. But still as, in the case of nutriment, animals with straight intestines are more violent in their desire for food, so those which have not testes but only ducts, or which have them indeed but internally, are all quicker in accomplishing copulation. But those which are to be more temperate in the one case have not straight intestines, and in the other have their ducts twisted to prevent their desire being too violent and hasty. It is for this that the testes are contrived; for they make the movement of the spermatic secretion steadier, preserving the folding back of the passages in the vivipara, as horses and the like, and in man. (For details see the Enquiries about Animals.) For the testes are no part of the ducts but are only attached to them, as women fasten stones to the loom when weaving; if they are removed the ducts are drawn up internally, so that castrated animals are unable to generate; if they were not drawn up they would be able, and before now a bull mounting immediately after castration has caused conception in the cow because the ducts had not yet been drawn up. In birds and oviparous quadrupeds the testes receive the spermatic secretion, so that its expulsion is slower than in fishes. This is clear in the case of birds, for their testes are much enlarged at the time of copulation, and all those which pair at one season of the year have them so small when this is past that they are almost indiscernible, but during the season they are very large. When the testes are internal the act of copulation is quicker than when they are external, for even in the latter case the semen is not emitted before the testes are drawn up.

## 5

Besides, quadrupeds have the organ of copulation, since it is possible for them to have it, but for birds and the footless animals it is not possible, because the former have their legs under the middle of the abdomen and the latter have no legs at all; now the penis depends from that region and is situated there. (Wherefore also the legs are strained in intercourse, both the penis and the legs being sinewy.)

So that, since it is not possible for them to have this organ, they must necessarily either have no testes also, or at any rate not have them there, as those animals that have both penis and testes have them in the same situation.

Further, with those animals at any rate that have external testes, the semen is collected together before emission, and emission is due to the penis being heated by its movement; it is not ready for emission at immediate contact as in fishes.

All the vivipira have their testes in front, internally or externally, except the hedgehog; he alone has them near the loin. This is for the same reason as with birds, because their union must be quick, for the hedgehog does not, like the other quadrupeds, mount upon the back of the female, but they conjugate standing upright because of their spines.

So much for the reasons why those animals have testes which have them, and why they are sometimes external and sometimes internal.

## 6

All those animals which have no testes are deficient in this part, as has been said, not because it is better to be so but simply because of necessity, and secondly because it is necessary that their copulation should be speedy. Such is the nature of fish and serpents. Fish copulate throwing themselves alongside of the females and separating again quickly. For as men and all such creatures must hold their breath before emitting the semen, so fish at such times must cease taking in the sea-water, and then they perish easily. Therefore they must not mature the semen during copulation, as viviparous land-animals do, but they have it all matured together before the time, so as not to be maturing it while in contact but to emit it ready matured. So they have no testes, and the ducts are straight and simple. There is a small part similar to this connected with the testes in the system of quadrupeds, for part of the reflected duct is sanguineous and part is not; the fluid is already semen when it is received by and passes through this latter part, so that once it has arrived there

it is soon emitted in these quadrupeds also. Now in fishes the whole passage resembles the last section of the reflected part of the duct in man and similar animals.

## 7

Serpents copulate twining round one another, and, as said above, have neither testes nor penis, the latter because they have no legs, the former because of their length, but they have ducts like for on account of their extreme length the seminal fluid would take too long in its passage and be cooled if it were further delayed by testes. (This happens also if the penis is large; such men are less fertile than when it is smaller because the semen, if cold, is not generative, and that which is carried too far is cooled.) So much for the reason why some animals have testes and others not. Serpents intertwine because of their inaptitude to cast themselves alongside of one another. For they are too long to unite closely with so small a part and have no organs of attachment, so they make use of the suppleness of their bodies, intertwining. Wherefore also they seem to be slower in copulation than fish, not only on account of the length of the ducts but also of this elaborate arrangement in uniting.

## 8

It is not easy to state the facts about the uterus in female animals, for there are many points of difference. The vivipara are not alike in this part; women and all the vivipara with feet have the uterus low down by the pudendum, but the cartilaginous viviparous fish have it higher up near the hypozoma. In the ovipara, again, it is low in fish (as in women and the viviparous quadrupeds), high in birds and all oviparous quadrupeds. Yet even these differences are on a principle. To begin with the ovipara, they differ in the manner of laying their eggs, for some produce them imperfect, as fishes whose eggs increase and are finally developed outside of them. The reason is that they produce many young, and this is their function as it is with plants. If then they perfected the egg in themselves they must needs be few



in number, but as it is, they have so many that each uterus seems to be an egg, at any rate in the small fishes. For these are the most productive, just as with the other animals and plants whose nature is analogous to theirs, for the increase of size turns with them to seed.

But the eggs of birds and the quadrupedal ovipara are perfect when produced. In order that these may be preserved they must have a hard covering (for their envelope is soft so long as they are increasing in size), and the shell is made by heat squeezing out the moisture for the earthy material; consequently the place must be hot in which this is to happen. But the part about the hypozoma is hot, as is shown by that being the part which concocts the food. If then the eggs must be within the uterus, then the uterus must be near the hypozoma in those creatures which produce their eggs in a perfect form. Similarly it must be low down in those which produce them imperfect, for it is profitable that it should be so. And it is more natural for the uterus to be low down than high up, when Nature has no other business in hand to hinder it; for its end is low down, and where is the end, there is the function, and the uterus itself is naturally where the function is.

## 9

We find differences in the vivipara also as compared with one another. Some produce their young alive, not only externally, but also internally, as men, horses, dogs, and all those which have hair, and among aquatic animals, dolphins, whales, and such cetacea.

## 10

But the cartilaginous fish and the vipers produce their young alive externally, but first produce eggs internally. The egg is perfect, for so only can an animal be generated from an egg, and nothing comes from an imperfect one. It is because they are of a cold nature, not hot as some assert, that they do not lay their eggs externally.

## 11

At least they certainly produce their eggs in a soft envelope, the reason being that they have but little heat and so their nature does not complete the process of drying the egg-shell. Because, then, they are cold they produce soft-shelled eggs, and because the eggs are soft they do not produce them externally; for that would have caused their destruction.

The process is for the most part the same as in birds, for the egg descends and the young is hatched from it near the vagina, where the young is produced in those animals which are viviparous from the beginning. Therefore in such animals the uterus is dissimilar to that of both the vivipara and ovipara, because they participate in both classes; for it is at once near the hypozoma and also stretching along downwards in all the cartilaginous fishes. But the facts about this and the other kinds of uterus must be gathered from inspection of the drawings of dissections and from the Enquiries. Thus, because they are oviparous, laying perfect eggs, they have the uterus placed high, but, as being viviparous, low, participating in both classes.

Animals that are viviparous from the beginning all have it low, Nature here having no other business to interfere with her, and their production having no double character. Besides this, it is impossible for animals to be produced alive near the hypozoma, for the foetus must needs be heavy and move, and that region in the mother is vital and would not be able to bear the weight and the movement. Thirdly, parturition would be difficult because of the length of the passage to be traversed; even as it is there is difficulty with women if they draw up the uterus in parturition by yawning or anything of the kind, and even when empty it causes a feeling of suffocation if moved upwards. For if a uterus is to hold a living animal it must be stronger than in ovipara, and therefore in all the vivipara it is fleshy, whereas when the uterus is near the hypozoma it is membranous. And this is clear also in the case of the animals which produce young

by the mixed method, for their eggs are high up and sideways, but the living young are produced in the lower part of the uterus.

So much for the reason why differences are found in the uterus of various animals, and generally why it is low in some and high in others near the hypozoma.

## 12

Why is the uterus always internal, but the testes sometimes internal, sometimes external? The reason for the uterus always being internal is that in this is contained the egg or foetus, which needs guarding, shelter, and maturation by concoction, while the outer surface of the body is easily injured and cold. The testes vary in position because they also need shelter and a covering to preserve them and to mature the semen; for it would be impossible for them, if chilled and stiffened, to be drawn up and discharge it. Therefore, whenever the testes are visible, they have a cuticular covering known as the scrotum. If the nature of the skin is opposed to this, being too hard to be adapted for enclosing them or for being soft like a true 'skin', as with the scaly integument of fish and reptiles, then the testes must needs be internal. Therefore they are so in dolphins and all the cetacea which have them, and in the oviparous quadrupeds among the scaly animals. The skin of birds also is hard so that it will not conform to the size of anything and enclose it neatly. (This is another reason with all these animals for their testes being internal besides those previously mentioned as arising necessarily from the details of copulation.) For the same reason they are internal in the elephant and hedgehog, for the skin of these, too, is not well suited to keep the protective part separate.

[The position of the uterus differs in animals viviparous within themselves and those externally oviparous, and in the latter class again it differs in those which have the uterus low and those which have it near the hypozoma, as in fishes compared with birds and oviparous quadrupeds. And it is different again in those which produce young in both ways, being oviparous internally and viviparous

externally. For those which are viviparous both internally and externally have the uterus placed on the abdomen, as men, cattle, dogs, and the like, since it is expedient for the safety and growth of the foetus that no weight should be upon the uterus.]

## 13

The passages also are different through which the solid and liquid excreta pass out in all the vivipara. Wherefore both males and females in this class all have a part whereby the urine is voided, and this serves also for the issue of the semen in males, of the offspring in females. This passage is situated above and in front of the passage of the solid excreta. The passage is the same as that of the solid nutriment in all those animals that have no penis, in all the ovipara, even those of them that have a bladder, as the tortoises. For it is for the sake of generation, not for the evacuation of the urine, that the passages are double; but because the semen is naturally liquid, the liquid excretion also shares the same passage. This is clear from the fact that all animals produce semen, but all do not void liquid excrement. Now the spermatic passages of the male must be fixed and must not wander, and the same applies to the uterus of the female, and this fixing must take place at either the front or the back of the body. To take the uterus first, it is in the front of the body in vivipara because of the foetus, but at the loin and the back in ovipara. All animals which are internally oviparous and externally viviparous are in an intermediate condition because they participate in both classes, being at once oviparous and viviparous. For the upper part of the uterus, where the eggs are produced, is under the hypozoma by the loin and the back, but as it advances is low at the abdomen; for it is in that part that the animal is viviparous. In these also the passage for solid excrement and for copulation is the same, for none of these, as has been said already, has a separate pudendum.

The same applies to the passages in the male, whether they have testes or no, as to the uterus of the ovipara. For in all of them, not only in the ovipara, the ducts adhere to the back and the region of

the spine. For they must not wander but be settled, and that is the character of the region of the back, which gives continuity and stability. Now in those which have internal testes, the ducts are fixed from the first, and they are fixed in like manner if the testes are external; then they meet together towards the region of the penis.

The like applies to the ducts in the dolphins, but they have their testes hidden under the abdominal cavity.

We have now discussed the situation of the parts contributing to generation, and the causes thereof.

## 14

The bloodless animals do not agree either with the sanguinea or with each other in the fashion of the parts contributing to generation. There are four classes still left to deal with, first the crustacea, secondly the cephalopoda, thirdly the insects, and fourthly the testacea. We cannot be certain about all of them, but that most of them copulate is plain; in what manner they unite must be stated later.

The crustacea copulate like the retromingent quadrupeds, fitting their tails to one another, the one supine and the other prone. For the flaps attached to the sides of the tail being long prevent them from uniting with the belly against the back. The males have fine spermatic ducts, the females a membranous uterus alongside the intestine, cloven on each side, in which the egg is produced.

## 15

The cephalopoda entwine together at the mouth, pushing against one another and enfolding their arms. This attitude is necessary, because Nature has bent backwards the end of the intestine and brought it round near the mouth, as has been said before in the treatise on the parts of animals. The female has a part corresponding to the uterus, plainly to be seen in each of these animals, for it contains an egg which is at first indivisible to the eye but afterwards splits up into many; each of these eggs is imperfect when deposited, as with

the oviparous fishes. In the cephalopoda (as also in the crustacea) the same passage serves to void the excrement and leads to the part like a uterus, for the male discharges the seminal fluid through this passage. And it is on the lower surface of the body, where the mantle is open and the sea-water enters the cavity. Hence the union of the male with the female takes place at this point, for it is necessary, if the male discharges either semen or a part of himself or any other force, that he should unite with her at the uterine passage. But the insertion, in the case of the poulps, of the arm of the male into the funnel of the female, by which arm the fishermen say the male copulates with her, is only for the sake of attachment, and it is not an organ useful for generation, for it is outside the passage in the male and indeed outside the body of the male altogether.

Sometimes also cephalopoda unite by the male mounting on the back of the female, but whether for generation or some other cause has not yet been observed.

## 16

Some insects copulate and the offspring are produced from animals of the same name, just as with the sanguinea; such are the locusts, cicadae, spiders, wasps, and ants. Others unite indeed and generate; but the result is not a creature of the same kind, but only a scolex, and these insects do not come into being from animals but from putrefying matter, liquid or solid; such are fleas, flies, and cantharides. Others again are neither produced from animals nor unite with each other; such are gnats, 'conopes', and many similar kinds. In most of those which unite the female is larger than the male. The males do not appear to have spermatic passages. In most cases the male does not insert any part into the female, but the female from below upwards into the male; this has been observed in many cases (as also that the male mounts the female), the opposite in few cases; but observations are not yet comprehensive enough to enable us to make a distinction of classes. And generally it is the rule with most of the oviparous fish and oviparous quadrupeds that the female is larger

than the because this is expedient in view of the increase of bulk in conception by reason of the eggs. In the female the part analogous to the uterus is cleft and extends along the intestine, as with the other animals; in this are produced the results of conception. This is clear in locusts and all other large insects whose nature it is to unite; most insects are too small to be observed in this respect.

Such is the character of the generative organs in animals which were not spoken of before. It remains now to speak of the homogeneous parts concerned, the seminal fluid and milk. We will take the former first, and treat of milk afterwards.

## 17

Some animals manifestly emit semen, as all the sanguinea, but whether the insects and cephalopoda do so is uncertain. Therefore this is a question to be considered, whether all males do so, or not all; and if not all, why some do and some not; and whether the female also contributes any semen or not; and, if not semen, whether she does not contribute anything else either, or whether she contributes something else which is not semen. We must also inquire what those animals which emit semen contribute by means of it to generation, and generally what is the nature of semen, and of the so-called catamenia in all animals which discharge this liquid.

Now it is thought that all animals are generated out of semen, and that the semen comes from the parents. Wherefore it is part of the same inquiry to ask whether both male and female produce it or only one of them, and to ask whether it comes from the whole of the body or not from the whole; for if the latter is true it is reasonable to suppose that it does not come from both parents either. Accordingly, since some say that it comes from the whole of the body, we must investigate this question first.

The proofs from which it can be argued that the semen comes from each and every part of the body may be reduced to four. First, the intensity of the pleasure of coition; for the same state of feeling is more pleasant if multiplied, and that which affects all the parts is

multiplied as compared with that which affects only one or a few. Secondly, the alleged fact that mutilations are inherited, for they argue that since the parent is deficient in this part the semen does not come from thence, and the result is that the corresponding part is not formed in the offspring. Thirdly, the resemblances to the parents, for the young are born like them part for part as well as in the whole body; if then the coming of the semen from the whole body is cause of the resemblance of the whole, so the parts would be like because it comes from each of the parts. Fourthly, it would seem to be reasonable to say that as there is some first thing from which the whole arises, so it is also with each of the parts, and therefore if semen or seed is cause of the whole so each of the parts would have a seed peculiar to itself. And these opinions are plausibly supported by such evidence as that children are born with a likeness to their parents, not in congenital but also in acquired characteristics; for before now, when the parents have had scars, the children have been born with a mark in the form of the scar in the same place, and there was a case at Chalcedon where the father had a brand on his arm and the letter was marked on the child, only confused and not clearly articulated. That is pretty much the evidence on which some believe that the semen comes from all the body.

## 18

On examining the question, however, the opposite appears more likely, for it is not hard to refute the above arguments and the view involves impossibilities. First, then, the resemblance of children to parents is no proof that the semen comes from the whole body, because the resemblance is found also in voice, nails, hair, and way of moving, from which nothing comes. And men generate before they yet have certain characters, such as a beard or grey hair. Further, children are like their more remote ancestors from whom nothing has come, for the resemblances recur at an interval of many generations, as in the case of the woman in Elis who had intercourse with the Aethiop; her daughter was not an Aethiop but the son of that daughter was. The same thing applies also to plants, for it is clear



that if this theory were true the seed would come from all parts of plants also; but often a plant does not possess one part, and another part may be removed, and a third grows afterwards. Besides, the seed does not come from the pericarp, and yet this also comes into being with the same form as in the parent plant.

We may also ask whether the semen comes from each of the homogeneous parts only, such as flesh and bone and sinew, or also from the heterogeneous, such as face and hands. For if from the former only, we object that resemblance exists rather in the heterogeneous parts, such as face and hands and feet; if then it is not because of the semen coming from all parts that children resemble their parents in these, what is there to stop the homogeneous parts also from being like for some other reason than this? If the semen comes from the heterogeneous alone, then it does not come from all parts; but it is more fitting that it should come from the homogeneous parts, for they are prior to the heterogeneous which are composed of them; and as children are born like their parents in face and hands, so they are, necessarily, in flesh and nails. If the semen comes from both, what would be the manner of generation? For the heterogeneous parts are composed of the homogeneous, so that to come from the former would be to come from the latter and from their composition. To make this clearer by an illustration, take a written name; if anything came from the whole of it, it would be from each of the syllables, and if from these, from the letters and their composition. So that if really flesh and bones are composed of fire and the like elements, the semen would come rather from the elements than anything else, for how can it come from their composition? Yet without this composition there would be no resemblance. If again something creates this composition later, it would be this that would be the cause of the resemblance, not the coming of the semen from every part of the body.

Further, if the parts of the future animal are separated in the semen, how do they live? and if they are connected, they would form a small animal.

And what about the generative parts? For that which comes from the male is not similar to what comes from the female.

Again, if the semen comes from all parts of both parents alike, the result is two animals, for the offspring will have all the parts of both. Wherefore Empedocles seems to say what agrees pretty well with this view (if we are to adopt it), to a certain extent at any rate, but to be wrong if we think otherwise. What he says agrees with it when he declares that there is a sort of tally in the male and female, and that the whole offspring does not come from either, 'but sundered is the fashion of limbs, some in man's...' For why does not the female generate from herself if the semen comes from all parts alike and she has a receptacle ready in the uterus? But, it seems, either it does not come from all the parts, or if it does it is in the way Empedocles says, not the same parts coming from each parent, which is why they need intercourse with each other.

Yet this also is impossible, just as much as it is impossible for the parts when full grown to survive and have life in them when torn apart, as Empedocles accounts for the creation of animals; in the time of his 'Reign of Love', says he, 'many heads sprang up without necks,' and later on these isolated parts combined into animals. Now that this is impossible is plain, for neither would the separate parts be able to survive without having any soul or life in them, nor if they were living things, so to say, could several of them combine so as to become one animal again. Yet those who say that semen comes from the whole of the body really have to talk in that way, and as it happened then in the earth during the 'Reign of Love', so it happens according to them in the body. Now it is impossible that the parts should be united together when they come into being and should come from different parts of the parent, meeting together in one place. Then how can the upper and lower, right and left, front and back parts have been 'sundered'? All these points are unintelligible. Further, some parts are distinguished by possessing a faculty, others by being in certain states or conditions; the heterogeneous, as tongue and hand, by the faculty of doing something, the homogeneous by

hardness and softness and the other similar states. Blood, then, will not be blood, nor flesh flesh, in any and every state. It is clear, then, that that which comes from any part, as blood from blood or flesh from flesh, will not be identical with that part. But if it is something different from which the blood of the offspring comes, the coming of the semen from all the parts will not be the cause of the resemblance, as is held by the supporters of this theory. For if blood is formed from something which is not blood, it is enough that the semen come from one part only, for why should not all the other parts of the offspring as well as blood be formed from one part of the parent? Indeed, this theory seems to be the same as that of Anaxagoras, that none of the homogeneous parts come into being, except that these theorists assume, in the case of the generation of animals, what he assumed of the universe.

Then, again, how will these parts that came from all the body of the parent be increased or grow? It is true that Anaxagoras plausibly says that particles of flesh out of the food are added to the flesh. But if we do not say this (while saying that semen comes from all parts of the body), how will the foetus become greater by the addition of something else if that which is added remain unchanged? But if that which is added can change, then why not say that the semen from the very first is of such a kind that blood and flesh can be made out of it, instead of saying that it itself is blood and flesh? Nor is there any other alternative, for surely we cannot say that it is increased later by a process of mixing, as wine when water is poured into it. For in that case each element of the mixture would be itself at first while still unmixed, but the fact rather is that flesh and bone and each of the other parts is such later. And to say that some part of the semen is sinew and bone is quite above us, as the saying is.

Besides all this there is a difficulty if the sex is determined in conception (as Empedocles says: 'it is shed in clean vessels; some wax female, if they fall in with cold'). Anyhow, it is plain that both men and women change not only from infertile to fertile, but also from bearing female to bearing male offspring, which looks as if the cause

does not lie in the semen coming from all the parent or not, but in the mutual proportion or disproportion of that comes from the woman and the man, or in something of this kind. It is clear, then, if we are to put this down as being so, that the female sex is not determined by the semen coming from any particular part, and consequently neither is the special sexual part so determined (if really the same semen can become either male or female child, which shows that the sexual part does not exist in the semen). Why, then, should we assert this of this part any more than of others? For if semen does not come from this part, the uterus, the same account may be given of the others.

Again, some creatures come into being neither from parents of the same kind nor from parents of a different kind, as flies and the various kinds of what are called fleas; from these are produced animals indeed, but not in this case of similar nature but a kind of scolex. It is plain in this case that the young of a different kind are not produced by semen coming from all parts of the parent, for they would then resemble them, if indeed resemblance is a sign of its coming from all parts.

Further even among animals some produce many young from a single coition (and something like this is universal among plants, for it is plain that they bear all the fruit of a whole season from a single movement). And yet how would this be possible if the semen were secreted from all the body? For from a single coition and a single segregation of the semen scattered throughout the body must needs follow only a single secretion. Nor is it possible for it to be separated in the uterus, for this would no longer be a mere separation of semen, but, as it were, a severance from a new plant or animal.

Again, the cuttings from a plant bear seed; clearly, therefore, even before they were cut from the parent plant, they bore their fruit from their own mass alone, and the seed did not come from all the plant.

But the greatest proof of all is derived from observations we have sufficiently established on insects. For, if not in all, at least in most of these, the female in the act of copulation inserts a part of herself into

the male. This, as we said before, is the way they copulate, for the females manifestly insert this from below into the males above, not in all cases, but in most of those observed. Hence it seems clear that, when the males do emit semen, then also the cause of the generation is not its coming from all the body, but something else which must be investigated hereafter. For even if it were true that it comes from all the body, as they say, they ought not to claim that it comes from all parts of it, but only from the creative part- from the workman, so to say, not the material he works in. Instead of that, they talk as if one were to say that the semen comes from the shoes, for, generally speaking, if a son is like his father, the shoes he wears are like his father's shoes.

As to the vehemence of pleasure in sexual intercourse, it is not because the semen comes from all the body, but because there is a strong friction (wherefore if this intercourse is often repeated the pleasure is diminished in the persons concerned). Moreover, the pleasure is at the end of the act, but it ought, on the theory, to be in each of the parts, and not at the same time, but sooner in some and later in others.

If mutilated young are born of mutilated parents, it is for the same reason as that for which they are like them. And the young of mutilated parents are not always mutilated, just as they are not always like their parents; the cause of this must be inquired into later, for this problem is the same as that.

Again, if the female does not produce semen, it is reasonable to suppose it does not come from all the body of the male either. Conversely, if it does not come from all the male it is not unreasonable to suppose that it does not come from the female, but that the female is cause of the generation in some other way. Into this we must next inquire, since it is plain that the semen is not secreted from all the parts.

In this investigation and those which follow from it, the first thing to do is to understand what semen is, for then it will be easier to inquire into its operations and the phenomena connected with

it. Now the object of semen is to be of such a nature that from it as their origin come into being those things which are naturally formed, not because there is any agent which makes them from it as simply because this is the semen. Now we speak of one thing coming from another in many senses; it is one thing when we say that night comes from day or a man becomes man from boy, meaning that A follows B; it is another if we say that a statue is made from bronze and a bed from wood, and so on in all the other cases where we say that the thing made is made from a material, meaning that the whole is formed from something preexisting which is only put into shape. In a third sense a man becomes unmusical from being musical, sick from being well, and generally in this sense contraries arise from contraries. Fourthly, as in the 'climax' of Epicharmus; thus from slander comes railing and from this fighting, and all these are from something in the sense that it is the efficient cause. In this last class sometimes the efficient cause is in the things themselves, as in the last mentioned (for the slander is a part of the whole trouble), and sometimes external, as the art is external to the work of art or the torch to the burning house. Now the offspring comes from the semen, and it is plainly in one of the two following senses that it does so- either the semen is the material from which it is made, or it is the first efficient cause. For assuredly it is not in the sense of A being after B, as the voyage comes from, i.e. after, the Panathenaea; nor yet as contraries come from contraries, for then one of the two contraries ceases to be, and a third substance must exist as an immediate underlying basis from which the new thing comes into being. We must discover then, in which of the two other classes the semen is to be put, whether it is to be regarded as matter, and therefore acted upon by something else, or as a form, and therefore acting upon something else, or as both at once. For perhaps at the same time we shall see clearly also how all the products of semen come into being from contraries, since coming into being from contraries is also a natural process, for some animals do so, i.e. from male and female, others from only one parent, as is the case with plants and all those animals in which male and female are not separately differentiated.

Now that which comes from the generating parent is called the seminal fluid, being that which first has in it a principle of generation, in the case of all animals whose nature it is to unite; semen is that which has in it the principles from both united parents, as the first mixture which arises from the union of male and female, be it a foetus or an ovum, for these already have in them that which comes from both. (Semen, or seed, and grain differ only in the one being earlier and the other later, grain in that it comes from something else, i.e. the seed, and seed in that something else, the grain, comes from it, for both are really the same thing.)

We must again take up the question what the primary nature of what is called semen is. Needs must everything which we find in the body either be (1) one of the natural parts, whether homogeneous or heterogeneous, or (2) an unnatural part such as a growth, or (3) a secretion or excretion, or (4) waste-product, or (5) nutriment. (By secretion or excretion I mean the residue of the nutriment, by waste-product that which is given off from the tissues by an unnatural decomposition.)

Now that semen cannot be a part of the body is plain, for it is homogeneous, and from the homogeneous nothing is composed, e.g. from only sinew or only flesh; nor is it separated as are all the other parts. But neither is it contrary to Nature nor a defect, for it exists in all alike, and the development of the young animal comes from it. Nutriment, again, is obviously introduced from without.

It remains, then, that it must be either a waste-product or a secretion or excretion. Now the ancients seem to think that it is a waste-product, for when they say that it comes from all the body by reason of the heat of the movement of the body in copulation, they imply that it is a kind of waste-product. But these are contrary to Nature, and from such arises nothing according to Nature. So then it must be a secretion or excretion.

But, to go further into it, every secretion or excretion is either of useless or useful nutriment; by 'useless' I mean that from which nothing further is contributed to natural growth, but which is par-

ticularly mischievous to the body if too much of it is consumed; by 'useful' I mean the opposite. Now it is evident that it cannot be of the former character, for such is most abundant in persons of the worst condition of body through age or sickness; semen, on the contrary, is least abundant in them for either they have none at all or it is not fertile, because a useless and morbid secretion is mingled with it.

Semen, then, is part of a useful secretion. But the most useful is the last and that from which finally is formed each of the parts of the body. For secretions are either earlier or later; of the nutriment in the first stage the secretion is phlegm and the like, for phlegm also is a secretion of the useful nutriment, an indication of this being that if it is mixed with pure nutriment it is nourishing, and that it is used up in cases of illness. The final secretion is the smallest in proportion to the quantity of nutriment. But we must reflect that the daily nutriment by which animals and plants grow is but small, for if a very little be added continually to the same thing the size of it will become excessive.

So we must say the opposite of what the ancients said. For whereas they said that semen is that which comes from all the body, we shall say it is that whose nature is to go to all of it, and what they thought a waste-product seems rather to be a secretion. For it is more reasonable to suppose that the last extract of the nutriment which goes to all parts resembles that which is left over from it, just as part of a painter's colour is often left over resembling that which he has used up. Waste-products, on the contrary, are always due to corruption or decay and to a departure from Nature.

A further proof that it is not a waste-product, but rather a secretion, is the fact that the large animals have few young, the small many. For the large must have more waste and less secretion, since the great size of the body causes most of the nutriment to be used up, so that the residue or secretion is small.

Again, no place has been set apart by Nature for waste-products but they flow wherever they can find an easy passage in the body, but a place has been set apart for all the natural secretions; thus the



lower intestine serves for the excretion of the solid nutriment, the bladder for that of the liquid; for the useful part of the nutriment we have the upper intestine, for the spermatic secretions the uterus and pudenda and breasts, for it is collected and flows together into them.

And the resulting phenomena are evidence that semen is what we have said, and these result because such is the nature of the secretion. For the exhaustion consequent on the loss of even a very little of the semen is conspicuous because the body is deprived of the ultimate gain drawn from the nutriment. With some few persons, it is true, during a short time in the flower of their youth the loss of it, if it be excessive in quantity, is an alleviation (just as in the case of the nutriment in its first stage, if too much have been taken, since getting rid of this also makes the body more comfortable), and so it may be also when other secretions come away with it, for in that case it is not only semen that is lost but also other influences come away mingled with it, and these are morbid. Wherefore, with some men at least, that which comes from them proves sometimes incapable of procreation because the seminal element in it is so small. But still in most men and as a general rule the result of intercourse is exhaustion and weakness rather than relief, for the reason given. Moreover, semen does not exist in them either in childhood or in old age or in sickness- in the last case because of weakness, in old age because they do not sufficiently concoct their food, and in childhood because they are growing and so all the nutriment is used up too soon, for in about five years, in the case of human beings at any rate, the body seems to gain half the height that is gained in all the rest of life.

In many animals and plants we find a difference in this connexion not only between kinds as compared with kinds, but also between similar individuals of the same kind as compared with each other, e.g. man with man or vine with vine. Some have much semen, others little, others again none at all, not through weakness but the contrary, at any rate in some cases. This is because the nutriment is used up to form the body, as with some human beings, who, being in good condition and developing much flesh or getting rather too

fat, produce less semen and are less desirous of intercourse. Like this is what happens with those vines which 'play the goat', that is, luxuriate wantonly through too much nutrition, for he-goats when fat are less inclined to mount the female; for which reason they thin them before breeding from them, and say that the vines 'play the goat', so calling it from the condition of the goats. And fat people, women as well as men, appear to be less fertile than others from the fact that the secretion when in process of concoction turns to fat with those who are too well-nourished. For fat also is a healthy secretion due to good living.

In some cases no semen is produced at all, as by the willow and poplar. This condition is due to each of the two causes, weakness and strength; the former prevents concoction of the nutriment, the latter causes it to be all consumed, as said above. In like manner other animals produce much semen through weakness as well as through strength, when a great quantity of a useless secretion is mixed with it; this sometimes results in actual disease when a passage is not found to carry off the impurity, and though some recover of this, others actually die of it. For corrupt humours collect here as in the urine, which also has been known to cause disease.

[Further the same passage serves for urine and semen; and whatever animals have both kinds of excrement, that of liquid and that of solid nutriment, discharge the semen by the same passage as the liquid excrement (for it is a secretion of a liquid, since the nutriment of all animals is rather liquid than solid), but those which have no liquid excrement discharge it at the passage of the solid residua. Moreover, waste-products are always morbid, but the removal of the secretion is useful; now the discharge of the semen participates in both characteristics because it takes up some of the non-useful nutriment. But if it were a waste-product it would be always harmful; as it is, it is not so.]

From what has been said, it is clear that semen is a secretion of useful nutriment, and that in its last stage, whether it is produced by all or no.

## 19

After this we must distinguish of what sort of nutriment it is a secretion, and must discuss the catamenia which occur in certain of the vivipara. For thus we shall make it clear (1) whether the female also produces semen like the male and the foetus is a single mixture of two semens, or whether no semen is secreted by the female, and, (2) if not, whether she contributes nothing else either to generation but only provides a receptacle, or whether she does contribute something, and, if so, how and in what manner she does so.

We have previously stated that the final nutriment is the blood in the sanguinea and the analogous fluid in the other animals. Since the semen is also a secretion of the nutriment, and that in its final stage, it follows that it will be either (1) blood or that which is analogous to blood, or (2) something formed from this. But since it is from the blood, when concocted and somehow divided up, that each part of the body is made, and since the semen if properly concocted is quite of a different character from the blood when it is separated from it, but if not properly concocted has been known in some cases to issue in a bloody condition if one forces oneself too often to coition, therefore it is plain that semen will be a secretion of the nutriment when reduced to blood, being that which is finally distributed to the parts of the body. And this is the reason why it has so great power, for the loss of the pure and healthy blood is an exhausting thing; for this reason also it is natural that the offspring should resemble the parents, for that which goes to all the parts of the body resembles that which is left over. So that the semen which is to form the hand or the face or the whole animal is already the hand or face or whole animal undifferentiated, and what each of them is actually such is the semen potentially, either in virtue of its own mass or because it has a certain power in itself. I mention these alternatives here because we have not yet made it clear from the distinctions drawn hitherto whether it is the matter of the semen that is the cause of generation, or whether it has in it some faculty and efficient cause thereof, for the hand also or any other bodily part is not hand or

other part in a true sense if it be without soul or some other power, but is only called by the same name as the living hand.

On this subject, then, so much may be laid down. But since it is necessary (1) that the weaker animal also should have a secretion greater in quantity and less concocted, and (2) that being of such a nature it should be a mass of sanguineous liquid, and (3) since that which Nature endows with a smaller portion of heat is weaker, and (4) since it has already been stated that such is the character of the female- putting all these considerations together we see that the sanguineous matter discharged by the female is also a secretion. And such is the discharge of the so-called catamenia.

It is plain, then, that the catamenia are a secretion, and that they are analogous in females to the semen in males. The circumstances connected with them are evidence that this view is correct. For the semen begins to appear in males and to be emitted at the same time of life that the catamenia begin to flow in females, and that they change their voice and their breasts begin to develop. So, too, in the decline of life the generative power fails in the one sex and the catamenia in the other.

The following signs also indicate that this discharge in females is a secretion. Generally speaking women suffer neither from haemorrhoids nor bleeding at the nose nor anything else of the sort except when the catamenia are ceasing, and if anything of the kind occurs the flow is interfered with because the discharge is diverted to it.

Further, the blood-vessels of women stand out less than those of men, and women are rounder and smoother because the secretion which in men goes to these vessels is drained away with the catamenia. We must suppose, too, that the same cause accounts for the fact that the bulk of the body is smaller in females than in males among the vivipara, since this is the only class in which the catamenia are discharged from the body. And in this class the fact is clearest in women, for the discharge is greater in women than in the other animals. Wherefore her pallor and the absence of prominent blood-ves-

sels is most conspicuous, and the deficient development of her body compared with a man's is obvious.

Now since this is what corresponds in the female to the semen in the male, and since it is not possible that two such discharges should be found together, it is plain that the female does not contribute semen to the generation of the offspring. For if she had semen she would not have the catamenia; but, as it is, because she has the latter she has not the former.

It has been stated then that the catamenia are a secretion as the semen is, and confirmation of this view may be drawn from some of the phenomena of animals. For fat creatures produce less semen than lean ones, as observed before. The reason is that fat also, like semen, is a secretion, is in fact concocted blood, only not concocted in the same way as the semen. Thus, if the secretion is consumed to form fat the semen is naturally deficient. And so among the bloodless animals the cephalopoda and crustacea are in best condition about the time of producing eggs, for, because they are bloodless and no fat is formed in them, that which is analogous in them to fat is at that season drawn off to form the spermatic secretion.

And a proof that the female does not emit similar semen to the male, and that the offspring is not formed by a mixture of both, as some say, is that often the female conceives without the sensation of pleasure in intercourse, and if again the pleasure is experience by her no less than by the male and the two sexes reach their goal together, yet often no conception takes place unless the liquid of the so-called catamenia is present in a right proportion. Hence the female does not produce young if the catamenia are absent altogether, nor often when, they being present, the efflux still continues; but she does so after the purgation. For in the one case she has not the nutriment or material from which the foetus can be framed by the power coming from the male and inherent in the semen, and in the other it is washed away with the catamenia because of their abundance. But when after their occurrence the greater part has been evacuated, the remainder is formed into a foetus. Cases of conception when the cat-

amenia do not occur at all, or of conception during their discharge instead of after it, are due to the fact that in the former instance there is only so much liquid to begin with as remains behind after the discharge in fertile women, and no greater quantity is secreted so as to come away from the body, while in the latter instance the mouth of the uterus closes after the discharge. When, therefore, the quantity already expelled from the body is great but the discharge still continues, only not on such a scale as to wash away the semen, then it is that conception accompanies coition. Nor is it at all strange that the catamenia should still continue after conception (for even after it they recur to some extent, but are scanty and do not last during all the period of gestation; this, however, is a morbid phenomenon, wherefore it is found only in a few cases and then seldom, whereas it is that which happens as a regular thing that is according to Nature).

It is clear then that the female contributes the material for generation, and that this is in the substance of the catamenia, and that they are a secretion.

## 20

Some think that the female contributes semen in coition because the pleasure she experiences is sometimes similar to that of the male, and also is attended by a liquid discharge. But this discharge is not seminal; it is merely proper to the part concerned in each case, for there is a discharge from the uterus which occurs in some women but not in others. It is found in those who are fair-skinned and of a feminine type generally, but not in those who are dark and of a masculine appearance. The amount of this discharge, when it occurs, is sometimes on a different scale from the emission of semen and far exceeds it. Moreover, different kinds of food cause a great difference in the quantity of such discharges; for instance some pungently-flavoured foods cause them to be conspicuously increased. And as to the pleasure which accompanies coition it is due to emission not only of semen, but also of a spiritus, the coming together of which precedes the emission. This is plain in the case of boys who are not

yet able to emit semen, but are near the proper age, and of men who are impotent, for all these are capable of pleasure by attrition. And those who have been injured in the generative organs sometimes suffer from diarrhoea because the secretion, which they are not able to concoct and turn into semen, is diverted into the intestine. Now a boy is like a woman in form, and the woman is as it were an impotent male, for it is through a certain incapacity that the female is female, being incapable of concocting the nutriment in its last stage into semen (and this is either blood or that which is analogous to it in animals which are bloodless owing to the coldness of their nature). As then diarrhoea is caused in the bowels by the insufficient concoction of the blood, so are caused in the blood-vessels all discharges of blood, including that of the catamenia, for this also is such a discharge, only it is natural whereas the others are morbid.

Thus it is clear that it is reasonable to suppose that generation comes from this. For the catamenia are semen not in a pure state but in need of working up, as in the formation of fruits the nutriment is present, when it is not yet sifted thoroughly, but needs working up to purify it. Thus the catamenia cause generation mixture with the semen, as this impure nutriment in plants is nutritious when mixed with pure nutriment.

And a sign that the female does not emit semen is the fact that the pleasure of intercourse is caused by touch in the same region of the female as of the male; and yet is it not from thence that this flow proceeds. Further, it is not all females that have it at all, but only the sanguinea, and not all even of these, but only those whose uterus is not near the hypozoma and which do not lay eggs; it is not found in the animals which have no blood but only the analogous fluid (for what is blood in the former is represented by another fluid in the latter). The reason why neither the latter nor those sanguinea mentioned (i.e. those whose uterus is low and which do not lay eggs) have this effluxion is the dryness of their bodies; this allows but little matter to be secreted, only enough for generation but not enough to be discharged from the body. All animals that are viviparous without

producing eggs first (such are man and all quadrupeds which bend their hind-legs outwards, for all these are viviparous without producing eggs)- all these have the catamenia, unless they are defective in development as the mule, only the efflux is not abundant as in women. Details of the facts in each animal have been given in the Enquiries concerning animals.

The catamenia are more abundant in women than in the other animals, and men emit the most semen in proportion to their size. The reason is that the composition of their bodies is liquid and hot compared to others, for more matter must be secreted in such a case. Further, man has no such parts in his body as those to which the superfluous matter is diverted in the other animals; for he has no great quantity of hair in proportion to his body, nor outgrowths of bones, horns, and teeth.

There is evidence that the semen is in the catamenia, for, as said before, this secretion appears in the male at the same time of life as the catamenia in the female; this indicates that the parts destined to receive each of these secretions are differentiated at the same time in both sexes; and as the neighboring parts in both become swollen the hair of puberty springs forth in both alike. As the parts in question are on the point of differentiating they are distended by the spiritus; this is clearer in males in the testes, but appears also about the breasts; in females it is more marked in the breasts, for it is when they have risen two fingers' breadth that the catamenia generally begin.

Now, in all living things in which the male and female are not separated the semen (or seed) is a sort of embryo; by embryo I mean the first mixture of male and female; hence, from one semen comes one body- for example, one stalk of wheat from one grain, as one animal from one egg (for twin eggs are really two eggs). But in whatever kinds the sexes are distinguished, in these many animals may come from one emission of semen, showing that the semen differs in its nature in plants and animals. A proof of this is that animals which can bear more than one young one at a time do so



in consequence of only one coition. Whereby, too, it is plain that the semen does not come from the whole of the body; for neither would the different parts of the semen already be separated as soon as discharged from the same part, nor could they be separated in the uterus if they had once entered it all together; but what does happen is just what one would expect, since what the male contributes to generation is the form and the efficient cause, while the female contributes the material. In fact, as in the coagulation of milk, the milk being the material, the fig-juice or rennet is that which contains the curdling principle, so acts the secretion of the male, being divided into parts in the female. Why it is sometimes divided into more or fewer parts, and sometimes not divided at all, will be the subject of another discussion. But because it does not differ in kind at any rate this does not matter, but what does matter is only that each part should correspond to the material, being neither too little to concoct it and fix it into form, nor too much so as to dry it up; it then generates a number of offspring. But from this first formative semen, if it remains one, and is not divided, only one young one comes into being.

That, then, the female does not contribute semen to generation, but does contribute something, and that this is the matter of the catamenia, or that which is analogous to it in bloodless animals, is clear from what has been said, and also from a general and abstract survey of the question. For there must needs be that which generates and that from which it generates; even if these be one, still they must be distinct in form and their essence must be different; and in those animals that have these powers separate in two sexes the body and nature of the active and the passive sex must also differ. If, then, the male stands for the effective and active, and the female, considered as female, for the passive, it follows that what the female would contribute to the semen of the male would not be semen but material for the semen to work upon. This is just what we find to be the case, for the catamenia have in their nature an affinity to the primitive matter.

## 21

So much for the discussion of this question. At the same time the answer to the next question we have to investigate is clear from these considerations, I mean how it is that the male contributes to generation and how it is that the semen from the male is the cause of the offspring. Does it exist in the body of the embryo as a part of it from the first, mingling with the material which comes from the female? Or does the semen communicate nothing to the material body of the embryo but only to the power and movement in it? For this power is that which acts and makes, while that which is made and receives the form is the residue of the secretion in the female. Now the latter alternative appears to be the right one both a priori and in view of the facts. For, if we consider the question on general grounds, we find that, whenever one thing is made from two of which one is active and the other passive, the active agent does not exist in that which is made; and, still more generally, the same applies when one thing moves and another is moved; the moving thing does not exist in that which is moved. But the female, as female, is passive, and the male, as male, is active, and the principle of the movement comes from him. Therefore, if we take the highest genera under which they each fall, the one being active and motive and the other passive and moved, that one thing which is produced comes from them only in the sense in which a bed comes into being from the carpenter and the wood, or in which a ball comes into being from the wax and the form. It is plain then that it is not necessary that anything at all should come away from the male, and if anything does come away it does not follow that this gives rise to the embryo as being in the embryo, but only as that which imparts the motion and as the form; so the medical art cures the patient.

This a priori argument is confirmed by the facts. For it is for this reason that some males which unite with the female do not, it appears, insert any part of themselves into the female, but on the contrary the female inserts a part of herself into the male; this occurs in some insects. For the effect produced by the semen in the female (in

the case of those animals whose males do insert a part) is produced in the case of these insects by the heat and power in the male animal itself when the female inserts that part of herself which receives the secretion. And therefore such animals remain united a long time, and when they are separated the young are produced quickly. For the union lasts until that which is analogous to the semen has done its work, and when they separate the female produces the embryo quickly; for the young is imperfect inasmuch as all such creatures give birth to scoleces.

What occurs in birds and oviparous fishes is the greatest proof that neither does the semen come from all parts of the male nor does he emit anything of such a nature as to exist within that which is generated, as part of the material embryo, but that he only makes a living creature by the power which resides in the semen (as we said in the case of those insects whose females insert a part of themselves into the male). For if a hen-bird is in process of producing wind-eggs and is then trodden by the cock before the egg has begun to whiten and while it is all still yellow, then they become fertile instead of being wind-eggs. And if while it is still yellow she be trodden by another cock, the whole brood of chicks turn out like the second cock. Hence some of those who are anxious to rear fine birds act thus; they change the cocks for the first and second treading, not as if they thought that the semen is mingled with the egg or exists in it, or that it comes from all parts of the cock; for if it did it would have come from both cocks, so that the chick would have all its parts doubled. But it is by its force that the semen of the male gives a certain quality to the material and the nutriment in the female, for the second semen added to the first can produce this effect by heat and concoction, as the egg acquires nutriment so long as it is growing.

The same conclusion is to be drawn from the generation of oviparous fishes. When the female has laid her eggs, the male sprinkles the milt over them, and those eggs are fertilized which it reaches, but not the others; this shows that the male does not contribute anything to the quantity but only to the quality of the embryo.

From what has been said it is plain that the semen does not come from the whole of the body of the male in those animals which emit it, and that the contribution of the female to the generative product is not the same as that of the male, but the male contributes the principle of movement and the female the material. This is why the female does not produce offspring by herself, for she needs a principle, i.e. something to begin the movement in the embryo and to define the form it is to assume. Yet in some animals, as birds, the nature of the female unassisted can generate to a certain extent, for they do form something, only it is incomplete; I mean the so-called wind-eggs.

## 22

For the same reason the development of the embryo takes place in the female; neither the male himself nor the female emits semen into the female, but the female receives within herself the share contributed by both, because in the female is the material from which is made the resulting product. Not only must the mass of material exist there from which the embryo is formed in the first instance, but further material must constantly be added that it may increase in size. Therefore the birth must take place in the female. For the carpenter must keep in close connexion with his timber and the potter with his clay, and generally all workmanship and the ultimate movement imparted to matter must be connected with the material concerned, as, for instance, architecture is in the buildings it makes.

From these considerations we may also gather how it is that the male contributes to generation. The male does not emit semen at all in some animals, and where he does this is no part of the resulting embryo; just so no material part comes from the carpenter to the material, i.e. the wood in which he works, nor does any part of the carpenter's art exist within what he makes, but the shape and the form are imparted from him to the material by means of the motion he sets up. It is his hands that move his tools, his tools that move the material; it is his knowledge of his art, and his soul, in which is the

form, that moves his hands or any other part of him with a motion of some definite kind, a motion varying with the varying nature of the object made. In like manner, in the male of those animals which emit semen Nature uses the semen as a tool and as possessing motion in actuality, just as tools are used in the products of any art, for in them lies in a certain sense the motion of the art. Such, then, is the way in which these males contribute to generation. But when the male does not emit semen, but the female inserts some part of herself into the male, this is parallel to a case in which a man should carry the material to the workman. For by reason of weakness in such males Nature is not able to do anything by any secondary means, but the movements imparted to the material are scarcely strong enough when Nature herself watches over them. Thus here she resembles a modeller in clay rather than a carpenter, for she does not touch the work she is forming by means of tools, but, as it were, with her own hands.

## 23

In all animals which can move about, the sexes are separated, one individual being male and one female, though both are the same in species, as with man and horse. But in plants these powers are mingled, female not being separated from male. Wherefore they generate out of themselves, and do not emit semen but produce an embryo, what is called the seed. Empedocles puts this well in the line: 'and thus the tall trees oviposit; first olives...' For as the egg is an embryo, a certain part of it giving rise to the animal and the rest being nutriment, so also from a part of the seed springs the growing plant, and the rest is nutriment for the shoot and the first root.

In a certain sense the same thing happens also in those animals which have the sexes separate. For when there is need for them to generate the sexes are no longer separated any more than in plants, their nature desiring that they shall become one; and this is plain to view when they copulate and are united, that one animal is made out of both.

It is the nature of those creatures which do not emit semen to remain united a long time until the male element has formed the embryo, as with those insects which copulate. The others so remain only until the male has discharged from the parts of himself introduced something which will form the embryo in a longer time, as among the sanguinea. For the former remain paired some part of a day, while the semen forms the embryo in several days. And after emitting this they cease their union.

And animals seem literally to be like divided plants, as though one should separate and divide them, when they bear seed, into the male and female existing in them.

In all this Nature acts like an intelligent workman. For to the essence of plants belongs no other function or business than the production of seed; since, then, this is brought about by the union of male and female, Nature has mixed these and set them together in plants, so that the sexes are not divided in them. Plants, however, have been investigated elsewhere. But the function of the animal is not only to generate (which is common to all living things), but they all of them participate also in a kind of knowledge, some more and some less, and some very little indeed. For they have sense-perception, and this is a kind of knowledge. (If we consider the value of this we find that it is of great importance compared with the class of lifeless objects, but of little compared with the use of the intellect. For against the latter the mere participation in touch and taste seems to be practically nothing, but beside absolute insensibility it seems most excellent; for it would seem a treasure to gain even this kind of knowledge rather than to lie in a state of death and non-existence.) Now it is by sense-perception that an animal differs from those organisms which have only life. But since, if it is a living animal, it must also live; therefore, when it is necessary for it to accomplish the function of that which has life, it unites and copulates, becoming like a plant, as we said before.

Testaceous animals, being intermediate between animals and plants, perform the function of neither class as belonging to both.

As plants they have no sexes, and one does not generate in another; as animals they do not bear fruit from themselves like plants; but they are formed and generated from a liquid and earthy concretion. However, we must speak later of the generation of these animals.

