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GENERATION OF ANIMALS
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dedicat
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In reviewing Karl Bitterauf’s book\textsuperscript{a} in 1914, H. Stadler\textsuperscript{b} described the \textit{Generation of Animals} as “this still inadequately appreciated work of Aristotle’s,” and it must be confessed that his description is not yet out of date. It has, perhaps, been more appreciated by men of science than by scholars and philosophers; but it has a strong interest for both classes of students. Its neglect by scholars and philosophers\textsuperscript{c} is the more surprising, since it may, I think, be justly claimed that in this treatise 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\textsuperscript{d}, have in Aristotle’s view the best claim to the title of “being” (οὐσία), 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.

\textsuperscript{a} Der Schlussteil der aristotelischen Biologie; see below, p. xxv.

\textsuperscript{b} In \textit{Berliner Philologische Wochenschrift} (1914), p. 833.

\textsuperscript{c} Among the less learned, however, the outstanding achievement of Aristotle in this branch of study has been for at least the last three centuries acknowledged by the title of the popular handbook known as \textit{Aristotle’s Masterpiece}.

\textsuperscript{d} Aristotle’s strong interest in plants is shown by the large number of references to them in \textit{G.A.}; see Index.
Perhaps philosophers, like the visitors who came to call on Heracleitus and found him in the kitchen, have felt embarrassed at finding Aristotle in his laboratory, and have thought it more dignified to wait until he came out; failing to perceive that "there too gods are present." And where the gods are, there too is beauty, however mean and however small the creature may be which is the subject of study—greater beauty than is to be found in the products of human skill; for these are the workmanship of Nature, who does nothing idly or without purpose; and in them too is to be found the activity of Soul, working through its instrument pneuma, which is the terrestrial counterpart of the celestial "quintessence," aither, the divine constituent of the heavenly spheres and of the stars; in them, therefore, Form at its highest and Matter at its highest are seen operating in unison. For men of science, the Generation of Animals has a special interest, in that it is the first systematic treatise on animal reproduction and embryology, containing records of observations, marking out schemes of classification, and suggesting methods of dealing with problems, much of which has proved of permanent value; indeed, Aristotle's work was not resumed until after the lapse of nearly two thousand years, and some of his observations were not repeated until comparatively recent times. Of this I shall have more to say presently.

Aristotle's Embryology

The De generatione animalium is the culminating

\[\text{See P.A. I. 645 a 20 ff.}\]
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portion of Aristotle's zoological works, of which the scheme may be exhibited as follows:

I. Record of observations.  
*Historia animalium*.

II. Theory based upon observations (including also many observational data).

(a) \( \text{De partibus animalium} \) treating of the "matter" of animals and the way in which it is arranged to subserve their various purposes; *i.e.*, their "parts," excluding those used in reproduction.

(b) \( \text{De anima} \) treating of the "form" of animals —*i.e.*, Soul, and its "parts" or functions.

(c) \( \text{Parva naturalia} \) treating of the functions "common to body and Soul," excluding reproduction.

(d) \( \text{De generatione animalium} \) treating of the "parts" used in reproduction, and of the reproductive functions (which are common to body and Soul).

The section (b) is necessary to the completeness of the scheme, but as it has given rise to a whole department of study, it is usually treated apart from the rest. Thus the main bulk of the zoological and biological works may be taken to consist of the three great treatises *H.A.*, *P.A.* and *G.A.*. It was these which, through Latin translations made from the Arabic, were restored to the West by those who revived scientific studies at the beginning of the 13th century.

It is generally held that the zoological works were written during the second period of Aristotle's composition.  

\( ^a \) For abbreviations, see p. lxxvi.
residence at Athens, when he was engaged in organizing systematic observation and specialized research, which produced, among other results, the collection of 158 constitutions of states (of which the Constitution of Athens, recovered at the end of the 19th century, is one), as well as the Historia animalium. The zoological works have not been subjected to such minute criticism as, for instance, the Metaphysics and Politics, but, according to Jaeger, the H.A. shows clear traces of different authors, and he suggests that the work of observation was distributed among several persons from the outset. It is probable that some collection of material was made by Aristotle himself between the two periods of his residence at Athens. But the real importance of these works is that they represent the first attempt in Europe to observe and describe in a scientific way the individual living object.

Aristotle's method may be described as substantially the same as that of modern scientific workers: it is inductive-deductive, as opposed on the one hand to earlier (and later) methods of pure deduction from a priori premisses, and on the other hand to the Baconian method of almost exclusive induction. Aristotle often complains that his predecessors' work was marred by insufficient observation, and the importance which he himself attached to careful and thorough observation is apparent throughout the zoological treatises. Of particular interest in this connexion are his observations of the viviparous dogfish (Mustelus laevis), observations not repeated in

\[a\] See W. D. Ross, Aristotle, and W. W. Jaeger, Aristotle.

\[b\] See D. W. Thompson, prefatory note to translation of H.A., p. vii.
modern times until the seventeenth century, and his knowledge of the hectocotylization of one of the tentacles in the Octopus; the problem involved in the latter case has not yet been solved. Other problems raised by him have found their solution only in very recent years; among them may be mentioned the breeding of eels and the anatomy of the hyena. His discussion of the reproduction of bees is a remarkable piece of analysis; and here, again the facts are not yet fully ascertained. It is in connexion with this problem that Aristotle makes his well-known dictum: "But the facts have not yet been sufficiently ascertained; and if at any future time they are ascertained, then credence must be given to the direct evidence of the senses rather than to theories—and to theories too provided that the results which they show agree with what is observed." This, indeed, is the principle upon which his work is based; and although he is often forced to rely upon bare theories, it is only because he was unable to obtain experimental data—most insects, he regrettfully remarks, are too small to be observed—in other words, it is only because he lacked the necessary apparatus. For his magnificent *apologia* (if such it can be called— *protreptic* would be a better word) on the subject of the study of natural history, the reader should refer to the passage in the first Book of the *De partibus* (ch. 5). Nevertheless it is probable that his theories, though they sometimes led him astray, did in fact often help him to adopt a correct general outlook, even if the detailed working out of them is

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*a* By Nicolaus Steno (1638–1686): although the facts were not widely known until the work of J. Müller in the 19th century (see 754 b 33, n.).

*b* See p. 565.
erroneous. As examples of this we may quote his discussions and conclusions upon preformation and epigenesis and upon the time of sex-determination in the embryo. The main contributions of Aristotle to embryology, as judged from the viewpoint of a modern embryologist, may be stated as follows:

1. Following the lead of men like the author of the Hippocratic treatise π. γονης, Aristotle greatly extended the field of careful and accurate observation, and was thereby enabled to introduce for the first time the comparative method into embryology, and so to arrange the available data in an orderly way. This is expressed, e.g., by his classification of animals according to their methods of embryonic development.

2. He stated in the clearest terms the two rival theories of preformation and epigenesis, and decided in favor of the latter. He also laid down that the sex of the embryo was determined at the very beginning of its development.

3. He clearly stated that generic characteristics precede specific characteristics in embryonic development, and, by his theory that the various faculties of Soul developed successively in the embryo, foreshadowed the modern theory of "recapitulation." By his observation that the "upper" parts of the embryo develop more rapidly than the "lower" parts he foreshadowed

For a useful general estimate of Aristotle's work, see E. S. Russell, The Interpretation of Development and Heredity (1930), pp. 11-24.

the modern doctrine of "axial gradients" (see 741 b 28, n.).
4. He correctly understood the functions of the placenta and the umbilical cord; and
5. He prefigured (see 772 b 13 ff.) with wonderful insight the cell-streams or morphogenetic movements which are fundamental in embryonic development during the period when the germ-layers are taking up their definitive positions. His dynamic view of the origin both of normal structures and of monstrous deviations can be fully appreciated only in the light of modern knowledge of the great part played by movement, migration of cells, etc., in early embryonic development.

On the contrary side we must range such mistakes as these:
1. The insect larva, which Aristotle regarded as the earlier stage of an egg, "an egg laid too soon," has in fact passed the embryonic stage.
2. Observations of newly-castrated animals led him to regard the testes as of secondary importance.

With regard to his famous doctrine that the male supplies the Form and the female the Matter of the embryo (see 729 a 11), some misunderstanding may easily arise. And also, with regard to his insistence upon the importance of the Final Cause, we find that modern scientific opinion, following the lead of Francis Bacon, who led the attack upon Formal and Final Causes, often tends to consider Aristotle's talk

\[a\] See J. Needham, *Biochemistry and Morphogenesis* (1942), where also the most modern views on the origin of monsters will be found. On this subject, C. Dareste's *Production artistique des monstruosités* (1877) is still the classical work.

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about these Causes as inferior to what he has to say on other matters. It is, however, open to question whether Aristotle would in fact have reached some of his most valuable conclusions apart from his insistence upon the pre-eminence of the Final Cause (any more than Harvey might have discovered the circulation of the blood unless he had tried to discover what was the Final Cause of the valves in the veins); and although Aristotle was of course ignorant of the existence of spermatozoa and of the mammalian ovum, and although he considered that the menstrual fluid was the "matter" out of which the embryo was formed, it is not so certain that he was quite as wrong-headed as he is often said to be.

Before coming to a conclusion, we must consider what exactly Aristotle meant by Form and Matter in this connexion. In the first place, we must realize that the Form is not bare Form, nor is the Matter bare Matter: this, indeed, is a fundamental doctrine of Aristotle. Form is not found apart from Matter (that was a Platonic view); nor is Matter found which is not to some extent "informed"; and Aristotle can say (end of Met. H) that Matter in its ultimate stage is identical with Form (see Introd. § 17). At any rate, the Matter with which we are concerned in the generation of animals is far from being "uninformed." Like the "residue" contributed by the male, the "residue" contributed by the female is "concocted blood"; and, since blood is the "ultimate nourishment" which maintains the upkeep of

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*a* Discovered by K. E. von Baer; there is a complete facsimile of his fundamental memoir *De ovi mammalium et hominis genesi* (Leipzig, 1827) in Sarton’s *Isis*, XVI (1931), 315 ff.
the body and its parts, both “residues” are potentially the body of a living creature of the same kind as that which produced them. Indeed, the only important difference between them is one of the degree of “concoction” which they have undergone, for the female, whose vital heat is weaker, cannot carry the “concoction” of blood as far as the male can. But the female’s “residue” (viz., the menstrual fluid) is, potentially, all the parts of the body; and hence, too, it is, or contains, Soul potentially (this is merely another way of saying the same thing, because just as any actual living body must possess Soul, which is its Form, actually, so a potential living body must possess Soul potentially). That the female’s “residue” does in fact possess Soul potentially is shown, says Aristotle, by the occurrence of wind-eggs in birds: these possess nutritive Soul, and up to a point they grow and “are fertile.” The Matter, therefore, is “informed” to a high degree; and the only part of the Form which it lacks is sentient Soul. Hence, the meaning of the statement that “the male supplies the Form” can only be that the male supplies that part of the Form known as sentient Soul: everything else, including nutritive Soul, can be, and is, supplied by the female.

We may now go on to consider the “residue” contributed by the male. Aristotle, as we saw, held that Form is not normally found apart from Matter (i.e., body) of some sort, and besides that, according

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*a* See Introd. § 42. An exception is rational Soul, which is not the Form of any body (§ 44), but this is a separate question, and in any case affects man only. We must also except the 55 immaterial unmoved movers, which Aristotle posits in the Metaphysics (1074 a) to account for the movements of the planets.
to him, action can only be exerted, change can only be brought about, by something that can come into contact with another thing. Therefore in any case something corporeal must be supplied by the male as well as Form, and this is of course the substance which carries the (potential) Form: it is the substance with which the sort of Form known as Soul is specially and regularly connected, and in which it resides, viz., connate pneuma. This pneuma, which is thus present in the semen, is charged with the "movements" proper to Soul, including (in the case of the male) the "movements" proper to sentient Soul; and these "movements," when given the right material to work upon (viz., material which is potentially an animal of the right kind) and the right conditions, are able to produce an animal of the same kind as that which they would have produced or maintained in the male parent even if the blood in which they were originally present had not undergone the further stage of being concocted into semen.

Hence it is clear that fundamentally the contributions of both parents in generation are identical; both are potentially a living animal of a certain kind, and this involves that both possess the living animal's Form, viz., its Soul, potentially; and the only difference between them is that the male's contribution possesses also sentient Soul potentially.

At the same time, this is an important difference, and makes itself apparent in the difference of bulk between the two: the female's is large in bulk, the male's is small. And this difference of bulk is accounted for by the fact that the female's is less "concocted" than the male's—it is less concentrated. Further, the only Matter that the semen need con-
tain is a sufficient amount to transmit the "movements" to the female’s residue, and once this has been done—that is to say, once the embryo or rather its heart has been "constituted," once it has been given its "principle" and has the power to grow—then the "body" of the semen can "evaporate," for the Matter which provides the embryo with its wherewithal for growth is of course supplied by the female parent.

As a final word on the subject we may recall that, in addition to what we have already found Aristotle saying about the identity of Matter and Form in the long run, he finds no greater difficulty in identifying φύσις with Matter than he does in identifying it with Form or with the Motive Cause and the Final Cause (see Introd. § 14, end); and when all the attributes have been ascribed to Matter which Aristotle ascribes to it in spontaneous generation (see App. B § 17, additional note), there is very little more left for it to desire.

I have not thought it necessary to call attention to all Aristotle’s mistakes, partly because of lack of space, but chiefly because it would serve no really useful purpose. Nor have I given an account of modern embryological theory. My main object has been to ensure that the reader shall be able to find out what Aristotle said, and to secure that Aristotle shall get neither credit nor discredit for things which he did not say. In a treatise such as G.A., this means that fairly copious footnotes are necessary, and as a further help to the reader I have provided not only a full account of Aristotle’s technical terms (which gives an opportunity for explaining a good deal of the

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See also p. xxxiv.

a See also p. xxxiv.
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framework of his thought), but also, in the Appendix, accounts of his theory of the universe and movement (without which parts of Books II and IV cannot be understood) and of the functions of Σύμφωνον Πνεῦμα, an essential factor in his doctrine of generation. On the principle that, for the most part, Aristotle is his own best interpreter, these accounts are compiled almost entirely from passages taken direct from Aristotle's own treatises.

In reading Aristotle's scientific works, it is important not only to recognize how great were the advances which he himself made in natural history, both in practical observation and in theory, but also to remember that his work was a continuation and an expansion of what had been begun by previous scientific workers. Those to whom he most frequently refers by name are three: Anaxagoras, Empedocles, and Democritus, besides several references to theories which can be traced in the Hippocratic treatises; and the fact that he often quotes them in order to disagree with them should not lead us to underrate their achievement. It is not possible here to give any adequate account of these predecessors of his, and for details about them the reader must be referred to the standard works on

\[ a \] The doctrine of ΣΠ was older than Aristotle (see Jaeger; references given Introd. § 46, n.), but in this volume I am concerned only with Aristotle's presentation of it.

\[ b \] Aristotle calls them collectively φυσικοί or φυσιολόγοι, "physiologers," i.e., writers on "Nature," "natural" scientists. See 741 b 10, n.

\[ c \] There are also, of course, references to theories stated by Plato, to which attention is called in the notes; but Plato is not mentioned by name. See also K. Prächter, Platon Präformist? in Philologus, LXXXIII (1927), 18-30.
the early scientists and philosophers and to other works of reference. Alcmeon, to whom also he refers, is an important figure, since it was he, apparently, who originated the famous doctrine of "passages" (or "pores," πόροι) in connexion with sensation, and held that the brain was the common sensorium, in which belief he was followed by Hippocrates and Plato, whereas Empedocles and Aristotle reverted to the older view that the heart is the central organ of sensation. Alcmeon also treated systematically of the special senses, in particular that of sight. Other theories of his mentioned by Aristotle may be found by reference to the Index.

Anaxagoras of Clazomenae, the last great name in the Ionian philosophic succession of Asia Minor, is well known for his theory that νοῦς is responsible for the order of the universe as a whole, just as it is for the order which is to be discerned in living creatures, and for his remarkable theory of matter, which he constructed specially with a view to accounting for generation and growth. I have treated fully of this elsewhere.

Empedocles of Acragas, a striking figure, was a slightly younger contemporary of Anaxagoras, and was renowned as a politician, religious teacher, rhetorician, philosopher, and physician: he was the

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b *C.Q.* XXV (1931), 27 ff., 112 ff.; see also *G.A.* 723 a 7.
founder of the "Italian" school of medicine. Considerable portions of his poems on *Nature* and *Purifications* are extant. He adopted, perhaps formulated, the doctrine of the four Elements, which really means (see π. ἄρχαίς ἰητρικῆς, chh. 13 ff.) that he selected, as especially important, four out of the many substances already recognized as fundamental in traditional Greek medical theory (see Introd. § 24).

Democritus of Abdera, the follower of Leucippus, is best known for his advancement of the atomic theory originated by his master. Abdera is not far from Aristotle's birthplace, Stageira, and Aristotle seems to have been specially interested in Democritus.a

The following table will indicate roughly the dates of these early scientists:

<table>
<thead>
<tr>
<th>Scientist</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcmeon</td>
<td>c. 510-480</td>
</tr>
<tr>
<td>Anaxagoras</td>
<td>c. 494-434</td>
</tr>
<tr>
<td>Empedocles</td>
<td>c. 494-434</td>
</tr>
<tr>
<td>Democritus</td>
<td>c. 460-370</td>
</tr>
</tbody>
</table>

a For further details about Democritus, see C. Bailey, *The Greek Atomists and Epicurus*.

b According to W. A. Heidel, however, *Hippocratic Medicine* (1941), 43, and *American Journal of Philology*, LXI (1940), 3 ff., Alcmeon's *floruit* should be put considerably later, say at 450 B.C.
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It is not possible to assign exact dates for all the treatises in the Hippocratic collection; indeed they cannot all be ascribed to a single author, but one of the most important, the π. ἀρχαίας ἑτρεκής, refers to Empedocles as having introduced new-fangled ideas into the long established science of medicine (ch. 20). Other treatises relevant to our subject are the π. ἀέρων ὄδάτων τόπων, the π. διαίτης, and the π. γονῆς καὶ π. φύσιος παιδίου. All of these are most interesting and will repay study. The last named in particular is the work of a most active and enterprising man, always ready to experiment and to record his results and to make use of them.

It should of course be remembered that although Aristotle introduced much new technical terminology and sometimes gave new content to what already existed, many of the terms which he uses were the common property of scientific writers, among them being such important ones as the following: δύναμις, κράσις, σύντηγμα, συμμετρία, εἴδος, πνεῦμα and the like. I have attempted to trace the development of one such term in my account of δύναμις (Introd. §§ 23 ff.).

It is not possible here to say much about Aristotle’s successors, but it is necessary to say enough to emphasize the important influence which they have had in the history of science. Hieronymus Fabricius ab Aquapendente (1537–1619) knew and admired Aristotle’s work on embryology, and what is more, himself carried out further important observations on the same subject. His brilliant successor, William Harvey (1578–1657), was a student of Aristotle, and much of his inspiration came from Aristotle’s works. Harvey was indeed the first to make any substantial advance in embryology since Aristotle him-
self. In other departments of study, however, during the 17th century, the authority of Aristotle and the scholastic doctrine with which he was identified were being combated in the name of "freedom," and so it came about that the zoological works too, which had been brought to light by the "dark" ages, were allowed to pass back into oblivion by the age of enlightenment. It was not until the end of the 18th century that they were rediscovered for the second time by Cuvier (1769–1832) and members of the Saint-Hilaire family.

**Early Translators**

Lack of space forbids reprinting here the account which I gave in the Introduction to *P.A.* of the fascinating history of the early translators of Aristotle's zoological works, and I must be allowed to refer the reader to that volume (pp. 39 ff.) for details and other references. A mere list of the four most important translations must here suffice:

(1) The physician Ibn al-Batriq translated the *H.A.*, *P.A.* and *G.A.* into Arabic at Bagdad during the time of the Caliphate of al-Mamun (813–833), son of Harun al-Rashid. There is a ms. of an Arabic translation, probably Ibn al-Batriq's, in the British Museum; and there

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\(^a\) B.M. Add. 7511, 13th–14th century (=Steinschneider B.M. 437). I have seen this ms. Judging from the passages which Dr. R. Levy kindly read for me in this ms., Scot's Latin version is a close translation from the Arabic. This is confirmed by the fact that the contents-preface which is found prefixed to Scot's translation corresponds exactly with the preface which precedes the Arabic version in this ms. (see B.M. *Catalogus codicum manusciptorum orientalium*, p. 215).
can be little doubt that this is the translation from which Michael Scot made his Latin version.

(2) Michael Scot translated *H.A.*, *P.A.* and *G.A.* into Latin from the Arabic at Toledo. This translation was finished before 1217.

(3) William of Moerbeke translated the zoological works into Latin from the Greek, at Thebes, in or before 1260.

(4) Theodore of Gaza began at Rome in 1450 to make translations of Aristotle and other Greek authors. His translation of the zoological works of Aristotle is dedicated to Pope Sixtus IV, and this soon became the standard Latin version. It is printed in the Berlin edition of Aristotle.

**The Text**

It soon became clear that for the purpose of translation it was necessary to make a working version of the Greek text, and to this end I made my first draft with the Berlin edition, Aubert and Wimmer’s edition, and Platt’s translation and textual emendations before me. Next, I transcribed suspected passages with their contexts from the mss. of Scot’s version, in order to give them fuller consideration. Then, having incorporated a large number of changes into the text, some of them my own, I took into consideration the work of Bitterauf and others. In some cases I found that the same emendation had been proposed by two or more scholars independently, and also that some of these emendations were confirmed by Scot. Finally, I found it necessary to transcribe further portions of Scot’s version.
I do not wish to claim more for the text here offered than that it is a better text than any hitherto available. I have done my best with the data at my disposal, but I am well aware that many passages yet remain to which I have not been able to offer any satisfactory solution.

When I have accepted the reading of Bekker’s edition, I have not normally given the mss. variants. These will be found in Bekker’s apparatus. Corrected reports of mss. readings as given by Susemihl and Bitterauf I have distinguished by an asterisk; the other readings are as reported by Bekker a (sometimes confirmed by Bitterauf). Every departure from Bekker’s text is recorded.

The text has been reparagraphed throughout, and in many places the punctuation has been corrected.

The following manuscripts b are cited for the Greek text:

Z Oxoniensis Collegii Corporis Christi W.A. 2. 7 (=Coxe 108). Late 12th century. Presented to the College by Henry Parry, Fellow, in 1623. It contains P.A., I.A., G.A., some of the Parva Naturalia, and De spiritu. G.A. begins f. 74 r, and ends f. 161 r, but this page is identical with 62 r. The ms. is confusedly bound, and some passages it has lost altogether.

S Laurentianus Mediceus 81, 1. Written in different hands, some of the 12th, some of the 13th

a A few (for m and E) are as reported by Bussemaker.
b For further details, see Bitterauf (below, p. xxv), Dittmeyer, H.A. (Introd.), Jaeger, M.A. and I.A. (Introd.), etc.
c 738 b 1 βελτ[ίων] ... 740 a 7 τό] γενόμενον; and 760 a 13 πως [η γένεσις ... 760 b 27 μὲν] ἐλάττω, the latter passage having been supplied by a later hand.
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century. *G.A.* is written in a 12th century hand.

P Vaticanus graecus 1339. Great variation of opinion upon the date of this manuscript has been expressed by various scholars. Some date it 12th century, others 15th.

Y Vaticanus graecus 261. 14th century (Btf.).

The following are cited for a few places only:

m Parisinus 1921. 14th century. In this ms. *G.A.* is accompanied by the commentary of Michael of Ephesus.

Ob Riccardianus 13. Late 14th century.

E Parisinus regius 1853. Written in various hands, from 10th to 15th century. *G.A.* is in a 15th century hand.

The following manuscripts of Michael Scot's translation are to be found in this country:

Cambridge, University Library Il. 3. 16.
Cambridge, University Library Dd. 4. 30.
Cambridge, Gonville and Caius College 109.
Oxford, Merton College 278.
Oxford, Balliol College 252.
London, British Museum Royal 12. C. XV.
London, British Museum Harl. 4970.

All these are of the 13th or 14th century. I have seen all these mss. of Scot's translation, but chiefly owing to present conditions I have worked with the two first mentioned only.\(^\text{a}\)

The chief mss. cited by Bekker for *G.A.* (namely, PSYZ) are identical with four of the six cited by him.

\(^{\text{a}}\) Lists of mss. of William of Moerbeke's translation will be found in G. Rudberg, *Textstudien zur Tiergeschichte des Aristoteles* (1908), and L. Dittmeyer (see below, p. xxix).

\(^{(b)}\) Michael Scot's translation.

\(^{(a)}\) Bekker's edition;
for *P.A.* A Some years ago, when working on *P.A.* for the Loeb edition, my examination of the ms. Z at several places led me to state (*P.A.* Introd. p. 46) that a more reliable collation of the chief mss. than Bekker's *apparatus criticus* afforded was clearly needed. This view is amply confirmed by K. E. Bitterauf, who has in fact undertaken such a collation for *G.A.* (see below), and he shows that there are several errors and misleading reports on every page in Bekker's *apparatus*.

A comparison of the text of *P.A.* exhibited by our Greek mss. with the translation of Michael Scot showed me that the former had all suffered identical corruptions or losses (or both) in certain passages (e.g., *P.A.* 684 b 22 ff.), by which the Greek ms. from which Scot's Arabic original was translated had not been affected; and I found exactly the same when I came to work on *G.A.* (see, e.g., 722 a 20, 766 b 35). My conclusion about the common origin of our Greek mss. is also supported by Bitterauf, who comes independently to the conclusion, based exclusively upon a study of the Greek mss., that they are all derived from a single archetype, which, in his opinion, contained a number of variant readings.

This brings us to a consideration of the ms. tradition of *G.A.* After the publication of Bekker's Berlin edition in 1831, very little work was done on the mss. of *G.A.* for about eighty years. Bussemaker, who edited *G.A.* in the Didot edition (Paris, 1854), cites many readings from the two Paris mss. E and m, and several times quotes the authority of William of Moerbeke, less frequently that of Michael Scot, and

* Of the other two, U does not contain *G.A.*, and in E *G.A.* is written in a later hand.

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in a few cases quotes their Latin versions. Aubert and Wimmer, in their Leipzig edition published in 1860, took into account throughout the commentary of Michael of Ephesus and Gaza’s Latin translation, but they too relied upon Bekker for the mss. readings. The first to go back again direct to the mss. was F. Susemihl, at whose request in 1885 Bywater and Vitelli inspected a number of selected places in Aristotle’s zoological works in the mss. Z and S respectively, and of these fourteen are places in G.A. The majority of these, however, are of minor importance. A really serious attempt to revise the text throughout on the basis of a new collation of the mss. was made about 1913 by K. E. Bitterauf in preparation for a new Teubner edition, which however was never published. In all, Bitterauf enumerates 31 mss. containing G.A., and of these he collated three in full himself from photographs (Z, Y and E), and a single selected Book (not the same Book in each case) in eight more (of which m was one). He also had at his disposal collations of seven others, of which five were apparently collated direct by Hugo Tschierschky

a Kritische Studien zu den zoologischen Schriften des Aristoteles, in Rh. Mus. XL (1885), 563 ff., and a very convenient summary of his proposals there made in Bursian, XLII, 245 f.

b But he published some of his results in two preliminary pamphlets: (1) Der Schlussteil der aristotelischen Biologie: Beiträge zur Textgeschichte und Textkritik der Schrift “De generatione animalium.” (Wissenschaftliche Beilage zum Jahresbericht des kgl. humanistischen Gymnasiums Kempten für das Schuljahr 1912/13). Kempten im Allgäu, 1913. (2) Neue Textstudien zum Schlussteil der aristotelischen Biologie. (Ibid., 1913/14.) Kempten im Allgäu, 1914. These are the source of the readings recorded throughout the text where they differ from Bekker’s apparatus.
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(these include S and O^b, and another ms. called β, which contains only a very small part of the beginning of G.A.) and the remaining two (one of which is P) were collated by L. Dittmeyer from photographs. Five others were collated (apparently from photographs) by Bitterauf sufficiently to establish their character; of the remaining eight he gives no report on the character of their text. The upshot of Bitterauf’s work is to show that Bekker was right in basing the text upon PSYZ, and that although the most faithful witness to the original text is Z, with P a good second, no ms. has a monopoly of the truth, since their common descent gives them all a fair chance of preserving a good reading, just as it has undoubtedly ensured, as I mentioned above, that they have all failed to preserve the text in certain passages.

With regard to the defective nature of Bekker’s *apparatus*, the corrections which Bitterauf gives are of value primarily in determining the comparative trustworthiness of the mss. rather than in yielding substantial improvements of the text; but there are many places where they do make an improvement possible, and all the suggestions which Bitterauf makes for so doing I have carefully considered, and many I have adopted. When the changes indicated are of a minor character, for

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^[a] Examples are: 718 a 36, Bekker’s *app.* αὐταῖς Z, actually αὐταῖς SZ; 719 a 31, Bekker’s *app.* ἔντος, τὰ δ’ ἐκτός Y, but actually PZ. Bitterauf had access to Bekker’s own copy of the Basel Aristotle (1550), and shows that some of Bekker’s errors are due to his having used one set of symbols for the mss. in his collation and another set in his *apparatus.*

^[b] It should be remembered that Bitterauf’s pamphlets are merely “foretastes” of his projected edition, and therefore the list of passages dealt with by him cannot be treated as exhaustive.

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instance those affecting merely the order of words, I have not always felt it necessary to alter Bekker's text, though it might be held that ceteris paribus Z's reading should be preferred.

Bitterauf does not appear, at any rate from what he has published, to have envisaged the existence of deep-seated corruptions or serious losses from the text. The furthest he ventures along this path is to suggest that αἴμα and σάρξ should be written twice instead of once at 722 b 34, and that καὶ θώον has dropped out at 746 a 34; but the latter suggestion, which is certainly right, is taken over from Bussemaker. However, that loss of phrases and corruption of the text have occurred is sometimes clear from intrinsic evidence, and loss can sometimes be proved by the survival of the original words in M. Scot's translation.

Apart from re-examination of the mss., proposals to improve the text by conjectural emendation have been made by the following:

(1) Wimmer, who was responsible for the textual work in Aubert and Wimmer's edition of 1860, made a number of conjectures, some of which he incorporated in the text and others he printed in the footnotes. Many of them are undoubtedly correct, and some I have found are supported by Scot (though I have no reason to think that Wimmer himself was aware of this).

(2) F. Susenmihl, a beside the work which he did on the mss., dealt with the question of duplicate recensions in the text, and also that of interpolations.

\[a \textit{Rhein. Mus. XL (1885), 563 ff.}\]
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by commentators, and made a number of conjectural emendations.

(3) Arthur Platt, in his translation of G.A. in the Oxford Translations of Aristotle, published 1910, suggests a number of emendations, many of which have been adopted in the present text; and some of these, again, I have found to be confirmed by Scot’s translation, though Platt himself was unaware of this. Platt also detected many corrupt places and misplaced passages or interpolations.

(4) Bitterauf himself puts forward about ten conjectural emendations in addition to his other suggestions for improving the text, but few of them are of major importance.

A few suggestions for emendation were made by:

(5) H. Bonitz, in *en passant*, as asides to his treatment of passages in other works of Aristotle, and by

(6) H. Richards; some of these will be found recorded in their proper places.

Single small emendations are proposed by M. Hayduck and E. Zeller. A few are proposed by H. Diels and one by W. Kranz. J. G. Schneider, too, in his edition of *H.A.* (1811) made some suggestions for improving the text of G.A. based partly on the Latin versions, but most of his work is superseded by Bekker’s edition. Some passages are also discussed by J. Zahlfleisch.

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*a Aristot. Studien* (1866), IV. 363, 378, 413.

*b J. of Philology, XXXIV* (1918), 254.

*c Emendationes Aristoteleae, in Neue Jahrbücher f. Philol.*

*d Phil. der Gr. II.* 23, 569-570.

*e Die Fragmente der Vorsokratiker (5th edn., ed. Kranz, 1934–1937).*

*f Philologus, LIII* (1894), 39-44.

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Platt seems to have known nothing of Bonitz' or Susemihl's work, and Bitterauf seems to have known nothing of Platt's work. Bitterauf refers to and quotes Susemihl's article, but puts forward as an original conjecture one which Susemihl had already made (756 a.24).

Several emendations have been put forward by various scholars, beginning with Schneider, on the strength of Gaza's Latin version, others on that of William of Moerbeke. As a contribution to the projected Teubner edition of G.A., Dittmeyer a published in 1915 the first part of William's version (up to 737 b 5). Although this version gives support to two small emendations already adopted in my present text (at 733 b 34 and 734 b 18), and at 775 a 11 ff. (testa Schneider) preserves a passage which our Greek mss. have lost, in general it does not yield anything that is independent of our existing Greek mss. and is, as Dittmeyer himself agreed, of little value for the restoration of the text.b

The case is far different with Michael Scot's version. This was made about 1217, not from a Greek text, but from an Arabic translation, itself made at the beginning of the 9th century, and hence the Greek text involved must have been considerably older than any of our present mss. and a priori may have represented an independent tradition of the text; indeed, my examination of Scot's version has proved this to be so. Dittmeyer quotes Schneider's opinion (IV. xxxvii) that Scot's version is of little value for restor-


b See also P.A. (Loeb ed.), p. 47.
ing the text, but it is obvious that neither he nor Bitterauf\(^a\) had troubled to read Scot’s version of G.A. beyond the tiny fragments (frustula, Dittmeyer’s own word) quoted by previous scholars. Against this we have the opinion of G. Rudberg,\(^b\) who had made a considerable study of it in connexion with H.A. and published its version of H.A. X in extenso, that there is no doubt of its critical value for rectifying the text; and this judgement I can confirm from my own experience. Naturally, the circumstances dictate that proper safeguards must be adopted in using it for correcting the Greek text; and what these are can be learnt only by fairly wide experience of the version itself; any judgement given,\(^c\) either for or against, without this experience as a foundation is worse than useless. My own method has involved the transcription of a large number of continuous passages from the mss. of Scot’s version, containing places which some previous editor or I myself had already felt for some reason to be doubtful; and the pertinent parts of these, where they have anything to contribute, I have given in the apparatus. Scot’s version sometimes confirms conjectures previously made, sometimes it confirms the suspected corruption of the text either through glosses or otherwise, and in these cases may suggest means for remedying the trouble. Often it clearly confirms the existing text; sometimes it gives no clear indication, and sometimes

\(^a\) Bitterauf quotes Scot only once, and that quotation is taken from Bussemaker.

\(^b\) Kleinere Aristotelesfragen, in Eranos, IX (1909), 92 ff.; see also Zum so-genannten 10. Buch der Tiergeschichte, Upsala, 1911.

\(^c\) e.g., D. W. Thompson, C.R. LII (1938), 15 “the dubious aid of an Arabic version”; see also ibid., p. 89.

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it simply omits the passage. I consider the time and trouble spent upon Scot’s version as well spent.

The Greek commentary of Michael of Ephesus (formerly attributed to Johannes Philoponus), 11–12th century A.D., has been edited by Michael Hayduck (Berlin, 1903), but it is of little use for textual criticism.

Apart from manuscript errors of the usual kind, and losses of words or phrases due to *homoiooteleuton*, etc., which will be found noted in their places where they can be detected, the chief points of note in the text of G.A. may be classed as follows:

A. Paragraphs, occasionally sentences only, which obviously interrupt the line of argument or are superfluous to it. Of these, some seem to be

(a) genuine Aristotelian material, but misplaced, perhaps incorporated at the wrong place, or perhaps originally supplementary notes never intended to stand in the text;

(b) alternative versions of matter already in the text;

(c) extraneous matter, derived from commentators’ remarks and wrongly incorporated in the text (e.g., 724 b 12-23, 726 b 25-30).

These are often found at the beginning or end of a section, which suggests that they were originally appended in the margin. There is no need to give a full list of these passages, but a list of (a) and (b) may be useful. They are:

715 b 26-30; 718 a 27-34; 726 a 16-25; 732 a 12-23; 737 a 35-b 7; 760 a 26-27; 760 b 2-8; 760 b 33—761 a 2; 781 a 21-b 6.

B. Short passages, often only a few words, derived
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from glosses which have either \((a)\) supplanted the
text or \((b)\) been incorporated into it.

There are a great many short interpolations, and
I have frequently omitted them from the translation.

MODERN EDITIONS

1. The Berlin edition of Aristotle, by Immanuel
(by the columns and lines of which the work is

1a. The Oxford edition (a reprint of the preceding).

2. One-volume edition of Aristotle's works, by C. H.
Weise.\(^a\) Leipzig, 1843.

III includes G.A. Paris, 1854.

edited and translated into German by H. Aubert
and Fr. Wimmer. Leipzig, 1860. Contains a
useful introduction, table of animals, and Greek
index.

TRANSLATIONS ONLY \(^b\)

5. Thomas Taylor. English translation of Aristotle

6. J. Barthélemy - Saint - Hilaire.\(^c\) Introduction,

\(^a\) The text of this edition is the pre-Bekker \textit{vulgata},
founded on Sylburg and Casaubon.

\(^b\) The publication of a Spanish translation of the complete
works of Aristotle was begun in 1931, but I have been unable
to discover whether G.A. has yet appeared in it.

\(^c\) Saint-Hilaire argues (I. cclix ff.) that Book V of G.A.
does not belong with the rest of the treatise, but goes rather
THE TRANSLATION

In translating G.A. I have followed two main principles, with the aim of presenting Aristotle as faithfully as possible to the English reader:

1. I have attempted to translate G.A. into English, and therefore I have not felt obliged to write in Aristotelian, or even in Greek, idiom. Hence, for example, I have not uniformly translated \( \gamma\alpha\rho \) by “for,” \( \kappa\alpha\iota \) by “and,” or \( \delta\epsilon \) by “but”: unfortunately, it is still necessary to point out, even to learned reviewers, that there is a better way than that of “stock” translations; and a translator is not automatically a traitor if he sometimes omits \( \gamma\alpha\rho \)—as the most idiomatic way of translating it.

2. Technical terms, on the other hand, must whenever possible be uniformly represented by an invariable term in the English. Sometimes this rule must be broken, either (a) because the original term has a variety of meanings (e.g., \( \delta\upsilon\alpha\mu\upsilon\varsigma \)), sometimes (b) because there is no English word which will do (e.g., \( \sigma\nu\nu\mu\sigma\tau\alpha\nu\alpha \)). I have avoided modernizing Aristotle’s terms, so as to avoid misleading any modern with P.A. The same suggestion, unknown to him, had been made by Weise (p. xxix) in 1843. Saint-Hilaire thinks that its inclusion with G.A. dates from the time of Andronicus of Rhodes, head of the Peripatetic School at Rome, who edited Aristotle’s works from the mss. belonging to Apellicon’s library brought to Rome by Sulla in 84 B.C.
readers who may have but little Greek; and on the positive side I have given a full account of many of these terms in the Introduction. In my opinion, it is essential that the Introduction be read before undertaking any study of the treatise itself.

The purpose I have had in mind, therefore, is to ensure so far as possible, that the reader shall not have the unnecessary difficulty of "translators' English" to overcome, but shall be able to give his full attention to Aristotle's thought and argument: this is especially necessary in the present case, where we are dealing primarily with a scientific treatise. My aim has not been to paraphrase Aristotle or to "improve" upon him, but to represent what he says as closely and as faithfully as possible in English.

Since, however, G.A. is not intelligible, even to a Greek scholar, without some familiarity with Aristotle's general thought and some of his main doctrines, I have provided an outline of these in the Introduction and in the Appendix; and in the footnotes I have given many cross-references to other passages in G.A. and other treatises; attention is also called to points of special interest. One of these, which I think has not hitherto been noticed, may be mentioned here: the possibility that there is an allusion at 735 b 17 to an early process of oil-flotation in ore-dressing.

The Index is not intended to be exhaustive, but forms a supplement to the Contents-Summary (p. lxxi) and the Introduction. Particular attention is given to certain key-phrases and ideas. It covers the Preface, Introduction, footnotes and Appendix as well as the translation.

A glance through the Index may help a reader with special interests to find the passages most xxxiv
relevant to his subject: e.g., the entry "causation, mechanical" gives a reference to the passage, specially interesting to modern readers, which compares the development of the embryo to the action of automatic puppets.

A number of books which the student of Aristotle's zoological works will find useful are mentioned in the footnotes throughout the volume; to them may be added the following:


In addition to Ross's *Aristotle* and Jaeger's *Aristotle* (English translation by R. Robinson) and *Diokles von Karystos*, which are of special importance, the fol-

* For other works on the early translations, see my edition of *P.A.* (Loeb Library).
lowing bear upon certain subjects dealt with in G.A.:

P. Bochert, *Aristoteles' Erdkunde von Asien und Libyen*, 1908, and

H. Diller, *Wanderarzt und Aitiologe*, 1934 (for the effects of climate, etc.).


The following more general technical works may also be mentioned:


The standard work on its subject is *Geschlecht und Geschlechter im Tierreiche*, by Johannes Meisenheimer (1921).

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It is a great pleasure to acknowledge here the help which I have received from many friends in many ways, and above all to thank them for their continuous interest and encouragement. First I thank Dr. W. H. D. Rouse, my old teacher and present colleague,
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A. L. P.

Easter Eve, 1942
INTRODUCTION

The "Causes"

The four Causes.

(1) Aristotle begins and ends the *G.A.* with a paragraph about Causes: and indeed Causes are at the foundation of all his thought, especially of his theories about animal reproduction and development.

To know, says Aristotle, is to know by means of Causes (see *Anal. Post.* 94 a 20). A thing is explained when you know its Causes. And a Cause is that which is responsible, in any of four modes, for a thing's existence. The four Causes are:

(1) The Final Cause, the End or Object towards which a formative process advances, and *for the sake of which* it advances—the *logos*, the rational purpose.

(2) The Motive (or Efficient) Cause, the agent which is responsible for having set the process going: it is that *by which* the thing is made.

(3) The Formal Cause, or Form, which is responsible for the *character* of the course which the process follows (this also is described as the *logos*, as expressing what the thing is, or is to be).

(4) The Material Cause, or Matter, *out of which* the thing is made.

(2) As an illustration of the theory of Causes the following will serve. Suppose the thing to be explained is a dog. The chronological order of the Causes is different from their logical order.

(1) The Motive Cause: the male parent which supplied the "movement" that set the process of development going.

(2) The Material Cause: the menstrual fluid and the nourishment supplied by the female parent and other nourishment taken after birth.

(3) The Formal Cause. The embryo and the puppy as it grew into a dog followed a process of development which had the special character proper to dogs.

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*In the translation I have retained the traditional rendering "cause" for αἴτια, although perhaps in some contexts "reason" or "explanation" might have been a closer rendering; but a variation in the English term might well produce more obscurity than clarity.*

*See § 10 below.*
The Final Cause: the end towards which the process was directed, the perfect and full-grown dog.

A similar set of examples could be constructed to suit the case of artificial objects, though some adjustments would have to be made. In both cases the Formal Cause comes from the same source as the Motive Cause, but with a difference: in the case of natural objects, the parent already possesses the Form fully realized in himself; in the case of artificial objects, the craftsman possesses the Form “in his Soul.” Both the parent and the craftsman normally employ “instruments” to deal with the “material”; these are not mentioned in the table given above, but will be dealt with in Appendix B §§ 9 ff.

Very often the Final and Motive Causes tend naturally to coalesce with the Formal Cause, in opposition to the Material Cause; and this opposition is found in G.A. (e.g., Book II, init.), where Aristotle regards the male (which possesses the Form and which supplies the “movement” and therefore acts as a Motive Cause) as superior and more “divine” than the female (which supplies the raw material for the embryo, i.e., supplies the Material Cause). At the same time, we shall find (below, §§ 6, 7) that the Motive and Material Causes are often together contrasted with the Final Cause, just as Necessity is contrasted with the Good.

In modern parlance the term Cause has become generally limited to Motive (Efficient) Causes, as is shown by the common phrase “cause and effect”; and hence when Aristotle is concerned especially with the operation of Motive Causes (as e.g. at 734 b 9 ff.) his words have a more modern and familiar ring than when he is speaking of Final Causes.

For Aristotle himself, however, it is the Final Cause, the “Teleology,” which is of paramount importance and which dominates every process. This is abundantly clear in the P.A., where Aristotle endeavours throughout to provide a Final Cause which will explain the existence and structure of the various parts; and it is no less clear in the G.A., where the whole process of development of the embryo from start to finish is subservient to the Final Cause: the course of the process is deter-
mined by the nature of the product which is to result from it, not the other way round: things γίγνεται as they do because they are what they are.\(^a\) We are therefore justified in describing Aristotle's outlook as "teleological"; but we must not read too much into this description. "Nature does nothing without a purpose"; but if we ask what that purpose is, we may find that the answer is not quite what we had expected, that the purpose is not so grand as we had hoped. Aristotle seems to be satisfied when the τάλος has been realized in each individual's full development; and this is because for him Form is not normally independent of Matter (as it is for Plato); Form must be embodied in matter, that is, in individuals. Each complete and perfect embodiment and realization of Form in Matter is therefore for him the crowning achievement of the efforts of the four Causes—it is the End towards which they were directed. We might, then, describe this "teleology" in Bergson's phrase as a doctrine of "internal finality": each individual is "complete" in itself.\(^b\) Aristotle does, however, maintain that the "most natural" thing for an animal to do is to produce another one like itself, and hence the species is implicated in so far as it is the individual's business to perpetuate it (see App. A §§ 15 ff.). We must also remember that the continuity of γένεσις, one department of which is the continuous succession of generations of animals, is, for Aristotle, "necessary" (App. A § 14); and it is also part of the general purpose of "God," who always aims at "the better," and who, because he was unable to fill the whole universe from circumference to centre with eternal "being," filled up the central region of it with the next best available, viz., continuous γένεσις.\(^c\) In another connexion, too, in the Ethics, we find that Aristotle looks further than the individual, at any rate so far as man is concerned, for there he tells us that man cannot attain his τάλος in the fullest sense—the "good life"—except in association (τὸ συνήσια) with other men.

\(^{a}\) Cf. quotation from Dante, Paradiso xx. 78, on p. 1.

\(^{b}\) Cf. § 16.

\(^{c}\) For further details see App. A § 12.
GENERATION OF ANIMALS

in a πόλις. But this seems to be due exclusively to the fact that man possesses Reason; and so far as other animals are concerned, Aristotle does not appear to have envisaged any such widening of the τέλος. From yet another point of view, however, when discussing the subject of property and household management at the beginning of the Politics (1236 b 15), Aristotle says that just as Nature provides sustenance for animals from the very beginning of their existence in the larva, in the egg, or in the uterus, so we must hold that after birth as well Nature provides plants for the sake of animals, and also that she provides animals other than man for the sake of men, for food and service. And if we are right in holding that Nature makes nothing without a purpose (ἀτελὲς) or pointlessly, we must of necessity say that “Nature has made all the animals for the sake of men.”

(6) As Aristotle says at the beginning of G.A. I, the two Causes with which he is chiefly concerned in this treatise are (1) the Motive (or Efficient) Cause, with which he had not dealt in P.A., and (2) the Material Cause. In zoology, of course, the Material Cause is represented by the “parts” of the body of an animal, and all of these except the generative “parts” he had dealt with in P.A.; hence in G.A. the Material Cause is represented chiefly by the parts concerned in generation—those, in fact, through which and upon which the Motive Cause operates. At the beginning of Books II and V and at the end of Book V we have further discussions about Causes, and here we find these two Causes identified with “that which is of necessity” (ἐξ ἀνάγκης); while on the other side and contrasted with them is the Final Cause (the Cause “for the sake of which”), which is equated with τὸ βέλτιον or τὰ γαθόν (cf. Met. A 983 a 33, etc.). Indeed, this contrast of Necessity and the Better is continually confronting us throughout the G.A. For instance (717 a 15 ff.), whatever Nature does or makes is done or made either διὰ τὸ ἀνάγκας or διὰ τὸ βέλτιον; one or other of these will account for every

(a) Perhaps Aristotle would have been willing to include Bees, which possess some “divine” ingredient (see 761 a 5).
(b) It should be remembered that “parts” includes semen, milk, etc. See §§ 18 ff.
phenomenon in the realm of Nature. The whole of Book V is devoted to those features—"conditions" (πάθη) as Aristotle calls them—in animals which are in no way due to a Final Cause but are due purely to Necessity, i.e., to Material and Motive Causes.

Necessity: (7) We must, however, distinguish two sorts of Necessity (the second of which will be the one just described):

(i) "conditional";

(1) The first is that which elsewhere (e.g., P.A. 642 a 7 ff., a 32 ff.; cf. 639 b 25 ff., Phys. 199 b 33 ff.) Aristotle describes as "conditional" (ἐξ ὑποθέσεως) Necessity; that is to say, assuming that some end or purpose is to be achieved, certain means are necessary in order to achieve it. In other words, this is the sort of Necessity which is implied by the Final Cause being what it is. Thus, if a piece of wood is to be split, an axe or some such instrument is necessary, and the axe must, owing to the nature of the circumstances, be hard and sharp, hence of necessity bronze or iron must be used to make it. The same sort of Necessity is obviously involved in the construction by Nature of the living body and its various parts: certain materials must of necessity be used and certain processes gone through if this or that living body is to be produced.\(^a\)

(ii) "absolute,"

(2) The other sort of Necessity is that which Aristotle (Phys. 199 b 33 et al.) calls "simple" or "absolute" Necessity (ἀπλοῦς). This applies in cases (a) where the presence of a material object or set of objects (i.e., a Material Cause), and the fact that their nature is what it is, entails as a necessary consequence a certain result or set of results; (b) where the nature of the "movement" set up by an activating agent (a Motive Cause) similarly entails certain results. This "simple" or "absolute" Necessity may therefore be regarded as the sort of Necessity involved in the Material and Motive Causes—as a reassertion of themselves by these Causes against the Final Cause (G.A. 778 b 1) and against Nature as she advances towards her achievement of it. "In the field of natural objects, Necessity is what

\(^a\) Thus even this Necessity can be said to be located "in the matter" (Phys. 200 a 15).
GENERATION OF ANIMALS

we call matter and the κινήσεις of matter" (Phys. 202 a 32). a

(8) Aristotle, however, 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. For example (738 a 33 ff.), the production of "residue" by females is ἐξ ἀνάγκης, simply because the female is not hot enough to effect complete concoction; but Nature makes use of this residue to provide the material out of which the embryo is to be formed. Other instances of things which, though occurring ἐξ ἀνάγκης, are nevertheless employed by Nature ἐνεκτά τινος, will be found at, e.g., 739 b 28, 743 a 36 ff., 755 a 22, 776 a 15 ff., b 33. See also P.A. 642 a 31, 663 b 13, b 20 ff. On the other hand, Nature cannot always manage to do this, and what results then is a useless residue (e.g., excrements), or a "colliquescence" (P.A. 677 a 12 ff.). These by-products, however, may still be regarded as "natural," b because they are of general occurrence (that is one definition of what is "natural"); see G.A. 727 b 29, 770 b 10 ff., 777 a 20 ff., P.A. 663 b 28). When, however, Nature is more seriously thwarted by the indeterminateness or the unevenness of matter (G.A. 778 a 7; cf. App. A § 11), we find unnatural results occurring, such as monstrati- and deformities (see G.A. IV. 766 a 18 et passim). c

(9) The "simple" or "absolute" Necessity described in the preceding paragraphs refers only to the limited field of some particular γενόμενον, i.e., to the process by means of which some particular natural object is pro-duced and to the Causes therein concerned. But there is a wider and more universal meaning of "simple" or "absolute" Necessity (which we may, if we like, consider as being an extension by Aristotle of the narrower meaning of Necessity as applied to the γένειας of individual things, though it is really on a different

a The verb συμβαίνειν (sometimes in the phrase συμβαίνει ἐξ ἀνάγκης) is frequently used with reference to the results of this sort of Necessity, as being facts which merely "occur" and are not designed to forward any purpose.

b A "colliquescence" may be an unnatural by-product; see G.A. 724 b 26-29 and § 67 below.

c For further notes on "Nature," see §§ 12 ff.

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plane)—a Necessity which embraces the whole field of γένεως in the universe at large, i.e., the whole process of the seasonal and cyclic transformations of the "elements," and the whole process of the cyclical generation of animals and plants (see App. A §§ 12 ff.); and which even further still (ibid.; and see P. A. 639 b 24) includes those things which do not pass through a process of formation (γένεως) at all, but persist eternal and immutable. In this context Aristotle lays down (G. § C. 337 b 35) that ἐὰν ἀνάγκης and ἀεὶ coincide; thus "eternity"—whether it be individual eternity, as of the stars, or specific eternity, as of plants and animals—and Necessity are mutually interconnected (see App. A § 14); thus, that which always is or always γίγνεται, is, or γίγνεται, of necessity; that which is, or γίγνεται, of necessity, is, or γίγνεται, always. This meaning of "absolute" Necessity, however, does not enter directly into the G.A., though it is once touched upon in passing (at 770 b 12; cf. 742 b 26 ff.), and it is incidentally implied to some extent in the passages of Books II and IV referred to and supplemented in the Appendix, A and B.«

Λόγος

(10) Frequently in the translation, rather than represent λόγος by an inadequate or misleading word, I have transliterated it by logos. This serves the useful purpose of reminding the reader that we have here a term of wide and varied application, with which a number of correlated conceptions are associated, one or other of which may be uppermost in a particular case. The fundamental idea of λόγος, as its connexion with λέγειν shows, is that of something spoken or uttered, more especially a rational utterance or rational explanation, expressing a thing's nature and the plan of it; hence λόγος can denote the defining formula, the definition of a thing's essence, of its essential being (as often in the phrase λόγος τῆς ὑσώσιας), expressing the structure or character of the object to be defined. See also § 1 above.

a Other modes of Necessity not relevant to G.A. are here omitted.
b The less technical meanings are translated in the normal way.
For want of a better term, and in order to preserve the line of Aristotle’s thought, I have usually translated ἀρχή by “principle,” or “first principle.” There is, however, really but little difficulty about this term, for the context will usually indicate what its connotation is. A few examples of its use may be given. (1) Often, as at 715 a 6, it is a principle or source of “movement” (ἀρχή τῆς κινήσεως). Hence, obviously, (2) the Motive Cause may be described as an ἀρχή, and so too may the other Causes (e.g., 716 a 5 ff., 778 a 7), including Matter; and for the same reasons the sexes also are ἀρχαί; so is semen. (3) An ἀρχή is something which though small in itself is of great importance and influence as being the source or starting-point upon which other things depend, and which causes great changes (κινήσεως) in them (cf. 716 b 3, 763 b 23 ff., 766 a 14 ff.). An ἀρχή may, of course, be of greater or less fundamental importance; and the ultimate ἀρχή of an animal is its heart (e.g., 766 a 35), though there are also ἀρχαί that are external to the animal, e.g., the sun and moon (777 b 24).

Φύσις, πήρωμα

(12) Πήρωμα, ἀναπηρία, and cognate words occur several times in G. A., and for convenience I have translated them “deformation” or “deformity.” Other possible renderings, none of which fully brings out the meaning of the Greek word, are given in the note on 737 a 25. The underlying notion is that φύσις has not succeeded in achieving her proper τέλος; and this close connexion of πήρωμα with a falling short of natural completeness is clearly brought out by the reasons given at 724 b 33 why semen cannot be a πήρωμα, viz., because it is found in all individuals (for that which is “general” is “natural,” see § 8), and because ἥ φύσις γίγνεται out of semen.

(13) Perhaps the most striking instance of Aristotle’s application of this idea is his statement (775 a 15) that femaleness (θηλυτής) is “as it were a natural ἀναπηρία.” Here we have two conceptions of Nature asserting themselves...
in Aristotle’s mind — (1) that the male represents the full development of which Nature is capable; it is hotter than the female, and more “able” to effect concoction, etc.; but at the same time (2) the female is so universal and regular an occurrence that it cannot be dismissed out of hand as “unnatural”; besides, the female is essential for generation, which is a typically “natural” process (see § 5).

This opposition of “Nature” to “Nature” is, however, not unique, for it is found elsewhere in Aristotle; e.g., at G.A. 770 b 20 he can say that τὸ παρὰ φύσιν is in a way κατὰ φύσιν, viz., when ἡ κατὰ τὸ εἴδος φύσις has not mastered ἡ κατὰ τὴν ὕλην φύσις; and at P.A. 663 b 22 he speaks of ἡ κατὰ τὸν λόγον φύσις making use of the products of ἡ ἀναγκαῖα φύσις in order to serve a purpose (cf. also P.A. 641 a 26, 642 a 17; at Phys. 199 a 31 Aristotle distinguishes φύσις ὡς ὑλή and φύσις ὡς μορφή, the latter being a τέλος and ἡ αἰτία ἢ οὐ ἐνεκα. Cf. 729 a 34, n.).

It is impossible and unnecessary to provide here a full account of what Aristotle intended by the term φύσις, since a proper understanding of it can best be obtained by reading Aristotle’s works themselves, and for this G.A. is one of the most useful, because it is pervaded by references to φύσις. A few remarks may however be made here about φύσις in its highest manifestation.

By Aristotle, φύσις and the products of φύσις are constantly compared with τέχνη and the products of τέχνη: φύσις works to produce a finished product, a τέλος, just as the artist or craftsman does; and φύσις, again like the artist, uses “instruments,” charged with a specific “movement,” in order to bring these products to fulfilment. And the most typical of the products of φύσις are, of course, living creatures; indeed, Aristotle can speak of the φύσις of each living thing as being identical with nutritive Soul (741 a 1, where see note, and cf. P.A. 641 b 9), the Soul which generates and fashions it and promotes its growth; and again (De caelo 301 b 17), φύσις is to be regarded as a principle of movement in the

\footnote{φύσις is also compared (744 b 16) to a careful housekeeper, who throws away nothing that is useful; or to a cook (743 a 31; cf. 767 a 17 ff.), tempering the heat of her stove so that the food she is preparing may be done to a turn. See also Συμμετρία, § 39.}
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ing thing itself. An artist, then, at work—yes, but in each several thing; and it is doubtful whether Aristotle had, or intended to have, any idea of Nature over and above, outside, the individual things a which he described as her "works." In fact, he goes so far as to say (P.A. 641 b 11) that no abstraction can be the object of study for Natural science, because Nature makes all that she makes to serve some purpose (ἐνέκα τοῦ). Nature aims always at producing a τέλος in the sense of a completely formed individual, and that is the Final Cause in each case, for that is what has the best claim to be called a "being" (ὁνία). There is, says Aristotle, more beauty and purpose (τὸ ὠ ἐνέκα καὶ τὸ καλόν) to be found in the works of Nature than in those of art (P.A. 639 b 20).

(17) Nevertheless, we must remember that Nature is not, in Aristotle's view, a term to be exclusively reserved for the Final Cause, with which are associated the Formal and often the Motive Causes; it may be applied also, as we saw just now (§ 14), to the Material Cause; and in this connexion we may recall that, for Aristotle, Matter and Form themselves pervade all the strata of existence, for even the simplest sort of Matter is to some extent "informed," and Matter in its highest phase is identical with Form (see 729 a 34, n.).

Μόριον, μέρος, "part"

(18) The term "part," which occurs in the title of the treatise De partibus animalium, περὶ ζώων μορίων (or, as Aristotle himself calls it at G.A. 782 a 21, "the treatise Of the Causes of the Parts of Animals"), includes considerably more than is normally included by the English "part of the body." For instance, we should not normally call blood a "part," but Aristotle applies the term μόριον to all the constituent substances of the body as well as to the limbs and organs. For him, blood is one of the ζώων μόρια (see P.A. 648 a 2; and note on G.A. 720 b 31). Since, however, all the "parts" are either "uniform" or "non-uniform," a detailed description of them will be more appropriate in the following paragraphs.

a See however § 5 above.
b See App. A § 18.
Two sorts of "parts.

Relation between them.

(19) At G.A. 724 b 23 ff., Aristotle classifies the substances found in the body into five divisions, one of which is "natural parts," and this division he subdivides into "uniform parts" and "non-uniform parts." As examples of "uniform parts" he cites (P.A. 647 b 10 ff.) blood, serum, lard, suet, marrow, semen, bile, milk, flesh (these are soft and "fluid" ones); also bone, fish-spine, sinew, blood-vessel (these are hard and "solid" ones). And although in some cases the same name is applied to the substance out of which the whole is made and to the whole that is made out of it, this is not true in all cases. Examples of "non-uniform" parts are (P.A. 640 b 20) face, hand, foot.

The relation of the "uniform" to the "non-uniform" parts Aristotle describes as follows (P.A. 647 b 22 ff.):

(a) some of the uniform parts are the material out of which the non-uniform are made (i.e., each instrumental part is made out of bones, sinews, flesh, etc.);

(b) some, viz., "fluid" ones, serve as nourishment for those in class (a), since all growth is derived from fluid matter;

(c) some are "residues" from those in class (b), e.g., faeces, urine.

Thus it is not possible to equate this division into uniform and non-uniform parts with the more modern division into tissues and organs; for instance, blood, though a uniform part, is not a tissue. The term "organs," on the other hand, corresponds closely with Aristotle's own description of the non-uniform parts (P.A. 647 b 23) as та ὁργανικὰ μέρη, "the instrumental parts."

(21) The fundamental difference between the two sorts of "parts" is that each of the uniform parts has its own definite character as a substance (in the modern sense),

a This must not be taken to imply the existence of unnatural "parts."

b Some of these are also "residues"; see below, § 65.

c For the meaning of "fluid" and "solid," see below, § 38.

d e.g., we speak of "bone" and "a bone"; Aristotle's own example is "blood-vessel."

e See § 65.
while each of the non-uniform parts has its own definite character as a conformation or organ. The heart is the only "part" which belongs to both classes (P.A. 647 a 25 ff.): it is made out of one uniform part only, but at the same time it has essentially a definite configuration or shape, and thus it is a non-uniform part.

(22) The four stages or "degrees of composition," so far as biology is concerned, are thus enumerated by Aristotle (G.A. 715 a 10 ff.; cf. P.A. 646 a 13 ff.):
(1) The four "Elements," Fire, Air, Water, Earth;
(2) the uniform parts;
(3) the non-uniform parts;
(4) the animal organism as a whole.

We thus begin from the simplest sorts of matter (Aristotle calls the four Elements "simple bodies") and proceed upwards by stages until the most organized or most "informed" sort of matter is reached: each stage is the "material" for the stage next above it (G.A. 715 a 9 ff.).

Δύναμις

(23) This term has a number of different, though related, meanings, and it is not always easy to determine precisely which one Aristotle has uppermost in mind. Unlike some other terms, therefore, this one cannot always be represented by the same term in English, and sometimes it is best left untranslated.

(24) (A) To begin with, we will examine the pre-Aristotelian meaning of δύναμις, as found for instance in the Hippocratic corpus and in Plato's Timaeus. Δύναμις was the old technical term for the simplest sorts of matter, i.e., for what came later to be called στοιχεῖα ("elements"). Δύναμις was however applied exclusively to substances of a particular class, viz., τὸ ἄγρον, τὸ ξηρὸν, τὸ θερμὸν, τὸ ψυχρὸν, τὸ πικρόν, τὸ γλυκὸ, τὸ δρυμῦ, etc., etc. In the Hippocratic treatise περὶ ἀρχαῖς ἱπτικῆς (The Ancient and Genuine Art of Medicine) these substances are regarded as being the constituents both of the body and

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a In the P.A. passage Aristotle says it might be better to substitute for these "the δύναμεις," or rather four of them; see below, § 24. Fire, Air, Water, Earth are of course the constituents of non-living things as well; see App. A § 2.
Earth, Air, Water, Fire, resolvable into "dynamis".

Origin of (25) this usage.

of its foods. The δύναμεις are referred to by Aristotle at the beginning of P. A. II (see § 22, note), where he speaks of "the 'elements' as they are called, viz., Earth, Air, Water, Fire, or perhaps it is better to say the δύναμεις—not all the δύναμεις, of course, but these four, ὑγρόν, ἕτρων, θερμόν, ψυχρόν." The explanation of this is that although Aristotle held that in a sense Earth, Air, Water, and Fire were "elements," i.e., that they were the simplest states of matter actually found in the world as we know it, yet theoretically each of them could be resolved into a pair of δύναμεις: thus Fire is θερμόν and ἕτρων, Air θερμόν and ὑγρόν, Water ψυχρόν and ὑγρόν, Earth ψυχρόν and ἕτρων (G. & C. 330 a 30 ff.), each of them being characterized by one constituent in the excellence, Fire by θερμόν, Air by ὑγρόν, Water by ψυχρόν, Earth by ἕτρων. According to Aristotle, all other physical "differences" are consequent upon these four fundamental ones.

The meaning implied in this use of δύναμεις seems to have been "substance of a specific character" (perhaps the adjective "strong" should be prefixed: this would, of course, be very appropriate to δύναμεις such as τὸ δρυμόν, τὸ πυρόν, etc.). But originally, no doubt, the term was an item in the Pythagorean political metaphor terminology, as would appear for instance from the theory held by Alcmeon that bodily health was maintained by the ἰσομοίως τῶν δύναμεων, and that the "monarchy" of any one of them produced disease. It is important to notice that there is no notion here of the substance having power in the sense of power to produce a specific effect upon a body, though this was a meaning

a See Aëtius v. 30. 1 (Diels, Doxographi Graeci 442).

b e.g., causing stomach-ache. In Plato's Timaeus we find this extended meaning of δύναμεις (i.e., power to produce a specific effect) side by side with the old meaning of specific substance; and it is frequent in π. δυναμέως. Clearly, this marks a change over from the medical theory originally associated with the political metaphor terminology; and we find that, as δύναμεις takes on the meaning of "power to produce a specific effect," the term "humour" comes in to denote the specific substances to which δύναμεις was originally applied. Thus Dioecles (apud Galen vi. 455) can argue against doctors who hold that all things which possess similar "humours" also possess the same δύναμεις (powers of producing specific effects on the body), e.g., are laxative, diuretic, etc. There is no space to say more here on this development, which I dealt with fully in my thesis Pseudo-Hippocrates Philosophus (1928). Studies
which developed later. A δύναμις is rather a substance which is a power, which can assert itself, and by the simple act of asserting itself, by being too strong, stronger than the others, can cause trouble. The remedy in such a case is to deprive it of some of its strength, until it again takes its proper place among its peers, or, in the language of medicine, to “concoct” it or otherwise bring it into a harmless condition by “blending” a it with the other substances.

(26) (B) As each of the substances known as δύναμεις had its own specific and peculiar character, sharply marked off from the others, it was easy for the meaning “peculiar and distinctive character” to become closely associated with the term δύναμις, quite apart from any reference to these particular substances. In fact, it almost comes to mean any “substance of a distinctive quality”; and in this sense it is found in G.A., for instance at 720 b 32 (ἀλλὰ τις δύναμις) and 736 a 21 (Aphrodite was called after “this δύναμις,” sc. ἀφρός, foam). From this it is an easy step to “distinctive physical quality,” or simply “distinctive character” (as, e.g., at 731 b 19, where it is joined with λόγος τῆς οὐσίας; at 751 a 33, where it refers to the distinctive character of the yolk and white of an egg respectively b; and cf. 733 b 15 ἔχει δύναμιν ὕφο— it has the distinctive character of an egg, it is equivalent to an egg; and 780 b 8, 784 b 15): or “characteristic” (applied to the sexes at 756 a 1, 763 b 23; cf. 760 a 19).

(27) In the sense of “(substance of) distinctive character” it can be used practically as an alternative to φύσις, or in conjunction with φύσις (as indeed it often is in Hippocrates and Plato), and this seems to be the use of it in P.A. 655 b 12 ἐξ ἀνάγκης δὲ ταῦτα πάντα γεώδη καὶ στερεὰν ἔχει τὴν φύσιν ὀπλοῦ γάρ αὐτὴ δύναμις (cf. P.A. 651 b 21).

(28) (C) From this usage it is not far to the idiomatic, pleonastic usage, e.g., ἡ τῶν ἐντέρων δύναμις (almost = τὰ ἐντερα P.A. 678 a 13); ἡ τῶν πτερῶν δύναμις (= τὰ πτερα, 682 b 15); and this is paralleled by the similar usage on some of the uses of δύναμις have been made by J. Souilhé, Étude sur le terme δύναμις dans les dialogues de Platon, Paris, 1919, and A. Keus, Uber philosophische Begriffe u. Theorien in den hippokratischen Schriften, Köln, 1914, pp. 46 ff.

a See § 40. b φύσις is used in a similar context at 758 a 35.
of φύσις, e.g., ἕ των ὀστρακοδέρμων φύσις (G. A. 761 b 24), ἕ των αἰδοιοῦ φύσις (717 b 18; cf. also 755 a 20), ἕ τῶν πτερῶν φύσις (749 b 7, a striking instance, because φύσις is used in an entirely different sense, “Nature,” in the very next line); and even σύστασις is sometimes used in a similarly weakened sense, e.g., ἕ τῶν ὄρχεων σύστασις (G. A. 717 a 15), ἕ τῶν καταμηνίων σύστασις (G. A. 727 b 33); and σύστασις appears in two manuscripts as a variant for φύσις at G. A. 717 b 20.

(D) In the passages dealing with the rôle of the male parent in generation we find phrases such as “the δύναμις in the semen,” “the δύναμις in the male” (e.g., 726 b 19, 727 b 14, 729 b 27, 730 a 3, a 14, 736 a 27, etc.). The meaning of δύναμις here would appear to be fundamentally the same as that dealt with in § 26 above, i.e., δύναμις here is the physical substance by means of which impregnation is effected; and the distinctive physical characteristic with which we find this δύναμις closely associated by Aristotle is “vital heat” or “Soul-heat.” b The most distinctive characteristic, however, of this substance is that it is charged with a specific “movement,” capable of constituting and developing an embryo out of the matter supplied by the female; and hence we also find a close association of δύναμις with κίνησις. c This is the most important extension of δύναμις in its ancient sense made by Aristotle, for it links up the old sense of the term with the typically and peculiarly Aristotelian sense of δύναμις = “potentiality” (see §§ 34 ff. below).

(30) (E) Under the same category comes the use of δύναμις and ἀδύναμια as applied to male and female respectively (G. A. 765 b 9 ff., 766 a 32 ff.), for these are explained by Aristotle as the ability and inability respectively to effect “concoction” of the ultimate nourishment (blood) into semen, and this is directly dependent upon the possession of sufficient “natural heat.”

a An interesting example, because δύναμις (= potentially) occurs in the previous line.

b Not to be confused with the ordinary δύναμις “θερμῶν”; see App. B §§ 13, 18.

c References for δύναμις associated with “vital heat” and κίνησις, e.g., 726 b 19 ff., 729 b 6 ff., 738 b 12, 739 b 24, 740 b 30 ff., 767 b 17 ff. (cf. 755 a 20 “the φύσις of the Soul-heat”). See also κίνησις, § 50.
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(31) (F) Under the same category too must be placed the use of the term δύναμις in the remarkable discussion on heredity in Book IV. This is admittedly a particularized use of the term, a and Aristotle carefully explains its meaning when he first introduces it (767 b 23 ff., q.v.). But here too it is applied to special and distinctive characteristics, be it those of genus, species, or individual, and therefore this use of it stands in the same line of succession as the meaning already described in §§ 24 ff. As for the way in which Aristotle conceived these δύναμεις to operate, it is clear that, as they were present both in the semen and in the menstrual fluid (see loc. cit.) and gave rise to κυήσεις (767 b 36), they must have been closely associated with Soul and inherent in its instrument pneuma.

(32) It may be noted here that the physical substance concerned throughout the theory of generation is pneuma (a substance "analogous to aither," the "fifth element," the "element of the stars"), with which Soul is "associated"; and it is this pneuma which Soul charges with a specific "movement" and uses as its "instrument" in generation just as it does in locomotion, and as an artist uses his instruments, to which he imparts "movement," in order to create his works of art. (For fuller details about pneuma, see App. B, and cf. § 45.)

(33) Thus δύναμις, even at its most glorified, still retains the marks of its descent from the historic δύναμις of the early medicine, for, although Soul-heat is something different from the old θερμόν and superior to it, nevertheless it is still θερμόν. And there is another respect in which its descent is still to be seen, though this time it may be fortuitous and perhaps no more than a verbal coincidence. This physical substance is the vehicle for the activity of Form (εἴδος); and in the Hippocratic treatise π. ἀρχαῖς ἱπτρικῆς each of the innumerable physical substances known as δύναμεις had also been called an εἴδος.

(34) (G) We now come to the last and most typically Aristotelian of the meanings of δύναμις: and although it is

a And therefore I have felt justified in translating it "faculty" in this sense, to avoid repeated recurrence of the Greek word transliterated. It may perhaps be simply an extension of the meaning dealt with in the last section but one.
usually considered independently of the ones we have already described, it is clear from Aristotle's own words that he did not so regard it himself, for he associates it very closely with κίνησις. In Met. Δ 1019 a 15 ff. and Θ 1046 a 10 f., he defines the primary and fundamental sense of δύναμις in this connexion in the following words: δύναμις is ἀρχή κινήσεως ἡ μεταβολής ἐν ἑτέρῳ ἡ ἐτέρων: δύναμις is a principle (or source) of κίνησις or of change—a principle either (a) subsisting in some other thing than that which is to be affected by the κίνησις or change, or (b) subsisting in the thing itself qua other than changeable in that respect. An example of (a) is building; an example of (b) is the science of medicine in the case of a person who is being healed but not qua being healed (a man doctoring himself). That is the fundamental sense of this δύναμις; but Aristotle goes on at once to mention the complementary sense of it, which in fact is the sense in which he commonly uses it, viz., the δύναμις of being acted upon (παθεῖν), which he describes as the ἀρχή in the thing acted upon of a passive change caused either by some other thing or by itself qua other (ἡ ἐν αὐτῷ τῶ πάσχουτι ἀρχή μεταβολῆς παθητικῆς ύπ’ ἀλλου ἡ ἡ ἀλλο). It is therefore clear that there is the closest possible connexion between this notion also of δύναμις and κίνησις: δύναμις is in fact the capacity to set up "movement" or (more commonly) to be set in "movement"; it is a "dynamic" conception. To say that A is B δύναμει (potentially) means that A is a Material Cause capable of being set moving with a certain κίνησις by a Motive Cause, which κίνησις will result in A acquiring the Form of B, thus attaining the Final Cause (becoming a B itself). It is thus a conception which integrates the four Causes through the process of κίνησις.

The correlative of δύναμει (potentially) is ἐνεργεῖα (in actuality); "X ἐνεργεῖα" means something in which the Form X has been realized—something which already possesses the Form X, and further, in the case of animals, something which can reproduce the Form X in other matter which is so far only "δύναμει X."

Of all the possible translations or mistranslations of δύναμις, "force" is one of the most misleading; for
there is nothing more fundamental in Aristotle's—and in his predecessors'—idea of δύναμις than that it is something natural; and the associations of the term "force" run counter to this. Aristotle himself contrasts "natural" and "enforced" movement (see App. B § 22, and cf. 739 a 4, 788 b 27, Politics 1253 b 22). It is also important that any notion of a vague and indefinite urge, even (and perhaps especially) where Soul is involved, should be excluded; for, as we have seen, δύναμις is associated primarily with some material substance of a specific character or with some κίνησις (carried in a definite substance) of a specific character. From every point of view it is best to avoid "force" altogether as a translation of δύναμις.

Τὸ υγρὸν καὶ τὸ ἕνεργον, "fluid substance and solid substance"

(38) These are two of the original δυνάμεις (§ 24); and Translation. following Ogle in his translation of P.A. I use the above renderings as being more in conformity with the definitions given by Aristotle himself than "moist" and "dry" which have sometimes been used. Actually neither pair of English words quite expresses the Greek. Aristotle's definition of them (at G. & C. 329 b 30) is this: "υγρὸν is that which is not bounded by any boundary of its own but can readily be bounded; ἕνεργον is that which is readily bounded by a boundary of its own but can with difficulty be bounded"; at the end of each definition there should of course be understood "by a boundary imposed from without." (υγρὸν is τὸ ἀόριστον ὁικεῖῳ ὅρῳ εὐόριστον ὁν, ἕνεργον is τὸ εὐόριστον μὲν ὁικεῖῳ ὅρῳ δυσόριστον δὲ.)

Συμμετρία, κράσις

(39) An idea which recurs a number of times in G.A. is that of συμμετρία. In this treatise the majority of the references to συμμετρία are concerned with the relative amounts of residue contributed in generation by the two

a See list of passages in the Index.
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parents, or to the heat or "movement" contributed by the male or otherwise provided (e.g., by the Sun). Σύμμετρος κίνησις is also mentioned in connexion with the amount of fluid in the pupil of the eye (779 b 25; cf. 780 b 24). The meaning throughout is that the amount of substance, or of heat, must be adjusted in the correct proportion; and this, as the context at 786 b 5 indicates, means suitably adjusted between the two extremes of too much and too little. This at once recalls to mind the famous doctrine of the "mean" in the Ethics, where goodness (or "virtue," ἀρετή) is held to be a mean between the two extremes of excess and deficiency; indeed, at E.N. 1104 a 12 ff. Aristotle says that whereas the moral ἀρεταί are destroyed by excess and deficiency, they are produced and preserved by the mean, just as excessive food and drink destroy health, whereas τὰ συμμετρὰ produce and preserve it. a Similarly, at Phys. 246 b 4 he says "we posit that the ἀρεταί of the body, viz., health and fitness, lie in the κράσις (blend) and συμμετρία of hot things and cold, b either as regards each other internally, or as regards the surrounding environment; and the same applies to the other ἀρεταί and κακίαι." This reference to κράσις and to the environment is closely parallel to the most important passage on συμμετρία in G.A., 767 a 14 ff., where Aristotle says that the male and female need συμμετρία as towards each other, because all things formed by Nature or by Art λόγῳ τινὶ ἐστὶν—depend upon a certain proportional relationship, or ratio. Just as in cooking, the heat must strike the due proportion, the mean, or your meat will be either overdone or underdone. c So too in the mixture of male and female, συμμετρία is required. He then goes on to speak of the dependence of our bodily condition upon the κράσις of the environing air (cf. 777 b 7) and of the foods we take, and especially the water.

(40) This is not the place to discuss the origin of the doctrine

a The importance of συμμετρία in the growth of a State is also emphasized by comparing it with the growth of the body (Pol. 1302 b 35 ff.).
b Cf. the phrase ψυχρότερα τῆς συμμέτρου κράσεως used of the parts around the brain (P.A. 652 b 36).
c Cf. § 16 above.
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of the mean, nor of the closely allied doctrine of κράας, except that it should be noted that great importance is attached in the Hippocratic treatise π. ἀρχαῖς ἰττρικῆς to securing proper κράας for the ingredients of the food we take and of the constituents of our bodies (the two sets of substances being identical); and that in π. διαίτης the κράας of Fire and Water in the Soul is responsible for its health and sensitivity (cf. G.A. 744 a 30). References to the pertinent passages of the Hippocratic treatises will be found in the notes; see also P.A. (Loeb ed.), pp. 37 f. It should also be noted that Alcmeon of Crotona (Aëtius v. 30; see Diels, Doxographi 442) held that health was the σύμμετρος τῶν ποιῶν κράας (cf. § 25). It is important to realize that some, at any rate, of Aristotle's terminology was the common property of scientific writers.

Ψυχή, "Soul"

(41) The English word Soul, as will be seen, owing to its associations is not entirely satisfactory as a rendering of ψυχή, but it is by far the most convenient one, and I have used it in preference to "life" or "vital principle" (for which Aristotle employs other terms).

(42) Animate bodies, bodies "with Soul in them" (ἐμψυχα), are "concrete entities" made up of Form and Matter, Soul being the Form and body the Matter; indeed, Soul is the Form of the body. (Cf. G.A. 738 b 27, n., 741 a 1.) Aristotle also describes this relationship by saying that Soul is the "realization" (ἐντελέχεια, "actuality") of the animal body. Strictly speaking, Soul is the "first realization" of an animal body, for an animal can "have Soul in it" and yet be asleep; its active, waking life will be its "second realization." Further, Aristotle tells us that Soul is the first realization of a body furnished with organs. The importance of this is clear: the body is for the sake of the Soul (because the Soul is the Final Cause as well); and hence (P.A. 687 a 8 ff.) Aristotle maintains that man has hands because he is the most intelligent animal, not, as some had said, the most intelligent animal because he has hands. Soul is "prior" to body, and the body is such as it is because that is the sort of body the Soul
requires in order to function. Indeed, the Soul cannot function without a body; it cannot, we may say, exist (De anima 414 a 19).

This will be clear if we distinguish the different parts or "faculties" of Soul. They can be arranged in a definite order, so that the possession of any one of them implies the possession of all those which precede it in the list; and it will be seen that all except the last of them obviously require a body for their functioning.

(1) Nutritive and generative Soul, in all plants;
(2) sentient Soul, in all animals;
(3) appetitive Soul
(4) locomotive Soul
(5) rational Soul, in man only.

It is the last faculty of Soul which stands out by itself. Aristotle feels that he cannot admit that Soul is wholly dependent upon body for its functioning; there may, he says, be some "part" of Soul which is not the "realization" of any body, a "part" whose activities have nothing whatever to do with any physical activities (G.A. 736 b 28). This part, which is "rational Soul," comes in over and above, from without (G.A. 736 b 25 ff.), and continues to exist after the death of the body (De anima 413 a 6, b 24 ff., 430 a 22, etc., Met. A 1070 a 26).

The problems raised by this belief are, however, not fully dealt with by Aristotle even in G.A., where he has much to say about the development of Soul in the embryo; indeed, he nowhere offers any solution of them.

So much then for the theoretical relationship of Soul and body. What is their practical relationship? How precisely does Soul function through the body? The answer to these questions is one of the most striking parts of all Aristotle’s philosophical work. Soul, says Aristotle, is not, as some have wrongly supposed, Fire or any such stuff (δύναμις); it is better to say that it "subsists in some such substance" as Fire (ἐν ταύτῳ τῷ σώματι συνεστάναι), viz., in "hot substance" (τὸ θερμόν), which is the most serviceable of all substances for the activities of Soul (P.A. 652 b 8); and elsewhere (G.A. 736 b 30 ff.; see App. B § 13) he is more explicit.

\(^a\) See also 744 b 33, n.

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This θερμόν is no ordinary θερμόν, but it is pneuma, a substance “more divine” than Fire, Air, Water, or Earth, and “analogous to” the fifth element, aether, the element of the Upper Cosmos. It is this pneuma, and the substance (φύσις) in the pneuma, which is the vehicle of Soul, and it is pneuma which Soul uses as its “instrument,” through which it brings about κίνησις, both in moving the full-grown body and in “moving” i.e., developing the embryo. Here, then, we have reached the heart of the business: pneuma is the last physical term of the series; pneuma is the immediate instrument of Soul, and it is through pneuma first of all that Soul expresses itself.

It must not be supposed that this pneuma is the breath breathed in by the animal from outside; Aristotle is most explicit on this point, and he often describes this pneuma as “connate” (σύμφυτον). Owing to the important place of Σύμφυτον Πνεύμα in Aristotle's biology, I have provided a full account of its nature and functions in Appendix B. 

Kίνησις

Kίνησις is a term of wider range than the English “movement,” though it is useful to retain “movement” as a translation in order to preserve the line of Aristotle's thought. Kίνησις is one department of μεταβολή (Change), of which there are three divisions:

Two, which are changes affecting οὐσία:
(1) γένεσις, change from the non-existent to the existent;
(2) φθορά, change from the existent to the non-existent.

And one, which comprises changes affecting categories other than οὐσία:
(3) κίνησις, change in existing things.

Kίνησις has three subdivisions:
(a) as regards Quantity: Growth and diminution;
(b) as regards Quality: “Alteration” (ἀλλοίωσις);

See also G. L. Duprat, La théorie du πνεύμα chez Aristote, Archiv f. Gesch. d. Phil. XII (1899), 305 ff., and W. W. Jaeger, Das Pneuma im Lykeion, Hermes, XLVIII (1913), 29 ff.; the latter also gives a history of the pneuma-doctrine. See also W. W. Jaeger, Diokles von Karystos (1938) and J. I. Beare, Greek Theories of Elementary Cognition from Alcmeon to Aristotle (1906).
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(c) as regards Place: Locomotion (φορά), either (i) in a circle, or (ii) in a straight line.

Sometimes Aristotle includes γένειας and φθορά as a fourth subdivision of κίνησις, thus making κίνησις embrace every variety of change. (See also Met. A 1069 b 8 ff.)

Definition. (49) The definition of κίνησις which he gives at Phys. 201 a 11 ff. is this: ἡ τοῦ δυνάμει ὄντος ἐντελέχεια, ἡ τοιοῦτον, κίνησις ἐστιν: “Movement” is the realizing of that which is potentially X, qua potentially X. For example, to take the case of ἄλλοιως, κίνησις is the altering of a thing which is alterable, qua alterable; and so with the other modes of potentiality.

“Movement” and Form. (50) It will be seen at once that, in order to set going the κίνησις by which the various potentialities are to be realized, Motive Causes are required. And the thing which causes the “movement,” says Aristotle (Phys. 202 a 10), will always bring with it some Form (maybe some οὐσία, or some quality, or some quantity), which will be a “principle” and a cause of “movement.” In other words, the “movement” will be informed, determined, characterized, in such a way that it will produce a thing which has a certain οὐσία, or quality, or quantity. The agent (or Motive Cause), then, will set up in the material a “movement” which will result in the material which is potentially Α becoming Α in actuality, that is to say, in its acquiring the same Form as that which the agent possessed. And this result is brought about, generally, by the use of an intermediary, an “instrument” (see App. B §§ 6, 15), to which the agent imparts the “movement” for transmission.

“Movement” derived from Soul, (51) All these sorts of κίνησις, Aristotle points out (De anima 415 b 22 ff.), are derived from Soul; they are not found apart from Soul. This is because Soul is the Cause (αἰρία) and principle (ἀρχή) of the living body: it is alike its Motive Cause, its Final Cause and its Formal Cause (ibid. 415 b 8 ff.), and it is situated in the heart. We must not forget, however, that in the long run κίνησις, at any rate κίνησις of inorganic things, is due to the Unmoved Mover, from whom “movement” is mediated by the heavenly bodies to the Lower Cosmos (App. A §§ 3 ff.); and even in the case of living things (“things
with Soul in them”), the heavenly bodies act as a Motive Cause, for “man is begotten by man and by the Sun” (see App. A §§ 6, 9).

Γένεσις, γίγνεσθαι

(52) Γένεσις, as we have already seen (§ 47), is a process Meaning. of change; in fact, it is the most fundamental sort of change, viz., “coming into being”; hence, the product resulting from a process of γένεσις is some ούσια, for although some sorts of ούσια persist eternally, there are others which are “perishable,” i.e., which are subject to γένεσις and φθορά (see App. A §§ 1, 12, 16). Indeed, the sort of ούσια produced by the γένεσις with which our present treatise is concerned—animals and plants—is the ούσια which Aristotle considers to have the best claim to the name (App. A § 18).

(53) Γένεσις, and its verb γίγνεσθαι, are terms of frequent Translation. occurrence in Aristotle, and especially in G.A. In the title of the treatise, γένεσις is commonly translated “generation,” and this is a convenient rendering of it there; but we must not forget that γένεσις also refers to the whole process of an animal’s development until it has reached its completion; that is to say, γένεσις includes the whole subject of reproduction and embryology. In the body of the treatise “generation” is often not satisfactory as a translation; nor is “coming-to-be” particularly neat or indeed appropriate in a biological work. I have therefore commonly used “formation,” “process of formation” and the like to render γένεσις, and for γίγνεσθαι “to be formed,” “to come to be formed,” etc.

Συνιστάναι, συνιστασθαι

(54) Another verb closely connected with γίγνεσθαι is the Meaning, verb συνιστάναι, which might almost be regarded as the active voice of γίγνεσθαι, though συνιστάναι tends rather to refer to the beginning of the process. It is specially frequent in passages describing the initial action of the semen in constituting a “fetation” out of the menstrual fluid of the female, and it is also used by Aristotle to describe the action of rennet upon milk, a parallel
instance which he cites by way of illustration (739 b 23). Σωμιστάναν therefore denotes the first impact of Form upon Matter, the first step in the process of actualizing the potentiality of Matter. The meaning of σωμιστάναν therefore is plain enough, but there is no really convenient English word to translate it; and in consequence makeshift devices have to be adopted. Sometimes I have used "constitute," sometimes "set," sometimes "cause to take shape"; and for σωμιστάναι, which is also very frequent, "set" (intransitive), "take shape," "arise," etc. I decided against "composit," chiefly because I found it essential to introduce the term "feta-
tion" for κύημα (q.r.), and as the two so often occur together, the outlandish phrase "composit the feta-
tion" would have been frequently occurring. Never-
theless, it would have represented Aristotle's thought much more precisely, and for that reason alone I am convinced that it would have been amply justified.

Another possible rendering would have been "organize"; and indeed "organizers" is a term which has recently been introduced into embryology to denote substances which are responsible for bringing about the differentiation of the parts of the embryo. It is interesting in this connexion to note that Aristotle seems to be working on a similar theory in G.A. IV, viz., that there is a κύημα (i.e., a specific "movement," implying a δύναμις or specific substance) for each part of the body, which brings about its development in the embryo. We should, however, note that the "organizers" are not found until after impregnation is effected, whereas the distinctive "movements" proper to sensitive Soul are ex hypothesi already in the semen.

Κύημα

This is a term which occurs very frequently in G.A. At 728 b 34 we read that by κύημα is meant "the first (or primary) mixture of male and female"; and although the term is very often so used, it is also used by Aristotle to include more than this. Actually it covers all stages of the living creature's development from the time when the "matter" is first "informed" (a common phrase is
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κύμα συνισταται; see § 54) to the time when the creature is born or hatched. Hence we find κύμα applied to the embryo or fetus of Vivipara; to the "perfect" eggs of birds and to the "imperfect" eggs of Cephalopods, etc. (733 a 24; they are still so called after deposition), to the roe of fishes (741 a 37), and to larvae (758 a 12); indeed, the larva is compared with the earliest stage of the κύμα in viviparous animals (758 a 33).

(57) In all the foregoing cases, the "matter" for the κύμα is (b) spontaneous by the female parent; but in the case of spontaneous generation there is of course no female parent, and the κύμα is formed, e.g., out of the seawater by the pneuma acting upon it (762 b 17).

(58) There are, however, some κύματα which never reach the (c) infertile point of hatching (e.g., "wind-eggs"); thus a κύμα fetations; is not necessarily fertilized. Such a κύμα is, however, to some extent "informed" and can develop up to a point because it possesses nutritive Soul potentially.

(59) There is no English word which covers the wide range of the term κύμα, and I have therefore introduced the term "fetation," by which I invariably translate it.

(60) Aristotle holds that the seeds of plants are "as it were a (d) feta-kύμα," because in them male and female are not separated; hence the seed of a plant begins with the male factor and the female factor already mixed in it; and that is why only one stalk or plant can be formed from one seed: there is no such opportunity available, as there is in the case of animals, for the male dynamis to "set" numerous fetations out of the material supplied.

Nourishment, Residues, etc.

(61) Several important terms in Aristotle's technical vocabulary are connected with the processes through which the food passes in the living body, and therefore an account of these processes will most conveniently explain the meaning of the terms.

(62) After mastication, the food passes into the stomach, Concoction, where it is "concocted" by means of the "natural (or

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a See also § 77 below.

b The Greek word for concoction is the same as that employed to denote the process of ripening or maturing of fruit, corn and the like by means of heat—also that of baking and cooking (see 1xiii
vital) heat " resident there. Any living thing (anything " with Soul in it ") possesses " natural heat, " and the chief seat of the Soul and the source of the vital heat is the heart (or its analogue). But also, every part of the body as well has its own natural heat (cf. 784 b 26 ff.), derived from the heart through the blood: thus, the stomach concocts the nourishment before passing it on to the heart, and other parts may concoct it still further when the heart has sent it on to them. Beside the stomach, the liver and the spleen assist in the concoction of the nourishment (P.A. 670 a 20 ff.).

Blood. (63) Having received its first stage of concoction in the stomach, the nourishment passes on to the heart, where as we should expect it undergoes the most important stage of its concoction, and is thereby turned into blood, the " ultimate nourishment " for the whole body (P.A. 647 b 5, cf. 666 a 8). It is probable that, in Aristotle's view, an important part of this process was the " pneumatization " of the blood (see App. B §§ 31, 32), i.e., the charging of it with Σύμφυτον Πνεύμα and with the special " movement " requisite to enable it (a) to maintain the " being " of the animal and (b) to supply its growth. These two functions of nourishment, and the consequent distinction of two grades of nourishment, which is made by Aristotle at 744 b 33 ff. (where see note; and cf. list of passages in the Index), enable us also to distinguish the different classes of residues. The first-grade nourishment (a), which is described as " nutritive " and " seminal," provides the whole animal and its parts with " being "; the second-grade (b) is described as " growth-promoting," and causes increase of bulk. In the development of the embryo, it is the leavings of the first-grade nourishment, or " nutritive residue," left over after the " supreme parts " — flesh and the other sense-organs — have been provided for, which are used to form the bones and sinews; the second-grade, inferior, nourishment (which is taken in by way of supplement from the mother or from outside) is used to form nails, hair, horns, etc. The latter is more " earthy "

715 b 24, n.). Indeed, the processes are regarded by Aristotle as being fundamentally identical. (Cf. 743 a 31 ff.) It is also applied by him to the " maturing " of the embryo (719 a 34).
than the former; indeed, with such residue in mind, Aristotle can say (745 b 19) that "residue is unconcocted substance, and the most unconcocted substance in the body is earthy substance"; see also § 66 below.

(65) Generally, then, more blood is produced than is required for the purposes mentioned at the end of § 63, and the surplus may then undergo a further stage of concoction, and Nature is often able to turn it to some useful purpose (cf. § 8 above). These are the useful "residues," and (a) useful; Nature has provided each with its proper place (G.A. 725 b 1); indeed, it is only in its proper place that each "residue" is formed (739 a 2). Examples of useful residues are semen, menstrual fluid, milk. Marrow, which gives the backbone coherence and elasticity, is produced when "the surplus of bloodlike nourishment is shut up in the bones" and concocted by their heat (P.A. 652 a 5, a 20). Sometimes, when the nourishment is particularly abundant, the surplus blood is concocted into fat, such as lard and suet (651 a 20). Also, some of the blood, reaching the extremities of the vessels in which it is carried, makes its way out in the form of nails, claws or hair.\(^a\)

(66) Residues may appear at various stages (725 a 13); they (b) ambiguously appear before, as well as after, the nourishment has been turned into blood; and then they are residues of "nourishment at its first stage"; thus (653 a 2, cf. 458 a 1 ff.), after a meal, the nourishment rises as vapour through the vessels to the brain, where it is cooled, and then condenses into phlegma and ichor (serum). But both of these, it seems, may also be useless residues, for at 677 b 8 phlegma is mentioned in company with "the sediment from the stomach," though perhaps it is most often a residue of the useful nourishment (725 a 14). Ichor, too, the "watery part of the blood," is sometimes unconcocted blood, sometimes corrupted blood (653 a 2; cf. 458 a 1 ff., 651 a 15; no doubt ε' τι ἀλόο τοιοῦτον at G.A. 725 a 15 refers to ichor).

(67) Residues, then, are "the surplus of the nourishment" (c) useless;

\(^a\) The Aristotelian doctrine of "residues" came down to Shakespeare, as is shown by the passage in Hamlet (III. iv), where the Queen says to Hamlet:

"Your bedded hair, like life in excrements,
Start up, and stand an end."

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(724 b 26); but there are useless as well as useful residues, for residue may come either from the useful or the useless nourishment (725 a 4). Useless nourishment is "that which can contribute nothing further to the natural organism, and if too much of it is consumed it causes very great injury to it" (725 a 5 ff.). Among the useless residues are the excrements; these are natural useless residues; but there are also some unnatural ones, as has already been hinted. Among them perhaps should be included bile, which serves no useful purpose whatever. It is a residue produced by the liver (677 b 1), it is the residue of blood in those animals which are made out of less pure blood; it is merely a "necessary" product, an "offscouring," a "colliquescence." Colliquescence (σώτηγμα, σώτηγες) is defined at 724 b 26 ff. as that which is produced as an ἄποκρισις from the material that supplies growth, as the result of decomposition proceeding contrary to Nature" (τὸ ἄποκριθὲν ἐκ τῶν αὐξήματος ὑπὸ τῆς παρὰ φύσιν ἀναλύοντος). Colliquescence, then, is an unnatural residue, and therefore there is no proper place set apart for it by Nature (725 a 1); it just runs about wherever it can in the body. (See also 726 a 11 ff.) Colliquescence is a very common term in the Hippocratic treatise περὶ διαίτης, where its effect is said to be the production of an unhealthy ἄποκρισις (abscessio), and both there and in Aristotle ἄποκρισις is specially associated with residues, useful, or useless, or even harmful ones. A great deal of π. διαίτης is taken up with suggestions for getting rid of harmful ἄποκρίσεις.

The most important residues so far as G.A. is concerned are of course semen and menstrual fluid: natural and useful residues, for which Nature has set apart special places in the body. The difference between them is one of degree of concoction: semen is a residue of the final stage of useful nourishment (726 a 26); so is menstrual fluid (738 a 36), but the female has not sufficient natural heat to carry the concoction far enough to produce semen. Hence, the difference between male and female

Source of

Generative (68)

residues.

(d) unnatural:

Colliquescence.

It seems however that a "colliquescence" may sometimes be a natural residue, for at P.A. 677 a 13 bile is said to be "a residue or a colliquescence," and it is classed with the sediment in the stomach and intestines. See also P.A. (Loeb ed.), pp. 38 f.
is to be traced back to the innermost source of the organism, viz., the heart: the sexual organs may serve as an outward expression of the difference, but the difference is not due to them. Like the blood, of which it is a more fully concocted form, semen derives its character primarily from the heart; where the blood is pneumatized and charged with the requisite specific "movements" (see § 63 and G.A. 737 a 19). Semen, therefore, like blood, is the vehicle of "Soul," and especially so in virtue of the Σύμφυτον Πνεύμα which it contains, for Σύμφυτον Πνεύμα is the physical substance with which Soul is most intimately "associated." In terms of Soul, the difference between semen and menstrual fluid is that semen possesses the principle of sentient Soul, menstrual fluid possesses only nutritive Soul (potentially): the fluid has not been charged with the "movement" proper to sentient Soul owing to deficiency of heat in the female. The other "movements" in these generative residues are a most important factor in the determination of generic, specific, sexual, and even individual characteristics: see the discussion in G.A. IV. 766 a 13 ff., 767 b 15 ff.

(69) It should be noted that the heat both of blood and of semen (the concocted residue of blood) is not inherent, but is acquired from a source other than themselves. The logos of blood, it is true, includes the term "hot," but only in the same sense that the logos of "boiling water" (if we had one word for that as we have for blood) would include the term "hot." In other words, the permanent substratum of blood is not hot; and thus, although in one way blood is "essentially" hot, in another way it is not "essentially" hot (P.A. 649 b 21 ff.). Similarly, the "matter" of semen is "watery" (i.e., the substratum of it is the Element Water; cf. 736 a 1 and preceding passage); and its heat is a supplementary acquisition (ἐπίκτητος: G.A. 747 a 18, cf. 750 a 9, 10). The explanation of these statements, as will be obvious from the preceding sections, is that blood is produced by the heat of the heart out of the fluid matter supplied by the stomach from the food (§ 63), and semen of course has to undergo still further concoction by the vital heat in the appropriate parts (§ 62).
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Two modes of difference; Blood; Classification of Animals

(1) "The more and less." Differences "by the more and less," or "of excess and deficiency"—differences of degree, as we should say, are minor differences such as are found as between different species of one and the same genus or of any larger group. Thus (P. A. 644 a 19, 692 b 24) the parts of birds differ in this way, some having long legs, or feathers, others short ones; some a broad tongue, others a narrow one. Again, the male will have the same defensive or offensive organ as the female, but "to a greater degree," and this sometimes holds good of organs essential for food and nutrition a (661 b 28 ff.). Difference "by the more and less" can also be applied to skin, blood-vessel, membrane, sinew: these are substances which differ among themselves in this way (G. A. 737 b 4; cf. 739 b 32).

(2) "Counterparts." Where the divergence is wider, as for instance between different groups of animals such as birds and fishes, the difference is no longer τό μάλλον καὶ ἱπτομ, but τό ἀνάλογον (P. A. 644 a 21): the corresponding parts, e.g., the feathers of birds, the scales of fishes, and the scales of reptiles, differ "by analogy," i.e., they are merely the "counterparts," the "opposite numbers" of each other, as indeed the large groups of animals themselves may be (see G. A. 761 a 27 and context; cf. also 784 b 16 ff., and 737 b 4, n.).

(72) Many examples of this usage occur in G. A.: we find mention of τό ἀνάλογον of the heart; of the blood, and of the menstrual fluid, in bloodless creatures; of teeth; of flesh; of fat; of hair; of sinew. Menstrual fluid in females is ἀνάλογον to semen in males (727 a 3); we might have expected this difference to be only a difference "by the more and less," but no doubt the reason why it is a wider divergence is that menstrual fluid lacks sentient Soul (see § 68). The most frequent references to τό ἀνάλογον in G. A. are the counterparts of the heart and of the blood. And the most important of all the counterparts is of course "the substance in the pneuma,"

a Cf. the view that the female is a "deformity," § 13.

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which is ἀνάλογον to the element of the stars, aither (736 b 37).

(73) It should be noted that by “blood” Aristotle means red blood only, and he makes a division of animals into “blooded” (ἐναίμα) and “bloodless” (ἀνάμα). These two classes do not quite coincide with vertebrates and invertebrates, for there are some invertebrates which have red blood, e.g., mollusces (Planorbis), insect larvae (Chironomus), and worms (Arenicola). In other invertebrates the blood may be blue (Crustacea and most mollusces) or green (Sabellid worms), or there may be no respiratory pigment at all (most Insects).

(74) The following table shows how Aristotle’s division works out:

<table>
<thead>
<tr>
<th>Blooded animals</th>
<th>Bloodless animals</th>
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</thead>
<tbody>
<tr>
<td>Viviparous quadrupeds.</td>
<td>Cephalopods.</td>
</tr>
<tr>
<td>Oviparous quadrupeds and footless animals (= reptiles and amphibians).</td>
<td>Insects.</td>
</tr>
<tr>
<td>Birds.</td>
<td>Testacea.</td>
</tr>
<tr>
<td>Fishes.</td>
<td></td>
</tr>
</tbody>
</table>

It may be convenient to give here the Greek names used by Aristotle for the four classes of Bloodless animals, together with their literal translation and the terms which I have used to translate them:

τὰ μαλακόστρακα soft-shelled animals Crustacea.
τὰ μαλάκια softies Cephalopods.
τὰ ἐντομα insected animals Insects.
τὰ δοστρακόδερμα shell-skinned animals Testacea.\(^a\)

(75) The Testacea were a source of considerable embarrassment to Aristotle, who considered them to be intermediate between animals proper and plants. Nor, according to him, did they reproduce sexually, but arose from spontaneous generation. In his treatise on the Progression of Animals, he defers mention of them to

\(^a\) In using “Testacea” to translate τὰ δοστρακόδερμα (“the animals with earthenware skins”) I use it in the old-fashioned sense, so as to include a number of shelled invertebrates, comprising Gasteropods, Lamellibranchs, and some Echinoderms. Modern zoologists apply the term Testacea to the Foraminifera, which are shelled Protozoa. The term Ostracoderms (a transliteration of Aristotle’s word) is now given by zoologists to a group of primitive fossil fishes.
the very end and then says that strictly speaking they ought not to move about at all, yet in fact we see them moving: anyway, their movement is "contrary to nature," because they "have no right and left." (The mechanism of their movement can be detected only by the microscope, and is known as ciliary.)

In G.A., however, although Aristotle adheres to his classification into Blooded and Bloodless animals, perhaps a more important classification is that which is based upon their method of reproduction. This classification will be found in the Contents-Summary, pp. lxii ff. And in this connexion we must notice that the list is headed by the Viviparous animals, of which the first is Man: these are the "most perfect animals," and therefore they produce their offspring in the most perfected condition. And by "most perfect" (732 b 29) Aristotle means the animals which are "in their nature hotter and more fluid (υρώτερα), and are not earthy"; and, as the test of natural heat is the presence of the lung, and further, a lung well supplied with blood, no animal can be internally viviparous unless it respires. (See the whole passage 732 a 26—733 b 16.)

It should be noted that Aristotle clearly distinguishes between what he calls "perfect" and "imperfect" eggs; that is to say between eggs which do not and those which do increase in size after deposition. This is the basis of the modern distinction between cleidoic and non-cleidoic eggs (see 718 b 7, n.). He also clearly distinguishes between an egg and a larva: an egg is that from part of which the young creature is formed, the remainder serving as nourishment for it; a larva is something of which the whole is used to form the young animal. (See 732 a 29 and note, and 758 b 10 ff.)

The fact that Aristotle drew these distinctions so clearly is particularly noteworthy. He was, of course, unaware of the existence of the mammalian ovum, which cannot be detected without the aid of the microscope. It should also be noted that Aristotle compares the growth of a non-cleidoic egg with the action of yeast in fermentation; see 755 a 18.
CONTENTS-SUMMARY

Introductory

The Causes. The Motive and Material Causes of animals are the main theme of G.A.

The Sexes

(a) Distinction of sexes not universal. They are (a) found in most blooded animals, and in Cephalopods and Crustacea, but not in all Insects; (b) not found in Testacea.

2 (b) Definition of male and female: they are the "principles" of generation, the male providing the motive agent and the female the material. Hence a corresponding difference in the sexual parts, which vary in the various animals, but are always double.

1—Sexual Parts in Blooded Animals

4 (a) Sexual parts in males. The purpose of testes.
8 (b) Sexual parts in females:
(1) Ovipara laying imperfect eggs.
(2) Ovipara laying perfect eggs.
10 (3) Ovoosphera (Selachia and vipers).
12 (4) Vivipara.
14 (c) Further remarks on position of sexual organs.

2—Copulation of Bloodless Animals

14 (a) Crustacea.
15 (b) Cephalopods (including reference to the hectocotylized arm of the Octopus).
16 (c) Insects: some (1) are generated by copulation, copulate, and produce larvae; some (2) are generated spontaneously, copulate, and produce larvae; some (3) are generated spontaneously and do not copulate.
(1) Includes locusts, cicadas, spiders, wasps, ants;
(2) fleas, flies, cantharides;
(3) gnats, mosquitoes, etc.

3—Theory of Sexual Generation

17 (A) What is the nature of semen?
(a) Theory of "pangenesis" examined and refuted by various arguments.
(b) Definition of semen: it is that "from" which natural objects are produced. It is one of the "residues"—a residue of the useful nourishment in its final form—not a colliquescence.

19 (B) Menstrual fluid. This also is a residue, similar to semen, but less concocted. It is the matter for generation. Since the male provides the form, several offspring may be originated by one semen.

21 (C) (a) Elaboration of the theory of generation.
(b) The female cannot generate alone because it cannot provide the form (viz., sentient Soul). Semen is the instrument used by Nature, charged with the movement which conveys the form.

23 (c) Comparison and contrast of animals and plants. Sexes are not separate in plants because reproduction is almost their only function.

II. 1 (D) The Final Cause of the existence of the Sexes. They subserve generation, the perpetuation of the species, and this is the way by which "perishable" things are able to partake in eternal "being."

Classification of the various methods of Generation

Note on the difference between an egg and a larva.

The classes (Vivipara, Oovovivipara, Ovipara laying perfect egg, Ovipara laying imperfect egg, Larvipara) do not correspond to differences in the organs of locomotion, but to the degrees of "perfection" of the animals concerned, the most perfect being those which are hot, as is shown by the fact that they breathe.

1. Animals that are hot and fluid. Viviparous. Man, etc.
2. Animals that are cold and fluid. Oovoviviparous. Selachia and vipers.
3. Animals that are hot and solid. Oviparous (perfect egg). Birds and scaly animals.
4. Animals that are cold and solid. Oviparous (imperfect egg). Fishes, Crustacea, Cephalopods.
5. Animals that are coldest of all. Larviparous. a Insects.

3 (resumed)—Theory of Sexual Generation

(a) What is the agent that fashions the embryo? Preformation versus epigenesis. It is the male parent, or rather the semen in which the parent’s "movement" is transmitted, which fashions the embryo. Thus the material (provided by the female), which is potentially a living body of a particular kind, is gradually actualized. The parts of the body—and of the Soul—are actualized successively: first the heart and nutritive Soul.

2 (b) The physical character of semen. It is a foam, a compound of Water and pneuma.

3 (c) Does semen contain Soul? Yes—potentially; all the sorts of Soul which act through a body must be present first of all potentially. The problem of the entry of rational Soul.

(d) The physical substance in which Soul is carried is pneuma, a "divine" substance analogous to aither, the fifth element.

(e) Menstrual fluid contains all the parts of the body potentially, but it lacks sentient Soul.

a The larva represents a stage previous to that of the egg, for, according to Aristotle, the larva develops into an egg-like object.

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GENERATION OF ANIMALS

Generation in Blooded Animals—I. Vivipara

II. 4 Man and the "perfect" animals.
   (a) The secretion of the generative residues. Semen is not produced by all male animals.
   (b) The male—either by means of semen or directly—"sets" the purest portion of the female's residue and so produces a fetation.
   (c) The development of the fetation. The heart is formed first, as being the seat of nutritive Soul.
   (d) Theory of the action of the male factor on the female. Nutritive Soul uses heat and cold as "instruments."
   (e) The female cannot generate alone because it lacks sentient Soul (in some animals, however, the sexes are not separate).

5 (f) Later development of the fetation. The upper parts develop first (but not so in Insects and Cephalopods).
   (g) The differentiation of the parts is effected by means of connate pneuma.
   (h) The order of development of the parts.
   (i) The bloodvessels; the "uniform" parts; nails, etc.; sinews and bones.
   (j) Heating and cooling are employed as instruments in the development of the fetation. Necessity and purpose.
   (k) The brain; the eyes.
   (l) Bones, etc.
   (m) Two grades of nourishment: "nutritive" and "growth-promoting."
   (n) Teeth.

6 (o) Function of the umbilicus and cotyledons.
   (p) Hybrids; sterility; mules; deformed animals.

Generation in Blooded Animals—II. Ovipara (laying perfect eggs)

III. 1 Birds and Quadrupeds.
   (a) General.
   (b) Wind-eggs.
   (c) Difference between yolk and white: the white is hot and is the seat of the Soul-principle.

2 (d) Shape of the egg.
   (e) Growth of the egg.
   (f) Incubation by parent animal (not needed for quadrupeds' eggs).
   (g) Behaviour of white and yolk during incubation.
   (h) Description of the umbilical cords, etc.

Generation in Blooded Animals—III. Ovovivipara (laying perfect eggs)

3 Fishes (A) Selachia.
   (a) Description of the development of the embryo.
   (b) Differences as between Birds and Selachia (including reference to Mustelus laevis).

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ARISTOTLE

Generation in Blooded Animals—IV. Ovipara (laying imperfect eggs)

(a) Growth of the egg: a process comparable with fermentation.
(b) Erroneous theories:
   (1) Fish are not oviparous and have no sex distinction;
   (2) swallowing of milt;
   (3) apocryphal methods of copulation in birds;
   (4) stories about trochos and hyena.
7 Method of action of male birds and male fishes upon the eggs contrasted.

Generation in Bloodless Animals

(A) Cephalopods and Crustacea.
(B) Insects.
   (a) The larva is comparable to the earliest stage of an egg. All Insects, whether formed as a result of copulation or by spontaneous generation, originate from larvae.
   (b) Development of the larva.
    (c) Bees. Hornets and Wasps.
(C) Testacea: intermediate between animals and plants. Various animals proper to the various Elements. Moon- and Fire-animals.
   (a) Side-shoot (quasi-seminal) propagation, etc.
   (b) Spontaneous generation: the action of pneuma. The theory expounded. Traditional view of the origin of animals. The process of development resembles that of larvae. Examples of spontaneous generation.

Origin of Sex-differentiation in the Individual and Inheritance

IV. 1 (a) Various theories: Anaxagoras, Empedocles, Democritus, Leophanes.
   (b) The fundamental distinction between male and female is that the male can concoct and discharge semen; the female cannot concoct or discharge semen, but can receive it: the difference of the sex-organs is consequent upon this distinction, and therefore the sex of the developing embryo is so too. Thus the ultimate source of sex-distinction is the heart, which provides the vital heat necessary for concoction. Further statement on the difference of formation of the sexual organs.
2 (c) Facts cited to support theory.
   (d) Importance of συμμετρία, both internally and externally (" blend" of climate).
3 (e) Resemblance to parents. Theory of inheritance.
   (f) Fallings away from type:
       Male changes over to female.
       Father changes over to mother.
Relapses:
Father to grandfather, then to great-grandfather, etc.
Mother to grandmother, then to great-grandmother, etc.
This is applicable to the parts as well as to the whole body.

(g) Further departures: unevenly developed individuals.
(h) Earlier theories of resemblances examined.
(i) Monstrosities:
   (1) fancied resemblance to animals;
   (2) with redundant parts;
   (3) deficient in parts.
(j) Connexion of this with the number of young produced.
(k) Reason for the redundance of parts.
(l) Other irregular formations.

Varia

Superfetation.

Degree of perfection of the young at birth.
In human beings, more males born deformed than females. The female itself is a deformity, though a natural deformity.

The mola uteri.

Milk. The heart controls the production of milk, as it does the production of the voice. Milk is concocted blood.

Animals are born head first.

Length of gestation-period. The periods of animals are governed by cosmic periods.

Secondary Characteristics

Introductory. This part of the work is concerned with characteristics which are due entirely to Necessity (i.e., the Motive and Material Causes), and in no way to the Final Cause.

(a) Embryos are mostly asleep.
(b) Colour of eyes.
(c) Keenness of sight, due (1) to the amount of fluid in the eyes; (2) to the condition of the skin on the pupil.
   There are two senses of "keenness": ability to see at a distance; ability to distinguish colours.
(d) Keenness of smell and hearing.
   Digression on the inner mechanism of the senses.
(e) Hair: thickness, curliness, rigidity, baldness and moulting.
(f) Colour of hair, in man, and in other animals.
(g) Coloration of animals. Colour of tongue. Seasonal colour-changes. General remarks on colour.
(h) Voice.
(i) Teeth: order of growth, etc.
(j) The relation of the Material and Motive Causes (Necessity) to the Final Cause.
### ABBREVIATIONS USED IN THIS VOLUME

#### Works of Aristotle

<table>
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<td>Phys. Physica</td>
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<td>P.A.</td>
<td>De partibus animalium</td>
<td>Met. Metaphysica</td>
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<tr>
<td>G.A.</td>
<td>De generatione animalium</td>
<td>Meteor. Meteorologica</td>
</tr>
<tr>
<td>I.A.</td>
<td>De incessu animalium</td>
<td>Pol. Politica</td>
</tr>
<tr>
<td>M.A.</td>
<td>De motu animalium</td>
<td>E.N. Ethica Nicomachea</td>
</tr>
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*G. & C. De generatione et corruptione De resp. De respiratione De an. De anima*

#### Other Works

- L. & S. Liddell and Scott's *Greek-English Lexicon* (1925–1940)
- C.Q. Classical Quarterly
- C.R. Classical Review

Other abbreviations are self-explanatory.
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### SIGLA

#### Manuscripts cited throughout
- **Z** Oxoniensis Collegii Corporis Christi W.A. 2. 7.
- **S** Laurentianus Mediceus 81, 1.
- **P** Vaticanus graecus 1339.
- **Y** Vaticanus graecus 261.

#### Manuscripts occasionally cited
- **m** Parisinus 1921.
- **O** Riccardianus 13.
- **E** Parisinus 1853.

All mss. readings are as reported by Bekker (by Bussemaker for E at 723 b 5 and 769 b 34, and for m at 723 b 5 and 768 b 36) except that

* denotes corrected or additional reports of readings as given by Bitterauf (and twice only, for Z at 768 b 36 and 786 a 3, as given by Susemihl).

#### Readings and emendations

- **Σ** Michael Scot’s Latin translation (either its actual words, or the original Greek reading clearly implied), from my own transcription.
- **Gul.** William of Moerbeke's Latin translation.
- **Aldus** The Aldine editio princeps, Venice, 1497.
- **vulg.** The usual reading, as in the Berlin edition.
- **Buss.** Bussemaker, in the Didot edition.
- **A.-W.** Wimmer, in Aubert and Wimmer’s edition.
- **Sus.** Susemihl.
- **Btf.** Bitterauf.
- **Rackham** Suggestions in private communications to me by Mr. H. Rackham.

Emendations and proposals by other scholars are attributed to them by name (for references see pp. xxvii f.).

[ ] Denote words wrongly placed or incorporated into the text.

< > Denote (a) in the Greek text, words or parts of words supplied conjecturally;
(b) in the English, either the translation of words supplied in the Greek, or words required to complete the sense.

**a** Z¹, Z², etc. = first hand, second hand, of Z, etc.

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Ciascuna cosa qual ella è diventa.
ἈΡΙΣΤΟΤΕΛΟΤΣ
ΠΕΡΙ ΖΩΙΩΝ ΓΕΝΕΣΕΩΣ
A

715 a 1  Ἐπεὶ δὲ περὶ τῶν ἄλλων μορίων εὑρηται τῶν ἐν τοῖς ἄφοις καὶ κοινῆ καὶ καθ’ ἕκαστον γένος περὶ τῶν ἅδιων χωρίς, τίνα τρόπον διὰ τὴν τοιαύτην αἰτίαν ἐστὶν ἕκαστον, λέγω δὲ ταύτην τὴν ἕνεκά του· ὑπόκεινται γὰρ αἰτίαι τέτταρες, τὸ τε ὦ τέκνα ἕνεκα ὡς τέλος, καὶ ὁ λόγος τῆς οὐσίας (ταῦτα 5 μὲν ὦ ἐν τῷ σχεδὸν ὑπολαβεῖν δεῖ), τρίτον δὲ καὶ τέταρτον ἡ ὕλη καὶ ὁθεν ἡ ἀρχή τῆς κτισματικῆς—περὶ μὲν ὀν ὑπὸ τῶν ἄλλων εὑρηται (ὅ τε γὰρ λόγος καὶ τὸ ὦ ἕνεκα ὡς τέλος ταύτων, καὶ ὕλη). 10 τοῖς ἄφοις τὰ μέρη, παντὶ μὲν τῷ ὄλῳ τὰ ἀνωτέρων μορίων, τοῖς δ’ ἀνωτέρων μορίων,

a  i.e., in the De partibus animalium.
b  See Introd. § 18.
c  i.e., the Final Cause appropriate to each part, either qua part belonging to all animals, or qua part belonging to some special group of animals.
d  See Introd. §§ 1 ff.
e  See Introd. § 10.
f  See Introd. §§ 19 ff.
With one exception we have now a spoken about I all the parts b that are present in animals, both generally concerning them, and also taking them group by group and dealing separately with the parts peculiar to each, and have shown in what way each part exists on account of the Cause which is of a corresponding kind: I refer to the Cause which is "that for the sake of which " a thing exists. c As we know, there are four basic Causes d : (1) "that for the sake of which " the thing exists, considered as its "End" ; (2) the logos e 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 f of the thing's movement. And with one exception I have already spoken about all of these Causes, since the logos of a thing and "that for the sake of which " it exists, considered as its End, are the same; and, for animals, the matter of them is their parts (the non-uniform g parts are the matter for the animal as a whole in each case; the uniform parts are the matter for the non-uniform
toútois de tā kaloúmena stoicheía tōn sōmátwn),
loipón de tōn mēn moríwn tā prōs tēn gēnein
syntelouúnta toús zōōis, peri òn outhēn diwrístai
prōteron, peri aitías de tēs kivnūsēs, tis aytē.
tō de peri taútēs skopein kai tō peri tēs
gēnesein tēs ēkástou τρόπου τινα ταυτόν ἐστιν:
dióper ò lógōs eis ēn sūnēgagē, tōn mēn peri tā
mōria teleutairia taúta, tōn de peri gēněseis tēn
άρχην ἐξομένην τούτων τάξασ.

Tōn dē zōōn tā mēn ēk sīnduaśmuō gínetai
θῆλεος καὶ ἄρρενος, ēn ósois gēnein tōn zōōn ēstī
20 tō θῆλυ καὶ tō ἄρρεν: ou γάρ ēn pāsīn ēstīn, āllē
ēn mēn tois ēnaiēmos ēzw olīγōn āpασi tō mēn
ἀρρεν tō de θῆλυ tēleōwβēn ēstī, tōn d' ānaiμων
tā mēn ēchei tō θῆλυ kai tō ἄρρεν, ὡστε tā ēmogenē
γεννάν, tā de γεννά mēn, ou mēntoi tā ge ἓmogenē:
τοιαύτα d' ēstīn ὡσα gínetai μη ēk zōōn sīnduaśμο-
25 mēnōn, ἀλλ' ēk γῆς σημομένης καὶ περιττῳμάτων.1
ws de kata panta ēteiēn, ωσα mēn kata tōpon
mebhalētikā tōn zōōn ēstī2 tā mēn nevstikā tā

1 huc procul dubio transferenda vv. 715 b 25-30 ēstī de . . .
ēzōs, quae ibi aliena, hic congrua.
2 ēstī Peck: ónta vulg.: locus hic corruptus.

a Elements: στοιχεία. The term is a metaphor taken
from "letters of the alphabet," the original meaning of the
term. In the physical sense, "element," may be defined as
ēz ou sūγkeiētai prōtou ēnuπάρχοντος ἀνδρετοῦ tō eiβei ēis
ετερον ēbios (Met. 1014 a 26). See Introd. § 24.
b i.e., after the De partibus and the De incessu animalium.
c See Introd. § 74.
d The exceptions are the erythrinus and the channa: see
e See Introd. § 67. Here probably=excrements: cf.
H.A. 551 a 6. See however 737 a 4, 762 a 3 ff.
parts; and the corporeal "elements," as they are called, are the matter for the uniform parts. Consequently, of the parts it remains to describe those which subserve animals for the purpose of generation, about which I have so far said nothing definite, and of Causes we still have the Motive Cause to deal with, and to explain what it is. And, in a way, consideration of this Cause and consideration of the generation of each animal comes to the same thing: and that is why our treatise has brought the two together, by placing these parts at the end of our account of the parts, and by putting the beginning of the account of generation immediately after them.

Now of course some animals are formed as a result of the copulation of male and female, namely, animals belonging to those groups in which there exist both male and female, for we must remember that not all groups have both male and female. Among the blooded animals, with a few exceptions, the individual when completely formed is either male or female; but among the bloodless animals, while some groups have both male and female and hence generate offspring which are identical in kind with their parents, there are other groups which, although they generate, do not generate offspring identical with their parents. Such are the creatures which come into being not as the result of the copulation of living animals, but out of putrescent soil and out of residues.

Speaking generally, however, we may say that (a) in the case of all those animals which have the power of locomotion, whether they are adapted

The passage 715 b 25-30 should be inserted here, if anywhere.
715 a

δὲ πτημα τὰ δὲ πεζευτικὰ τοῖς σώμασιν, ἐν πάσι
tούτοις ἐστὶ̣ τὸ θῆλυ καὶ τὸ ἄρρεν, οὐ μόνον
30 τοῖς ἐναίμοις, ἀλλὰ ἐνίοις καὶ ἀναίμοις. καὶ
tούτων τοῖς μὲν καθ’ οἶ λον τὸ γένος, οἶ νον τοῖς
μαλακίοις καὶ τοῖς μαλακοστράκοις. ἐν δὲ τῶν
ἐντόμων γένει τὰ πλείστα. τούτων δ’ αὐτῶν ἄσσα
μὲν ἐκ συνδυασμοῦ γίνεται τῶν συγγενῶν ζώων,
καὶ αὐτὰ γεννᾷ κατὰ τὴν συγγένειαν. ὅσα δὲ μὴ
5 ἐκ ζῷων ἀλλ’ ἐκ σηπομένης τῆς υλῆς, ταῦτα δὲ
γεννᾷ μὲν ἑτερον δὲ γένος, καὶ τὸ γιγνόμενον
οὕτε θῆλυ ἐστὶ̣ν οὐτέ ἄρρεν. τοιαῦτα δ’ ἐστὶ̣ν ἐνὶ
tῶν ἐντόμων. καὶ τούτῳ συμβεβηκέν εὐλόγως·
eὶ γὰρ ὅσα μὴ γίγνεται ἐκ ζῷων, ἐκ τούτων
ἐγίνετο ζῶα συνδυαζομένων, εἰ μὲν ὀμογενῆ, καὶ
10 τὴν εὖ ἀρχὴς τοιαύτην ἔδει τῶν τεκνωσάντων
ἐναι γένεσιν (τούτῳ δ’ εὐλόγως ἀξιοῦμεν· φαίνεται
γὰρ συμβαίνου ὑπός ἐπὶ τῶν ἄλλων ζώων). εἰ
d’ ἀνόμοια μὲν δυνάμενα δὲ συνδυαζομέναι, πάλιν
ἐκ τούτων ἑτέρα τις ἂν ἐγίνετο φύσις, καὶ πάλιν
ἀλλή τες ἐκ τούτων, καὶ τοῦτ’ ἐπορεύετ’ ἄν εἰς
15 ἀπειρον. ἢ δὲ φύσις φεύγει τὸ ἀπειρον· τὸ μὲν
γὰρ ἀπειρον ἀτελές, ἢ δὲ φύσις ἂει ζητεῖ τέλος.
ὅσα δὲ μὴ πορευτικά, καθάπερ τὰ ὀστρακόδερμα
tῶν ζώων καὶ τὰ ζώντα τῶν προσπεφυκέναι, διὰ
tὸ παραπλησίαν αὐτῶν εἶναι τὴν οὐσίαν τοῖς
φυτοῖς, ὥσπερ οὔδ’ ἐν ἐκείνοις, οὔδ’ ἐν τούτοις

1 ἐν πάσι τούτοις ἐστὶ̣ Z*: ἐν ἐνίοις μὲν τούτων ἄπαν τὸ γένος
ἐχει vulg.  2 μόνον SZ: μόνον ἐν vulg.
3 sic PZ: ἀλλ’ καὶ τῶν ἀναίμων ἐν τοιον vulg.
4 ὀμογενῆ PZ1*.

* See Introd. § 74.
to be swimmers, or fliers, or walkers, male and female are found; and this applies not only to the blooded animals but to some of the bloodless ones as well. And among the latter, in some cases it holds good of a whole group, as for instance the Cephalopods and the Crustacea; and it holds good of most of the Insects. Among animals of this class, those which are formed as the result of the copulation of animals of the same kind, themselves generate in turn after their own kind; those, however, which arise not from living animals but from putrescent matter, although they generate, produce something that is different in kind, and the product is neither male nor female. Some of the Insects are like this. And this is what we should expect; for supposing that creatures which are produced otherwise than from living animals copulated and produced living animals: if these products were similar in kind to their parents, then the manner of their parents' original generation should have been like theirs. This we may reasonably claim, because it is evident that this is so with all other animals. If, on the other hand, the products were dissimilar from their parents, and yet able to copulate, we should then get arising from them yet another different manner of creature, and out of their progeny yet another, and so it would go on \( \textit{ad infinitum} \). Nature, however, avoids what is infinite, because the infinite lacks completion and finality, whereas this is what Nature always seeks. (b) The creatures which cannot move about, like the Testacea and those which live by being attached to some surface, are in their essence similar to plants, and therefore, as in plants, so also in them, male and

\[\text{See 732 a 25 ff., 758 b 6 ff.}\]
20 ēsti ὁ θῆλυ καὶ τὸ ἄρρεν, ἀλλ' ἡδὴ καθ' ὁμοιότητα καὶ κατ' ἀναλογίαν λέγεται: μικρὰν γάρ τινα τοιαύτην ἔχει διαφοράν. καὶ γὰρ ἐν τοῖς φυτοῖς ὑπάρχει τὰ μὲν καρποφόρα δένδρα τοῦ αὐτοῦ γένους, τὰ δ' αὐτὰ μὲν οὐ φέρει καρπὸν, συμβάλλεται δὲ τοῖς φέρουσι πρὸς τὸ πέπτευν, οἷον 25 συμβαίνει περὶ τὴν συκῆν καὶ τὸν ἔρινεόν.

1["Εστι δὲ καὶ ἐπὶ τῶν φυτῶν τὸν αὐτὸν τρόπον· τὰ μὲν γὰρ ἐκ σπέρματος γίνεται, τὰ δ' ἀναπτυσσόμενα τῆς φύσεως: γίνεται γὰρ ἡ τῆς γῆς σπονδήμενη ἡ μορίων τινῶν ἐν τοῖς φυτοῖς· ἐνα γὰρ αὐτὰ μὲν οὐ συνήσταται καθ' αὐτὰ χωρίς, 30 ἐν ἑτέροις δ' ἐγγίνεται δενδρεύν, οἷον ὁ ἰχός.]

1 quae sequuntur vv. 25-30 plane huc aliunde tralata, hic enim iamdudum de plantis sermo. transferenda censeo ad 715 a 25 post πεπτωμάτων.
2 χωρίς ἐκ γῆς ΖΣ.

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a The concoction referred to here is that which produces the ripening of fruit. See Introd. § 62. The use of the same word πέπτευν both for the fruit of plants and for the semen of animals is appropriate, in that both, according to Aristotle, are produced out of “nourishment” by a process of “concoction.”

b See 755 b 10, and H.A. 557 b 31. The fig tree commonly cultivated in S. Europe is Ficus carica. This species includes two kinds of individual trees: (1) those whose inflorescences contain fully-developed female flowers only; (2) those whose inflorescences contain male flowers near the opening, and lower down aborted female flowers known as “gall-flowers” owing to their being specially prepared to receive the eggs of the fig-wasp (Blastophaga grossorum), which turns the ovary of the flower into a “gall.” The latter trees are known as Caprificus. The female wasps, after impregnation by the male wasps within the gall, emerge from it and get dusted with pollen from the male
female are not found, although they are called male and female just by way of similarity and analogy, since they exhibit a slight difference of this sort. Thus among plants also we find that in one and the same kind some individual trees bear fruit, while some, although they do not bear any themselves, assist in the concocting of that which is borne by the others. An instance of this is the fig and the caprifig.

*e [The same sort of thing is found in plants too: some are formed out of seed, others as it might be by some spontaneous activity of Nature—they are formed when either the soil or certain parts in plants become putrescent, since some of them do not take shape independently on their own, but grow upon other trees, as for instance the mistletoe does.]

flowers as they leave the inflorescence, and then pollinate female flowers elsewhere. Caprification is the name given to the artificial assistance of this process by hanging inflorescences of the caprifig on to trees of class (1). The growers believe that the fruit of the Ficus is improved by the wasps; but in fact excellent fruit is produced by these trees without pollination, though of course no fertile seeds. Hence caprification must be a traditional usage dating from the time when fertile seeds were required for propagation, which is now done by means of cuttings. See Kerner and Oliver, Natural History of Plants, ii. 160-162; H. Müller, Fertilization of Flowers, tr. p. 531 and bibliography. Cf. H.A. 557 b 26 ff., where the wasp is mentioned.

c The following sentence is obviously out of place here, as is shown (a) by the opening words, which must mark the beginning of a reference to plants, whereas here plants are already being discussed; and (b) by its inappropriateness to the particular point under discussion. It would be relevant if transferred to 715 a 25. Cf. H.A. 539 a 16 ff.

cf. 762 b 19.

cf. H.A. 539 a 16 ff.

cf. 762 b 19.

c See Introd. § 54.
Περὶ μὲν οὖν φυτῶν, αὐτὰ καθ’ αὐτὰ χωρὶς ἐπισκέπτετον.

II Περὶ δὲ τῶν ἄλλων ζῷων τῆς γενέσεως λεκτέων κατὰ τὸν ἐπιβάλλοντα λόγον καθ’ ἐκαστὸν αὐτῶν, ἀπὸ τῶν εἰρημένων συνείροντας. καθάπερ γὰρ 5 εἴπομεν, τῆς γενέσεως ἀρχὰς ἂν τις οὐχ ἦκιστα θείη τὸ θῆλυ καὶ τὸ ἄρρεν, τὸ μὲν ἄρρεν ὡς τῆς κυνῆσεως καὶ τῆς γενέσεως ἔχον τὴν ἀρχῆν, τὸ δὲ θῆλυ ὡς ὑλῆς. τούτῳ δὲ μάλιστ’ ἂν τις πιστεύσει θεωρῶν πῶς γίνεται τὸ σπέρμα, καὶ πόθεν. ἐκ τούτου μὲν γάρ τὰ φύσει γινόμενα συνισταται, τούτῳ 10 δὲ πῶς ἀπὸ τοῦ θήλεος καὶ τοῦ ἄρρενος συμβαίνει γίγνεσθαι, δεῖ μὴ λανθάνειν. τῷ γὰρ ἀποκρίνεσθαι τὸ τοιοῦτον μόριον ἀπὸ τοῦ θήλεος καὶ τοῦ ἄρρενος, καὶ ἐν τούτοις τὴν ἀπόκρισιν εἶναι καὶ ἐκ τούτων, διὰ τούτῳ τὸ θῆλυ καὶ τὸ ἄρρεν ἀρχαὶ τῆς γενέσεως εἰσιν. ἄρρεν μὲν γὰρ λέγομεν ζῷων τὸ εἰς ἄλλο 15 γεννών, θῆλυ δὲ τὸ εἰς αὐτό. διὸ καὶ ἐν τῷ ὅλῳ τῇ τῆς γῆς φύσιν ὡς θῆλυ καὶ μητέρα οὐνομάζουσιν, οὐρανόν δὲ καὶ ἦλιον ἢ τι τῶν ἄλλων τῶν τοιούτων ὡς γεννώντας καὶ πατέρας προσαγορεύουσιν.

Τὸ δ’ ἄρρεν καὶ τὸ θῆλυ διαφέρει κατὰ μὲν τὸν λόγον τῷ δύνασθαι ἐτερον ἐκάτερον, κατὰ δὲ τὴν

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1 οὐνομάζουσιν Z: νομίζουσιν vulg.

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a It is impossible to represent the force of the Greek neuter in English.
b See note on Causes, Introd. §§ 1 ff. This statement, here unexplained and unjustified, will be fully dealt with later on.
c See Introd. § 54.
Still, plants will have to be considered independently all by themselves.

As far as animals are concerned, we must describe their generation just as we find the theme requires for each several kind as we go along, linking our account on to what has already been said. As we mentioned, we may safely set down as the chief principles of generation the male (factor) and the female (factor); the male as possessing the principle of movement and of generation, the female as possessing that of matter. One is most likely to be convinced of this by considering how the semen is formed and whence it comes; for although the things that are formed in the course of Nature no doubt take their rise out of semen, we must not fail to notice how the semen itself is formed from the male and the female, since it is because this part is secreted from the male and the female, and because its secretion takes place in them and out of them, that the male and the female are the principles of generation. By a “male” animal we mean one which generates in another, by “female” one which generates in itself. This is why in cosmology too they speak of the nature of the Earth as something female and call it “mother,” while they give to the heaven and the sun and anything else of that kind the title of “generator,” and “father.”

Now male and female differ in respect of their logos, in that the power or faculty possessed by the one differs from that possessed by the other; but they differ also to bodily sense, in respect of certain

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* See Introd. § 10. With this passage cf. 766 a 18 ff.

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*a* Cf. the definition given at 724 a 17 ff., and also 721 b 6.

*e* See Introd. § 18.
20 aiōθησιν μορίοις τισίν, κατὰ μὲν τὸν λόγον τῷ ἀρρεν μὲν εἶναι τὸ δυνάμενον γεννάν εἰς ἑτερον, καθάπερ ἐλέχθη πρότερον, τὸ δὲ θῆλυ τὸ εἰς αὐτό, καὶ εἶ ὦ γίνεται ἐνυπάρχον ἐν τῷ γεννώντι τὸ γεννώμενον. ἐπεὶ δὲ δυνάμει διώρισται καὶ ἔργω τιν, δεῖται δὲ πρὸς πᾶσαι ἐργασίαι ὀργάνων,
25 ὄργανα δὲ ταῖς δυνάμεσι τὰ μέρη τοῦ σώματος, ἀναγκαῖοι εἶναι καὶ πρὸς τὴν τέκνωσιν καὶ τὸν συνδυασμὸν μόρια, καὶ ταῦτα διαφέροντ' ἀλλήλων, καθὸ τὸ ἀρρεν διοίσει τοῦ θήλεος. εἰ γὰρ καὶ καθ' ὅλον λέγεται τοῦ ζῷου τοῦ μὲν τὸ θῆλυ τοῦ δὲ τὸ ἀρρεν, ἀλλ' οὔ κατὰ πᾶν γε [τὸ]¹ αὐτὸ θῆλυ καὶ
30 ἀρρεν ἐστίν, ἀλλὰ κατὰ τινα δύναμιν καὶ κατὰ τι μόριον, ὅσπερ καὶ² ὀρατικοῖν καὶ πορευτικοῖν, ὅσπερ καὶ φαίνεται κατὰ τὴν αἰσθησιν. τοιαῦτα δὲ τυγχάνει μόρια ὅντα τοῦ μὲν θήλεος αἰ καλούμεναι υπερτεραί, τοῦ δ' ἀρρενος τὰ περὶ τοὺς ὅρχεις καὶ τοὺς περινέους ἐν πᾶσι τοῖς ἐναίμοις. τὰ μὲν γὰρ ὅρχεις 35 ἔχει αὐτῶν, τὰ δὲ τοὺς τοιούτους πόρους. εἰσὶ δὲ διαφοραὶ τοῦ θήλεος καὶ ἀρρενος καὶ ἐν τοῖς ἀναίμοις, ὅσα αὐτῶν ἔχει ταύτην τὴν ἐναντίωσιν. διαφέρει δ' ἐν τοῖς ἐναίμοις τὰ μέρη τὰ πρὸς τὴν μίξιν τοῖς σχῆμασιν. δεῖ δὲ νοεῖν ὅτι μικράς ἀρχῆς μετακινομένης πολλὰ συμμεταβάλλει εἰσὶν τῶν μετὰ

1 seclusit Rackham, om. Z1*.  
2 καὶ PZ: καὶ τὸ vulg.

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¹ The force of this important remark will be explained later. Cf. 734 b 35.
² Cf. 766 b 2 ff.; also 729 b 12 ff.
³ This introduces what is to some extent a modification of
physical parts. They differ in their logos, because the male is that which has the power to generate in another (as was stated above), while the female is that which can generate in itself, i.e., it is that out of which the generated offspring, which is present in the generator, a comes into being. Very well, then: they are distinguished in respect of their faculty, and this entails a certain function. Now for the exercise of every function instruments are needed, and the instruments for physical faculties are the parts of the body. Hence it is necessary that, for the purpose of copulation and procreation, certain parts should exist, parts that are different from each other; in respect of which the male will differ from the female; for although male and female are indeed used as epithets of the whole of the animal, it is not male or female in respect of the whole of itself, but only in respect of a particular faculty and a particular part b —just as it is “seeing” and “walking” in respect of certain parts—and this part is one which is evident to the senses. Now in the female this special part is what is called the uterus, and in the male the regions about the testes and the penis, so far as all the blooded animals are concerned: some of them have actual testes, some testicular passages. There are also differences between male and female in those of the bloodless creatures which have this opposition of the sexes. In the blooded animals the parts which serve for copulation differ in their shapes. We must note, however, c that when a small principle d changes, usually many of the things which depend upon it

the statement just made (716 a 27 ff.). And cf. the passage H.A. 583 b 31 ff. Cf. also 764 b 28, 766 a 24 ff.

d See Introd. § 11.
716b

5 τὴν ἀρχήν. δήλον δὲ τοῦτο ἐπὶ τῶν ἐκτεμομένων· τοῦ γεννητικοῦ γὰρ μορίου διαφθειρωμένου μόνον ὀλη σχεδὸν ἡ μορφὴ συμμεταβάλλει τοσοῦτον ὡστε ἡ θῆλυ δοκεῖν εἶναι ἡ μικρὸν ἀπολείπειν, ὡς οὐ κατὰ τὸ τυχὸν μόριον ὑδὲ κατὰ τὴν τυχοῦσαν

10 ὁμαμίαν θῆλυ ὁν καὶ ἁρρεν τὸ ξώον. φανερὸν οὖν ὃτι ἀρχή τις οὕσα φαίνεται τὸ θῆλυ καὶ τὸ ἁρρεν· πολλὰ γοῦν συμμεταβάλλει μεταβαλλόντων ἡ θῆλυ καὶ ἁρρεν, ὡς ἀρχής μεταπατούσης.

III Ἐχει δὲ τὰ περὶ τοὺς ὀρχείς καὶ τὰς υστέρας οὐχ ὀμοίως πάσι τοῖς ἐναίμοις ξύοις, καὶ πρῶτον

15 τὰ περὶ τοὺς ὀρχείς τοῖς ἀρρεσιω. τὰ μὲν γὰρ ὅλως ὀρχεῖς οὐκ ἔχει τῶν τοιούτων ξώων, οἶον τὸ τε τῶν ἵχθυων γένος καὶ τὸ τῶν ὀφεων, ἀλλὰ πόρους μόνον δύο σπερματικούς· τὰ δὲ ἔχει μὲν ὀρχεῖς, ἐντὸς δὲ ἔχει τούτους πρὸς τῇ ὀσφύι κατὰ τὴν τῶν νεφρῶν χώραν, ἀπὸ δὲ τούτων ἐκατέρου

20 πόρου, ὥσπερ ἐν τοῖς μὴ ἔχουσιν ὀρχείς, συνάπτοντας εἰς ἐν, καθάπερ καὶ ἐπὶ ἐκείνων, οἶον οὐ τε ὀρνιθες πάντες καὶ τὰ ὕφοτοκαὶ αὐτα τετράποδα τῶν δεχομένων τὸν ἀέρα καὶ πλεύμονα ἐχόντων· καὶ γὰρ ταῦτα πάντα ἐντὸς ἔχει πρὸς τῇ ὀσφὺ τους ὀρχείς, καὶ δύο πόρους ἀπὸ τούτων ὀμοίως τοῖς

25 ὀφεσιν, οἶον σαῦροι καὶ χελώναι καὶ τὰ φολιδώτα

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a In this passage Aristotle prefigures the distinction made to-day between primary sex-characters, i.e., the genital organs themselves including testis or ovary; and the secondary sex-characters, e.g., the cock’s comb or the hen’s special feathering, which, as is now known, depend on the secretion of the primary sex hormones.
undergo an accompanying change. This is clear with castrated animals, where, although the generative part alone is destroyed, almost the whole form of the animal thereupon changes so much that it appears to be female or very nearly so, which suggests that it is not merely in respect of some casual part or some casual faculty that an animal is male or female. It is clear, then, that "the male" and "the female" are a principle. At any rate, when animals undergo a change in respect of that wherein they are male and female, many other things about them undergo an accompanying change, which suggests that a principle undergoes some alteration.

The testicles and the uterus are not of similar arrangement in all the blooded animals. Consider first the males, and their testicles. Some blooded animals (as the groups of Fishes and Serpents) have no testicles at all, only two seminal passages. Others have testicles, but they are inside, by the loin, near the place where the kidneys are; from each of them runs a passage (as in those animals which have no testicles), and these two passages join up together (again like those other animals): among the class of animals which breathe air and have a lung, this occurs in all the Birds and in the oviparous quadrupeds, for all these as well have their testicles inside, by the loin, and two passages leading from them, just as the Serpents have: examples are the lizards, the tortoises, and all the animals with horny scales. All sex hormones from the interstitial cells of the testis and ovary respectively.

These are in fact the testes, but Aristotle reserves this name for the firm, oval-shaped testes. This negative statement does not of course include the cartilaginous fishes, the Selachia, many of which are viviparous.
πάντα. τα δὲ ζωοτόκα πάντα μὲν ἐν τῷ ἐμπροσθεν ἔχει τοὺς ὄρχεις, ἀλλ' ἐνα αὐτῶν ἐσοὶ πρὸς τῷ τέλει τῆς γαστρός, οἴον ὁ δελφίς, καὶ οὗ πόρους ἀλλ' αἴδοιον ἀπὸ τούτων περαιών εἰς τὸ ἔξω, καθάπερ οἱ βόες, τα δὲ ἔξω, καὶ τούτων τὰ μὲν 30 ἀπηρτημένους, ὡσπερ ἀνθρώπους, τα δὲ πρὸς τῇ ἐδρά, καθάπερ οἱ ἔσ. διώρισται δὲ περὶ αὐτῶν ἀκριβέστερον ἐν ταῖς ἱστορίαις ταῖς περὶ τῶν ζώων. Αἰ δ' ὑστέρα πᾶσι μὲν εἰσὶ διμερεῖς, καθάπερ καὶ οἱ ὄρχεις τοῖς ἀρρεσι δύο πᾶσιν τούτας δ' ἔχουσι τὰ μὲν πρὸς τοῖς ἀρθροῖς, καθάπερ αἳ τε 35 γυναίκες καὶ πάντα τὰ ζωοτοκούντα μὴ μόνον θύραζε ἀλλὰ καὶ ἐν αὐτοῖς, καὶ οἱ ἰχθύες οὔσι ωτοκούσιν εἰς τούμφανες, τα δὲ πρὸς τῷ ὑπο-ζώματι, καθάπερ οἱ τ' ὀρνιθές πάντες καὶ τῶν ἰχθύων οἱ ζωοτοκούντες. ἔχουσι δὲ δικρόας καὶ τὰ μαλακόστρακα τὰς ὑστέρας καὶ τὰ μαλάκια. τα 5 γὰρ καλοῦμενα τούτων ὡς τοὺς περιέχοντας ὑμένας υστερικοὺς ἔχει.

Μάλιστα δὲ ἄδιόριστον ἐπὶ τῶν πολυπόδων ἐστίν, ὡστε δοκεῖν μίαν εἶναι: τούτου δ' αὐτίνον ο τοῦ σώματος ὄγκοσ πάντη ὄμοιος ὄν. δικρόα δὲ καὶ

1 καθάπερ οἱ βόες delet Platt, qui tauros credit significari.
2 πᾶσι PSYZ*: πᾶσι Bekker per errorum.

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a In front: that is, with reference to the ideal posture of an animal, viz., that of man.
b The term αἴδοιον seems to be used inclusively by Aristotle for any genital organs; often it means "penis," but obviously it cannot mean this here. Cf. II. A. 509 b 27-29.
c For the bôs, one of the Selachia or cartilaginous fishes, cf. II. A. 540 b 17 ff., 566 b 4. It is probably either Notidanus griseus, which has very large eyes, or Cephaloptera giorna (= Dicerobatis g.), the "ox-ray."
This reference to βόες is excised from the text by Platt, who
the Vivipara, however, have their testicles in front, though some of them have them inside by the end of the abdomen—e.g., the dolphin—and have no passages, but a sexual duct which leads from them to the outside, as the ox-fish have; while some have the testicles outside, and of these some are pendent (as in man), others fastened by the fundament (as in swine). I have given a more accurate account of these in the *Researches upon Animals.*

The uterus is always double without exception, just as in males there are always two testes without exception. In some animals the uterus is by the pudenda (as it is in women and in all animals that are viviparous internally as well as externally, and such of the fishes as lay their eggs visibly); in other animals the uterus is up towards the diaphragm (as it is in all birds and in the viviparous fishes). The Crustacea, too, and the Cephalopods have a double uterus, since the membranes which surround their "eggs" as they are called are uterine in nature.

The uterus is particularly indistinct in the Octopuses, so that it appears to be single. The reason for this is that the whole bulk of the creature’s body is of similar consistency throughout. In the large supposes βόες here to be "oxen." A.-W. translate "wie die Stiere."

*d* See *H.A. Bk. III, ch. 1.*

*e* It should be noted, once for all, that this term includes what are now known as oviducts.

*f* Aristotle does not confine his use of this term to mammals, which alone have a diaphragm in the usual sense of that term, and hence it must be understood to refer also to the corresponding position in lower animals, as in the present passage; cf. also *De respiratione* 475 a 8, where the ῤόξωμα of wasps, crickets, etc., is mentioned.

*g* See *H.A. Bk. V, ch. 18.*

*h* Cf. 758 a 8.
AI τῶν ἑντὸμῳν εἰσὶν ἐν τοῖς μέγεθος ἔχουσιν· ἐν δὲ τοῖς ἐλάττωσιν ἀδήλου διὰ τὴν μικρότητα τοῦ σώματος.

Τὰ μὲν οὖν εἰρημένα μόρια τοῖς ζύφοις τούτον ἔχει τὸν τρόπον.  

IV Περὶ δὲ τῆς ἐν τοῖς ἀρρεσὶ διαφορᾶς τῶν σπερματικῶν ὀργάνων, εἰ τις μέλλει θεωρῆσαι τὰς αἰτίας δι’ ἃς εἰσίν, ἀνάγκη λαβεῖν πρῶτον τίνος ἐνεχεῖν ἡ τῶν ὀρχεῶν ἐστὶ σύστασις. εἴ δὴ πάν ἡ φύσις ἡ διὰ τὸ ἀναγκαῖον ποιεῖ ἡ διὰ τὸ βέλτιον, κἂν τούτῳ τὸ μόριον εἴη διὰ τούτων θάτερον. ὅτι μὲν τοῖνυν οὐκ ἀναγκαίον πρὸς τὴν γένεσιν, φανερῶν πάσι γὰρ ἂν ὑπήρχε τοῖς γεννώσι, νῦν δ’ οὖθ’ οἱ ὀφεῖς ἔχουσιν ὀρχεῖς οὐθ’ οἱ ἠχθές· ὠμμένοι γὰρ εἰσὶ συνδυαζόμενοι καὶ πληρεῖς ἔχοντες θοροῦ τοὺς πόρους. λείπεται τοῖνυν βελτίονός τινος χάριν. ἐστὶ δὲ τῶν μὲν πλεῖστων ζύφων ἔργον σχεδὸν οὐθὲν ἀλλο πλὴν ὡσπερ τῶν φυτῶν σπέρμα καὶ καρπός. ὡσπερ δ’ ἐν τοῖς περὶ τὴν τροφὴν τὰ εὐθεντέρα λαβρότερα πρὸς τὴν ἐπιθυμίαν τὴν τῆς τροφῆς, οὕτω καὶ τὰ μὴ ἔχοντα ὀρχεῖς πόρους δὲ μόνον, ἡ ἔχοντα μὲν ἐντὸς δ’ ἔχοντα, πάντα ταχύτερα πρὸς τὴν ἐνέργειαν τῶν συνδυασμῶν. ἄ δὲ δὲι σωφρονέστερα εἶναι, ὡσπερ ἐκεῖ οὐκ εὐθυ- ἐντερα, καὶ ἐνταῦθ’ ἐλικὰς ἔχουσιν οἱ πόροι πρὸς τὸ μὴ λάβρον μηδὲ ταχεῖαν εἶναι τὴν ἐπιθυμίαν.  

30 οἱ δ’ ὀρχεῖς εἰσὶ πρὸς τοῦτο μεμηχανημένοι· τοῦ
Insects too the uterus is double, whereas in the smaller ones it is indistinct on account of the smallness of the creatures' body.

This describes the arrangement of those parts of animals which I have mentioned.

Returning to the subject of the difference of the seminal organs in various groups of male animals: If we are to consider the causes to which this is due, we must first of all understand the purpose for the sake of which a testes exist. If we agree that everything which Nature does is done either because it is necessary or else because it is better, we should expect to find that this part, like the rest, exists for one or the other of these two reasons. Now it is evident that it is not necessary for generation, otherwise all animals that generate would have it, whereas actually neither Serpents nor Fishes have testes, and these do in fact generate, because they have been observed copulating, with their passages full of milt. The other reason then remains: testes exist for some purpose—because it is better that they should exist. Now the business of most animals may be summed up pretty much as that of plants is—viz., seed and fruit; and, just as (to take a parallel case) animals which have straight intestines are more violent in their desire for food, so here also, animals which have no testes but passages only, or which have testes but not external ones, are all quicker with the business of copulation. Those, however, which have to be more sober (a) in the case of feeding, have not straight intestines, and (b) in the case of copulation, have passages which are twisted, so that their desire shall not be violent or speedy. This then is the object for which the testes have been contrived: they make
γάρ σπερματικοῦ περιπτώματος οτασιμωτέραν ποιοῦσι τὴν κίνησιν, ἐν μὲν τοῖς ζωοτόκοις, οἷον ἵπποις τε καὶ τοῖς ἄλλοις τοῖς τοιούτοις καὶ ἐν ἀνθρώποις, σώζοντες τὴν ἔπαναδίπλωσιν (ὅν δὲ τρόπον ἔχει αὐτῇ, ἐκ τῶν ἱστορίων τῶν περὶ τὰ 35 ζῷα δὲι θεωρέιν). οὐθὲν γὰρ εἰσὶ μόριον τῶν πόρων οἱ ὀρχείς, ἀλλὰ πρόσκενται, καθάπερ τὰς λαῖς προσάπτουσιν αἱ υφαίνουσα τοῖς ἱστοῖς. ἀφαιρομένων γὰρ αὐτῶν ἀνασπώνται οἱ πόροι ἐντὸς, ὡστε οὐ δύνανται γεννᾶν τὰ ἐκτεμνόμενα, ἐπεὶ εἰ μὴ ἀνεσπώντο, ἐδύναντο αὖ, καὶ ἡδή ταῦτας τις μετὰ τὴν ἐκτομήν εὐθέως ὀχεύσας ἐπλήρωσε διὰ τὸ 5 μῆπω τοὺς πόρους ἀνεσπάσθαι. τοῖς δὲ ὀρνισι καὶ τοῖς ψωτόκοις τῶν τετραπόδων δέχονται τὴν σπερματικὴν περίπτωσιν, ὡστε βραδυτέραν εἶναι τὴν ἔξοδον ἡ τοῖς ἱχθύσιν. φανερὸν δ΄ ἐπὶ τῶν ὀρνίθων· περὶ γὰρ τὰς ὀχείας πολὺ μείζους ἵσχουσι τοὺς ὀρχεῖς, καὶ ὅσα γε τῶν ὀρνέων καθ’ ὦραν μίαν 10 ὀχεύει, ὅταν δ’ χρόνος οὕτως παρέλθῃ, οὕτω μικροῦς ἔχουσιν ωστε σχέδον ἀδήλους εἶναι, περὶ δὲ τὴν ὀχείαν σφόδρα μεγάλους. θάττον μὲν οὖν ὀχεύουσι τὰ ἐντὸς ἔχοντα· καὶ γὰρ τὰ ἐκτὸς ἔχοντα οὐ πρότερον τὸ σπέρμα ἀφίησι πρὶν ἀνασπάσαι τοὺς ὀρχεῖς.

V Ἡτὶ δὲ τὸ ὀργανὸν τὸ πρὸς τὸν συνδυασμὸν τὰ 15 μὲν τετράποδα ἔχει· ἐνδέχεται γὰρ αὐτοῖς ἔχειν· τοῖς δὲ ὀρνισι καὶ τοῖς ἀποσιν οὐκ ἐνδέχεται διὰ τὸ

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1 διέξοδον PZ. 2 ἔχουσι PSY.
the movement of the seminal residue more steady. (1) In the Vivipara, as for instance in horses and other such animals, and also in man, they do this by maintaining in position the doubling-back of the passages (for a description of this reference must be made to the Researches upon Animals), since the testes are no integral part of the passages: they are merely attached thereto, just like the stone weights which women hang on their looms when they are weaving. When the testes are removed, the passages are drawn up within; this is why castrated animals cannot generate, whereas if the passages were not so drawn up they would be able to do so. A bull immediately after castration has been known to mount a cow and effect impregnation, because the passages had not yet been drawn up. (2) In Birds and in the oviparous quadrupeds the testes receive the seminal residue, so that its emission is slower than it is in the case of Fishes. This is clearly to be seen in Birds: their testes are much larger at the time of copulation. Those birds which copulate at one season only of the year have such tiny testes when this period is over that they are almost indistinguishable, whereas during the breeding season they are very big. So then the animals whose testes are internal accomplish their copulation more quickly, since in fact those with external testes do not emit the semen until the testes have been drawn up.

Another point. The organ for copulation is present V in the quadrupeds because it is possible for them to have it, whereas it is not possible for birds and foot-

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*a H.A. 510 a 20 ff., and 718 a 15 below.
*b Cf. 787 b 26.
*c Cf. H.A. 510 b 3.
*d Which have no "testes" in Aristotle's sense.
*e Cf. H.A. 509 b 35 ff.
717 b
tóv mén tā skélh ὑπὸ μέσην εἶναι τήν γαστέρα, tā d' ὅλως ἀσκελῆ εἶναι, τήν δὲ τοῦ αἰδοῖον φύσιν ἡρτῆσθαι ἐντεῦθεν καὶ τῇ θέσει κείσθαι ἐνταῦθα. διὸ καὶ ἐν τῇ ὦμιλίᾳ ἡ σύντασις γίνεται τῶν σκε-20 λῶν· τὸ τε γὰρ ὀργανον νευρῶδες καὶ ἡ φύσις1 τῶν σκελῶν νευρῶδης. ὥστ' επεὶ τοῦτ' οὐκ ἐν-δέχεται ἔχειν, ἀνάγκη καὶ ὀρχεῖς ἡ μὴ ἔχειν ἡ μὴ ἐνταῦθ' ἔχειν· τοῖς γὰρ ἔχουσιν ἡ αὐτῇ θέσις ἀμφοτέρων αὐτῶν.

*Ετι δὲ τοῖς γε τοὺς ὀρχεῖς ἔχουσιν ἔξω διὰ τῆς κινήσεως θερμανομένου τοῦ αἰδοῖον προέρχεται τὸ 25 στέρμα συναθροισθέν, ἀλλ' οὐχ ὡς ἑτομον ὄν εὐθὺς θιγοῦσιν, ὦσπερ τοῖς ἰχθύσιν.

Πάντα δ' ἔχει τὰ ζωοτόκα τοὺς ὀρχεῖς ἐν τῷ πρόσθεν [ἡ ἔξω],2 πλὴν ἔχινου· οὗτος δὲ πρὸς τὴν ὁσφυῖ μόνος, διὰ τὴν αὐτὴν αὐτίαν δι' ἦνπερ καὶ οἱ ὄρνιθες, ταχύν γὰρ ἀναγκαῖον γίνεσθαι τὸν συν-30 δυσαμοῦν αὐτῶν3· οὐ γὰρ ὦσπερ τὰ ἀλλὰ4 τετρά-ποδα ἐπὶ τὰ πρανῇ ἐπιβαίνει, ἀλλ' ὅρθοι μίγνυνται διὰ τὰς ἀκάνθας.

Δι' ἥν μὲν οὖν αὐτίαν ἔχουσι τὰ ἔχοντα ὀρχεῖς, εἰρήται, καὶ δι' ἥν αὐτίαν τὰ μὲν ἔξω τὰ δ' ἐντός.

1 σύντασις SZ.
2 aut ἔξω secludenda (om. Σ), aut ἔντος addenda (Platt).
3 διὰ ... αὐτῶν fortasse secludenda; sed cf. 769 b 34 seqq.
4 ἀλλὰ Z: om. vulg.

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*a But the goose has a penis, H.Ā. 509 b 30.
*b Cf. 718 a 5, 739 a 10.
*c Omit, or read “either outside or inside.”
*d Inside, of course.
GENERATION OF ANIMALS, I. v.

less animals. It is impossible for birds \(^a\) because their legs are under the middle of the abdomen. It is impossible for the other creatures because they have no legs at all, and that is the place where the penis is always suspended and that is the position for it. (This also is the reason why there is strain on the legs during sexual intercourse: both the organ itself and the legs are by their nature sinewy.) And so, since it is impossible for them to have this organ, they must of necessity have no testes either, or else not have them in that place, since in those animals which possess both penis and testes the situation of both is one and the same.

Another point. As far as the animals with external testes are concerned, as the penis is set in movement and gets heated, the semen first collects itself together, and then advances: it is not ready immediately contact is established, as it is in fishes.\(^b\)

All the Vivipara have their testes in front, [or outside,\(^c\)] except the hedgehog. This is the only one that has them by the loin,\(^d\) and the reason is the same as for the birds,\(^e\) since they must of necessity accomplish their copulation quickly, for they do not mount on the back as the other quadrupeds do, but on account of their spines stand upright for intercourse.

We have now said why those animals which have testes have them, and why some have them outside

\(^a\) This remark, if it remains in the text, obviously cannot refer to the only reason so far given for birds at 717 b 15-17; if taken as referring to the reason which immediately follows, this will roughly correspond to the statement in II. A. 539 b 34 that some birds copulate quickly. But no doubt the reason Aristotle has in mind is the one mentioned below at 719 b 11 ff., viz., that the skin is too hard.
VI δὲ μὴ ἔχει, καθάπερ εὑρήται, διὰ τε τὸ μὴ εὖ ἄλλα
35 τὸ ἀναγκαῖον μόνον οὐκ ἔχει τοῦτο τὸ μόριον, καὶ
dιὰ τὸ ἀναγκαῖον εἶναι ταχεῖαν γίνεσθαι τὴν ὄχειαν:
tοιαύτη δ' ἐστὶν ἢ τῶν ἰχθύων φύσις καὶ ἢ τῶν
ὀφεων. οἱ μὲν γὰρ ἰχθύες ὀχεύουσι παραπέπτοντες
καὶ ἀπολύουσιν ταχεῖς. ὥσπερ γὰρ ἐπὶ τῶν ἀν-
θρώπων καὶ πάντων τῶν τοιούτων ἀνάγκη κατα-
σχόντας τὸ πνεύμα προεσθαι τὴν γονήν, τούτο δ' 5
ἐκείνοις συμβαίνει μὴ δεχομένοις τὴν θάλασσαν,
εἰς δὲ εὐφθαρτοὶ τοῦτο μὴ ποιοῦντες, οὐκοιν δεῖ
ἐν τῷ συνδυασμῷ τὸ σπέρμα πέπτειν αὐτοὺς,
ἠσπερ τὰ πεζὰ καὶ ζωοτόκα, ἀλλ' ὑπὸ τὴν ὦραν1
τὸ σπέρμα πεπεμμένον ἄθροόν ἔχουσιν, ὥστε μὴ
ἐν τῷ θιγγάνειν ἀλλήλων πέπτειν,2 ἀλλὰ προέσθαι
10 πεπεμμένον. διὸ ὄρχεις οὐκ ἔχουσιν, ἀλλ' εὕθεις
καὶ ἀπλοῦς τοὺς πόρους, οἶνον μικρὸν μόριον τοῖς
tετράποσιν ὑπάρχει περὶ τοὺς ὄρχεις· τῆς γὰρ
ἐπαναδιπλώσεως τοῦ πόρου τὸ μὲν ἐναίμον μέρος
ἐστὶ τὸ δ' ἀναίμον, δ' δέχεται καὶ δι' οὗ ἡ ὕδη σπέρμα
ἐν πορεύεται, ἤσθ' ὅταν ἐνταῦθα ἐλθῇ ἡ γονή.
15 ταχεῖα καὶ τοῦτοι γίνεται ἡ ἀπόλυσις. τοῖς δ' ἰχθύοις
tοιοῦτος δ' πόρος πᾶς ἐστὶν οἷς ἐπὶ τῶν

1 ὑπὸ τὴν ὦραν A.-W., cf. II.A. 509 b 20, 35: πρὸ τῆς ὦρας
coniecerat Platt: ὑπὸ τῆς ὦρας vulg.
2 πέπτειν A.-W., digestio Σ: ποιεῖν vulg.

*a See ch. 4, init. For necessity, see Introd. § 6.
*b This appears to be the meaning; Michael Scot renders
eicunt sperma velociter: cf. the English phrase “relieve
themselves.” Also at 718 a 14.
*c Viz., all that breathe.
*d This, according to Aristotle, corresponds to breathing;
it is their method of self-refrigeration: see De respiratione
476 a 1 ff.

24
and others inside. And as for those which have no VI testes, they lack this part, as we have said, because such absence is not good, but necessary merely; and also because it is necessary that their copulation should be accomplished quickly. Fishes and serpents come under this class. Fishes copulate by placing themselves alongside each other and quickly ejaculate. Just as men and all such animals in order to emit the semen must of necessity hold their breath, so fishes must refrain from taking in the seawater, and when they omit to do this they easily come to grief. On this account they are bound to avoid concocting the semen during the act of copulation (which is what the viviparous land-animals do); instead, they have their semen ready concocted and collected at the proper time, so that they do not concoct it while in contact with each other, but emit it already concocted. For this reason they have no testes, but passages which are straight and simple. In the testes of quadrupeds there is a small portion of a similar character: I refer to the latter portion of that length of the passage which is doubled back. One portion of this length has blood in it and one has not, and by the time the fluid enters this latter portion and passes through it, it is already semen; so that when it arrives there, ejaculation quickly takes place in these animals too. In Fishes the whole of the passage is of the same character as this latter

* Cf. 717 b 25 above.
† The *vas deferens*: cf. above 717 a 33; and H.A. 510 a 23 ff.
‡ Cf. above, 718 a 1: Scot’s Arabic original seems to have been extremely cautious and to have given both possible meanings of ἀπόλυσις; for Scot has *eius exitus est velox, et cum exit sperma separatur mas et femina*.
ἀνθρώπων καὶ τῶν τοιούτων ζῴων κατὰ τὸ ἐτερὸν μέρος τῆς ἐπαναδιπλώσεως.

VII Οἱ δὲ ὄφεις ὀχεύονται περιελιπτόμενοι ἄλληλοις, οὐκ ἔχουσι δεν ὄρχεις οὐδ' αἰdioίον, ὥστε ἐφηταὶ πρότερον, αἰdioίον μὲν ὅτι οὐδὲ σκέλη, ὄρχεις δὲ διὰ τὸ μῆκος, ἀλλὰ πόρους, ὥστε οἱ ἤχθες· διὰ γὰρ τὸ εἶναι αὐτῶν προμήκη τὴν φύσιν, εἰ ἐτυ ἐπι- στασις ἐγιγνετο περὶ τοὺς ὄρχεις, ἐφύχετ' ἀν ἡ γούνη διὰ τὴν βραδυτήτα. ὅπερ συμβαίνει καὶ ἐπὶ τῶν μέγα τὸ αἰdioίον ἕχοντων· ἄγονωτεροί γὰρ εἰσὶ τῶν μετραζόντων διὰ τὸ μὴ γόνυμον εἶναι τὸ σπέρμα τὸ ψυχρόν, ψύχεσθαι δὲ τὸ φερόμενον λίαν μακράν. δὲ ὧν μὲν οὖν αἰτίαν τὰ μὲν ὄρχεις ἐχει τὰ δὲ οὐκ ἐχει τῶν ζῷων, ἐφηται.

1[Περιπλέκονται δ' ἄλληλοις οἱ ὄφεις διὰ τὴν ἀφύαν τῆς παραπτώσεως. μικρῷ γὰρ προσαρ- μότοντες μορίω λίαν μακροὶ ὅντες οὐκ εὐσών-

30 ἄρμοστοι εἰσιν· ἐπεὶ οὖν οὐκ ἔχουσι μόρια οἷς περιλήψονται, ἀντὶ τούτων τῇ ύγρότητι χρῶνται τοῦ σώματος, περιελιπτόμενοι ἄλληλοις. διὸ καὶ δοκοῦσι βραδύτερον ἀπολύεσθαι τῶν ἤχθων, οὐ μόνον διὰ τὸ μῆκος τῶν πόρων ἀλλὰ καὶ διὰ τὴν περὶ ταύτα σκευωρίαν.]

VIII 35 Τοῖς δὲ θήλεσι τὰ περὶ τὰς υστέρας ἀπορήσειν ἃν τις ὅν τρόπον ἐχει· πολλὰς γὰρ ὑπεναντιώσεις

1 quae sequuntur non proprio loco posita videntur.  
2 τούτων PZ.
portion of it in man and other such animals (i.e., the latter portion of that length of it which is doubled back).

Serpents copulate by twisting round each other, VII but they have no testes and not even a penis, as I said earlier: no penis, because they have no legs either, and no testes because of their length—instead, they have passages just as fish do—since as their bodies are so very long, if there were to be yet further delay in the region of the testes, the semen would be cooled off owing to its slow rate of progress. This does in fact happen with men who have a large penis: they are less fertile than those who have a moderately large one, because the semen gets cooled off by being transported too great a distance, and cold semen is not generative. I have now stated why some animals have testes and others not.

[Serpents intertwine because they are not naturally fitted for placing themselves alongside each other; their bodies are so long, and the part by which they unite is so small, that they find difficulty in achieving union; and so, as they have no parts by which they can take hold of each other, they make use of the suppleness of their bodies instead, and twist around each other. On this account, they seem, too, to take longer to ejaculate than fish do, not only because of the length of the passages but also because of the intricacy of the manoeuvre.]

One may well be puzzled concerning the arrangement of the uterus in the various female animals; many instances of quite contrary arrangements conclusion of the chapter, the remarks which follow are probably a supplementary note, or an alternative version, incorporated in the text.
Selachia: the cartilaginous fishes, including the Sharks. The "fishing-frog" is not viviparous (see 754 a 26, n.).

The observation of Aristotle that the eggs of many organisms swell during their development, though unappreciated for many centuries, is the basis of the modern distinction between cleidoic and non-cleidoic eggs. The walls of a cleidoic egg are permeable only to matter in the gaseous state (e.g., the hen’s egg). Most aquatic animals, however, lay non-cleidoic eggs, i.e., eggs which, though they have a sufficiency of organic material (such as proteins, fats,
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occur. To begin with, not all the Vivipara have the same arrangement. All that are land-animals, including human beings, have the uterus placed low down by the pudenda, whereas the viviparous Selachia have it higher up by the diaphragm. And then again, the Ovipara show the same variations. Fishes have the uterus low down like human beings and the viviparous quadrupeds, whereas birds have it higher up, and so do the oviparous quadrupeds. Nevertheless, there is rhyme and reason even in these contradictory phenomena. First of all, the egg-laying animals have different ways of laying their eggs. (a) Some creatures' eggs are imperfect when laid—e.g., those of fishes, which become perfected, i.e., grow, outside the creature which produces them.\(^a\) The reason is that these animals are very prolific and this is their function,\(^c\) as it is that of plants; so that if they brought the eggs to a state of perfection inside their bodies, the eggs would of necessity be few in number, whereas in actual fact they produce so many that each uterus seems to be just one mass of egg, at any rate in the very small fishes, which are the most prolific of all. The same is true both of those plants and of those animals which are of a corresponding nature\(^d\) in their own classes; what carbohydrates, etc.) to make each an embryo, are insufficiently supplied with water and inorganic materials; these they have to absorb from their environment. Hence their swelling. Though the main bulk of this is due to water-intake, it is interesting that the greater part of the copper, for example, which is present in the respiratory blood-pigment of the octopus at the time of hatching is derived, not from the egg as laid, but from the surrounding sea-water. See also 732 b 3, etc.

\(^a\) Cf. 717 a 22.
\(^c\) i.e., small.
15 μεγέθους αὐξήσας τρέπεται εἰς τὸ σπέρμα τούτοις. οἱ δ’ ὀρμιθεὶς καὶ τὰ τετράποδα τῶν ψωτοκων τέλεια φαὶ τίκτουσιν, ὅ δεὶ πρὸς τὸ σώζεσθαι σκληρόδερμα εἶναι (μαλακόδερμα γὰρ ἕως ἂν αὐξήσῃν ἔχει ἔστιν), τὸ δ’ ὀστρακον γίνεται ὑπὸ θερμότητος ἐξικμαζούσης τὸ υγρὸν ἐκ τοῦ γεώδους.

20 ἀναγκαῖον οὖν θερμὸν εἶναι τὸν τόπον ἐν ὃ τοῦτο συμβῆσαι. τοιοῦτος δ’ ὁ περὶ τὸ ὑπόξωμα· καὶ γὰρ τὴν τροφὴν πέπτει οὖτος. εἰ οὖν τὰ ψα ἀνάγκη ἐν τῇ υστέρᾳ εἶναι, καὶ τὴν υστέραν ἀνάγκη πρὸς τῶν ὑποξώματι εἶναι τοῖς τέλεια τὰ ψά τίκτουσι, τοῖς δ’ ἀτελῆ κάτω· πρὸ ὀδοῦ γὰρ οὔτως 25 ἔσται. καὶ πέφυκε δὲ μᾶλλον ἡ υστέρα κάτω εἶναι ἢ ἄνω, ὅπου μὴ τι ἐμποδίζει ἑτερον ἔργον τῆς φύσεως· κάτω γὰρ αὐτῆς καὶ τὸ πέρας ἔστιν· ὅπου δὲ τὸ πέρας, καὶ’ τὸ ἔργον· αὐτὴ’ δ’ οὔ τὸ ἔργον.

IX Ἐχει δὲ καὶ τὰ ζωοτοκοῦντα πρὸς ἄλληλα διαφορὰν. τὰ μὲν γὰρ οὐ μόνον θύραζε ζωοτοκεῖ 30 ἄλλα καὶ ἐν αὐτοῖς, οἶνον ἀνθρωποί τε καὶ ἵπποι καὶ κύνες καὶ πάντα τὰ τρίχας ἔχοντα, καὶ τῶν ἐνύδρων δελφίνες τε καὶ φάλαιναι καὶ τὰ τουατα κήτῃ.

X Τὰ δὲ σελάχη καὶ οἱ ἐχεις θύραζε μὲν ζωοτοκοῦσιν, ἐν αὐτοῖς δ’ ζωοτοκοῦσι πρῶτον. ζωοτοκοῦσι δὲ τέλειον ῥόν· οὔτως γὰρ γεννᾶται ἐκ

1 καὶ Z: om. vulg. 2 αὐτὴ PSYZ*: αὐτὴ vulg.

\( \text{a i.e., do not increase in size after being laid.} \\
\text{b i.e., without first producing an egg internally. Aristotle} \\
\text{knew nothing of the existence of the mammalian egg, which} \\
\text{is a single cell of microscopic size.} \)
would have produced increase of size is in them diverted to form seed. (b) Birds, however, and quadrupedal Ovipara lay eggs that are perfect, and these eggs for safety's sake are bound to have a hard skin (while they are still growing, they have a soft skin), and the shell is formed by heat, which evaporates the fluid from the earthy substance; hence the place where this is to be done must of necessity be hot—a condition which is fulfilled by the region round the diaphragm, as the fact that it concocts the food shows. So, if the eggs must of necessity be within the uterus, the uterus must of necessity be alongside the diaphragm in those animals whose eggs are in a perfected condition when laid, while it must be low down in those whose eggs are imperfect when laid; it will be advantageous so. Further, it is more natural that the uterus should be low down than high up (unless there is some other business of Nature's which prevents it), since its conclusion is down below too; and where the conclusion is, there also the function is; thus the uterus is where the function is.

Similarly, the Vivipara differ from one another. IX Some of them bring forth their young alive not externally only but also within themselves, as for instance, human beings, horses, dogs and all haired animals, also such water-animals as dolphins, whales and such cetacea.  

Selachia and vipers, though they bring forth their young alive externally, first of all produce eggs internally. And the egg they produce is a perfected one, for thus only is an animal generated from the

* Cf. H.A. 566 b 2, where Aristotle explains this to mean those creatures which have no gills, but a blowhole.
According to Aristotle, Empedocles had said that those animals which are hottest live in the water to counteract the excess of heat in their constitution (De respir. 477 b 1 ff.).

The Dissections, in seven Books, is no longer extant. Aristotle several times refers to the "diagrams in the Dissections" and the like (e.g. 746 a 14), and it was no doubt a collection of material with anatomical diagrams prepared for use in the lecture-room. Jaeger (Aristotle, Eng. trans., 336), following V. Rose, describes it as an anatomical atlas. See also Jaeger, Diokles von Karystos, 165-167.
egg: nothing is generated from an imperfect egg. The reason why they do not lay their eggs externally is because they are by nature cold creatures, not hot, as some persons allege.\(^a\) Anyway, the eggs they XI produce are soft-skinned—because the creatures have so little heat in them that their natural constitution does not dry off the outermost part of the eggs. Thus the coldness of the creatures is the reason why the eggs they produce are soft-skinned, and the fact that the eggs are soft-skinned is the reason they are not produced externally: if they were, they would come to grief.

When the animal is formed out of the egg, the process of formation is for the most part the same as for birds: (the eggs) descend, and the young animals are formed close by the pudenda, as occurs also in creatures which are viviparous right from the outset. Another result of this is that in animals such as we are now discussing the uterus differs both from that of the Vivipara and from that of the Ovipara, since they have a share in both these groups; that is to say, in all the Selachians the uterus is at the same time close by the diaphragm and also extends along downwards. (However, to ascertain the arrangement of the uterus of the Selachians and other kinds as well, the \textit{Dissections} \(^b\) should be inspected and also the \textit{Researches} \(^c\).) Thus the Selachians have their uterus high up because they are oviparous and lay perfected eggs, while they have it low down because they are viviparous; thus they have a share in both.

Animals which are viviparous from the outset \(^d\) all have the uterus low down, since they have no natural

\(^a\) H.A. 510 b 5 ff.
\(^b\) See above, 718 b 30.
\(^c\) H.A. 510 b 5 ff.
\(^d\) See above, 718 b 30.
ΑΡΙΣΤΟΤΕΛΗΣ

ἐμποδίζει τῆς φύσεως οὐδὲν ἔργον, οὐδὲ διπτο-15 γονεῖ. πρὸς δὲ τούτους ἀδύνατον ζῷα γίγνεσθαι πρὸς τοῖς ὑποζώμασιν· τὰ μὲν γὰρ ἐμβρυα βάρος ἐχεῖν ἀναγκαίον καὶ κίνησιν, ὥς δὲ τόπος ἐπίκαιρος ὅν τὸν ζῆν οὐκ ἂν δύνατο ταῦθ' ὑπενεγκεῖν. ἐτί δὲ ἀνάγκη δυστοκίαν εἶναι διὰ τὸ μήκος τῆς φορᾶς, ἐπεὶ καὶ νῦν ἐπὶ τῶν γυναικῶν, ἐὰν περὶ τὸν τόκον ἀνασπάσωσι χασμησάμεναι ἢ τι τοιοῦτον ποιή-20 σασαι, δυστοκούσιν. καὶ κεναὶ δ' οὖσαι αἱ ὑστέραι ἄνω προσιστάμεναι πνίγουσιν· καὶ γὰρ ἀνάγκη τὰς μελλοῦσας ζῴων ἐξειν ἱσχυροτέρας εἶναι, διὸ σαρκ-κόδεις εἰσίν αἱ τοιαῦται πᾶσαι, αἱ δὲ πρὸς τῷ υποζώματι1 ὑμενώδεις. καὶ ἐπ' αὐτῶν δὲ τῶν δυνοῦν ποιομένων ζῴων φανερὸν τοῦτο συμ-25 βαίνον· τὰ μὲν γὰρ όφα ἄνω καὶ ἐν τῷ πλαγίῳ ἱσχουσι, τὰ δὲ ζώα ἐν τῷ κάτω μέρει τῆς υστέρας.

Δι' ἦν μὲν οὖν αὐτίαν ὑπεναντίως ἔχουσι τὰ περὶ τὰς υστέρας ἐνα τῶν ζῴων, καὶ ὅλως διὰ τὰ τοῖς μὲν κάτω τοὺς δὲ ἄνω πρὸς τῷ υποζώματι εἴσων, εἰρήται.

XII 30 Διότι δὲ τὰς μὲν υστέρας ἔχουσι πάντα ἐντός, τοὺς δ' ὀρχεῖς τὰ μὲν ἐκτὸς τὰ δ' ἐντός, αὐτίων τοῦ μὲν τὰς υστέρας ἐντός εἶναι πάσων, ὅτι ἐν ταύταις ἐστὶ τὸ γινόμενον, δ' ἐφείται φυλακῆς καὶ σκέπης2 καὶ πέφεως, ὃ δ' ἐκτὸς τοῦ σώματος τόπος εὐβλα-

1 sic PZ: τοῖς υποζώμασιν vulg.
2 καὶ σκέπης om. Ρ'ΖΣ, Α.-W.

* They omit the internally oviparous stage.

* See Introd. § 62, and n.
function that prevents this, nor do they produce their young by the two-stage process.\textsuperscript{a} Besides, it is impossible for young animals to be formed near the diaphragm; embryos are bound to be heavy and to move about, and that part of the body is a vital spot and would not be able to put up with such things. Further, (if the uterus were placed high,) parturition would of necessity be difficult on account of the distance to be covered, since even as it is, in the case of women, if they draw up the uterus at the time of parturition by yawning or by doing something of the sort, difficulty in delivery is the result. Even when empty the uterus produces a stifling sensation if pushed upwards. Besides, a uterus which is destined to contain (not an egg but) an actual animal must of necessity be a stronger thing; that is why the uterus of all viviparous animals is fleshy, whereas in those cases where it is near the diaphragm the uterus is membranous. This is clearly to be seen in the case of those animals which produce their young by the two-stage process: the eggs are carried high up and towards one side, whereas the young creatures are carried in the lower part of the uterus.

We have now explained the reason why contrary arrangements of the uterus are found in certain animals, and in general why in some the uterus is placed low down and in others high up by the diaphragm.

We have seen too that while all animals have their XII uterus inside, some have their testes inside and others outside. The reason why the uterus is always inside is that it is the container for the young creature while it is being formed, and this needs protection, shelter, and concoction,\textsuperscript{b} which the outer part of the body
35 πτος καὶ ψυχρός. οἱ δ’ ὄρχεις τοῖς μὲν ἐντὸς τοῖς δ’ ἐκτὸς. διὰ (δὲ)2 τὸ δεῖσθαι καὶ τούτως σκέψης καὶ καλύμματος πρὸς τε σωτηρίαν καὶ πρὸς τὴν τοῦ ἑπὶ (ἀδύνατον γὰρ ἐψυχεῖν καὶ πεπηγώτας ἀναστάθαι καὶ προσέθεσθαι τὴν γονήν), [διόπερ]3 οὕσοι ἐν φανερῷ εἰσὶν οἱ ὄρχεις, ἐξοῦσι 5 σκέψῃ περιμετρικῆς τὴν καλουμένην ὀψεῖν. οὕσοι δ’ ἡ τοῦ δέρματος φύσις ἐναντιοῦται διὰ σκληροτῆτα πρὸς τὸ μὴ περιθετικὴν εἶναι μηδὲ μαλθακὴν καὶ δερματικὴν,4 οἷον τοῖς τ’ ἰχθυώδεις ἐξοῦσι τὸ δέρμα καὶ τοῖς φολικώτων, τούτως δ’ ἀναγκαίον 10 ἐντὸς ἑχειν. διόπερ οἱ τε δελφῖνες καὶ ὅσα τῶν κητωδῶν ὄρχεις ἐξοῦσιν, ἐντὸς ἐχουσι, καὶ τὰ φωτόκα καὶ τετράποδα τῶν φολικώτων. καὶ τὸ τῶν ὀρνίθων δὲ δέρμα σκληρόν, ὡστε κατὰ μέγεθος ἀυμυμέτρου εἶναι περιλαβεῖν, καὶ ταύτῃ αἰτίᾳ εἶναι πάσιν τούτως πρὸς τοῖς εὑρημέναις πρότερον 15 ἐκ τῶν περὶ τὰς οἰκείας συμβαινόντων ἀναγκαῖον. διὰ τὴν αὐτὴν δ’ αἰτίαν καὶ ὁ ἑλέφας καὶ ὁ ἔχινος ἐχουσι ἐντὸς τοὺς ὄρχεις. οὐδὲ γὰρ τούτως εὑρεῖς τὸ δέρμα πρὸς τὸ χωρίστον ἑχειν τὸ σκεπαστικὸν μόριον.

[Κεῖται δὲ καὶ τῇ θέσῃ υπεναντίως αἱ υστέραι τοῖς τε ἑφοτοκοῦσιν ἐν αὐτοῖς καὶ τοῖς ἑφοτοκοῦσι 20 θύραζε, καὶ τούτων τοῖς τε τὰς υστέρας ἐχουσι κάτω καὶ τοῖς πρὸς τῷ υποξύματι, οἷον τοῖς

1 ἐκτὸς τοῖς δ’ ἐντὸς SZ.
2 sic interpungunt A.-W., qui et <δὲ> addunt.
3 διόπερ seclusi.
4 μηδὲ . . . δερματικήν secludunt A.-W.

* * *

a Not in the Generation of Animals; but see 717 b 29.
cannot provide, being easily injured and cold. The testicles, however, are inside in some animals but outside in others: since, however, they also need shelter and covering to keep them safe and to secure concoction for the semen (for if they have been exposed to cold and rendered stiff they cannot be drawn up and emit the semen), those animals whose testes are in the open have a covering of skin over them known as the scrotum; while those animals the nature of whose skin is so hard that it is not amenable to this arrangement, and cannot be used for a wrapping and is not soft or like ordinary skin (e.g., animals whose skin is like that of fish, and those whose skin is made of horny scales)—they must of necessity have their testes inside. On this account the dolphins and those cetacea which possess testes have them inside; so do those horny-scaled animals which are oviparous and four-footed. Birds, too, have hard skin, which will not accommodate itself to the size of the testes and make a wrapping for them, and this makes another reason why in all these cases the testes are inside in addition to the reasons (previously mentioned) due to the necessary exigencies of copulation. And for this selfsame reason the testes are also inside in the elephant and in the hedgehog; the skin of these two animals, as of the others, is not well adapted for having the protective part separate.

b Contrary positions of the uterus are found in those animals which are internally viviparous and in those which are externally oviparous; and again in some of the latter class it is placed low down, in others by the diaphragm, as for instance in fishes on the one

b The following paragraph is simply a hash-up of parts of the preceding chapters.
ιχθύσι πρὸς τε τοὺς ὀρνιθὰς καὶ τὰ φωτόκα τῶν
tetraptόδων, καὶ τοῖς κατ’ ἀμφοτέρους τοὺς τρό-
pous γεννώσων, ἐν ἑαυτοῖς μὲν φωτοκούσιν, εἰς
dὲ τὸ φανερὸν ζωτοκοῦσιν. τὰ μὲν γὰρ ζωο-
tokouντα καὶ ἐν αὐτοῖς καὶ ἑκτὸς ἐπὶ τῆς γαστρὸς
ἐχει τὰς υστέρας, οἷον ἀνθρώπως καὶ θησαυρὸς καὶ
κύων καὶ τὰλλα τὰ τοιαῦτα: πρὸς γὰρ τὴν τῶν
ἐμβρύων σωτηρίαν καὶ αὐξήσιν συμφέρει μηθὲν
ἐπειναί βάρος ἐπὶ ταῖς υστέραις.]¹

XIII 'Εστι δὲ καὶ ἑτεροις ὁ πόρος δι᾽ οὗ ἡ τε ἔθηρ
30 περίττωσις ἐξέρχεται καὶ δι᾽ οὗ ἡ ύγρα τούτων
πάσης. διὸ ἔχουσιν αἰδοία τὰ τοιαῦτα πάντα καὶ τὰ
ἀρρένα καὶ τὰ θήλεα, καθ’ ἂν ἐκκρίνεται τὸ περίτ-
tωμα τὸ ύγρόν καὶ τοῖς μὲν ἄρρησι τὸ σπέρμα, τοῖς
dὲ θήλεσι τὸ κύμα.² οὔτος δ’ ἐπάνω καὶ ἐν τοῖς
προσθίοις ὑπάρχει ὁ πόρος (τοῦ)³ τῆς ἔθηράς τροφῆς.
35 [ὅσα δ’ φωτοκεὶ μὲν ἀτελές δ’ ὠν, οἷον ὁσοὶ τῶν
ἰχθύων φωτοκοῦσιν, οὕτω δ’ οἷον ὑπὸ τῇ γαστρὶ
ἀλλὰ πρὸς τῇ ὁσφύν ἔχουσι τὰς υστέρας: οὔτε γὰρ
ἐμποδίζει ἡ τοῦ ψοῦ αὐξήσις, διὰ τὸ ἐξω τελει-
οθεταὶ καὶ προϊέναι τὸ αὐξανόμενον.]⁴ οὐ τὸν πόρος
ὁ αὐτὸς ἐστι [καὶ]⁵ ἐν τοῖς μὴ ἔχουσι γεννητικοῖς
5 αἰδοίοιν τῶν⁶ τῆς ἔθηρᾶς τροφῆς, πάσι τοῖς φωτόκοις
καὶ τοῖς ἐχουσιν αὐτῶν κύστιν, οἷον ταῖς χελώναις:
tῆς γενέσεως γὰρ ἐνεκεν, οὗ τῆς τοῦ ύγροῦ περιτ-
tώματος ἐκκρίσεως, ἐἰσὶ διττοὶ οἱ πόροι: διὰ δὲ
tὸ ύγρὸν εἶναι τὴν φύσιν τοῦ σπέρματος καὶ ἡ τῆς

¹ κεῖνται . . ὑστέραις secludit Platt.
² ἀ Em: ὁ vulg. ³ τὰ καταμήνια A.-W.
⁴ <τοῦ> Aldus, A.-W.
⁵ ὁσα δ’ . . . αὐξανόμενον secludit Platt.

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hand as against birds and oviparous quadrupeds on the other; and then again it is different in those animals which produce their young by both of the two methods, viz., which are internally oviparous and outwardly viviparous. Those animals which are both internally and externally viviparous have their uterus placed against the abdomen, as for instance man, ox, dog, and other such animals, since it is expedient for the safety and growth of the embryo that no weight should be put upon the uterus.

In all these animals the passage through which the solid residue issues is other than that through which the fluid issues. On this account all such animals, both male and female, have pudenda by which the fluid residue is voided, and thereby too in males the semen passes out and in the females the fation. This passage is situated higher up than the passage for the solid nourishment and in front of it. Those animals which lay eggs, but lay imperfect ones, e.g., the oviparous fishes, have their uterus not under the abdomen but by the loin, since the growth of the egg causes no obstruction, because the growing object comes to its perfection and makes its advance outside the animal. In all those animals which have no pudendum which serves for generation, this passage is the same as that for the solid nourishment, viz., in all the Ovipara, including those Ovipara which have a bladder, e.g., the tortoises. The existence of two passages, it must be remembered, is for the sake of generation, not for the sake of voiding the fluid residue, and it is only because the semen is fluid in

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a See Introd. § 56.

b This sentence is a continuation of the previous interpolation.
720 a

licant oûn deî kai toûs tôn árrénwv pórous
tous spermatikous érheîsthai kai mh planássthai,
kai toîs thîlesi tás ústéraas, touto d' anagkaiôn
hî prôs tâ prósia tû swmatos hî prôs tâ pranî

15 sumbaîneîn, toîs men zωstôkois diâ tâ ëmbrya en
tois prosbîous ai ústeraî, toîs d' zωstôkois prôs
thî ñsfû kai toîs pranéseîn. òssa d' zōtotikhsante
en autoîs zōstoteki ëktoûs, taûta d' ãmfortérws
êxei diâ to meteîlhîfînai ãmfortérwn kai êinaî kai
zōstotika kai zōstotka: tâ men gar, ánw thîs

20 ústeraas, kai hî gîngnetai tâ ñâ, ùpô to úpôzwsma
prôs thî ñsfû ësî kai toîs pranéseî, prôiôusâ1 de
kâtî epî thî gästrî: taûtê gar zōstoteki ëndhê. dê
dê póros eîs kai toûtois thîs te ëmpras perîyttôswos
kai thîs õcheîas: outhên gar êxei toûtwv aîdoîon,

25 kathâper eîrhtai prôteron, áphtnhmenon. õmôîws
d' êxouoî kai oî tôn árrénwv pórôi, kai tôn êxôn-
twv kai tôn mû êxôntwv õrxeis, taîs twn õzotôkwn
ústerais: pâsi ãgar prôs toîs pranéseî prospeîfû-
kaî kai kata tîn tôpòn tûn2 thûs pâkheww: deî meîn
gar mû planássthai allû ãdrâlous eînai, toîûntos dê

30 õ õptwthêv tôpôs: õûto gar tî swneîxes parêchéi kai
thîn stásin. toîs men ouîn êntos êxouhî toûs õrxeis
eûthûs ñrhreîsmênai eîsw [âma toîs pórôi],3 kai toîs

1 prôiôusa Platt, prôiûusa vulg.: cf. 719 a 7, H. A. 511 a 7
seqq.: prôiûusa de <tà> kâtô Sus.
2 tôv Z: om. vulg.
3 âma toîs pórôi secl. Platt.
nature that the residue from the fluid nourishment shares the use of the same passage. This is clear from the fact that although all animals produce semen, fluid residue is not formed in all of them.

Now in males the seminal passages must have a fixed position and not stray about, and the same is true of the uterus in females; and this fixed position must of necessity be either towards the front or the back of the body. Hence, (a) in the Vivipara the uterus is in front, on account of the embryo; (b) in the Ovipara it is by the loin and at the back; (c) in those animals which begin by producing eggs within themselves and later bring their young forth externally, both positions are found combined, because the animals share the characteristics of both classes; they are viviparous and oviparous alike; thus, the upper portion of the uterus, in which the eggs are formed, is below the diaphragm by the loin, and towards the back; but its continuation is lower down, by the abdomen, for from this point onwards the production of live young begins. In these animals also there is one passage only for the solid residue and for copulation; none of them has a pudendum projecting from the body, as has been said before. What is true of the uterus in Ovipara is true also of the passages in the males, both those which have testes and those which have not. In all of them the passages are fastened towards the back near the region of the spine; fastened, because they may not stray about, but must have a settled position, which is just what the back part of the body provides; it gives continuity and stability. Indeed, in those animals which have their testes inside, the passages acquire their fixed position at
ARISTOTLE

720 a

\[\text{\textit{ektos d' omois\:' eit' apanta\'swen eis en pro\'s t\'on t\'ou aidoi\'on topov. omois de kai tois delph\'ion oi poroi exousin: alla tois orkeis exousi kekrivi-}}\]

35 me\'ous upo to per\'i t\'in ga\'stera k\'utos.\]

\[\text{P\'os men ou\'n exousi t\'\i\i thesei per\'i ta mo\'ria ta sunteleounta pro\'s t\'in ge\'nesin, kai di\a t\'inas a\'titias, eir\'etai.}\]

720 b

XIV T\'on d' \'allon x\'wov t\'on anai\'mwn ou\'x o autos tr\'opos t\'on mori\'on t\'on pro\'s t\'in ge\'nesin sun-

teleoun\'on ou\'te tois enai\'mois ou\'th\'e anau\'toy. \'Esti de 5 ge\'n\'h tet\'tara ta loupa, en men to t\'on malakos-

trak\'on, de\u03b5teron de to t\'on malakian, trito\'n de to to-

t\'on evtop\'on, kai tet\'tartoon to t\'on osttrakode\'rmow (tou\'ton de per\'i men pant\'on \'ad\'hlon, ta de plei\'sta

\[\text{oti ou\'i sunde\'av\'exetai faveno\'n t\'ina de suv\'ista\'tau tr\'opon, ustieron lekt\'e\'on). ta de malakost\'raka 10 sunde\'av\'exetai men \'ostper ta \'opisthouri\'tika, \'ota\n\[\text{nen up\'tio\'n to de prav\'es epallag\'e\'t\'a oura\'ia\'i tois g\'ar up\'tio\'s pro\'s ta pran\'h e\'pivainov \'e\'mpodi\'e\'i ta oura\'ia makr\'an \'e\'xon\'ta t\'in \'apat\'r\'h\'ou\'n t\'on pte-

rugwion, \'exousi de o\'i men \'ar\'e\'nes le\'ptou\'s po\'rou\'s th\'ori\'ko\'u\'s, a\'i de \'h\'ileiav uste\'r\'as \'ume\'n\'o\'dei\'s par\'a 15 to \'\\'eteron, \'\'en\'h\'en kai \'\'e\'n

\[\text{\'e\'xhoo\'n\'as, e\'n a\'is e\'n-}\]

\[\text{XV \'i\'netai to \'\'o\'n. ta de malakia su\'mplekeitai men kata to sto\'ma, anterei\’dounta kai diap\'\nu\'tounta}

to\'s plekt\'an\'as, su\'mplekeitai de to\'n tr\'opon tou\'ton ex anagni\'khs: \'h g\'ar fuh\'i\'es par\'a to sto\'ma t\'in te-

\[\text{leut\'h\'ou t\'ou peript\'\ou\'mato\'s suv\'i\'g\'a\'ge k\'am\'p\'a\'sa, kath-}\]

20 \'\'aper eir\'etai pro\'tou\'r [e\'n to\'is per\'i t\'on mori\'on}

\[\text{1 ou vulg., } \Sigma : \text{om. PY, Platt.}\]

\[\text{a Snails are the exception (762 a 33).}\]
the very outset [at the same time as the passages]; and similarly in those animals whose testes are external. Afterwards they meet and unite towards the region of the pudendum. The arrangement of the passages is the same as this in dolphins, although their testes are hidden below the abdominal cavity.

We have now described the situation of the parts which are concerned with generation in the blooded animals and have stated the causes.

In the other class of animals, viz., the bloodless ones, the manner of the parts concerned with generation is quite different from what it is in the blooded ones; and what is more they differ among themselves. We have here four groups still left to deal with: (1) Crustacea, (2) Cephalopods, (3) Insects, (4) Testacea (with regard to all of these the facts are obscure, but it is plain that most of them do not copulate); as for the manner in which they arise, we must describe this later on). (1) The Crustacea copulate as the retromingent animals do: one lies prone and the other supine and they fit their tail-parts one to the other. The males are prevented from mounting the females belly to back by their tail-parts which have long flaps attached to them. The males have narrow seminal passages, and the females have a membranous uterus by the side of the gut, divided on either side, and in this the egg is formed. (2) The Cephalopods copulate by the mouth, pushing against each other and intertwining their tentacles. This manner of copulation is due to necessity, because nature has bent the end of the residual passage so as to bring it round by the side of the mouth, as I have previously said [in the treatise

\[\text{Book III, ch. 11.}\]
λόγοις]. 1 ἐχει δ' ἡ θηλεια μὲν ύστερικὸν μόριον φανερῶς ἐν ἐκάστῳ τούτῳ τῶν ζώων· ὥστε γὰρ ἵσχει τὸ μὲν πρῶτον ἀδιάριστον, ἐπειτα διακρινόμενον γίνεται πολλά, καὶ ἀποτικεῖ ἐκαστὸν τούτων ἄτελες, καθάπερ καὶ οἱ ἑρωκοῦντες τῶν 25 ἵχθυων. ὃ δὲ πόρος ὁ αὐτὸς τοῦ περιττὸματος καὶ τοῦ ύστερικοῦ μορίου καὶ τοῖς μαλακοστράκοις καὶ τούτοις: [ἐστὶ γὰρ ἢ τὸν θορὸν ἀφύησε διὰ τοῦ 30 οἴκου] 3 τοῦτο 4 δὲ ἐστὶν ἐν τοῖς ὑπίπτεις τοῦ σώματος, ἢ τὸ κέλυφος ἀφέστηκε καὶ ἡ θάλαττα εἰσέρχεται. διὸ ὃ συνιδαιμνὸς κατὰ τοῦτο γίνεται 35 τῷ ἄρρητον πρὸς τὴν θηλειαν· ἀναγκαῖον γάρ, εἶπερ ἀφύησε τι 5 ὁ ἄρρητος εἴτε σπέρμα εἴτε μόριον εἴτε ἄλλην τινά δύναμιν, κατὰ τὸν ύστερικὸν πόρον πλησιάζειν. ἢ δὲ τῆς πλεκτάνης τοῦ ἄρρενος διὰ τοῦ αὐλοῦ δίεσις ἐπὶ τῶν πολυπόδων, ἢ φασίν ὧχείν πλεκτάνη οἱ ἄλλες, συμπλοκῆς χάριν ἐστίν, ἀλλ' οὖχ ὡς ὀργάνου χρησίμου πρὸς τὴν γένεσιν· ἐξω γὰρ ἐστὶ τοῦ πόρου καὶ τοῦ σώματος.

1 om. PZ, secl. A.-W.  
2 τὸ Bekker per hypothetae errorrem.  
3 seclusi.  
4 τοῦτο Peck, ταῦτα vulg.  
5 τι PZ : om. vulg.

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a 684 a 15, 685 a 1.  
b Cf. 718 b 11.  
c Cf. P. A. 684 a 17 ff.  

d See Introd. § 18. “Part” does not necessarily imply a limb, and the fact that it is mentioned here between semen and dynamis suggests that “limb” is not the meaning here (cf. P. A. 648 a 2, where blood is described as a “part”). All the same, Aristotle may here be intending to use “part” in the sense of limb, for in three genera of the Octopoda the hectocotylized arm (see note below, on l. 32) becomes detached from the male and remains within the 44
on *The Parts of Animals*. The female of each of these animals has a part like a uterus, which is plain to be seen; it contains an egg which at first is indistinct, but later divides up and is formed into a number of eggs, each of which the creature deposits in an imperfect state, just as the oviparous fishes do. In these animals as well as in the Crustacea the passage which serves for the residue and connects with the uterus-like part, is one and the same (it is on the under surface of the body, where the "mantle" lies open and the sea water enters in). Hence it is through this that the male effects copulation with the female, since if the male discharges anything, be it semen, or some part, or some other substance, he must of necessity unite with the female through the passage which leads to the uterus. In the case of the Octopuses, the male inserts his tentacle through the funnel of the female, and the fishermen allege that copulation is effected by means of this tentacle, but its purpose is really to link the two creatures together; it has no instrumental use so far as generation is concerned, because it is outside the passage (of the male) and outside his body.

mantle of the female. Aristotle however does not explicitly mention this detaching of the arm.

* Dynamis; see Introd. §§ 23 ff.

† This refers to the remarkable phenomenon in the Dibranchiata of the "hectocotylization" of one of the arms of the male, by means of which copulation is effected, as is stated in *H.A.* 524 a 5 ff., 541 b 9, 544 a 8 ff. Here, however, Aristotle denies that the arm is so used, and his argument is not unreasonable, for it is not yet known how the arm becomes charged with the spermatophores. For details and diagrams see P. Pelseneer, *Mollusca* (tr. G. Bourne), 323 ff.

‡ i.e., not a part of the main bulk of the body and not directly connected with the seminal passage.
720 b  'Ενώτε δὲ συνδυάζονται καὶ ἐπὶ τὰ πρανῆ τὰ μαλάκια· πότερον δὲ γενέσεως χάριν ἢ δι' ἀλλην αἰτίαν, οὐθὲν ὑπταί πω.

721 a XVI Τὼν δ' ἐντόμων τὰ μὲν συνδυάζεται, καὶ ἡ γένεσις αὐτῶν ἐστὶν ἐκ ζῷων συνωνύμων, καθάπερ ἐπὶ τῶν ἐναίμων, οἶνον αἱ τε ἄκριδες καὶ οἱ τέτειγες καὶ τὰ φαλάγγα καὶ οἱ σφῆκες καὶ οἱ μύρμηκες, τὰ δὲ συνδυάζεται μὲν καὶ γεννᾶσθαι, οὐχ ὁμογενὴς δ' αὐτοῖς ἀλλὰ σκώληκας μόνον, οὐδὲ γίγνονται ἐκ ζῷων ἀλλ' ἐκ σηπομένων ὕγρων, τὰ δὲ ἔρημον, οἶνον αἱ τε ψήλλαι καὶ αἱ μυῖαι καὶ αἱ καυθαρίδες· τὰ δ' οὖτ' ἐκ ζῷων γίγνονται οὖτε 10 συνδυάζονται, καθάπερ ἐμπίδες τε καὶ κώνωπες καὶ πολλὰ τοιαῦτα γένη. τῶν δὲ συνδυαζομένων ἐν τοῖς πλείστοις τὰ θήλεα μείζω τῶν ἄρρενων ἐστὶν. πόρους δὲ τὰ ἄρρενα θορικοὺς οὐ φαίνεται ἑχοντα. ἀφύσι δὲ ὡς ἐπὶ τὸ πλεῖστον εἰπεῖν τὸ ἄρρεν εἰς τὸ θήλυ οὐδὲν μόριον, ἀλλὰ τὸ θήλυ εἰς 15 τὸ ἄρρεν κάτωθεν ἄνω. τεθεώρηται δὲ τοῦτο ἐπὶ πολλῶν, [καὶ περὶ τοῦ ἀναβαίνειν ωσαύτως,] τοῦναντίον δ' ἐπ' ὅλιγων· ὡστε δὲ γένει διελεῖν, οὕτω συνεώραται. σχεδὸν δὲ τούτῳ καὶ ἐπὶ τῶν ὕστόκων ἰχθύων τῶν πλείστων ἐστὶ, καὶ ἐπὶ τῶν τετραπόδων καὶ ὕστόκων· τὰ γὰρ θήλεα μείζω 20 τῶν ἄρρενων ἐστὶ διὰ τὸ συμμφέρειν2 πρὸς τὸν γινό-

1 seclusi. 2 συμμφέρειν PZ: συμμφέρου vulg.

a See Categ. 1 a 5 “Things are called ‘synonymous’ when their name is common and the logos of the essence corresponding to the name is the same.” For ὀμώνυμον, see note on 726 b 24. A useful mnemonic is: συνώνυμον is same 46
Sometimes too Cephalopods copulate while both creatures are lying prone, but it has not yet been observed whether this is done for the purpose of generation or for some other cause.

(3) As regards Insects, some of them copulate, and in those cases the young are generated from animals which are of the same name and nature as themselves, just as happens in the blooded creatures; instances of this arc locusts, cicadas, spiders, wasps, ants. Others, although they copulate and generate, generate not creatures of the same kind as themselves but only larvae; and these insects moreover are not produced out of animals at all but out of putrefying fluids (in some cases, solids); instances of this are fleas, flies, cantharides. Others neither are produced out of animals nor do they copulate; such are gnats, mosquitoes and many similar kinds of insects. In most of the sorts which copulate the females are larger than the males; and the males do not seem to have any seminal passages. Speaking generally, the male does not insert any part into the female; but the female does so into the male upwards from below: this has been observed in many instances, [and similarly as concerns mounting,] the opposite in a few; but we have not yet enough observations to enable us to classify them distinctly. We find that the females are larger than the males not only in Insects but also in most of the oviparous fishes, and likewise in those quadrupeds which are oviparous; the reason being that the size is an advantage to them when a great bulk is produced inside

in name and same in nature; ὀμόνυμον is same in name but not in nature. 

" See Introd. § 77.

" It is not possible to say exactly what insects are meant.
μενον αὐτοῖς ὑπὸ τῶν ὑμών ὄγκον ἐν τῇ κυήσει. τοῖς δὲ θήλεσιν αὐτῶν τὸ ταῖς ύστεραις ἀνάλογον μόριον ἐσχημένον ἐστὶ παρὰ τὸ ἐντερον, ὀστερ καὶ τοῖς ἄλλοις, ἐν ὑ ἐγγύνεται τὰ κυήματα. δὴν δὲ τούτῳ ἐπὶ τε τῶν ἁκρίδων, καὶ ὅσα μὲ-
25 γεθος αὐτῶν ἔχει, συνδυάζεσθαι πεφυκότων τὰ γὰρ πλείστα μικρὰ λίαν τῶν ἐντόμων ἐστίν.

Τὰ μὲν οὖν περὶ τὴν γένεσιν ὄργανα τοῖς ζώοις, περὶ δὲν οὐκ ἐλέξθη πρότερον, τούτων ἔχει τῶν τρόπων τῶν δ’ ὀμοιομερῶν ἀπελεύθη περὶ γονής καὶ γάλακτος, περὶ δὲν καιρὸς ἐστὶν εἰπεῖν, περὶ 30 μὲν γονής ἡ ἡδη, περὶ δὲ γάλακτος ἐν τοῖς ἐχομένοις.

XVII Τὰ μὲν γὰρ προῖεται φανερῶς σπέρματὶ τῶν ζώων, οἶον ὅσα αὐτῶν ἐναίμα τὴν φύσιν ἐστὶ, τὰ δ’ ἐντόμα καὶ τὰ μαλάκια ποτέρως, ἀδηλον. ὡστε τούτῳ θεωρητέον, πότερον πάντα προῖεται σπέρμα τὰ ἄρρενα ἢ οὐ πάντα, καὶ εἰ μὴ πάντα, διὰ τοῦ 35 αἰτίαν τὰ μὲν τὰ δ’ οὐ. καὶ τὰ θήλεα δὲ πότερον συμβάλλεται σπέρμα τι ἢ οὐ, καὶ εἰ μὴ σπέρμα, πότερον οὐδ’ ἄλλο οὐθέν, ἢ συμβάλλεται μὲν τι, οὐ σπέρμα δὲ. ἐτι δὲ καὶ τὰ προϊέμενα σπέρμα τι συμβάλλεται διὰ τοῦ σπέρματος πρὸς τὴν γένεσιν σκεπτέον, καὶ ὅλως τῆς ἐστὶν ἢ τοῦ σπέρματος φύσις 5 καὶ ἢ τῶν καλομιέμονον καταμηνύων, ὅσα ταύτην τὴν υγρότητα προῖεται τῶν ζώων.

Δοκεῖ δὲ πάντα γίνεσθαι ἐκ σπέρματος, τὸ δὲ

1 σπέρμα om. SY*.

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*a It will be noticed that Aristotle omits to describe the Testacea, which would naturally follow at this point. The
them by the eggs at the time of breeding. In the females the part that answers to the uterus is divided and extends alongside the gut, as in other animals; this is where the feta\-tions are formed. This can be clearly seen in locusts and in any insect whose nature it is to copulate, provided it is large enough; most insects however are too small.\(^a\)

Such is the manner of animals’ instrumental parts connected with generation, which I had not dealt with in my previous treatise.\(^b\) Of the “uniform”\(^c\) parts, semen and milk were there left undescribed, and the time has now come to speak of these. We will deal with semen without delay, and with milk in the chapters which are to follow.\(^d\)

Some animals discharge semen plainly, for instance XVII those which are by nature blooded animals; but it is not clear in which way Insects and Cephalopods do so. Here then is a point we must consider: Do all male animals discharge semen, or not all of them? and if not all, why is it that some do and some do not? and further, Do females contribute any semen, or not? and if they contribute no semen, is there no other substance at all which they contribute, or is there something else which is not semen? And there is a further question which we must consider: What is it which those animals that discharge semen contribute towards generation by means of it? and generally, what is the nature of semen, and (in the case of those animals which discharge this fluid) what is the nature of the menstrual discharge?

It is generally held that all things are formed and reason is that, according to him, they do not copulate: see 731 b 8 ff. \(^b\) De partibus. \(^c\) See Introd. § 19. \(^d\) Book IV, ch. 8.
σπέρμα ἐκ τῶν γεννώτων. διὸ τοῦ αὐτοῦ λόγου ἐστὶ, πότερον καὶ τὸ θῆλυ καὶ τὸ ἄρρεν προϊέναι ἀμφω ἡ θάτερον μόνον, καὶ πότερον ἀπὸ παντὸς ἀπέρχεται τοῦ σώματος ἡ οὐκ ἀπὸ παντὸς· εὐλογον γάρ, εἰ μὴ ἀπὸ παντός, μηδ’ ἀπ’ ἀμφοτέρων τῶν γεννώτων. διόπερ ἐπισκεπτέον, ἐπειδὴ φασί τινες ἀπὸ παντὸς ἀπιεῖαν τοῦ σώματος, περὶ τούτου πῶς ἔχει πρῶτον. ἔστι δε σχεδόν, οἷς ἂν τις χρησαίτω τεκμηρίως ὡς ἀφ’ ἑκάστου τῶν μορίων ἀπιόντος τοῦ σπέρματος, τέταρτα, πρῶτον μὲν ἡ σφοδρότης τῆς ἥδονῆς· μάλλον γὰρ ἡδονὴ πλέον ταύτῳ γινόμενον πάθος, πλέον δὲ τὸ πάσι τοῖς μορίοις ἡ τὸ ἐνὶ ἡ ὀλίγοις συμβαίνων αὐτῶν. ἔτι τὸ ἑκ κολοβῶν κολοβὰ γίνεσθαι· διὰ μὲν γὰρ τὸ τοῦ μορίου ἐνδεές εἶναι οὐ βαδίζειν σπέρμα ἐν-20 τεῦθεν φασιν, ὀθέν δ’ ἂν μὴ ἐλθῇ, τοῦτο συμβαίνειν μὴ γίνεσθαι. πρὸς δὲ τούτοις αἱ ὁμοιότητες πρὸς τοὺς γεννήσαντας· γίνονται γὰρ ἐκοκότες, ὡσπερ3 καὶ ὅλον τὸ σῶμα, καὶ μορία μορίοις· εἴπερ οὖν καὶ τῷ ὀλῳ4 αὐτιον τῆς ὁμοιότητος τὸ ἀφ’ ὅλου ἐλθεῖν τὸ σπέρμα, καὶ τοῖς μορίοις αὐτιον ἂν εἰῃ τὸ

1 προϊέναι PSZ* : προϊέναι vulg.
2 ὡσ . . . σπέρματος om. PZ.
3 ὡσπερ om. P.
4 τῷ ὀλῳ Z : τοῦ ὀλου vulg.

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* This is a view which is found in the remarkable Hippocratic treatise π. γονῆς κτλ. 3 and 8 (vii. 474 and 480 Littre), and seems also to have been held by Democritus (see Diels, Vorsokr.⁵ 68 A 141 and 68 B 32). It closely resembles the hypothesis ("pangenesis") which was put forward by Darwin, that every unit of an organism contributes its share to the germ of the future offspring; in other words, that the 50
come to be out of semen, and semen comes from the parents. And so one and the same inquiry will include the two questions: (1) Do both the male and the female discharge semen, or only one of them? and (2) Is the semen drawn from the whole of the parent’s body or not?—since it is reasonable to hold that if it is not drawn from the whole of the body it is not drawn from both the parents either. There are some who assert that the semen is drawn from the whole of the body, and so we must consider the facts about this first of all. There are really four lines of argument which may be used to prove that the semen is drawn from each of the parts of the body. The first is, the intensity of the pleasure involved; it is argued that any emotion, when its scope is widened, is more pleasant than the same emotion when its scope is less wide; and obviously an emotion which affects all the parts of the body has a wider scope than one which affects a single part of a few parts only. The second argument is that mutilated parents produce mutilated offspring, and it is alleged that because the parent is deficient in some one part no semen comes from that part, and that the part from which no semen comes does not get formed in the offspring. The third argument is the resemblances shown by the young to their parents: the offspring which are produced are like their parents not only in respect of their body as a whole, but part for part too; hence, if the reason for the resemblance of the whole is that the semen is drawn from the carriers of heredity move centripetally from all the parts of the body to the germ, thus involving the inheritance of acquired characteristics (for which inheritance, however, there is no evidence).—See also Hippocrates, *peri áérion údátov tótpou* 16.

"Cf. 724 a 9-10."
721 b

άφ' ἐκάστου τι τῶν μορίων ἐλθεῖν. ἔτι δὲ καὶ
25 ἐὗλογον ἄν εἶναι δόξειεν, ὥσπερ καὶ τοῦ ὅλου ἐστὶ
tί' έξ οὐ γίνεται πρῶτον, οὐτω καὶ τῶν μορίων
ἐκάστου, ὥστ' εί ἐκείνου σπέρμα, καὶ τῶν μορίων
ἐκάστου εἰή ἄν τι σπέρμα ἓδον. τιθανά δὲ καὶ τὰ
tοιαύτα μαρτύρια ταύταις ταῖς δόξαις· οὐ γὰρ
μάγον τὰ σύμφωνα προσευκότες γίνονται τοῖς γο-
30 νεόσιν οἱ παιδες, ἀλλὰ καὶ τὰ ἐπίκτητα· οὐλάς τε
gὰρ ἐχόντων τῶν γεννησάντων ἥδη τινὲς έσχον ἐν
tοῖς αὐτοῖς τόποις τῶν ἐκγόνων τῶν τύπων τῆς
οὐλής, καὶ στίγμα ἐχόντος ἐν τῷ βραχίονι τοῦ
πατρὸς ἐπεσήμηνεν ἐν Χαλκηδόνι τῷ τέκνῳ συγ-
κεχυμένον μέντοι καὶ οὐ διηθρωμένον τὸ γράμμα.
35 ὅτι μὲν οὖν ἀπὸ παντὸς ἐρχεται τὸ σπέρμα, σχεδὸν
ἐκ τούτων μάλιστα πιστεύοις τίνες.

722 a

XVIII τοῦ λόγου τούναντίον
5 μᾶλλον· τά τε γὰρ εἰρημένα λύειν οὐ χαλεπόν, καὶ
πρὸς τούτοις ἀλλά συμβαίνει λέγειν ἀδύνατα. πρῶ-
tον μὲν οὖν ὅτι οὐθέν σημείον ἡ ὁμοιότης τοῦ
ἀπιέναι ἀπὸ παντός, ὅτι καὶ φωνήν καὶ οὖνχας καὶ
τρίχας ὁμοίοι γίγνονται καὶ τήν κίνησιν, ἂφ' ὧν
ὅθεν ἀπέρχεται. ἔνια δ' οὐκ ἔχουσί πιὸ ὅταν γεν-
νώσων, ὅτι τρίχωσιν πολιῶν ἡ γενειόν. ἔτι τοῖς
ἀνωθεν γονεύουσι ἐοίκασιν, ἂφ' ὧν οὐθέν ἀπῆλθεν·

*It will be seen that this translation, in spite of its sound
of modernity, is a close representation of the original.

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whole, then the reason for the resemblance of the parts is surely that something is drawn from each of the parts. Fourthly, it would seem reasonable to hold that just as there is some original thing out of which the whole creature is formed, so also it is with each of the parts; and hence if there is a semen which gives rise to the whole, there must be a special semen which gives rise to each of the parts. And these opinions derive plausibility from such evidence as the following: Children are born which resemble their parents in respect not only of congenital characteristics but also of acquired ones; for instance, there have been cases of children which have had the outline of a scar in the same places where their parents had scars, and there was a case at Chalcedon of a man who was branded on his arm, and the same letter, though somewhat confused and indistinct, appeared marked on his child. These are the main pieces of evidence which give some people ground for believing that the semen is drawn from the whole of the body.

Upon examination of the subject, however, the XVIII opposite seems more likely to be true; indeed, it is not difficult to refute these arguments, and besides that, they involve making further assertions which are impossible. First of all, then, resemblance is no proof that the semen is drawn from the whole of the body, because children resemble their parents in voice, nails, and hair and even in the way they move; but nothing whatever is drawn from these things; and there are some characteristics which a parent does not yet possess at the time when the child is generated, such as grey hair or beard. Further, children resemble their remoter ancestors, from whom nothing has been drawn for the semen. Resemblances
ΑΡΙΣΤΟΤΕΛΟΣ

722 a

άποδεδόσαι γάρ διὰ πολλῶν γενεῶν αἱ ὁμοιότητες,
10 οίον καὶ ἐν Ἡλίδῃ ἡ τῷ Αἰθίοπι συγγενομένη· οὐ
gάρ ἡ θυγάτηρ ἐγένετο, ἀλλ' ὁ ἐκ ταύτης Αἰθίοψ·
καὶ ἐπὶ τῶν φυτῶν δὲ ὁ αὐτὸς λόγος· δήλον γάρ ὦτι
καὶ τούτοις ἀπὸ πάντων ἃν τῶν μερῶν τὸ σπέρμα
gίγνοιτο. πολλὰ δὲ τὰ μὲν οὐκ ἔχει, τὰ δὲ καὶ
αφέλοι τις ἃν, τὰ δὲ προσφύεται. ἔτι οὖν ἀπὸ
15 τῶν περικαρπίων ἀπέρχεται· καίτοι καὶ ταύτα γί-
νεται τὴν αὐτὴν ἔχοντα μορφὴν.

"Επὶ πότερον ἀπὸ τῶν ὁμοιομερῶν μόνον ἀπ-
έρχεται ἀφ’ ἐκάστου, οἴον ἀπὸ σαρκὸς καὶ ὀστοῦ
καὶ νεύρου, ἡ καὶ ἀπὸ τῶν ἁνομοιομερῶν, οἴον
προσώπου καὶ χειρός; εἰ μὲν γὰρ ἀπ’ ἐκείνων
20 μόνον, ἦνικέναι ἐδει ἐκείνα μόνον· ἐοίκασι δὲ
μᾶλλον ταύτα τοῖς γονεῦσι [τὰ ἁνομοιομερῆ], οἴον
πρόσωπων καὶ χειρᾶς καὶ πόδας· εἰπὲρ οὖν
μηδὲ ταύτα τῷ ἀπὸ παντὸς ἀπελθεῖν, τί κωλύει
μηδ’ ἐκείνα τῷ ἀπὸ παντὸς ἀπελθεῖν ὁμοια εἶναι,
ἀλλὰ δι’ ἄλλην αἰτίαν; εἰ δ’ ἀπὸ τῶν ἁνομοιο-
μερῶν μόνον, οὐκ ἃρα ἀπὸ πάντων. προσήκει
25 δὲ μᾶλλον ἀπ’ ἐκείνων· πρότερα γὰρ ἐκείνα, καὶ
σύγκειται τὰ ἁνομοιομερῆ ἐξ ἐκείνων, καὶ ὡσπερ
πρόσωπον καὶ χειρᾶς γίγνονται ἐοικότες, οὕτω καὶ

1 ἦνικέναι ἐδει ἐκείνα μόνον Peck; monuerant A.-W. intellegi debere, e.g., ἐδει ἐκείνα μόνον ἦνικέναι.
2 τὰ ἁνομοιομερῆ secludenda, nam ταύτα hoc significat.
of this sort recur after many generations, as the following instance shows. There was at Elis a woman who had intercourse with a blackamoor; her daughter was not a black, but that daughter’s son was. And the same argument will hold for plants. We should have to say that the seed was drawn from the whole of the plant, just as in animals. But many plants lack certain parts; you can if you wish pull some of the parts off, and some parts grow on afterwards. Further, nothing is drawn from the pericarp to contribute to the seed, yet pericarp is formed in the new plant and it has the same fashion as that in the old one.

Here is a further question. Is the semen drawn only from each of the “uniform” parts of the body, such as flesh, bone, sinew, or is it drawn from the “non-uniform” parts as well, such as face and hand? Consider the possibilities: (1) The semen may be drawn from the uniform parts only. If so, then children ought to resemble their parents in respect of these only, but the resemblance occurs rather in the non-uniform parts such as face, hands, and feet. Therefore if even these resemblances in the non-uniform parts are not due to the semen being drawn from the whole body, why must the resemblances in the uniform parts be due to that and not to some other cause? (2) The semen may be drawn from the non-uniform parts only. This means that it is not drawn from all the parts. Yet it is more in keeping that it should be drawn from the uniform parts, because they are prior to the non-uniform, and the non-uniform are constructed out of them; and just as children are born resembling their parents in face and hands, so they resemble them in flesh and
The point of the argument is this. There is no additional material in the non-uniform parts beyond what there was in the uniform ones; the only additional factor is the assemblage (composition, combination, arrangement) of the uniform parts so as to make the non-uniform ones (e.g., of flesh, bone, blood, sinew, etc., so as to make a face or an arm). And as the assemblage, the fact that the uniform parts are arranged in a particular manner, is not a material thing, obviously nothing can be drawn from it as an ingredient for the semen. The argument can be carried a stage further still, as Aristotle points out, for the uniform parts themselves are merely assemblages of the elementary forms of matter, Earth, Air, Fire, Water. (See Introd. § 24, and 715 a 10 ff.)
The semen may be drawn from both uniform and non-uniform parts. The question then arises: What can be the manner in which generation takes place? The non-uniform parts are constructed out of uniform ones assembled together; so that being drawn from the non-uniform parts would come to the same thing as being drawn from the uniform parts plus the assemblage of them. (It is just like the case of a word written down on paper: if there were anything drawn from the whole of the word, it would be drawn from each of the syllables also, and this of course means that it would be drawn from the letters plus the assemblage of them together.) Now flesh and bones, we should agree, are constructed out of fire and the like substances; which means that the semen would be drawn from the elements only, because how can it possibly be drawn from the assemblage of them? And yet without this assemblage the parts would not have the resemblance; so if there is something which sets to work later on to bring this assemblage about, then surely this something, and not the drawing of the semen from the whole of the body, will be the cause of the resemblance.

Further, if the parts of the body are scattered about

Hence, the theory boils down to an assertion that the semen is drawn from the simplest forms of matter, and as this excludes any distinctive characteristics, the theory loses all meaning.

Contrast the interesting theory examined in Plato, *Theaetetus* 201 d ff., that "elements" (στοιχεῖα), whether physical elements or "letters" of the alphabet, are "ἄλογα" and cannot be known, until they are assembled into a "syllable," which is an entity over and above its components, and "has a λόγος," and so can be known.—See also 715 a 12, n.

The "elements"; see Introd. § 24.
5 πὼς ζῇ; εἰ δὲ συνεχῆ, ζῷον ἂν εἰη μικρόν. καὶ τὰ τῶν αἰδοίων πῶς; οὐ γὰρ ὁμοιον τὸ ἀπιὸν ἀπὸ τοῦ ἄρρενος καὶ τοῦ θῆλεως.

"Ετι εἰ ἀμφοτέρων ὁμοίως ἀπὸ πάντων ἀπέρχεται, δύο γίγνεται ζῷα. ἐκατέρων γὰρ ἀπαντὰ ἔξει. διὸ καὶ Ἕμπεδοκλῆς ἐοικεν, εἴπερ οὕτω λεκτέων, μάλιστα λέγειν ὁμολογούμενα τοῦτω τῷ λόγῳ [τὸ γε τοσοῦτον, ἀλλ' εἴπερ ἐτέρα πῆ, οὗ καλῶς]. φησι γὰρ ἐν τῷ ἄρρενι καὶ τῷ θῆλει οὐον σύμβολον ἐνείναι, ὅλον δ' ἀπ' οὐδέτερον ἀπιέναι, ἄλλα διεσπάσται μελέων φύσις, ἥ μὲν ἐν ἀνδρός . . .

diὰ τὶ γὰρ τὰ θῆλεα οὐ γεννᾶ ἐξ αὐτῶν, εἴπερ ἀπὸ παντὸς τε ἀπέρχεται καὶ ἔχει ύποδοχήν; ἀλλ' ὡς ἐοικεν ἡ οὐκ ἀπέρχεται ἀπὸ παντός, ἡ οὕτως ὡσπερ ἐκείνος λέγει, οὐ ταῦτα ἄφι ἐκατέρων, διὸ καὶ δέονται τῆς ἀλλήλων συνουσίας. ἄλλα καὶ τοῦτ' ἀδύνατον. ὡσπερ γὰρ καὶ μεγάλα οὐν' ἀδύνατον διεσπασμένα σώζονται καὶ ἐμφύχα εἶναι,

1 seclusi.

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a i.e., which generative organs is the offspring to have—male or female ones?
b Sc., in this respect, though it may be identical in respect of hand, nose, eyes, etc.
c "Nature" seems to mean here, as often, "natural substance," or "substance."
d Emped. fr. 63 (Diels, Vorsokr.5); it probably continued, e.g., "Seed, and the other portion is in woman's."
within the semen, how do they live? If on the other hand they are connected with each other, then surely they would be a tiny animal. And what about the generative organs? because that which comes from the male will be different from that which comes from the female.

Further, if the semen is drawn from all the parts of both parents alike, we shall have two animals formed, for the semen will contain all the parts of each of them. If this sort of view is to be adopted, the statement most closely in accord with it appears to be that of Empedocles [at any rate up to a point; if we take any other view, he appears wrong]. Empedocles says that in the male and in the female there is as it might be a tally—a half of something—and that the whole is not drawn from either of the parents. “But” (I quote his words)

torn asunder stands

The substance of the limbs; part is in man’s...

Otherwise the question arises, why is it that female animals do not generate out of themselves, if so be that the semen is drawn from the whole body and a receptacle for it is at hand? No; so far as we can see, either the semen is not drawn from the whole body, or if it is, it happens in the way described by Empedocles—the two parents do not both supply the same portions, and that is why they need intercourse with each other. But even Empedocles' explanation is impossible. The parts cannot remain sound and living if “torn asunder” from each other when small, any more than they can when they are fully grown. Empedocles, however, implies that they
καθάπερ Ἐμπεδοκλῆς γεννᾷ ἐπὶ τῆς φιλότητος,
20 λέγων

ἡ πολλαὶ μὲν κόρσαι ἀναύχενες ἐβλάστησαν.
εἴθ' οὗτως συμφύσεσθαι φησιν. τούτο δὲ φανερὸν
ὄτι ἀδύνατον. οὔτε γὰρ μὴ ψυχὴν ἔχοντα οὔτε
μὴ ζωῆν τινα δύνατ' ἀν σώζεσθαι, οὔτε ὃσπερ
ζῶα ὄντα πλείω συμφύσεσθαι ὡστ' εἶναι πάλιν ἐν.
25 ἀλλὰ μὴν τούτων τὸν τρόπον συμβαίνει λέγειν τοῖς
ἀπὸ παντὸς ἀπιέναι φάσκουσιν, ὃσπερ τότε ἐν
τῇ γῇ ἐπὶ τῆς φιλότητος, οὔτω τούτοις ἐν τῷ
σώματι. ἀδύνατον γὰρ συνεχῇ τὰ μόρια γίγνε-
σθαι, καὶ ἀπιέναι εἰς ἕνα τότον συνιάντα. εἶτα
πῶς καὶ "διέσπασται" τὰ ἀνώ καὶ κάτω καὶ
δεξιὰ καὶ ἀριστερὰ καὶ πρόσθια καὶ ὀπίσθια;
30 πάντα γὰρ ταύτα ἀλογά ἐστιν.

"Ετι τὰ μέρη τὰ μὲν δυνάμει τὰ δὲ πάθει διώ-
ρισται, τὰ μὲν ἀνομοιομερῆ τῷ δύνασθαι τι ποιεῖν,
οῖον γλῶττα καὶ χείρ, τὰ δ' ὁμοιομερῆ σκληρότητι
cαὶ μαλακότητι καὶ τοῖς ἄλλοις τοῖς τούτοις
πάθεσιν. οὐ πάντως οὖν ἔχον αἶμα οὐδὲ σάρξ.¹
35 δήλων τοῖνυν ὅτι ἀδύνατον τὸ ἀπελθὸν εἶναι συν-

¹ οὐ . . . σάρξ om. Σ: <αἴμα> αἶμα οὐδὲ <σάρξ> σάρξ Btf.

a According to Empedocles, there were alternating periods
during which Love and Strife respectively gained the mas-
tery; for details see Burnet, Early Greek Philosophy⁴,
pp. 231 ff.

b Emped. fr. 57 (Diels).

c See Introd. §§ 41 ff.

d Viz., in the formation of the embryo.

e Cf. below, 723 b 14 ff., 729 a 7 ff.
can when he says in his account of their generation during the "Reign of Love," \textsuperscript{a}.

There many neckless heads sprang up and grew \textsuperscript{b}; later on, he says, they grew on to each other. This is clearly impossible: on the one hand, if they had not Soul \textsuperscript{c} or life of some sort in them they could not remain safe and sound; and on the other hand, if they were a number of separate living animals, as one might say, they could not grow on to each other so as to become one animal again. Yet this is actually the kind of thing which those people have to say who allege that the semen is drawn from the whole of the body: just as it was in the beginning in the earth in the Reign of Love, so it is, according to them, in the living body.\textsuperscript{d} Of course it is impossible that the parts should become connected, \textit{i.e.}, come off from the parents so that they go together into one place.\textsuperscript{e} Besides, in any case, how were the upper and lower parts, the right and left, the front and the back, "sundered"? All these ideas are fantastic.

Further, among the parts, some are distinguished by some faculty they possess, others by having certain physical qualities \textsuperscript{f}: thus, the non-uniform parts (such as the tongue or the hand) are distinguished by possessing the faculty to perform certain actions, the uniform parts by hardness or softness or other such qualities. Unless, therefore, it possesses certain special qualities, a substance is not blood or flesh; and hence it is plain that the substance which is

\textsuperscript{f} One of the definitions of πάθος given at Met. 1022 b 15 is "a quality (ποιότης) in virtue of which a thing may be altered, \textit{e.g.}, whiteness, blackness, heaviness, lightness, etc."
It has no right to be called by the same name (συμώνυμον, implying the same λόγος of its essence) because it has not the same qualities, which clearly shows that it has not the same essence.

This phrase, which at once calls to mind the question asked by Anaxagoras (Diels 59 B 10) πῶς γὰρ ἀν ἐκ μὴ τριχός γένοντο βρίς καὶ σάρξ ἐκ μὴ σαρκός; leads on naturally to the reference to Anaxagoras which immediately follows.

According to Anaxagoras, the "uniform" substances, such as flesh, bone, blood, etc., were to be ranked as elements, i.e., as ultimate forms of matter, and therefore ex hypothesi did not come into being or pass out of being; and there was a portion of every one of them in every thing. Hence, there was a portion of flesh, bone, blood, etc., in all nourishment taken by the embryo, and so Anaxagoras could easily account for the growth in bulk of the flesh, bone, and blood in the embryo. The theory now being examined, says Aristotle, seems to make a similar assertion about the semen only—this, it holds, contains a portion of flesh, bone, blood, etc.—but it does not go on to assert that the nourishment
drawn from the various parts of the parent has no
ing another name \( a \) as those parts—we may not
be that "blood" which is drawn from the parent's
blood, and the same with flesh. This means that the
offspring's blood is formed out of something which is
other than blood, and if so, then the cause of its
resemblance will not be due to the semen's being
drawn from all the parts of the parent's body, as the
supporters of this theory assert—because if blood is
formed from something that is not blood, \( b \) the semen
need only be drawn from one part, there being no
reason why all the other constituents as well as blood
should not be formed out of the one substance. This
theory seems to be identical with that of Anaxagoras,\( c \)
in asserting that none of the uniform substances
comes into being; the only difference is that whereas
he applied the theory universally, these people apply
it to the generation of animals. Again, how are
these parts which were drawn from the whole of the
parent's body going to grow? Anaxagoras gives a
reasonable answer; he says that the flesh already
present is joined by flesh that comes from the nourish-
ment. Those people however, who do not follow
Anaxagoras in the statement just quoted, yet hold
that the semen is drawn from the whole body, are
faced with this question: how is the embryo to grow
bigger by the addition of different substance to it
which the embryo takes in afterwards also contains these
substances. Hence the theory gets into a difficulty when the
question arises of how the growth of the embryo is effected.
This difficulty is avoided by Anaxagoras, because he makes
his principle "a portion of every element in every thing"
apply universally, and does not limit its application to the
semen only. (For Anax., see A. L. Peck, C.Q. XXV (1931),
27 ff., 112 ff.)
μεταβάλλειν το προσελθόν; ἄλλα μὴν εἰ γε
15 δύναται μεταβάλλειν το προσελθόν, διὰ τί οὐκ εὐθὺς εξ ἀρχῆς τὸ σπέρμα τοιούτον ἐστιν ὡστ' εξ αὐτοῦ δυνατόν εἶναι γίνεσθαι αἷμα καὶ σάρκας, ἄλλα μὴ αὐτὸ εἶναι ἐκεῖνο καὶ αἷμα καὶ σάρκας; οὐ γὰρ δὴ οὐδὲ τοῦτο ἐνδεχεται λέγειν, ὡς τῇ κατακεράσῃ αὐξάνεται ύστερον ὁδὸν οἶνος οὗτος προσεγχυθέντος. αὐτὸ γὰρ ἂν πρῶτον μάλιστα
20 ἢν ἐκαστὸν ἄκρατον ὦν νῦν δὲ ύστερον μᾶλλον καὶ σάρξ καὶ ὀστοῦν καὶ τῶν ἄλλων ἐκαστὸν ἐστὶ μορίων. τοῦ δὲ σπέρματος φάναι τῷ νεύρον εἶναι καὶ ὀστοῦν λίαν ἐστὶν υπὲρ ἤμας τὸ λεγόμενον.

Πρὸς δὲ τούτοις εἰ τὸ θῆλυ καὶ τὸ ἄρρην ἐν τῇ κυήσει διαφέρει, καθάπερ Ἕμπεδοκλῆς ἱέγει
25 ἐν δ' ἐχύθη καθαροῖς τὰ μὲν τελέθουσι γυναῖκες
ψύχεος ἀντιάσαντα. . .

φαίνονται δ' οὖν μεταβάλλουσαι καὶ γυναῖκες καὶ ἄνδρες, ὥσπερ εξ ἀγόνων γόνυμοι, οὕτω καὶ ἐκ θηλυτοκών ἅρπεσχοκώι, ὡς οὐκ ἐν τῷ ἀπελθεῖν ἀπὸ παντὸς ἡ μὴ τῆς αἰτίας οὕσης, ἀλλ' ἐν τῷ 30 σύμμετρον ἡ ἀσύμμετρον εἶναι τὸ ἀπὸ τῆς γυναίκος καὶ τοῦ ἄνδρος ἁπίον, ἡ καὶ δὴ ἄλλην τινὰ τοιαύτην αἰτίαν. δῆλον τοῖνυν, εἰ τούτο θῇσομεν οὕτως, ὅτι οὐ τῷ ἀπελθεῖν ἀπὸ τῶν τὸ θῆλυ, ὥστ'  

1 μὴ μεταβάλλει Z: μένει vulg.
2 καὶ PY: om. vulg.

unless the substance that is added changes? If however it is admitted that this added substance can change, why not admit straight away that the semen at the outset is such that out of it blood and flesh can be formed, instead of maintaining that the semen is itself both blood and flesh? They might try to argue that it grows at a later stage by admixture, just as wine is increased in bulk by pouring in water; but even this line of argument proves impossible, because if that were so, then it would surely be at the outset that each of the parts was its own proper self, before it was mixed, whereas in actual fact it is at a later stage that this occurs (I refer of course to flesh and bone and every one of the rest of them). And the assertion that some of the semen is sinew and bone is quite beyond us, as the saying goes.

Here is another objection. Suppose it is true that the differentiation between male and female takes place during conception, as Empedocles says:

> Into clean vessels were they pour'd forth;  
> Some spring up to be women, if so be,  
> They meet with cold. . . .

Anyway, both men and women are observed to change: not only do the infertile become fertile, but also those who have borne females bear males; which suggests that the cause is not that the semen is or is not drawn from the whole of the parents, but depends upon whether or not that which is drawn from the man and from the woman stand in the right proportional relation to each other. Or else it is due to some other cause of this sort. Thus, if we are to assume this as true, viz., that the same semen is

\[ \text{Cf. 767 a 16, 772 a 17, and Introd. § 39.} \]
ARISTOTLE

723 a
oude to meros o' exe idion to te aeren kai to thelu, euper to auto spermata kai thelu kai aeren dynatai
35 gignesthai ws ouk ontos tov morion en tw spermatai.
ti ouv diaferei eti toutou legein epi twv allwn
morioiv; ei gar meid apo ths usteras spermata
ginetai, o autos logos kai eti twv allwn anv eirh
morioiv.

"Eti enia ginetai twv zewn ou't eis omogenein
ou te tw genei diaforon, idion ai mvaia kai ta geni
5 twv kalomemenov yullow.1 ek de toutwn ginetai
mein zwa, oukei o' omoia tih fous, alla genesi ti
skeleirion. dellov ouv oti ouk ap' panto merous
apiontos gignontai osa eterotheni omoia gar av
nim, euper tov apo pantos apienai semeion estin
h omoiotes.

"Eti apo mihas sounosiakai tovz zewn enia
10 geniva polla, ta de futa kai pantapasiw. dellov
gar oti apo mihas kinhseos tov epetelon pant
pherei karpom. kaitoi pous dunaton, ei apo pantos
apekrineto to spermata; miav gar apokrisin apo
mihas anagkaidon gineshthai sounosiakai kai mihas
diakeireswos. en de tais usteras xorizesthai adeunaton.

1 yullon Em, Aldus, Buss., A.-W., Platt: yullon SZ: fuxon vulg.; cf. 721 a 8 supra.

a And that the differentiation takes place in the uterus.
b This does not of course imply a belief in plant fertilization;
but the precise meaning of the remark is not clear.
On comparison with 728 b 35 ff., it appears that the product
of the "one act of coition " in animals corresponds to the
"seed " of plants, which also is a " fation," in which male
and female are not separate, just as male and female are

able to be formed into either male or female (implying that the sexual part is not present in the semen), it is clear that it is not the semen's being drawn from some one part which causes the offspring to be female, nor, in consequence, is it responsible for the special physical part which is peculiar to the two sexes. And what can be asserted about the sexual part can equally well be asserted about the other parts; since if no semen comes even from the uterus, the same will surely hold good of the other parts as well.

Further, some animals are formed neither from creatures of the same kind as themselves nor from creatures of a different kind; examples are: flies and the various kinds of fleas as they are called. Animals are formed from these, it is true, but in these cases they are not similar in character to their parents; instead we get a class of larvae. Thus in these creatures which differ in kind from their parents we clearly have animals which are not formed out of semen drawn from every part of the body, for if resemblance is held to be a sure sign that this has occurred, then they would resemble their parents.

Further, even among the animals there are some which generate numerous offspring from one act of coition, a phenomenon which is, indeed, universal with plants; these, as is manifest, produce a whole season's fruit as the result of one single movement. Now how is this possible on the supposition that the semen is secreted from the whole body? One act of coition, and one effort of segregation, ought necessarily to give rise to one secretion and no more. That it should get divided up in the uterus is impossible,
15 ἡδὴ γὰρ ὦσπερ ἀπὸ νέου φυτοῦ ἡ ἔφου, οὐ σπέρματος εἶη ἡ διαχώρισις.

'Ετι τὰ ἀποφυτεύομενα ἀπ’ αὐτοῦ φέρει σπέρμα· δήλου οὖν ὅτι καὶ πρὶν ἀποφυτεύθηναι ἀπὸ τοῦ αὐτοῦ μεγέθους ἔφερε τὸν καρπὸν, καὶ οὐκ ἀπὸ παντὸς τοῦ φυτοῦ ἀπῆκε τὸ σπέρμα.

Μέγιστον δὲ τούτων τεκμήριον τεθεωρήκαμεν ἐπὶ τῶν ἐντόμων. καὶ γὰρ εἰ μὴ ἐν πᾶσιν, ἀλλ’ ἐπὶ τῶν πλείστων ἐν τῇ ὁχείᾳ τὸ θῆλυ ἐἰς τὸ ἁρπεν μέρος τὶ αὐτοῦ ἀποτείνει [διὸ καὶ τῇ ὁχείᾳ, καθάπερ εἰπομεν πρότερον, οὕτω ποιοῦντα]. τὰ γὰρ κάτωθεν εἰς τὰ ἄνω φαίνεται ἐναφιέντα, οὐκ ἐν πᾶσιν, ἀλλ’ ἐν τοῖς πλείστοις τῶν τεθεωρη-25 μένων. ὡστε φανερὸν ἂν εἴη ότι οὔτ’ ὅσα προίται γονήν τῶν ἁρρεῦνον, οὐ τὸ ἀπὸ παντὸς ἀπιέναι τῆς γενεσεως αὐτῶν ἐστιν, ἀλλ’ ἄλλου τινὰ τρόπον, περὶ οὗ σκεπτεόν ύστερον. καὶ γὰρ ἔπερ τὸ ἀπὸ παντὸς ἀπιέναι συνέβαινεν, ὦσπερ φασίν, οὐδὲν ἐδει ἀπὸ πάντων ἄξιον ἀπιέναι, ἀλλὰ μόνον ἀπὸ 30 τοῦ δημουργοῦντος, οἷον ἀπὸ τοῦ τέκτονος ἀλλὰ μὴ ἀπὸ τῆς ύλης. νῦν δ’ ὁμοίων λέγουσιν ὦσπερ κἂν εἰ ἀπὸ τῶν ὑποδημάτων· σχεδὸν γὰρ ὁ ὁμοίος ὑίος τῷ πατρὶ ὁμοία φορεῖ.

"Οτι δ’ ἡδονὴ σφοδρὰ γίνεται ἐν τῇ ὁμιλίᾳ τῇ

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1 ἀπὸ . . . εἴη] ἀπὸ ἔφου σπέρμα ποιεῖ Ζ., sim. Σ.
2 μέρους coni. Bonitz.
3 seclusi : om. Σ.
4 ὁ ὁμοίος Ρ : ὁμοίος τὶς vulg.: ὁμοίος Ζ.

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a The text is probably corrupt; for the sense cf. 729 a 6 ff.
b Ch. 16.
for by that time the division would be made as it were from a new plant or animal, not of semen.\textsuperscript{a}

Further, transplanted cuttings bear seed—derived, of course, from themselves: which is proof positive that the fruit they bore before they were transplanted was derived from that identical amount of the plant which is now the cutting, and that the seed was not drawn from the whole of the plant.

The weightiest proof of all, however, we have sufficiently established by our observations of Insects. Perhaps not in all Insects, but certainly in most, during copulation the female extends a part of itself into the male [so, as we said earlier,\textsuperscript{b} this is actually the way in which they effect copulation]: the females can be seen inserting something into the males upwards from below. This does not apply to all Insects, but to most of those which have been observed. Hence surely it is clear that even in the case of those males which discharge semen generation is not caused by the semen’s being drawn from the whole of the body, but it is brought about in some other way, which we must consider later on. And indeed, if it were really true that the semen is drawn from the whole body, as these people say, there would still be no call for them to assert that it is drawn from all the parts; they need only say it is drawn from the creative part which does the fashioning—from the artificer, in other words, not from the material which he fashions. As it is, they talk as though even the shoes which the parent wears were included among the sources from which the semen is drawn, for on the whole a son who resembles his father wears shoes that resemble his.

It is true that there is intense pleasure in sexual
τῶν ἀφροδισίων, οὐ τὸ ἀπὸ παντὸς ἀπιέναι αὐτίων,
35 ἀλλ’ ότι κυνηγός ἐστιν ἱσχυρός· διὸ καὶ εἰ πολλάκις
συμβαίνει ἡ ὁμιλία αὐτή, ἢττον γίνεται τὸ χαίρειν
toῖς πλησιάζουσιν. ἔτι πρὸς τῷ τέλει ἡ χαρά· ἐδει
dὲ ἐν ἐκάστῳ τῶν μορίων, καὶ μὴ ἄμα, ἀλλ’ ἐν
μὲν τοῖς πρότερον ἐν δὲ τοῖς ύστερον.
Τοῦ δ’ ἐκ κολοβῶν γίνεσθαι κολοβὰ ἡ αὐτὴ αὐτία
5 καὶ διὰ τὶ ὁμοία τοῖς γονέωσιν. γίνεται δὲ καὶ οὗ
koloβα ἐκ κολοβῶν, ὡσπερ καὶ ἀνόμωσα τοῖς τε-
κνώσασιν· περὶ δὲν ύστερον τὴν αἰτίαν θεωρητέοιν·
tὸ γὰρ πρόβλημα τοῦτ’ ἐκείνοις ταύτων ἐστὶν.

'Ετι εἰ τὸ θῆλυ μη ἥντεται σπέρμα, τοῦ αὐτοῦ
λόγου μηδ’ ἀπὸ παντὸς ἀπιέναι. κἂν εἰ μὴ ἀπὸ
10 παντὸς ἀπέρχεται, οὐθὲν ἀλογοῦ τὸ μηδ’ ἀπὸ τοῦ
θῆλεος, ἀλλ’ ἄλλον τινὰ τρόπον αὐτίων εἶναι τὸ
θῆλυ τῆς γενέσεως. περὶ οὖ δὴ ἐχόμενον ἐστὶν
ἐπισκέψασθαι, ἐπειδὴ φανερὸν ὅτι οὐκ ἀπὸ πάντων
ἀποκρίνεται τὸ σπέρμα τῶν μορίων.

Ἀρχῇ δὲ καὶ ταύτης τῆς σκέψεως καὶ τῶν ἐπο-
15 μένων πρῶτον λαβεῖν περὶ σπέρματος τί ἐστιν·
οὕτω γὰρ καὶ περὶ τῶν ἐργῶν αὐτοῦ καὶ τῶν περὶ
αὐτὸ συμβαινόντων ἰσται μᾶλλον εὐθεώρητον. βοῦ-
λεταὶ δὲ τοιούτων τὴν φύσιν εἶναι τὸ σπέρμα, ἔξ
intercourse. The cause of this however is not that the semen is drawn from the whole body, but that there is violent stimulation; and that of course is why those who indulge often in such intercourse derive less pleasure from it. Moreover, the pleasure in fact comes at the end, but according to the theory it should occur (a) in every one of the parts, and (b) not simultaneously, but earlier in some and later in others.

As for mutilated offspring being produced by mutilated parents, the cause is the same as that which makes offspring resemble their parents. And anyway, not all offspring of mutilated parents are mutilated, any more than all offspring resemble their parents. The cause of these things we must consider later \(^a\); the problem in both cases is the same.

Moreover, if the female does not discharge any semen, then it is consistent to say that the semen is not drawn from the whole body either; or again, if it is not drawn from the whole body, there is nothing inconsistent in saying that it is not drawn from the female either, \(^b\) but that the female is responsible for generation in some other way than this. This, in fact, will be the next subject for us to investigate, now that it is clear that the semen is not secreted from all the parts of the body.

We must begin this investigation and those which are to follow by discovering first of all what semen is; this will enable us to consider more easily its functions and everything connected with it. Now the aim of semen is to be, in its nature, the sort of stuff from which the things that take their rise in the realm

\(^a\) Bk. IV, chh. 3 f.
\(^b\) Cf. 721 b 10.
With this definition, cf. 716 a 7 ff., 721 b 6, and Phys. 190 b 3-5.—At this point in the Greek text there follow some unintelligible phrases which I have omitted from the translation. The version of them given in the ed. princeps differs considerably from that in the Berlin edition, and they may be fragments of some annotation upon the definition (founded perhaps on some such passage as 765 b 12, 13 (q.v.) or, more probably, on ll. 724 b 2-4, where cf. note and reference to Physics; ἀνθρώπος is there used as an illustration and there may have been a similar illustration here, which has been corrupted). Actually any addition to the definition, as apart from an illustration of it, at this point is inappropriate, as Aristotle is here giving the simplest and basic definition, from which he builds up his final definition; this
of Nature are originally formed. There are, however, numerous senses in which one thing is formed or comes into being "from" another: (1) as we say "from day comes night," and "from boy comes man," meaning that the one comes after the other; (2) as a statue is formed from bronze, or a bedstead from wood, and all those cases where we describe things as being formed from some material; here the finished whole has been fashioned into a certain shape from something which was there to begin with; (3) as a person may become uncultured from being cultured or ailing from healthy, i.e., all cases of a contrary coming from its contrary; (4) as in a "cumulative" passage in Epicharmus: e.g., from slander comes abuse, from abuse a fight; in all these cases "from so-and-so" means that so-and-so is the source of the movement, and in some instances is also abundantly clear from the argument which immediately follows.

Cf. the similar discussion, with some of the same examples, on the meaning of "from" in Met. 1023 a 26 ff.; also Phys. 190 a 22 ff.

Epicharmus of Sicily (Aristot. Poet. 1448 a 33) was the chief Dorian comic poet. Aristotle may have in mind a passage of his similar to that quoted by Athenaeus (ii. 36 c, d), and Suidas, which G. Kaibel (Comicorum Graecorum Fragmenta, I. i. p. 118) prints as follows, with the Doric vowels restored and with the emendations of various scholars:

A. ἐκ μὲν θυσίας θοῖνα, ἐκ δὲ θοίνας πόσις, ἐγένετο. B. χαρίεν, ὡς γ' ἐμίν ἰδοκεί. A. ἐκ δὲ πόσιος μῶκος, ἐκ μῶκου δ' ἐγένεθ' υανία, ἐκ δ' υανίας ἰδίκα . . . ἐκ ἰδίκας δ' κατα'δίκα, ἐκ δ' καταδίκας πέδαι τε καὶ σφαλὸς καὶ ζαμία.


i.e., the "Efficient" or "Motive" Cause.
Τὸ δὲ σπέρμα φανερὸν ὅτι δυοῖν τούτοις ἐν θατέρῳ ἑστιν. ἦ γὰρ ὡς ἐξ υλῆς αὐτοῦ ἦ ὡς ἐκ πρώτου κινήσαντός ἑστι τὸ γνώμενον. οὐ γὰρ δὴ ὡς τὸδε μετὰ τὸδε, οἶον ἐκ τῶν Παναθηναίων ὁ πλοῦς, οὐδὲ ὡς ἐξ ἐναντίου φθειρομένου τε γὰρ γίγνεται τὸ ἐναντίον ἐκ τοῦ ἐναντίου, καὶ ἐτερὸν τι δεὶ ὑποκείσαται ἐξ οὗ ἑσται πρῶτον ἐνυπάρχοντος. τοῖν 5 δυοῖν δὴ ληπτέον ἐν ποτέρῳ θετέον τὸ σπέρμα, πότερον ὡς υλὴν καὶ πάσχον ἦ ὡς εἰδός τι καὶ ποιοῦν, ἢ καὶ ἄμφω. ἀμα γὰρ ἵνας δῆλον ἑσται καὶ πῶς ἦ ἐξ ἐναντίων γένεσις ὑπάρχει πάσι τοῖς ἐκ τοῦ σπέρματος: φυσικὴ γὰρ καὶ ἢ ἐκ τῶν ἐναντίων γένεσις· τὰ μὲν γὰρ ἐξ ἐναντίων γίγνεται,

10 ἄρρενός καὶ θῆλεος, τὰ δὲ ἐξ ἐνὸς μόνου, οἶον τὰ τε φυτὰ καὶ τῶν ζῴων ἐνία, ἐν ὦς ὥσις μή ἑστὶ διωρισμένον τὸ ἄρρεν καὶ τὸ θῆλυ χωρίς.

* Cf. the discussion on the meaning of γίγνεσθαι and γίγνεσθαι ἐκ τῶν in Phys. 190 a 5 ff. These contraries are merely attributes of something else, something which has being (οὐσία), is a concrete existing thing, and is the “substrate”: καὶ γὰρ ποσόν καὶ ποιοῦ … γίγνεται ὑποκείμενον τῶν ὅς (190 a 35). If we say that a man “becomes” cultured “from” being uncultured, it is “man” that persists through-

1 η Ζ: om. vulg.
of this sort the source of the movement is within the things themselves, as in the ones just quoted (where slander is actually one part of the whole to-do); in others it is external to them; e.g., craftsmanship of every kind is external to the works which the craftsman produces, and the torch is external to the house which is set on fire.

Now it is clear that the case of semen falls under one or other of these two senses: the offspring is formed "from" it either (a) as "from" material, or (b) as "from" a prime mover (a source of movement). It is definitely not an instance of (1) above, where "from" means "after," e.g., "from the Panathenaean festival comes the sea-voyage"; nor of (3), i.e., of coming into being "from" a contrary; for the one contrary is destroyed as the other comes into being from it, and so there must be present besides them some primary substrate, from which the new contrary is to come into being. Thus we now have to discover in which of the two classes semen is to be placed: Is it to be regarded as matter, i.e., as something which is acted upon, or as a form, i.e., as something which acts of itself—or even as both? for perhaps at the same time it will also be clear in what way formation from contraries has its place in all things that arise from semen. (After all, formation from contraries as well as the other methods of formation is found in nature; some animals are formed from contraries—male and female, though some are formed from one parent only, as are plants and certain of the animals in which there is no definite separation of male and female.)

out the change. Clearly, says Aristotle, this is not the meaning of γίγνεσθαι required here.
The following paragraphs seem to be an interpolation. They interrupt the argument; further definitions are here inappropriate, and one of those here given is incorrect. Besides, Aristotle does not in the Generation of Animals make the distinction between γονή and σπέρμα. These definitions seem to have been put in here because the following passage contains some definitions.
[Seminal fluid is the name given to that which comes from the generating parent, in the case of those animals whose nature it is to copulate, and it is that in which a generative principle is first found. Semen (seed) is the name given to that which contains the principles derived from both the parents which have copulated, as in the case of the plants and certain animals in which male and female are not separate, like the first mixture which is formed from the male and female, being as it were a sort of fetation or egg—for these objects too already contain that which comes from both parents.

Semen (seed) and fruit differ by the "prior and posterior": fruit (is posterior) in that it is derived from something else, whereas seed (is prior) in that something else is derived from it, since in fact they are both one and the same thing.

We must now resume and state what is the primary nature of semen, as it is called.

Now every substance, whatever it may be, that we find in the body, must of necessity be one of the following: (1) one of the parts which are there in accordance with nature, in which case it will be one of the uniform or non-uniform parts; (2) one which is there contrary to nature, e.g., a tumour; (3) residue; (4) colliquescence; (5) nourishment. By residue I mean that which is left over as surplus from the nourishment; by colliquescence that which is given off as an abscission from the material that

\[ a \]
\[ b \]
\[ c \]
\[ d \]
\[ e \]

The meaning of these terms is discussed in Met. 1018 b 9 ff.

See Introd. §§ 65 ff.

See Introd. § 67: also 725 a 27 ff. and De somno et vig. 456 b 34 ff.

See Introd. § 67.
And therefore would have to be reckoned as one of the uniform parts.

b Viz., the non-uniform parts, for the construction of which the uniform parts act as the "material."

c This may mean that it is not present continuously as such, but has to be "concocted" and "collected" on each occasion for which it is required: see 717 b 25.

d See Introd. § 12 and 737 a 26, n.

e e.g., Hippocrates, π. γονής 1 (vii. 470 Littré), where this statement occurs. Aristotle’s equation of this view with the belief that semen is a σύντηγμα is hardly fair, in face of the context, q.v. Compare, e.g., the statement η δε γονή...
supplies growth, as the result of decomposition proceeding contrary to nature. Now it is clear that semen cannot possibly be (1) one of the parts; since although it is uniform, it does not serve as the material out of which any other parts are composed, as sinew and flesh do; nor again is it separate and distinct, whereas all the other parts are. Nor (2) is it something contrary to nature, or a deformation, (a) because it is present in every single individual, and (b) because the natural organism develops out of it. As for (5) nourishment, obviously this is introduced into the body from without. It must therefore be either (4) a colliquescence or (3) a residue. The early thinkers appear to have supposed it was a colliquescence, because to say that it is drawn from the whole body in virtue of the heat which the movement produces; is equivalent to saying that the semen is a colliquescence. But colliquescence belongs to the class of things that are contrary to nature, and from such things nothing that is in accordance with nature is ever formed. Therefore the semen must of necessity be a residue. Very well. Every residue results either from useful or from useless nourishment. By “useless nourishment” I mean that which contributes nothing further to the natural organism and which if too much of it is consumed causes very great injury to the organism; “useful nourishment” is the opposite of this. It is obvious that semen cannot be a residue resulting from useless nourishment, for while residue of that sort is found in

έρχεται ἀπὸ παντὸς τοῦ ὑγροῦ τοῦ ἐν τῷ σώματι έόντος τῷ ἴχυρότατον ἀποκριθέν τούτου δὲ ἱστόριον τόδε, ὅτι ἀποκρίνεται τῷ ἴχυρότατον, ὅτι ἐπὶν λαγνεύσωμεν σμικρὸν οὕτω μεθέντες, ἀφεδενὲς γνώμεθα with Aristotle’s own statement at 7:25 b 6-8.
γὰρ κάκιστα διακειμένοις δι’ ἡλικίαν ἡ νόσον πλεῖστον ἐνυπάρχει
d’ τοιοῦτον, σπέρμα δὲ ἡκιστα· ἡ γὰρ ὅλως οὐκ ἔχουσιν ἡ οὐ γόνιμον διὰ τὸ μί·
10 γνυσθαί ἀχρηστον περίττωμα καὶ νοσηματικόν.
Χρησίμου ᾧρα περιπτώματος μέρος τί ἐστὶ τὸ σπέρμα. χρησιμωτατον δὲ τὸ ἔσχατον καὶ ἔξ οὐ ἦδη γίνεται ἐκαστον τῶν μορίων. ἐστὶ γὰρ τὸ μὲν πρότερον τὸ δ’ ὑστερον. τῆς μὲν οὖν πρώτης
15 τροφῆς περίττωμα φλέγμα καὶ εἰ τὶ ἀλλο τοιοῦτον· καὶ γὰρ τὸ φλέγμα τῆς χρησίμου τροφῆς περίττωμα ἐστὶν· σημείον δ’ ὅτι μηγνύμενον τροφῇ καθαρὰ τρέφει καὶ πονοῦσι καταναλίσκεται. τὸ δὲ τελευταῖον ἐκ πλείστης τροφῆς ὀλίγωστον.3 ἐννοεῖν δὲ δεὶ ὅτι μικρῷ αὐξάνεται τὰ ζῶα καὶ τὰ φυτὰ
20 τῶ4 καθ’ ἡμέραν: παμμικροῦ5 γὰρ ᾧν προστιθεμένου τῶ αὐτῶ6 ὑπερεβάλλε7 τὸ μέγεθος.
Τοῦναντίον ᾧρα ἡ οἱ ἄρχαιοι ἐλεγον λεκτέον. οἱ μὲν γὰρ τὸ ἀπὸ παντὸς ἀπίον, ἡμεῖς δὲ τὸ πρὸς ἄπαν ἴναι πεφυκὸς σπέρμα ἔροῦμεν, καὶ οἱ μὲν σύντηγμα, φαίνεται δὲ περίττωμα μᾶλλον. εὐ·
25 λογότερον γὰρ ὁμοίον ἐνίαι τὸ προσιόν ἔσχατον καὶ τὸ περιττὸν γινόμενον τοῦ τοιοῦτον, οἰον τοῖς γραφεύσι τοῦ ἀνδρεικέλου τολλάκις περιγίνεται

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1 νόσον ἡ ἐξιν Ὁ.
2 ἐνυπάρχει ΡΖ: ὑπάρχει vulg.
3 γίγνεται add. ΡΖ*.
4 τῶ PY: τὸ vulg.
6 τῶ αὐτῶ Platt: τοῦ αὐτοῦ vulg.
7 ὑπερεβάλλε PY: ὑπερβάλλε vulg.: ὑπερβαλλοι Platt.

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1 See Introd. § 66.  
2 Cf. 728 a 31. n.  
3 Cf. 765 b 29 ff.  
4 Because it is the concocted residue of blood, the “ultimate nourishment” distributed to all the parts of the body.  
5 80
considerable quantities in those who through age or disease are in a very bad state of health, the same is not true of semen; such persons either have none at all, or if they have, it is infertile because of the useless and diseased residue that gets mixed with it.

Hence, semen is part of a useful residue; and the most useful of the residues is that which is produced last, that from which each of the parts of the body is directly formed. I said “last,” for of course some of the residues are produced earlier, some later. Nourishment in its first stage yields as its residue *phlegma* and any other such stuff. Yes, *phlegma* too is a residue from the useful nourishment, as is shown by the fact that when it is mixed with pure nourishment it nourishes the body, and that the body consumes it in cases of disease. The residue which comes last, however, is very small in bulk though the nourishment which yields it is very large; but we must bear in mind that it requires very little to supply the growth of animals and plants from day to day, since the continual addition of a very small amount to the same thing would make its size excessive.

Our own statement therefore must be the opposite of what the early people said. They said the semen is that which was drawn from the whole of the body; we are going to say the semen is that whose nature it is to be distributed to the whole of the body. And whereas they said it was a colliquescence, we see it is more correct to call it a residue. After all, it is more reasonable to suppose that the surplus residue of the final nourishment which is distributed all over the body resembles that nourishment, just as (to take a common instance) the paint left over on an artist's
ομοιον τω ἀναλωθέντι. συντηκόμενον δὲ φθείρεται πάν καὶ εξίσταται τῆς φύσεως. τεκμηρίων δὲ τοῦ μὴ σύντηγμα εἶναι ἀλλὰ περίπτωμα μᾶλλον, τὸ 30 τὰ μεγάλα τῶν ζώων ὀλυγοτόκα εἶναι, τὰ δὲ μικρὰ πολύγονα. σύντηγμα μὲν γὰρ πλέον ἀναγκαῖον εἶναι τοῖς μεγάλοις, περίπτωμα δὲ ἑλαττον εἰς γὰρ τὸ σῶμα μέγα ἄν ἀναλίσκεται τὸ πλεῖότου τῆς τροφῆς, ὥστε ὄλγον γίνεται τὸ περίπτωμα. ἐτι τόπος συντηγματὶ μὲν οὕθεις ἀποδέδοται κατὰ 35 φύσιν, ἀλλὰ ἰδὶ ὅπου ἂν εὐδοκήσῃ τοῦ σώματος, τοῖς δὲ κατὰ φύσιν περιττώμασι πᾶσιν, οἷον τῆς τροφῆς τῆς ἔκφασις ἢ κατὰ κούλλα καὶ τῆς ὑγρᾶς ἢ κύστις καὶ τῆς χρησίμης ἢ ἄνω κούλλα, καὶ τοῖς σπερματικοῖς¹ υστέρα καὶ αἴδοια καὶ μαστοὶ· εἰς τούτους γὰρ ἀθροίζεται καὶ συρρεῖ. καὶ μαρτύρια 5 τὰ συμβαίνοντα ὅτι τὸ εἰρημένον σπέρμα ἐστὶ· ταῦτα δὲ συμβαίνει διὰ τὸ τὴν φύσιν εἶναι τοῦ περιττώματος τουαύτην². ἢ τε γὰρ ἐκλυσίς ἐλαχίστου ἀπελθόντος τούτου γίνεται επίθηλος, ὡς στερισκόμενα τὰ σώματα τοῦ ἐκ τῆς τροφῆς γινομένου τέλος. (οἶλος δὲ τισιν ἐν μικρῷ χρόνῳ 10 κατὰ τὰς ἡλικίας κοινίζει τοῦτον ἀπίον, ὅταν πλεονάση, καθάπερ ἡ πρώτῃ τροφῇ, ἂν ὑπερβάλη τῷ πλήθει· καὶ γὰρ ταύτης ἀπιόυσης τὰ σώματ' εὐ-

1 τοίς σπερματικοῖς PSZ: τῆς σπερματικῆς vulg.
2 ὅτι... τουαύτην fortasse secludenda (A.-W.), vel ὅτι τὸ σπέρμα περίπτωμά ἐστὶ̣ χρῆσιμον scribendum; vertit Σ et accidentia quae accurdiunt testificantur quod sperma est superfluum quo indigetur ad iuvamentum.

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a For εξίστασθαι τῆς φύσεως, see 768 a 2, n.
b i.e., the large intestine.
c i.e., the small intestine.
palette resembles that which he has actually used; whereas everything that undergoes colliquescence gets destroyed and departs from its proper nature. Here is a piece of evidence to show that semen is not a colliquescence but a residue: the large animals produce but few young, while the small ones are prolific. Now in the large animals there must of necessity be more colliquescence and less residue, because most of the nourishment is used up to maintain the large bulk of their body, so that but little residue is produced. Further, no place has been assigned by Nature for colliquescence, but it runs about in the body wherever it can find a clear way for itself; whereas there is a proper place for all the natural residues—e.g., the lower intestine is set apart for the residue from the solid nourishment, the bladder for that from the fluid, the upper intestine for that from the useful nourishment, the uterus, pudenda, and breasts for the seminal residues—they run into these places and collect there. As evidence of the truth of our statement about what semen is we can quote the actual facts, facts which directly result from this residue's being of the nature described by us. Thus (1) though only a very small quantity of semen be emitted, the exhaustion which follows is quite conspicuous, which suggests that the body is being deprived of the final product formed out of the nourishment. (There are, I know, a few who for a short period during the heat of youth derive relief from the emission of the semen when it is superabundant. The same is true also of nourishment in its first stage, if there is an excessive quantity of it;

\[d\] Cf. Hippocrates, \(\tau . \, \gamma νης\) 1 (vii. 470 Littré), quoted in note on 725 a 1.
ημερεῖ μᾶλλον. ἐτὶ ὅταν συναπτὴ ἄλλα περιττῶ- 
ματα· οὐ γὰρ μόνον σπέρμα τὸ ἀπιόν, ἄλλα καὶ ἔτεραι μεμιγμέναι δύναμεις τούτω̂ς συναπέρχονται,
15 αὖταὶ δὲ νασώδεις, διὸ ἐνίων γε καὶ ἄγονόν ποτε 
γίνεται τὸ ἀποχωροῦν διὰ τὸ ὄλγον ἑχειν τὸ σπερ-
ματικὸν. ἄλλα τοῖς πλείστοις καὶ ως ἐπὶ τὸ πολὺ 
eἰπεῖν συμβαίνει ἐκ τῶν ἄφροδισιασμῶν ἐκλύσιος 
καὶ ἀδυναμία μᾶλλον διὰ τὴν εἰρημένην αἰτίαν.)
ἐτὶ οὐκ ἐνυπάρχει σπέρμα οὔτ' ἐν τῇ πρώτῃ ἡλικίᾳ 
20 οὔτ' ἐν τῷ γῆρα εὐτ' ἐν ταῖς ἀρρωστίαις, ἐν μὲν 
tῷ κάμνειν διὰ τὴν ἀδυναμίαν, ἐν δὲ τῷ γῆρᾳ διὰ 
tὸ μὴ πέπτειν τὸ ἱκανὸν τὴν φύσιν, νέοις δ' οὐδὲ 
diὰ τὴν αὐξησίν· φθάνει γὰρ ἀναλυσκόμενον πάν 
en ἐτεσί γὰρ πέντε σχεδὸν ἐπὶ γε τῶν ἀνθρώπων 
ἡμισὶ λαμβάνειν δοκεῖ τὸ σῶμα τοῦ μεγέθους τοῦ 
25 ἐν τῷ ἀλλῷ χρόνῳ γιγνόμενον ἄπαντος.

Πολλοῖς δὲ συμβαίνει καὶ ξάφοις καὶ φυτοῖς καὶ 
γένεσι πρῶς γένη διαφορὰ περὶ ταῦτα κἀγὼ 
tῷ γένει τῷ αὐτῷ τοῖς ὀμοειδέσι πρὸς ἄλληλα, οἶον ἀνθρώπω 
πρὸς ἀνθρώπων καὶ ἀμπέλων πρὸς ἀμπέλον. τὰ 
μὲν γὰρ πολύσερμα τὰ δ' ὀλιγόσερμα ἐστὶ, τὰ 
30 δ' ἀσπέρμα πάμπταν, οὐ δὲ ἀσθενεῖαν, ἀλλ' ἐνίοις 
γε διὰ πολύνατιν· καταναλίσκεται γὰρ εἰς τὸ σῶμα, 
οἶον τῶν ἀνθρώπων ἐνίοις· εὔεκτικοὶ γὰρ ὄντες καὶ 
γινόμενοι πολύσερμοι ἡ πιστείς μᾶλλον ἤττον 
προίειναι σπέρμα καὶ ἤττον ἐπιθυμοῦσι τοῦ ἀφ-

1 τούτω Platt: τούτοις vulg. 2 διὰ ΕΖ: om. vulg.

a i.e., of nourishment. b Or, muscle.
the body is more comfortable for having got rid of it. Relief is obtained too when other residues are got rid of in company with the semen: in such cases what is emitted is not merely semen, but there are other substances which come away at the same time mixed up with it, and these are morbid. This explains why at certain times with some persons the emission is infertile: it contains so small an amount of actual semen. However, speaking generally for the majority of men, the sequel to sexual intercourse is exhaustion and weakness rather than relief, and the cause is as I have described.) Besides (2), semen is absent during childhood, old age, and infirmity; absent during infirmity on account of the weakness of the body, during old age because the organism does not concoct a sufficient amount; during childhood because the body is growing, and the concocted matter is all used up so soon that there is none left over: it is usually held that in about five years human beings, at any rate, grow to one-half of the complete size that they will attain in the rest of their lifetime.

In respect of semen we find that with many animals and plants one group differs from another group, and even within one and the same group individuals of the same kind differ from each other, e.g., one man from another, and one grape-vine from another. Some individuals have much semen, some little, some none at all; and this is not due to any bodily weakness, but in some cases, at any rate, it is due to the opposite: the available supply gets used up to benefit the body; as an example of this we have men in sound health putting on rather a lot of flesh and getting a bit fat: these emit less semen and have less desire for sexual intercourse than is normal. A
ροδισιάζειν. ὁμοιον δὲ καὶ τὸ περὶ τὰς τραγωδίας
35 ἀμπέλους πάθος, αἱ δὲ τὴν τροφὴν ἐξυβρίζουσιν
(ἐπεὶ καὶ οἱ τράγοι πίνουν ὄντες ἤττον ὀχεύοντων,
διὸ καὶ προλεπτύνουσιν αὐτούς· καὶ τὰς ἀμπέλους
τραγάν ἀπὸ τοῦ πάθους τῶν τράγων καλοῦσιν).
καὶ οἱ πίνουσι δὲ ἀγονώτεροι φαίνονται εἰναι τῶν
μὴ πίνων, καὶ γυναῖκες καὶ ἄνδρες, διὰ τὸ τοῖς
5 εὖτραφέσι πεπτόμενον τὸ περίττωμα γίνεσθαι πι-
μελήν. ἐστὶ γὰρ καὶ ἡ πιμελή περίττωμα, δι᾽
eὐβοσίαν ὑγιεινὸν.

"Ενα δ’ οὖν ὁδὲ φέρει σπέρμα, οὗν ἵτεα καὶ
αἰγεῖρος. εἰσὶ μὲν ὅπεν ἐκάτεροι αἰτίαι1 τούτον
τοῦ πάθους. καὶ γὰρ δι’ ἀδυναμίαν οὐ πέττουσι
καὶ διὰ δύναμιν ἀναλίσκουσιν, ὃσπερ εἰρηται.

10 ὁμοίως δὲ καὶ πολύχοα2 ἐστὶ καὶ πολύσπερμα3 τὰ
μὲν διὰ δύναμιν τὰ δὲ δι’ ἀδυναμίαν. πολὺ γὰρ καὶ
ἀχρητὸν περίττωμα συμμίγνυται, ὡστ’ ἐνίοις γι-
γνεσθαι καὶ ἀρρώστημα, ὅταν αὐτῶν μὴ εὐδόδησι
ἡ ἀποκάθαρσις. καὶ ἐνοῦ μὲν ὑγιάζονται, οἱ δὲ
cαὶ ἀναιροῦνται. συντήκονται γὰρ ταύτῃ ὃσπερ

15 καὶ εἰς τὸ ὀδρον. ἥδη γὰρ καὶ τοῦτ' ἀσθένημα
συνέβη τισίν.

4["Ετι ὁ πόρος ὁ αὐτὸς τῷ περιττῶματι καὶ τῷ
σπέρματι καὶ ὅσοις μὲν ἀμφοῦν γίγνεται περιτ-

1 ἐκατεροι αἰτίαι scripsi, post A.-W., qui αἰτίαι ἐκατεροι:
aitiae kai etereai P, kai etereai aitiae vulg. (aliae Σ).
2 πολυχοα PSY.
3 καὶ πολύσπερμα fort. secl.
4 vv. 16-25 seclusit Platt; 725 b 25—726 a 15 seclusit Sus.

a The former part of this interpolation seems to belong to
the interpolation connected with chh. 12 and 13 (cf. 719
similar phenomenon is that of grape-vines which "go goaty," rampaging all over the place because they are getting too much nourishment. (The reason for the phrase "go goaty" is that they behave just like he-goats, which when they get fat indulge less in copulation, and incidentally this explains why goats are made to slim before the breeding season comes on.) And further it seems that fat people, men and women alike, are less fertile than those who are not fat, the reason being that when the body is too well fed, the effect of concoction upon the residue is to turn it into fat (since fat also is one of the residues, a healthy one, because it results from good living).

Some living things actually produce no semen at all: examples are the willow and the poplar. Both reasons together are responsible for this state of affairs; in other words, on account of their weakness the trees cannot concoct their nourishment, and on account of their strength they use it all up, as described above. Similarly, some animals are prolific and have abundance of semen because they are strong, but others because they are weak; the explanation being that in the latter case much useless residue gets mixed up with the semen, and in some instances, when there is no clear way open by which the evacuated matter may leave, it actually produces disease, from which some recover though others succumb. Their semen is contaminated by the colliquescences which get into it, just as they do into the urine—another malady by no means unknown.

a [Further, the same passage serves both for the residue and for the semen: (a) in those animals which b 29 ff.]; the latter part refers to the subjects discussed in 725 a—726 a.
726a

tωμα, καὶ τῆς ύγρᾶς καὶ τῆς ξηρᾶς τροφῆς, ἤπερ ἡ τοῦ ύγροῦ, ταύτη καὶ ἡ τῆς γονῆς γίνεται ἀπόκρυσις (ὑγροῦ γὰρ περίττωμα ἔστιν· ἢ γὰρ τροφῆ πάντων ύγρὰ μᾶλλον), οἷς ὑπὲρ τὴν τῆς ξηρᾶς ὑποστάσεως ἀποχώρησιν. ἔτι ἡ μὲν σύντηξις ἢ ποσῶδης, ἢ δὲ τοῦ περιττῷ-

ματος ἀφαίρεσις ωφέλιμος· ἢ δὲ τοῦ σπέρματος ἀποχώρησις ἀμφωτέρων1 διὰ τὸ προσλαμβάνειν τῆς μὴ χρησίμου τροφῆς. εἰ δὲ γ’ ἴν σύντηξις, 25 ἤει ἐβλάπτεν ἀν’ νῦν ὅ’ οὐ ποιεῖ τοῦτο.]

"Οτι μὲν οὖν περίττωμα ἐστι τὸ σπέρμα χρη-

σίμου τροφῆς καὶ τῆς ἐσχάτης, εἴτε πάντα προῖται σπέρμα εἴτε μή, ἐν τοῖς προειρημένοις φανερῶν.

XIX Μετὰ δὲ ταύτα διωριστέον περίττωμα τε ποίας

30 τροφῆς, καὶ περὶ καταμηνύων· γίνεται γὰρ τις καταμήνια τῶν ωτοτόκων. διὰ τούτων γὰρ φα-

νερῶν ἔσται καὶ περὶ τοῦ θῆλεος, πότερον προῖται σπέρμα ὁποῖον τὸ ἀρρέν καὶ ἐστιν ἐν2 μίγμα το

γινόμενον ἐκ δυοῦν σπερμάτων, ἢ οὐθὲν σπέρμα ἀποκρίνεται ἀπὸ τοῦ θῆλεος· καὶ εἰ μηθὲν, πότερον

35 οὐδὲ ἄλλο οὐθὲν συμβάλλεται εἰς τὴν γένεσιν ἄλλα 

μόνον παρέχει τόπον, ἢ συμβάλλεται τι, καὶ τοῦτο πῶς καὶ τίνα τρόπον.

"Οτι μὲν οὖν ἐστιν ἐσχατή τροφὴ τὸ αἷμα τοῖς

1 haec non sana; Aldus habet ἢ ποσῶδης, ἢ δὲ τοῦ σπέρ-

ματος ἀποχώρησις ωφέλιμος διὰ τὸ προσλαμβ. κτλ.

2 ἐν om. ΡΖΣ.

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a See P. A. 650 a 34, 651 a 15, 678 a 8 ff.; it has been implied throughout the discussion in the preceding chapter (ch. 18).

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produce residue both from the fluid nourishment and
from the solid, the semen is discharged by the same
exit as the fluid residue, because it is itself a residue
from a fluid, the nourishment of all animals tending
to be fluid rather than solid; (b) in those animals
which produce no fluid residue, the semen leaves by
the same way as the solid excrement. Further,
colliquescence is always morbid, whereas the removal
of residue is beneficial; and the discharge of semen
has both characteristics because it includes some of
the useless nourishment. If it were just a colliques-
cence, it would always be injurious, whereas in fact
it is not so.

To conclude: the foregoing discussion makes it
clear that, whether all animals discharge semen or
not, semen is a residue derived from useful nourish-
ment, and not only that, but from useful nourishment
in its final form.

Our next task is to determine what is the character XIX
of the nourishment from which this residue is derived;
and we must discuss the menstrual discharge as well,
because this occurs in some of the Vivipara. By this
means we shall be able to give a clear answer to
the following questions: Does the female discharge
semen as the male does, which would mean that the
object formed is a single mixture produced from
two semens; or is there no discharge of semen from
the female? And if there is none, then does the
female contribute nothing whatever to generation,
merely providing a place where generation may
happen; or does it contribute something else, and if
so, how and in what manner does it do so?

We have said before a that in blooded animals
blood is the final form of the nourishment, and in

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a Footnote: [187]
ἐναίμοις, τοῖς δ’ ἀναίμοις τὸ ἀνάλογον, εὑρήσατι πρῶτερον. ἐπεὶ δὲ καὶ ἡ γονὴ περίττωμα ἐστὶ τροφῆς καὶ τῆς ἐσχάτης, ἦτοι αἴμα ἣν εἴη ἡ τὸ 5 ἀνάλογον ἢ ἐκ τούτων τι. ἐπεὶ δ’ ἐκ τοῦ αἴματος πεττομένου καὶ μεριζομένου ποις γίνεται τῶν μορίων ἐκαστον, τὸ δὲ σπέρμα πεθέν μὲν ἁλλοτέρων ἀποκρίνεται τοῦ αἴματος, ἀπέπτων δ’ ὄν, καὶ ὅταν τις προσβιάζηται πλεονάκις χρώμενος τῷ ἁφροδισιάζειν, εἴνοις αἴματῶδες ἦδη προελή- 10 λυθεῖ, φανερὸν ὅτι τῆς αἴματικής ἃν εἴη περίττωμα τροφῆς τὸ σπέρμα, τῆς εἰς τὰ μέρη διαδιδομένης τελευταίας. καὶ διὰ τοῦτο μεγάλην ἐχει δύναμιν— καὶ γὰρ ἡ τοῦ καθαροῦ καὶ υγιεινοῦ αἵματος ἀπο- χώρησις ἐκλυτικόν—καὶ τὸ ὄμοια γίγνεσθαι τὰ ἐκγόνα τοῖς γεννήσασιν εὐλογοῦν ὤμοιον γὰρ τὸ 15 προσελθὼν πρὸς τὰ μέρη τῷ ὑπολειφθέντι. ὡστε τὸ σπέρμα ἐστὶ τὸ τῆς χειρὸς ἡ τὸ τοῦ προσώπου ἡ ὅλου τοῦ ζώου ἀδιορίστως χειρ ἡ πρόσωπων ἡ ὅλον ζῷον· καὶ οἶν ἐκεῖνων ἐκαστον ἐνεργεία, τοιοῦτον τὸ σπέρμα δυνάμει, ἣ κατὰ τὸν ὄγκον τὸν ἑαυτοῦ, ἢ ἔχει 1 τινὰ δύναμιν ἐν ἑαυτῷ (τούτο γὰρ 20 οὕτω δῆλον ἡμῖν ἐκ τῶν διωρισμένων, πότερον τὸ

1 ἔχων Α.-W.

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a See Introd. § 18.  
 b Cf. P.A. 678 a 8 ff.  
 c Dynamis: see below, b 19.  
 d And concocted into semen. Cf. also 725 a 25 ff.  
 e Introd. § 36.  
 f See Introd. §§ 26 ff. This is an important passage for the meaning of dynamis in this particular connexion. Cf. 727 b 14, and ch. 21.
bloodless animals the analogous substance. And since semen also is a residue from nourishment—from nourishment in its final form, surely it follows that semen will be either blood or the analogous substance, or something formed out of these. Now every one of the parts is formed out of the blood as it becomes concocted and in some way divided up into portions; and though semen which has been concocted is by the time of its secretion from it considerably different in character from blood, yet unconcocted semen, and semen emitted under strain due to excessively frequent intercourse, has been known in some cases to have a bloodlike appearance when discharged; and this shows that semen is pretty certainly a residue from that nourishment which is in the form of blood and which, as being the final form of nourishment, is distributed to the various parts of the body. This, of course, is the reason why semen has great potency—the loss of it from the system is just as exhausting as the loss of pure healthy blood—and this, too, is why we should expect children to resemble their parents: because there is a resemblance between that which is distributed to the various parts of the body and that which is left over. Thus, the semen of the hand or of the face or of the whole animal really is hand or face or a whole animal though in an undifferentiated way; in other words, what each of those is in actuality, such the semen is potentially, whether in respect of its own proper bulk, or because it has some dynamis within itself (I mention both alternatives because from what we have said so far it is not clear which is the correct one, i.e., whether...
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726 b

σῶμα τοῦ σπέρματός ἐστι τὸ αὐτὸν τῆς γενέσεως; ἡ ἔχει τινὰ ἐξει καὶ ἀρχὴν κινήσεως γεννητικήν. οὐδὲ γὰρ ἡ χεῖρ οὐδὲ ἀλλο τῶν μορίων οὐδὲν ἀνέυ ψυχῆς ¹ ἡ ἄλλης τινὸς δυνάμεως ἐστὶ χεῖρ οὐδὲ μόριον οὐδέν, ἀλλὰ μόνον ὁμόνυμον.

25 Ὁ Φανερὸν δὲ καὶ ὅτι ὅσοι σύντηξις γίνεται σπερματική, καὶ τοῦτο περίττωμα ἐστιν. συμβαῖνει δὲ τοῦτο ὅταν ἀναλύσει εἰς τὸ προελθόν, ὥσπερ ὅταν ἀπο湿润 τὸ ἐναλειφθέν ⁴ τοῦ κονάματος εὐθὺς· ταῦτον γὰρ ἐστι τὸ ἀπελθὸν τῷ πρώτῳ προστεθέντι. τὸν αὐτὸν τρόπον καὶ τὸ τελευταῖον περίττωμα τῷ πρώτῳ συντήγματι ταῦτὸν ἐστιν. ⁵ καὶ 30 περὶ μὲν τούτων διωρισθώ τὸν τρόπον τούτον.

'Επει δ' ἂναγκαῖον καὶ τῷ ἀσθενεστέρῳ γίγνεσθαι περίττωμα πλείον καὶ ἦττον πεπεμένου, τοιούτων δ' ὅν ἂναγκαῖον εἶναι ἀματῶδος ὕγροτητος πλήθος, ἀσθενέστερον δὲ τὸ ἐλάττωνος

¹ ψυχῆς PSY.
² vv. 24-30 secluserunt Λ.-W., Sus., Platt.
³ προελθόν Ζ, προσελθόν vulg.: in primo dissolvitur Σ, qui et valde diversa hic habet.
⁴ ἐναλειφθέν YZ: confer τὸ προελθόν ... ὑπολειφθέντι supra, vv. 14, 15.
⁵ ἐστὶ τὸ ἀπελθὸν ... ταῦτὸν ἐστιν] ἐστι τὸ τελευταῖον (τελευταίον om. P) περίττωμα τῷ πρώτῳ περιττώματι PSY.

ᵃ ἐξει. See definition in Met. 1022 b 4: οίνον ἐνέργεια τις του ἔχοντος καὶ ἐχομένου, ὥσπερ πρᾶξις τις ἡ κίνησις· ὅταν γὰρ τὸ μὲν ποιήτικα, τὸ δὲ ποιήτικον ἐστὶ ποίησις μεταξὺ.
ᵇ See Introd. §§ 41 ff.
ᶜ Aristotle often repeats this in the Generation of Animals and the Parts of Animals; see also Met. 1035 b 24. For ὁμόνυμον, cf. Cat. 1 a 1 ὁμόνυμα λέγεται ὅν ὁνομά μόνον 92
the physical substance of the semen is the cause of generation, or whether it contains some disposition and some principle of movement which effects generation), since neither a hand nor any other part of the body whatsoever is a hand or any other part of the body if it lacks Soul or some other dynamis; it has the same name, but that is all.

[It is clear also that in cases where seminal colliquescence occurs, this too is a residue; and this happens when (a fresh secretion) is decomposed into that which preceded it; just as when a (fresh) layer of plaster spread on a wall immediately drops away, the reason being that the stuff which comes away is identical with that which was applied in the first instance. In just the same way, the final residue is identical with the original colliquescence. Such then are the lines on which we treat that subject.]

Now (1) the weaker creature too must of necessity produce a residue, greater in amount and less thoroughly concocted; and (2) this, if such is its character, must of necessity be a volume of bloodlike fluid. (3) That which by nature has a smaller share

κονόν, ὁ δὲ κατὰ τούνομα λόγος τῆς ὀυσίας ἔτερος. In this case, the ὀυσία required to be present is Soul (see following note, and reference to De anima given in note on 738 b 26); but it is absent. For σωμάτιον, see note on 721 a 3.

* Because Soul is the essence of any particular body (or of any part of it). Cf. 738 b 26 and note there.

† This paragraph seems to be a continuation of the preceding interpolation, 726 a 25. There are variations in the text. Thus, the ms. PSY replace “stuff which . . . colliquescence” by “final residue is the same as the first residue.” Some of the words seem to echo lines 14 and 15 above.

‡ Semen of course has undergone a further stage of concoction, and has lost its bloodlike appearance.
726 b

θερμότητος κοινωνούν κατὰ φύσιν, τὸ δὲ θῆλυ ὑπ' ὑπὸ τὴν ἐν τῷ θῆλει γινομένην αἰματώδη ἀπόκρισιν περίττωμα εἶναι. γίνεται δὲ τοιαύτη ἢ τῶν καλουμένων καταμηνίων ἐκκρίσεως.

727 a

"Ὅτι μὲν οὖν ἐστὶ τὰ καταμημα τὰ περίττωμα, καὶ ὅτι ἀνάλογον ὡς τοὺς ἄρρεσι καὶ γονὴ οὕτω τοῖς θῆλει τὰ καταμημα, φανερόν. ὁτι δ’ ὀρθῶς εἴρηται, σημεῖα τὰ συμβαίνοντα περὶ αὐτά. κατὰ γὰρ τὴν αὐτήν ἥλικιαν τοὺς μὲν ἄρρεσι ἀρχεῖα ἐγγίνεσθαι γονὴ καὶ ἀποκρίνεται, τοῖς δὲ θῆλειρήγνυται τὰ καταμημα καὶ φωνὴν τε μεταβάλλουσι καὶ ἐπισημαίνει τὰ περὶ τοὺς μαστοὺς. καὶ παύει τῆς ἥλικιας ληγούσης τοὺς μὲ τὸ δύνασθαι γεννᾶν, ταῖς δὲ τὰ καταμημα. ἔτι δὲ καὶ τὰ τουίδι σημεῖα ὧτι περίττωμα ἐστὶν αὐτὴ ἡ ἐκκρίσεως τοῖς θῆλειν. ὡς γὰρ ἐπὶ τὸ πολὺ οὖθ' αἰμαρροθές γίνονται ταῖς γυναιξιν οὕτ' ἐκ τῶν ῥινῶν Ρύσις αἰματος οὔτε τι ἄλλο μὴ τῶν καταμηνίων ἱσταμένων· εάν τε συμβῇ τι τούτων, χείρος γίγνονται αἰ καθάρσεις ὡς μεθισταμένης εἰς ταῦτα τῆς ἀποκρίσεως. ἔτι δὲ οὗτε φλεβώδης ὀμοίως γλαφυρώτερά τε καὶ λειώτερα τὰ θῆλεα τῶν ἄρρενων ἔστι διὰ τὸ συνεκκρίνεσθαι τὴν εἰς ταῦτα περίττωσιν εν τοῖς καταμημνοῖς. τὸ δ’ αὐτὸ τοῦτο δει νομίζειν αὑτὸν εἶναι καὶ τοῦ τοὺς ὄγκους ἐλάττους εἶναι τῶν σωμάτων τοῖς θῆλευν ἢ τοῖς ἄρρεσιν ἐν τοῖς ἠμοτοσκοῦσιν· εν τούτοις γὰρ ἡ

1 μεθισταμένης PZ: ἀναλισκομένης vulg.
2 φλεβώδη Peck, φλεβώδεις vulg.
3 ἀτριχώτερα Z.
of heat is weaker; and (4) the female answers to this description, as we have said already. From which we conclude that the bloodlike secretion which occurs in the female must of necessity be a residue just as much (as the secretion in the male). Of such a character is the discharge of what is called the menstrual fluid.

Thus much then is evident: the menstrual fluid is a residue, and it is the analogous thing in females to the semen in males. Its behaviour shows that this statement is correct. At the same time of life that semen begins to appear in males and is emitted, the menstrual discharge begins to flow in females, their voice changes and their breasts begin to become conspicuous; and similarly, in the decline of life the power to generate ceases in males and the menstrual discharge ceases in females. Here are still further indications that this secretion which females produce is a residue. Speaking generally, unless the menstrual discharge is suspended, women are not troubled by haemorrhoids or bleeding from the nose or any other such discharge, and if it happens that they are, then the evacuations fall off in quantity, which suggests that the substance secreted is being drawn off to the other discharges. Again, their blood-vessels are not so prominent as those of males; and females are more neatly made and smoother than males, because the residue which goes to produce those characteristics in males is in females discharged together with the menstrual fluid. We are bound to hold, in addition, that for the same cause the bulk of the body in female Vivipara is smaller than that of the males, as of course it is only in Vivipara that the

\[ a \] Also implying "hairless," "delicate," "dainty."
727 a

τῶν καταμηνίων γίνεται ὅσις θύραζε μόνοις, καὶ τούτων ἐπιδηλότατα ἐν ταῖς γυναιξίν: πλείοντιν γὰρ ἀφίσιν ἀπόκρισιν γυνὴ τῶν ζώων. διόπερ ἐπιδηλότατως ἀεὶ χρόνον τέ ἐστι καὶ ἀδηλόφλεβον, 25 καὶ τὴν ἐλλεψιν πρὸς τοὺς ἄρρενας ἔχει τοῦ σώματος φανεράν.

'Επεὶ δὲ τούτ' ἐστὶν ὁ γίγνεται τοῖς θήλεσιν ὡς ἡ γονὴ τοῖς ἄρρεσιν, δύο δ' οὐκ ἐνδέχεται σπερματικὰς ἀμα γίνεσθαι ἀποκρίσεις, φανερὸν ὅτι τὸ θῆλυ οὐ συμβάλλεται σπέρμα εἰς τὴν γένεσιν. εἰ μὲν γὰρ σπέρμα ἦν, καταμήνια1 οὐκ ἂν ἦν· νῦν 30 δὲ διὰ τὸ ταῦτα γίγνεσθαι ἕκεινο οὐκ ἐστίν.

Διότι μὲν οὖν, ὥσπερ τὸ σπέρμα, καὶ τὰ καταμήνια περίττωμά ἐστιν, εἰρήται· λάβοι δ' ἂν τὶς εἰς τοῦτο μαρτύρια ἕνα τῶν συμβαινόντων τοῖς2 ζώοις. τὰ τὸ γὰρ πίονα ἤττον ἐστὶ σπερματικά τῶν ἀπιμέλων, ὥσπερ εἰρήται πρότερον. αὐτίον 35 δ' ὅτι καὶ ἡ πυμέλη περίττωμα ἐστὶ καθάπερ τὸ σπέρμα, καὶ πεπεμμένον αἷμα, ἀλλ' οὐ τὸν αὐτὸν τρόπον τῷ σπέρματι. ὥστ' εὐλόγως εἰς τὴν πυμέλην ἀνηλωμένης τῆς περιττώσεως ἐλλείπει τὰ περὶ τὴν γονὴν, ὦνὶ τῶν τε ἀναίμων τὰ μαλάκια καὶ τὰ μαλακόστρακα περὶ τὴν κύησιν ἐστίν ἁρinesis. διὰ τὸ ἄναμα γὰρ εἶναι καὶ μὴ γίνεσθαι 5 πυμελὴν ἐν αὐτόις, τὸ ἀνάλογον αὐτοῖς τῇ πυμελῇ ἀποκρίνεται εἰς τὸ περίττωμα τὸ σπερματικὸν.3 σημεῖον δ' ὅτι οὐ τοιοῦτο σπέρμα προέται τὸ θῆλυ ὦν τὸ ἄρρεν, οὕτως μυγνυμένων ἀμφοῖν γίνεται, ὥσπερ τινὲς φασίν, ὅτι πολλάκις τὸ θῆλυ συλλαμβάνει οὐ γενομένης αὐτῆς τῆς ἐν τῇ ὁμολίᾳ.

1 καταμὴνια P: τὰ καταμὴνια vulg.
2 τοῖς ἄλλοις PZ.
3 727 a 31-b 6 secl. Sus.
menstrual discharge flows externally, and most conspicuously of all in women, who discharge a greater amount than any other female animals. On this account it is always very noticeable that the female is pale, and the blood-vessels are not prominent, and there is an obvious deficiency in physique as compared with males.

Now it is impossible that any creature should produce two seminal secretions at once, and as the secretion in females which answers to semen in males is the menstrual fluid, it obviously follows that the female does not contribute any semen to generation; for if there were semen, there would be no menstrual fluid; but as menstrual fluid is in fact formed, therefore there is no semen.

We have said why it is that the menstrual fluid as well as semen is a residue. In support of this, there are a number of facts concerning animals which may be adduced. (1) Fat animals produce less semen than lean ones, as we said before, and the reason is that fat is a residue just as semen is, i.e., it is blood that has been concocted, only not in the same way as semen. Hence it is not surprising that when the residue has been consumed to make fat the semen is deficient. Take a parallel from the bloodless animals: Cephalopods and Crustacea are in their finest condition at the breeding season. Why? Because, being bloodless, they produce no fat; hence, what in them corresponds to fat is at this period secreted into the seminal residue. (2) Here is an indication that the female does not discharge semen of the same kind as the male, and that the offspring is not formed from a mixture of two semen, as some allege. Very often the female conceives although she has derived
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727 b

ηδονής: καὶ γυνομένης πάλιν οὐδὲν ἦττον, καὶ 10 ἰσοδρομησάντων [παρὰ]¹ τοῦ ἄρρενου καὶ τοῦ θῆλεος, οὐ γεννᾶ,² εάν μὴ ἡ τῶν καλουμένων καταμηνίων ἱκμαῖς ὑπάρχῃ σύμμετρος. διὸ οὔτε ὅλως μὴ γυνομενῶν αὐτῶν γεννᾶ τὸ θῆλυ, οὔτε γυνομένων ὅταν ἐξικμάζῃ ὡς ἐπὶ τὸ πολὺ, ἀλλὰ μετὰ τὴν κάθαρσιν. ὅτε μὲν γὰρ οὐκ ἔχει τροφὴν οὐδ᾽ 15 ὑλὴν ἐξ ἑς δυνήσεται συστῆσαι τὸ ζῴου ἣ ἀπὸ τοῦ ἄρρενος ἐνυπάρχουσα ἐν τῇ γουνῇ δύναμις, οὔτε ἐὰν συνεκκλύζεται διὰ τὸ πλῆθος. ὅταν δὲ γενομένων ἀπέλθῃ, τὸ ὑπολειφθὲν συνίσταται. ὅσαι δὲ μὴ γυνομενῶν τῶν καταμηνίων συλλαμβανοῦσιν, ἡ μεταξὺ γυνομενῶν ὕστερον δὲ μὴ, αὖτιον 20 ὅτι ταῖς μὲν τοσαυτῇ γίνεται ἱκμᾶς ὅση μετὰ τὴν κάθαρσιν ὑπολείπεται ταῖς γονίμοις, πλεῖστον δ' οὖ γίγνεται περίττωσι ὡστε καὶ θύραζε ἀπέλθειν, ταῖς δὲ μετὰ τὴν κάθαρσιν συμμεῖι τὸ στόμα τῶν ὕστερῶν. ὅταν οὖν πολὺ μὲν τὸ ἀπεληλυθὸς ἦ, ἐτι δὲ γίγνεται μὲν κάθαρσιν, μὴ τοσαυτῇ δὲ ὅστε 25 συνεξικμάζειν³ τὸ σπέρμα, τότε πλησιάζουσι συλλαμβάνουσι πάλιν.⁴ οὐδὲν δὲ ἀτοπον τὸ συνειλη- φύιας ἐτί γίγνεσθαι καὶ γὰρ ὕστερον μέχρι τῶν φοιτᾷ τὰ καταμήνια, ὅλιγα δὲ καὶ οὐ διὰ παντὸς.

¹ seclusit Platt: τὸ παρὰ Ζ.
² γεννᾶ A.-W.: γίγνεται vulg.: γίγνεται <σύλληψις> Btf.
³ συνεξικμάζειν Z: ἐξικμάζειν vulg.
⁴ πάλιν om. PS.

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² See above, 726 b 19.
³ This really means ordinary individuals in which the menstrual discharge takes place.

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no pleasure from the act of coitus; and, on the contrary side, when the female derives as much pleasure as the male, and they both keep the same pace, the female does not bear—unless there is a proper amount of menstrual liquid (as it is called) present. Thus, the female does not bear (a) if the menstrual fluid is completely absent, (b) if it is present and the discharge of moisture is in progress (in most instances); but only (c) after the evacuation is over. The reason is that in one case (a) the female has no nourishment, no material, for the dynamis supplied by the male in the semen to draw upon and so to cause the living creature to take shape from it; in the other case (b) it is washed right away owing to the volume of the menstrual fluid. When, however, (c) the discharge is over and most of it has passed off, then what remains begins to take shape as a fetus. There are instances of women who conceive without the occurrence of menstrual discharge; others conceive during its occurrence but not after it. The reasons are these. The former produce only just so much liquid as remains in fertile individuals after the evacuation is over, and there is no surplus residue to be discharged externally; in the latter, the mouth of the uterus closes up after the evacuation is over. Therefore, when there has been a plentiful discharge and yet the evacuation still continues, though not so copiously that the discharge of moisture carries the semen away with it, that is the time when if they have intercourse women can conceive again. There is nothing odd about the menstrual fluid's continuing to flow after conception has taken place; indeed it actually recurs afterwards up to a point, but it is scanty and does not last throughout gestation. How-
ARISTOTLE

727 b

ała τότο μὲν νοσηματώδες, διόπερ ὀλίγαις καὶ ὀλυγάκις συμβαίνει: τὰ δ’ ὡς ἐπὶ τὸ πολὺ γινόμενα
30 μάλιστα κατὰ φύσιν ἔστιν.

"Οτι μὲν οὖν συμβάλλεται τὸ θῆλυ εἰς τὴν γένεσιν τὴν ύλην, τούτο δ’ ἐστὶν ἐν τῇ τῶν κατα-
μηνίων συντάσει, τὰ δὲ καταμήνα περίττωμα, δήλον.

XX "Ὁ δ’ οὖνται τίνες σπέρμα συμβάλλεσθαι ἐν
35 τῇ συνύσιᾳ τὸ θῆλυ διὰ τὸ γίνεσθαι παραπλη-
σίαι τε χαρὰν ἐνίοτε αὐταῖς τῇ τῶν ἀρρένων καὶ
άμα ὑγραν ἀπόκρισιν, οὐκ ἔστιν ἡ ὑγρασία αὐτῆς
σπερματική ἀλλὰ τοῦ τόπου ἵδιος ἐκάστας. ἐστὶ
γὰρ τῶν ύστερῶν ἐκκρισις, καὶ ταῖς μὲν γίγνεται
ta思想政治 δ’ οὖν γίγνεται μὲν γὰρ ἑν ταῖς λευκοχρόοις καὶ
θηλυκαίς ὡς ἐπὶ τὸ πολὺ εἰπεῖν, οὐ γίγνεται δὲ ταῖς
μελανίαις καὶ ἀρρενωποῖς. τὸ δὲ πλήθος, αἷς γί-
5 γίγνεται, ἐνίοτε οὐ κατὰ σπέρματος προέσιν ἐστὶν,
ἀλλὰ πολὺ ὑπερβάλλει. ἐτὶ δὲ καὶ ἐδέσματα ἔτερα

1 γὰρ ΣΑ : om. vulg.

— Aristotele's notion that the menstrual blood is the sub-
stance from which the embryo is formed reigned un-
questioned for many centuries. (It appears in the Wisdom
of Solomon, vii. 2, "In the womb of a mother was I moulded
into flesh in the time of ten months, being compacted in
blood of the seed of man and the pleasure that came with
sleep.") It can be seen pictured in 16th century obstetrical
books such as the De conceptu et generatione hominis of
Jacob Rueff (1554). Its falsity was decisively demonstrated
by William Harvey, who in his Exercitationes de generatione
animalium (1651) describes his dissections of the uteri of
does in King Charles the First’s forests, at different stages
after coitus. The expected mass of blood and seed was
never found; a source of great perplexity to Harvey himself,
since the mammalian egg was not discovered until long after
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however, this is a morbid condition, and that is why it only occurs infrequently and in few subjects. It is what occurs generally that is most in accord with the course of Nature.

By now it is plain that the contribution which the female makes to generation is the matter used therein, that this is to be found in the substance constituting the menstrual fluid, and finally that the menstrual fluid is a residue.

There are some who think that the female contributes semen during coition because women sometimes derive pleasure from it comparable to that of the male and also produce a fluid secretion. This fluid, however, is not seminal; it is peculiar to the part from which it comes in each several individual; there is a discharge from the uterus, which though it happens in some women does not in others. Speaking generally, this happens in fair-skinned women who are typically feminine, and not in dark women of a masculine appearance. Where it occurs, this discharge is sometimes on quite a different scale from the semen discharged by the male, and greatly exceeds it in bulk. Furthermore, differences of food his death. We know now that the menstrual bleeding is a phase in the sexual cycle, this phase being usually succeeded by the periodical liberation of the egg from the ovary, and by its attachment (if fertilized) to the wall of the uterus.

The view that the female also contributed semen was apparently adopted by the Epicureans; see Lucretius iv. 1229 semper enim partus duplici de semine constat; cf. 1247, 1257-1258.

This apparently refers to the so-called vaginal discharge, which is a natural secretion (cf. 739 a 37); but the latter part of the paragraph seems to describe leucorrhoea, which is pathological. The two have apparently been confused.

Cf. H.A. 583 a 11.
ἐτέρων ποιεῖ πολλὴν διαφορὰν τοῦ γίγνεσθαι τῇ ἐκκρισιν ἢ ἐλάττων ἢ πλείω τῇ τοιαύτῃ, οἷον ἐνα τῶν δρμέων ἐπίδηλον ποιεῖ εἰς πλῆθος τῇ ἀπόκρισιν.

10 Τὸ δὲ συμβαίνειν ἡδονήν ἐν τῇ συννοσίᾳ οὐ μόνον τοῦ σπέρματος προϊμένου ἔστιν, ἀλλὰ καὶ πνεῦματος, εξ ὧν συνισταμένῳ ἀποσπερματίζει. δήλον δὲ ἐπὶ τῶν παιδῶν τῶν μήπω δυναμένων προέσθαι, ἐγγὺς δὲ τῆς ἡλικίας ο>xpathζών, καὶ τῶν ἀγόνων ἀνδρῶν· γίνεται γὰρ πάσι τούτοις ἡδονή ἐξουμένης.

15 καὶ τοῖς γε διεφθαρμένοις τὴν γένεσιν ἔστιν ὅτε ἀναλύονται αἱ κοιλίαι διὰ τὸ ἀποκράνθηθαι περίττωμα εἰς τὴν κοιλίαν οὐ δυνάμενον πεφθῆναι καὶ γενέσθαι σπέρμα.

"Εσικε δὲ καὶ τὴν μορφὴν γυναίκα1 παῖς, καὶ ἔστιν ἡ γυνη ὁσπερ ἄρρεν ἁγονον· ἀδυναμία γάρ τινι τὸ θῆλυ ἐστι, τῷ μὴ δύνασθαι πέπτειν ἐκ τῆς τροφῆς σπέρμα τῆς υστάτης (τούτω δὲ ἔστιν ἡ αἴμα ἤ τὸ ἀνάλογον ἐν τοῖς ἀναίμοις) διὰ ψυχρόττητα τῆς φύσεως. ὁσπερ οὖν ἐν ταῖς κοιλίαις διὰ τὴν ἀπεθάνου γίνεται διάρροια, οὔτως ἐν ταῖς φλεβίναι αἱ τ' ἀλλαὶ αἴμορροθῆδες καὶ ἡ τῶν καταμηνίων ῥύσις2· καὶ γὰρ αὕτη αἴμορροθῇ ἔστιν, ἀλλ' ἐκεῖναι μὲν διὰ 25 νόσον, αὕτη δὲ φυσική.

"Ωστε φανερῶν ὅτι εὐλόγως γίνεται ἐκ τούτου ἡ γένεσις. ἔστι γὰρ τὰ καταμηνήματα σπέρμα οὐ καθαρὸν ἀλλὰ δεόμενον ἐργασίας, ὁσπερ ἐν τῇ περὶ

1 γυναίκα Η: γυνη καὶ vulg.
2 ἡ τῶν κ. ῥύσις Υ: αἱ τῶν κ. vulg.
cause a great difference in the amount of this discharge which is produced: e.g., some pungent foods cause a noticeable increase in the amount.

The pleasure which accompanies copulation is due to the fact that not only semen but also pneuma \(^a\) is emitted: it is from this pneuma as it collects together that the emission of the semen results. This is plain in the case of boys who cannot yet emit semen, though they are not far from the age for it, and in infertile men, because all of them derive pleasure from attrition. Indeed, men whose generative organs have been destroyed sometimes suffer from looseness of the bowels caused by residue which cannot be concocted and converted into semen being secreted into the intestine.

Further, a boy actually resembles a woman in physique, and a woman is as it were an infertile male; the female, in fact, is female on account of inability \(^b\) of a sort, viz., it lacks the power to concoct semen out of the final state of the nourishment (this is either blood, or its counterpart in bloodless animals) because of the coldness of its nature. Thus, just as lack of concoction produces in the bowels diarrhoea, so in the blood-vessels it produces discharges of blood of various sorts, and especially the menstrual discharge (which has to be classed as a discharge of blood, though it is a natural discharge, and the rest are morbid ones).

Hence, plainly, it is reasonable to hold that generation takes place from this process; for, as we see, the menstrual fluid is semen, not indeed semen in a pure condition, but needing still to be acted upon. It

\(^a\) See 718 a 4, 738 a 1, etc.

\(^b\) Cf. 765 b 9.
τοὺς καρποὺς γενέσθαι, ὅταν ἡ μῆτρα διηθημένη, ἕνεστι μὲν ἡ τροφή, δεῖται δ’ ἐργασία πρὸς τὴν 30 καθαρσίαν. διὸ καὶ μεγαλυτέρα ἐκεὶνη μὲν τῇ γονῇ, αὐτὴ δὲ καθαρὰ τροφὴ, ἡ μὲν γεννᾶ, ἡ δ’ ἔτρεφεν.

Σημεῖον δὲ τοῦ τοῦ θήλυ μὴ προσεθεῖσθαι σπέρμα καὶ τὸ γίνεσθαι ἐν τῇ ομολογίᾳ τῆς ἱματίας τῇ ἀφή κατὰ τὸν αὐτῶν τόπον τοῖς ἀρρεσιν καίτοις οὐ προσεθεῖν τὴν ἰκμάδα ταύτην ἐντεῦθεν. ἔτι δ’ οὐ 35 πάσι γίνεσθαι τοῖς θήλεσιν αὐτὴ ἡ ἐκκρίσις, ἀλλὰ τοῖς αἰματικοῖς, καὶ οὐδὲ τούτοις πᾶσιν, ἀλλ’ ὅσων αἱ ὑστέραι μὴ πρὸς τῷ ὑποζώματι εἰσὶ μηδ’ ὑποτοκοῦσιν, ἔτι δ’ οὐδὲ τοῖς αἰμα μὴ ἔχουσιν ἀλλὰ τὸ ἀνάλογον. ὅπερ γὰρ ἐν ἑκεῖνους τὸ αἰμα, ἐν τού·

tois étéra ὑπάρχει σύγκρισις. τοῦ δὲ μῆτε τούτοις γίγνεσθαι καθαρσίαν μὴτὰ τῶν αἰμα ἔχουσιν τοῖς ἐιρημένοις, τοῖς κάτω ἔχουσι καὶ μὴ ὑποτοκοῦσιν, 5 αὕτη ἡ ἔρητής τῶν σωμάτων, ἐλθόν λείπουσα τὸ περίπτωμα, καὶ ποσοῦτον ὅσον εἰς τὴν γένεσιν ἰκανὸν μόνον, ἔξω δὲ μὴ προεσθαι. ὅσα δὲ ζυβόκα ἀνέμων ὑποτοκίας (ταῦτα δ’ ἐστὶν ἀνθρώπος καὶ τῶν τετραπόδων ὅσα κάμψτε τὰ ὁπίσθια σκέλη ἐν·

tós4. ταῦτα μὲν γὰρ πάντα ἑως τοκεῖ ἀνέμων ὑποτοκίας) τούτοις δὲ γίγνεται μὲν πᾶσιν, πλὴν εἰ τι πεπήρω-

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2 ἐν ἑκεῖνοι Platt: ἐνὶς vulg.
3 τοῖς κάτω . . . ὑποτοκοῦσι om. Ζ.
4 ἐκτός Ζ1, Platt: τὰ ἐκτός Υ .

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a Cf. Pol. 1281 b 37 ἡ μὴ καθαρὰ τροφὴ μετὰ τῆς καθαρᾶς τὴν πᾶσαν ποιεῖ χρησιμώτεραν τῆς ἐλάχιστος.—For the two sorts of τροφή, see 744 b 32 ff. Cf. 725 a 17.

b Cf. 739 b 15.

c i.e., the extremity of the bent limb is moved towards the
is the same with fruit when it is forming. The nourishment is present right enough, even before it has been strained off, but it stands in need of being acted upon in order to purify it. That is why when the former is mixed with the semen, and when the latter is mixed with pure nourishment, the one effects generation, and the other effects nutrition.

An indication that the female emits no semen is actually afforded by the fact that in intercourse the pleasure is produced in the same place as in the male by contact, yet this is not the place from which the liquid is emitted. Further, this discharge does not occur in all females, but only in those which are blooded, and not in all of them, but only in those whose uterus is not close by the diaphragm and which are not oviparous; nor again in those which have an analogous substance instead of blood (they have another composition which is for them what blood is for the others). Dryness of the body is the cause why neither these animals nor the blooded ones I mentioned (viz., those whose uterus is low down and which are not oviparous) produce this evacuation; their dryness leaves over but little residue, only enough in fact for generation, not enough to be emitted externally. Take next the animals which are viviparous but not previously oviparous: this means man, and those quadrupeds which bend their hind legs inwards. The menstrual discharge occurs in all of these; though if they are deformed in any respect main bulk of the body and not away from it, so that the angle of the bent joint points away from the body. "Inwards" thus has no reference to "knock knees." See I.A. 704 a 19 ff., 711 a 8 ff.; H.A. 498 a 3 ff.; and my diagram in Parts of Animals (Loeb), p. 433.

4 See Introd. § 12.
ταὶ εν τῇ γενέσει, οἶον ὅρευς, οὐ μὴν ἐπιπολάζουσιν γε αἱ καθάρσεις ὥσπερ ἀνθρώπους. δὲ ἀκριβείας δὲ, πῶς συμβαίνει ταῦτα περὶ ἐκαστον τῶν ζῴων, γέγραπται ἐν ταῖς περὶ τὰ ζώα ἱστορίαις. πλείστη
15 δὲ γίνεται κάθαρσις τῶν ζῴων ταῖς γυναιξί, καὶ τοῖς ἄρρεσι πλείστη τοῦ σπέρματος πρόσεις κατὰ λόγον τοῦ μεγέθους. αὕτων δ' ἡ τοῦ σώματος σύστασις ὑγρὰ καὶ θερμὴ οὕσα· ἀναγκαῖον γὰρ ἐν τῷ τοιοῦτῳ γίνεσθαι πλείστην περίττωσιν. ἔτι δὲ οὐδὲ τὰ τοιαῦτ' ἔχει ἐν τῷ σώματι μέρη εἰς ᾧ
20 τρέπεται ἡ περίττωσις, ὡσπερ εν τοῖς ἄλλοις· οὐ γὰρ ἔχει ὑπὲρ τριχῶν πλήθος κατὰ τὸ σῶμα, ὑπὲρ ὁστῶν καὶ κεράτων καὶ ὀδόντων ἐκκρίσεις.

Σημεῖον δ' ὅτι εν τοῖς καταμηνίοις τὸ σπέρμα ἐστὶν· ἂμα γὰρ, ὡσπερ εἰρηταὶ πρῶτον, τοῖς ἄρρεσι γίνεται τὸ περίττωμα τοῦτο καὶ τοῖς θήλεις
25 τὰ καταμήνια ἐπισημαίνει ἐν τῇ αὐτῇ ἡλικία, ὡς καὶ ἂμα διυσταμένων τῶν τόπων τῶν δεκτικῶν ἐκατέρου τοῦ περίττωματος· καὶ ἀραίουμένων ἐκατέρων τῶν πλησίον τόπων ἐξανθεῖ ἡ τῆς ἥβης τρίχωσις. μελλόντων δὲ διυσταθαι οἱ τόποι ἀνοιδοῦσιν ὑπὸ τοῦ πνεύματος, τοῖς μὲν ἄρρεσιν ἐπιδηλότερον περὶ τοὺς ὅρχεις, ἐπισημαίνει δὲ καὶ
30 περὶ τοὺς μάστους, τοῖς δὲ θήλεις περὶ τοὺς μαστοὺς μᾶλλον· ὅταν γὰρ δύο δακτύλους ἀρθῶσι, τότε γίνεται τὰ καταμήνια ταῖς πλείσταις.¹

¹ Ἐν ὅσοις μὲν οὖν τῶν ζῴων ἐχόντων μὴ κεχώρισται τὸ θῆλυ καὶ τὸ ἄρρεν, τούτοις μὲν τὸ

¹ vv. 22-32 secl. Sus.
in their formation, as, e.g., the mule, the evacuation is not as obvious as it is in human beings. An exact account of this matter, as it concerns every sort of animal, is to be found in the Researches upon Animals. A larger amount of evacuation is produced by women than by any other animal, and a larger amount of semen in proportion to their size is emitted by men; the reason being that the composition of the human body is fluid and warm, and that is just the sort of organism which of necessity produces the greatest amount of residue; further, the human body does not possess the sort of parts to which the residue gets diverted, as other animals do: it has no great coat of hair all over the body, and no secretions in the form of bones, horns and tusks.

Here is an indication that the semen resides in the menstrual discharge. As I said before, this residue is formed in males at the same time of life as the menstrual discharge becomes noticeable in females; which suggests that the places which are the receptacles of these residues also become differentiated at the same time in each sex; and as the neighbouring places in each sex become less firm in their consistency, the pubic hair grows up too. Just before these places receive their differentiation, they are swelled up by the pneuma: in males, this is clearer in regard to the testes, but it is also to be noticed in the breasts; whereas in females it is clearer in the breasts: it is when the breasts have risen a couple of fingers' breadth that the menstrual discharge begins in most women.

Now in those living creatures where male and female are not separate, the semen (seed) is as it

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* Or, in proportion to the size of the body.
728 b

σπέρμα οἶον κύημα ἐστιν. λέγω δὲ κύημα τὸ

35 πρῶτον μύγμα ἡθλεος καὶ ἀρρενος. διὸ καὶ εὖ

ἐνὸς σπέρματος ἐν σῶμα γίνεται, οἶον ἐξ ἐνὸς

πυροῦ εἰς πυθμήν, ὡσπερ ἐξ ἐνὸς ὄου ἐν ζωον (τὰ

γὰρ δίδυμα τῶν ψῶν δύο ὡς ἐστὶν). ἐν δεόντι δὲ

τῶν γεννῶν διώρισται τὸ θῆλυ καὶ τὸ ἄρρεν, ἐν τῶ

τουτοῦ ᾠδὸς ἐνὸς σπέρματος ἐνδέχεται πολλὰ γίνεσθαι

ζῶα, ὡς διαφέροντος τῇ τύχῃ τοῦ σπέρματος ἐν
tοῖς φυτοῖς τε καὶ ζῶοις. σημείον δὲ, ἀπὸ μᾶς

5 γὰρ οὐχίας πλεῖω γίνεται ἐν τοῖς πλεῖοι δυναμένοις

gεννᾶν ἐνὸς. ἂν καὶ δήλον ὅτι οὐκ ἀπὸ παντὸς

ἐρχεται ἡ γονή, οὔτε γὰρ ἂν κεχωρισμένα ἀπὸ τοῦ

αὐτοῦ μέρους εὐθὺς ἀπέκριντο, οὔτε ἢμα ἐλθόντα
eis τὰς υστέρας ἐκεῖ διεχωρίζετο. ἀλλὰ συμβαίνει

10 ὡσπερ εὐλογον, ἐπειδὴ τὸ μὲν ἄρρεν παρέχεται τὸ

tε εἶδος καὶ τὴν ἄρχην τῆς κινήσεως, τὸ δὲ θῆλυ
tὸ σῶμα καὶ τὴν ύλην, οἶον ἐν τῇ τοῦ γάλακτος

πὴξεῖ τὸ μὲν σῶμα τὸ γάλα ἐστὶν, ὅ δὲ ὅπος ἡ ἡ

πυτία τὸ τῆν ἄρχην ἔχον τὴν συνιστάσαν, οὔτω
tὸ ἀπὸ τοῦ ἄρρενος ἐν τῷ θῆλη μεριζόμενον. δὲ

15 ἡν δὲ αἰτίαν μεριζεῖται ἐνθα μὲν εἰς πλεῖον ἐνθα δε

eiś ἐλάττω ἐνθα δὲ μοναχῶς, ἐτέρος ἐσται λόγος.

ἀλλὰ διὰ τὸ μηθέν γε διαφέρειν τῷ εἴδει, ἀλλ᾽ ἐάν

1 ἐκ add. PSY, om. vulg., Z*.

2 ἐξ YZ*, om. vulg.

3 ἐν Z ; ἐν δὲ vulg. ; ἐν δὴ Y.


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a See Introd. §§ 56 ff.

b Cf. 723 b 10, 728 a 27.


d The “Formal” Cause, and the “Motive” (or “Efficient”) Cause, i.e., sentient Soul.

e The “Material” Cause. See Introd. §§ 1 ff. With this passage cf. Met. 1044 a 34 ἀνθρώπου τὸς αἰτία ὡς ύλη; ἄρα τὰ καταμήνια; τὰ δ᾽ ὡς κυνοῦ; ἄρα τὸ σπέρμα;

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were a fetation. (By fetation I mean the primary mixture of male and female.) This explains incidentally why one body only is formed from one seed—e.g., one stalk from one grain of corn, just like one animal from one egg (double-yolked eggs of course count as two eggs). In those groups, however, where male and female are distinct, many animals may be formed from one semen, which suggests that the nature of semen in animals differs from that in plants. We have as a proof of this those animals which are able to produce more offspring than one at a time, where more than one are formed as the result of one act of coitus. This shows also that the semen is not drawn from the whole body; because we cannot suppose (a) that at the moment of discharge it contains a number of separate portions from one and the same part of the body; nor (b) that these portions all enter the uterus together and separate themselves out when they have got there. No; what happens is what one would expect to happen. The male provides the "form" and the "principle of the movement," the female provides the body, in other words, the material. Compare the coagulation of milk. Here, the milk is the body, and the fig-juice or the rennet contains the principle which causes it to set. The semen of the male acts in the same way as it gets divided up into portions within the female. (Another part of the treatise will explain the Cause why in some cases it gets divided into many portions, in others into few, while in others it is not divided up at all.) But as this semen which gets divided up exhibits no difference in kind, all that

\[ \text{Cf. 739 b 23.} \]

\[ 771 \text{ b 14 ff.} \]
μόνον σύμμετρον ἢ τὸ διαιροῦμενον πρὸς τὴν ὕλην, καὶ μήτε ἔλαττον ὡστε μὴ πέττειν μηδὲ συν-
ιστάναι, μήτε πλεῖον ὡστε ἐξηρᾶναι, πλείω οὕτω
20 γεννᾶται. ἐκ δὲ τοῦ συνιστάντος πρώτου, ἐξ ἐνὸς
ἡδή ἐν γίνεται μόνον.

"Ὅτι μὲν οὖν τὸ θῆλυ εἰς τὴν γένεσιν γονὴν μὲν
οὐ συμβάλλεται, συμβάλλεται δὲ τι, καὶ τοῦτ
ἐστὶν ἢ τῶν καταμηνίων σύστασις καὶ τὸ ἀνάλογον
ἐν τοῖς ἀναίμοις, ἐκ τε τῶν εἰρημένων δῆλον καὶ
κατὰ τὸν λόγον καθόλου σκοπούμενος. ἀνάγκη
25 γὰρ εἶναι τὸ γεννῶν καὶ (τὸ)1 ἐξ οὐ, καὶ ταύτ'2 ἂν
καὶ ἐν ἦ, τῶ γε εἰδεί διαφέρειν καὶ τῷ τὸν λόγον
αὐτῶν εἶναι ἐτέρων, ἐν δὲ τοῖς κεχωρισμένας ἔχουσι
τὰς δυνάμεις καὶ τὰ σώματα καὶ τὴν φύσιν ἐτέραν
εἶναι τοῦ τε ποιοῦντος καὶ τοῦ πάσχοντος. εἰ οὖν
τὸ ἄρρεν ἐστὶν ὡς κυνὸν καὶ ποιοῦν, τὸ δὲ θῆλυ,
30 ἢ θῆλυ,3 ὡς παθητικόν, εἰς τὴν τοῦ ἄρρενος γονὴν
τὸ θῆλυ ἄν συμβάλλοιτο οὐ γονὴν ἄλλῃ ὕλῃ. ὅπερ
καὶ φαίνεται συμβαίνον· κατὰ γὰρ τὴν πρώτην
ὑλήν4 ἐστὶν ἢ τῶν καταμηνίων φύσις.

1 <το> Rackham.
2 ταύτ' Peck : τοῦτ' vulg.
3 ἢ θῆλυ fort. secl. (ex 729 b 12 insertum ?).
4 κατὰ . . . ὕλην ἢ γὰρ πρώτη ὕλη Ζ.

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a Cf. 772 a 12.
b In one individual.
c i.e., specifically, in "form."
d See Introd. § 10.

a At Met. 1015 a 8 (cf. 1014 b 27) Aristotle speaks
of "prime matter" in two senses: e.g., in the case of bronze
articles (a) the prime matter relatively to them is bronze, but
(b) generally it is water (because all things that can be melted,
according to Aristotle, consist of water). And "prime
matter" is one of the meanings of φύσις, both according to
Met. (loc. cit.) and Phys. 193 a 28: "one meaning of φύσις
is ἢ πρώτη ἐκάστῳ ὑποκειμένη ὕλη τῶν ἐχόντων ἐν αὐτοῖς ἀρχήν
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is required in order to produce numerous offspring is that there should be the right amount of it to suit the material available—neither so little that it fails to concoct it or even to set it, nor so much that it dries it up. If on the other hand this semen which causes the original setting remains single and undivided, then one single offspring only is formed from it.

The foregoing discussion will have made it clear that the female, though it does not contribute any semen to generation, yet contributes something, viz., the substance constituting the menstrual fluid (or the corresponding substance in bloodless animals). But the same is apparent if we consider the matter generally, from the theoretical standpoint. Thus: there must be that which generates, and that out of which it generates; and even if these two be united in one, at any rate they must differ in kind, and in that the logos of each of them is distinct. In those animals in which these two faculties are separate, the body—that is to say the physical nature—of the active partner and of the passive must be different. Thus, if the male is the active partner, the one which originates the movement, and the female qua female is the passive one, surely what the female contributes to the semen of the male will be not semen but material. And this is in fact what we find happening; for the natural substance of the menstrual fluid is to be classed as "prime matter." 

κινήσεως καὶ μεταβολῆς." In its lowest phase, "prime matter" is that which, united with the prime contrarieties (hot, cold, solid, fluid), produces the "elements" Earth, Air, Fire, Water; but, as the term "prime" itself suggests, "matter" is altogether a relative conception, and in its highest phase matter is one and the same as "form" (Met. 1045 b 18).
ARISTOTLE

729 a

XXI. Καὶ περὶ μὲν τοῦτων διωρίσθω τὸν τρόπον τοῦ-35 τον. ἀμα δ’ ἐκ τοῦτων φανερὸν, περὶ δὲν ἐχόμενόν
ἐστὶν ἐπισκέψασθαι, πῶς ποτὲ συμβάλλεται εἰς τὴν
gένεσιν τὸ ἄρρεν, καὶ πῶς αὐτίκον ἐστὶ τοῦ γυνο-
mένου τὸ σπέρμα τὸ ἀπὸ τοῦ ἄρρενος, τότερον ὡς
ἐνυπάρχον καὶ μόριον ὃν εὐθὺς τοῦ γυνομένου σώ-
ματος, μιγνύμενον τῇ ὕλῃ τῇ παρὰ τοῦ θήλεος, ἦ
5 τὸ μὲν σώμα οὐθὲν κοινωνεῖ τοῦ σπέρματος, ἦ δὲ
ἐν αὐτῷ δύναμις καὶ κίνησις. αὐτῇ μὲν γάρ ἐστὶν
ἡ ποιοῦσα, τὸ δὲ συνιστάμενον καὶ λαμβάνον τὴν
μορφὴν τὸ τοῦ ἐν τῷ θήλει περιττώματος λοιπόν.
kατὰ τε δὴ τὸν λόγον οὕτω φαίνεται καὶ ἐπὶ τῶν
ἔργων. καθόλου τε γὰρ ἐπισκοποῦσιν οὐ φαίνεται
10 γυνόμενον ἐν ἐκ τοῦ παθητικοῦ καὶ τοῦ ποιοῦντος
ὡς ἐνυπάρχοντος ἐν τῷ γυνομένῳ τοῦ ποιοῦντος,
οὐδ’ ὄλως δὴ ἐκ τοῦ κινούμενου καὶ κινοῦντος.
ἀλλὰ μὴν τὸ γε θῆλυ, ἡ θῆλυ, παθητικόν, τὸ δὲ
ἀρρεν, ἡ ἀρρεν, ποιητικὸν καὶ οἶδεν ἡ ἀρχὴ τῆς
κινήσεως. ὡστε ἄν ληφθῇ τὰ ἀκρα ἐκατέρων, ἦ
15 τὸ μὲν ποιητικὸν καὶ κινοῦν, τὸ δὲ παθητικὸν καὶ
κινούμενον, οὐκ ἐστὶν ἐκ τοῦτων τὸ γυνόμενον ἐν,
ἀλλ’ ἡ οὕτως ὡς ἐκ τοῦ τέκτων καὶ ξύλου ἡ
κλίνη, ἡ ὡς ἐκ τοῦ κηροῦ καὶ τοῦ εἴδους
ἡ σφαίρα. δὴ λοι ἄρα ὃτι οὕτ’ ἀνάγκη ἀπιέναι τι

a Aristotle now comes to grips with deciding between the
alternatives stated at 726 b 18 ff.
b i.e., that portion of the menstrual fluid which is not dis-
charged externally.
c Cf. 716 a 27 ff.

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These then are the lines upon which that subject should be treated. And what we have said indicates plainly at the same time how we are to answer the questions which we next have to consider, viz., how it is that the male makes its contribution to generation, and how the semen produced by the male is the cause of the offspring; that is to say, is the semen inside the offspring to start with, from the outset a part of the body which is formed, and mingling with the material provided by the female; or does the physical part of the semen have no share nor lot in the business, only the dynamis and movement contained in it? This, anyway, is the active and efficient ingredient; whereas the ingredient which gets set and given shape is the remnant of the residue in the female animal. The second suggestion is clearly the right one, as is shown both by reasoning and by observed fact. (a) If we consider the matter on general grounds, we see that when some one thing is formed from the conjunction of an active partner with a passive one, the active partner is not situated within the thing which is being formed; and we may generalize this still further by substituting "moving" and "moved" for "active" and "passive." Now of course the female, qua female, is passive, and the male, qua male, is active—it is that whence the principle of movement comes. Taking, then, the widest formulation of each of these two opposites, viz., regarding the male qua active and causing movement, and the female qua passive and being set in movement, we see that the one thing which is formed is formed from them only in the sense in which a bedstead is formed from the carpenter and the wood, or a ball from the wax and the form. It is plain, then,
ἀπὸ τοῦ ἄρρενος, οὔτε εἰ τι ἀπέρχεται, διὰ τότῳ
20 ἐκ τούτου ὡς ἐνυπάρχοντος τὸ γυνόμενον ἔστων,
ἀλλ’ ὡς ἐκ κινήσαντος καὶ τοῦ ἔδους, ὡς καὶ ἀπὸ
tῆς ἀτριμίας ὁ ὑγιασθεὶς. σύμβαίνει δ’ ὁμολογοῦ-
μενα τῷ λόγῳ καὶ ἐπὶ τῶν ἑργών. διὰ τότῳ γὰρ
ἐνα τῶν ἄρρενων καὶ συνδυαζομένων τοῖς θήλεσιν
οὐδὲ μόριον οὗθεν φαίνεται προϊέμενα εἰς τὸ θῆλυ,
25 ἀλλὰ τούναντίον τὸ θῆλυ εἰς τὸ ἄρρεν, δ’ σύμβαίνει
ἐνίοις τῶν ἐντόμων. ὁ γὰρ τοῖς προϊέμενοι ἀπε-
ρογάζεται τὸ σπέρμα ἐν τῷ θῆλει, τούτοις2 ἡ ἐν
tῷ ζῷῳ αὐτῷ θερμότητι3 καὶ δύναμις ἀπεργάζεται,
eἰσφέροντος τοῦ θήλεος τὸ δεκτικὸν τοῦ περιττώ-
ματος μόριον. καὶ διὰ τότῳ τὰ τοιαῦτα τῶν
30 ζῶν συμπλεύκεται μὲν πολὺν χρόνον, διαλυθέντα δὲ
γεννᾶ ταχέως. συνδεδυάσται μὲν οὖν4 μέχρις οὗ5
ἀν συστήσῃ, ὥσπερ ἡ γονή6. διαλυθέντα δὲ προτεται
tὸ κύμα ταχέως· γεννᾶ γὰρ ἀτέλες· σκωληκοτοκεῖ
γὰρ πάντα τὰ τοιαῦτα.
Μέγιστον δὲ σημεῖον τὸ συμβαίνουν περὶ τοῦσ
ὄρνιθας καὶ τὸ τῶν ἵππων γένος τῶν ὕποτόκων
35 τοῦ μῆτε ἀπὸ πάντων ἑναί7 τὸ σπέρμα τῶν μορίων,
μῆτε προτέσθαι τὸ ἄρρεν τοιοῦτον τι μόριον ὁ
ἔσται ἐνυπάρχων τῷ γεννηθέντι, ἀλλὰ μόνον τῇ δυ-
νάμει τῇ ἐν τῇ γονῇ ζωοποιεῖν, ὥσπερ εἴπομεν ἐπὶ

1 γὰρ Ζ : γὰρ εὐν vulg. 2 τούτοις Ζ : τοῦτο vulg.
3 θερμότης Ζ : ὑγρότης vulg.
4 μὲν οὖν] γὰρ Ζ. 5 μέχρις οὗ PL : μέχρι vulg.
6 hic locus hand sanus videtur ; fortasse συνδεδυάσται . . .
tαχέως secludenda ; om. Σ.
7 ἑναί Λ.-W., Ζ* : exul Σ : εἶναι vulg.

* See above, ch. 16.
b Probably the words "the copulation . . . discharge the
fetation" should be deleted.
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that there is no necessity for any substance to pass from the male; and if any 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." The relationship is the same as that of the patient who has been healed to the medical art. (b) This piece of reasoning is entirely borne out by the facts. It explains why certain of those males which copulate with the females are observed to introduce no part at all into the female, but on the contrary the female introduces a part into the male. This occurs in certain insects. In those cases where the male introduces some part, it is the semen which produces the effect inside the female; but in the case of these insects, the same effect is produced by the heat and dynamis inside the (male) animal itself when the female inserts the part which receives the residue. And that is why animals of this sort take a long time over copulation, and once they have separated the young are soon produced: the copulation lasts until (the dynamis in the male) has "set" (the material in the female), just as the semen does; but once they have separated they soon discharge the fetation, because the offspring they produce is imperfect; all such creatures, in fact, produce larvae.

However, it is the behaviour of birds and the group of oviparous fishes which provides us with our strongest proof (a) that the semen is not drawn from all the parts of the body, and (b) that the male does not emit any part such as will remain situated within the fetus, but begets the young animal simply by means of the dynamis residing in the semen (just as
τῶν ἐντόμων, ἐν οἷς τὸ θῆλυ προϊέται εἰς τὸ ἄρρεν.  
5 ἔάν τε γὰρ ὑπηνέμια τύχῃ κύουσα ἡ ὀρνις, ἕάν  
μετὰ ταῦτα ὠχεύται, μήπως μεταβεβληκότος τοῦ  
ψοῦ ἐκ τοῦ ὦχρον ὄλον ἐναι εἰς τὸ λευκαίνεσθαι,  
γόνιμα γίνεται ἀντὶ ὑπηνεμίων. εάν τε ύφ᾽ ἐτέρου  
ὠχευμένη (ἡ) καὶ ἐτὶ ὦχρον ὄντος, κατὰ τὸν ὑστερον  
ὀχεύσαντα τὸ γένος ἀποβαίνει πάν τὸ τῶν νεοτῶν.  
10 διὸ ἐνοι τοῦτον τὸν τρόπον τῶν περὶ τὰς ὀρνθάς  
tὰς γενναίας σπουδαζόντων ποιοῦσι, μεταβάλλοντες  
tὰ πρῶτα ὀχεία καὶ τὰ ὑστερα, ὡς οὐ συμμιγνυ-  
μενον καὶ ἐνυπάρχον, οὔτ᾽ ἀπὸ παντὸς ἔλθον τὸ  
σπέρμα· ἀπ᾽ ἀμφότερ γὰρ ἄν ἦλθεν, ὡστ᾽ εἰχὲν ἄν  
δις ταῦτα μέρη. ἀλλὰ τῇ δυνάμει τοῦ τὸν ἄρρενος  
15 σπέρμα τὴν ἐν τῷ θῆλει ὕλην καὶ τροφὴν ποιάν  
tίνα κατασκεύαζε. τοῦτο γὰρ ἐνδέχεται ποιεῖν τὸ  
ὑστερον ἐπεισελθὼν ἐκ τοῦ θερμᾶναι καὶ πέμαι·  
λαμβάνει γὰρ τροφὴν τὸ ὑδὸν ἐώς ἂν αὐξάνηται.  
Τὸ δ᾽ αὐτὸ συμβαίνει καὶ περὶ τῆς τῶν ἰχθύων  
γένεσιν τῶν ὀστοκομμένων. ὅταν γὰρ ἀποτέκτη  
20 τὰ ὄγα ἡ θῆλεια, ὁ ἄρρην ἐπιρραίνει τὸν θορὸν·  
καὶ ὃν μὲν ἄν ἐφάγηται, γόνιμα ταῦτα γίνεται τὰ  
ὄγα, ὃν δ᾽ ἂν μῆ, ἄγωνα, ὡς οὐκ εἰς τὸ ποσὸν  
συμβαλλομένου τοῖς ζῴων τοῦ ἄρρενος, ἀλλ᾽ εἰς  
tὸ ποιόν.  
"Οτι μὲν οὖν οὕτ᾽ ἀπὸ παντὸς ἀπέρχεται τὸ  
25 σπέρμα τοῖς προϊέμενοις σπέρμα τῶν ζῴων, οὕτε  
1 <ἡ> Peck.

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730 a

See below, 757 b 2 f.

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we said happened with those insects where the female inserts a part into the male). Here is the evidence. Supposing a hen bird is in process of producing wind-eggs, and then that she is trodden by the cock while the egg is still completely yellow and has not yet started to whiten: the result is that the eggs are not wind-eggs but fertile ones. And supposing the hen has been trodden by another cock while the egg is still yellow, then the whole brood of chickens when hatched out takes after the second cock. Some breeders who specialize in first-class strains act upon this, and change the cock for the second treading. The implication is (a) that the semen is not situated inside the egg and mixed up with it, and (b) that it is not drawn from the whole of the body of the male: if it were in this case, it would be drawn from both males, so the offspring would have every part twice over. No; the semen of the male acts otherwise; in virtue of the dynamis which it contains it causes the material and nourishment in the female to take on a particular character; and this can be done by that semen which is introduced at a later stage, working through heating and concoction, since the egg takes in nourishment so long as it is growing.

The same thing occurs in the generation of ovi-parous fishes. When the female fish has laid her eggs, the male sprinkles his milt over them; the eggs which it touches become fertile, but the others are infertile, which seems to imply that the contribution which the male makes to the young has to do not with bulk but with specific character.

What has been said makes it clear that, in the case of animals which emit semen, the semen is not drawn from the whole of the body, and also that in genera-
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730 a
to thēlu prōs tēn gènesin oútω συμβάλλεται τοις
συνισταμένοις ώς τὸ ἄρρεν, ἀλλὰ τὸ μὲν ἄρρεν
ἀρχήν κινήσεως, τὸ δὲ thēlu tēn ūlēn, δῆλον εκ
tōn eirhēménon. διὰ γὰρ τούτῳ οὔτ᾽ αὐτὸ καθ᾽
auto γεννᾷ τὸ thēlu, δεῖται γὰρ ἄρχης καὶ τοῦ
30 κινήσεων καὶ διορισθέντος (ἀλλ᾽ εὐίοις γε τῶν
ζῶν, ὁμιὶ τοῖς ὀρνισὶ, μέχρι τινὸς ἡ φύσις δύναται
gεννᾶν· αὐτὴ γὰρ συνιστάσει μὲν, ἀτελῆ δὲ συν-
XXII ἱστάσε τὰ καλούμενα ὑπηνέμα ὕόα), ἡ τε γένεσις
ἐν τῷ thēlei συμβαίνει τῶν γινομένων, ἀλλ᾽ οὐκ
eis τὸ ἄρρεν οὔτ᾽ αὐτὸ τὸ 1 ἄρρεν προῖται τῆν γονῆν
35 οὕτω τὸ thēlu, ἀλλ᾽ ἄμφω εἰς τὸ thēlu συμβάλλονται
τὸ παρ᾽ αὐτῶν γινόμενον, διὰ τὸ ἐν τῷ thēlei
einai tēn ūlēn ex ᾧ ἐστι τὸ δημιουργοῦμενον.
καὶ εὖθυς τὴν μὲν ἄθροιν ὑπάρχειν ἀναγκαῖον ἐξ
ἅς συνιστάται τὸ κύμα τοῦ πρῶτον, τὴν δ᾽ ἐπι-
γίνεσθαι αἰεὶ τῆς ūlēs, ἢν αὐξάνηται τὸ κυοῦμενον. 3
5 ὥστ᾽ ἀνάγκη ἐν τῷ thēlei ὑπάρχειν τὸν τόκον· καὶ
gar prōs τῷ ūlēw ὁ τέκτων καὶ prōs τῷ πηλῷ ὁ
κεραμεύς, καὶ ὅλως πᾶσα ἡ ἐργασία καὶ ἡ κίνησις
ἡ ἐσχάτη πρὸς τή ūlē, οἷον ἡ οἰκοδόμησις ἐν τοῖς
οἰκοδομομομένοις. λάβοι δ᾽ ἄν τις ἐκ τούτων καὶ
to ἄρρεν πῶς συμβάλλεται πρὸς τὴν gènesin· οὐδὲ
10 gar, to ἄρρεν ἀπαν προῖται σπέρμα, ὡσα τε

1 ἄρρεν oút' αὐτὸ τὸ Buss.-Platt (καὶ οὐκ αὐτὸ τὸ Z): ἄρρεν
οὔτ' αὐ τὸ vulg. (<καὶ oút' Sus.).
2 aiei SY: deii vulg.
3 κυόμενον SZ: κυόμενον vulg.

This is explained in the passage which follows (730 b 15 ff.).

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tion the contribution which the female makes to the embryos when they are being "set" and constituted is on different lines from that of the male; in other words, the male contributes the principle of movement and the female contributes the material. This is why (a) on the one hand the female does not generate on its own: it needs some source or principle to supply the material with movement and to determine its character (though in some (female) animals, as in birds, Nature can generate up to a point: the females of these species do actually "set" a fetaion, but what they "set" is imperfect, viz., what are known as wind-eggs); (b) on the other hand, the formation of the young does in fact take place in the female, whereas neither the male himself nor the female emits semen into the male, but they both deposit together what they have to contribute in the female—it is because that is where the material is out of which the creature that is being fashioned is made. And as regards this material, a good quantity of it must of necessity be available immediately, out of which the fetaion is "set" and constituted in the first place, and after that fresh supplies of it must be continually arriving to make its growth possible. Hence, of necessity, it is in the female that parturi-tion takes place. After all, the carpenter is close by his timber, and the potter close by his clay; and to put it in general terms, the working or treatment of any material, and the ultimate movement which acts upon it, is in all cases close by the material, e.g., the location of the activity of house-building is in the houses which are being built. These instances may help us to understand how the male makes its contribution to generation; for not every male emits
προτεται τῶν ἀρρένων, οὕθεν μόριον τούτ᾽ ἐστὶ τοῦ γιγνομένου κυήματος, ὡσπερ οὖν ἀπὸ τοῦ τέκτωνος πρὸς τὴν τῶν ἔνελμα ὤλην οὔτ᾽ ἀπέρχεται οὔθεν οὔτε μόριον οὕθεν ἐστὶν ἐν τῷ γιγνομένῳ τῆς τεκτονικῆς, ἀλλ᾽ ἡ μορφὴ καὶ τὸ εἴδος ἀπ᾽ 15 ἐκείνου ἐγγίνεται διὰ τῆς κινήσεως ἐν τῇ ὠλῇ, καὶ ἡ μὲν ψυχὴ ἐν ἡ το εἴδος καὶ ἡ ἐπιστήμη κινοῦσι τὰς χεῖρας ἡ τι μόριον ἔτερον ποιῶν τινα κίνησιν, ἐτέραν μὲν ἀφ᾽ ὧν τὸ γιγνόμενον ἔτερον, τὴν αὐτὴν δὲ ἀφ᾽ ὧν τὸ αὐτὸ, αἰ δὲ χεῖρες τὰ ὄργανα τὰ δ᾽ ὄργανα τὴν ὠλήν.1 ὁμοίως δὲ καὶ ἡ φύσις2 ἐν τῷ 20 ἀρρενὶ τῶν σπέρμα συμβάλλεται τῶν σπέρματι ὡς ὄργανῳ καὶ ἔχοντι κίνησιν ἐνεργεία, ὡσπερ ἐν τοῖς κατὰ τέχνην γιγνομένοις τὰ ὄργανα κινεῖται· ἐν ἐκείνοις γὰρ πως ἡ κίνησις τῆς τέχνης. ὅσα μὲν οὖν προτεται σπέρμα, συμβάλλεται τοῦτο τὸν 25 τρόπον εἰς τὴν γένεσιν· ὅσα δὲ μὴ προτεται σπέρμα, ἀλλ᾽ ἐναφήσῃ τὸ θῆλυ εἰς τὸ ἀρρεν τῶν αὐτοῦ τι μορίων, ὁμοιον ἐοικε ποιοῦντι ὡσπερ ἄν εἰ τὴν ὠλὴν κομίσει τίς πρὸς τὸν δημιουργόν. δι᾽ ἀσθενειαν γὰρ τῶν τοιούτων ἀρρένων οὕθεν δι᾽ ἐτέρων οἶα τε ποιεῖν ἡ φύσις, ἀλλὰ μόλις αὐτῆς προσεδρευούσης ἱσχύουσιν αἰ κινήσεις, καὶ οὐκε τοῖς 30 πλάττουσιν, οὐ τοῖς τεκτανομένοις· οὐ γὰρ δι᾽ ἐτέρου διεγγάνουσα δημιουργεῖ τὸ συνιστάμενον, ἀλλ᾽ αὐτὴ τοῖς αὐτῆς μορίοις.

XXIII Ἐν μὲν οὖν τοῖς ζύοις πάσι τοῖς πορευτικοῖς

1 sic Z: αἰ δὲ χεῖρες καὶ τὰ ὄργανα τὴν ὠλήν vulg.
2 φύσις Z: φύσις ἡ vulg.

sperm, and in the case of those which do, this sperm is not a part of the fætation as it develops. In the same way, nothing passes from the carpenter into the pieces of timber, which are his material, and there is no part of the art of carpentry present in the object which is being fashioned: it is the shape and the form which pass from the carpenter, and they come into being by means of the movement in the material. It is his soul, wherein is the "form," and his knowledge, which cause his hands (or some other part of his body) to move in a particular way (different ways for different products, and always the same way for any one product); his hands move his tools and his tools move the material. In a similar way to this, Nature acting in the male of semen-emitting animals uses the semen as a tool, as something that has movement in actuality; just as when objects are being produced by any art the tools are in movement, because the movement which belongs to the art is, in a way, situated in them. Males, then; that emit semen contribute to generation in the manner described. Those which emit no semen, males into which the female inserts one of its parts, may be compared to a craftsman who has his material brought to him. Males of this sort are so weak that Nature is unable to accomplish anything at all through intermediaries: indeed, their movements are only just strong enough when Nature herself sits watching over the business; the result is that here Nature resembles a modeller in clay rather than a carpenter; she does not rely upon contact exerted at second hand when fashioning the object which is being given shape, but uses the parts of her own very self to handle it.

In all animals which can move about, male and XXIII Conclusion.
κεχώρισται τὸ θῆλυ τοῦ ἄρρενος, καὶ ἔστων ἐτερον
35 ζῷον θῆλυ καὶ ἐτερον ἄρρεν, τῷ δὲ εἶδει ταύτον,
oi̇n ἀνθρώπος ἦ ἵππος̣1 ἀμφότερα· ἐν δὲ τοῖς φυτοῖς
μεμιγμέναι αὐταί αἱ δυνάμεις εἰσι, καὶ οὐ κεχώ-
ρισται τὸ θῆλυ τοῦ ἄρρενος. διὸ καὶ γεννᾷ αὐτὰ
ἐξ αὐτῶν, καὶ προῖται οὗ γονῆν ἄλλα κύμα τὰ
kαλούμενα σπέρματα. καὶ τοῦτο καλῶς λέγει
5 Ἐμπεδοκλῆς ποιήσας
οὖτω δ’ φιστοκεῖ μακρὰ δένδρα· πρῶτον ἐλαῖας . . .
tὸ τε γὰρ ζῷον κύμα ἐστὶ, καὶ ἐκ τινος αὐτοῦ
gίγνεται τὸ ζῷον, τὸ δὲ λουπὸν τροφή, καὶ τοῦ̣2
σπέρματος ἐκ̣3 μέρους γίγνεται τὸ φυόμενον, τὸ δὲ
λουπὸν̣4 τροφή γίγνεται τῷ βλαστῶ καὶ τῇ βίζῃ
10 τῇ πρώτῃ. τρόπον δὲ τινα ταύτα̣5 συμβαίνει καὶ
ἐν τοῖς κεχωρισμένοι έχουσι ζῴους τὸ θῆλυ καὶ τὸ
ἄρρεν. ὅταν γὰρ δεήσῃ γεννᾶν, γίνεται ἀργώριστον,
ώσπερ ἐν τοῖς φυτοῖς, καὶ βούλεται ἡ φύσις αὐτῶν
ἐν γίνεσθαι· ὀπερ ἐμφαίνεται κατὰ τὴν ὄψιν μιγνυ-
μένων καὶ συνδυαζομένων [ἐν τι ζῷον γίγνεσθαι
ἐξ ἀμφοῖν].̣6

15 Καὶ τὰ μὲν μὴ προϊέμενα σπέρμα πολὺν χρόνον
συμπεπλέχθαι πέφυκεν, ἐως ἀν συστήσῃ τὸ κύμα,
oi̇n τὰ συνδυαζόμενα τῶν ἐντόμων· τὰ δ’, ἐως ἀν
ἀποπέμψῃ τι τῶν ἐπεισάκτων αὐτοῦ μορίων, δ’
sυστήσῃ τὸ κύμα ἐν πλεῖον χρόνῳ, οἰόν ἐπὶ τῶν
ἐναίμων. τὰ μὲν γὰρ ἡμέρας τὶ μόριον συνέχεται,

1 ἦ ἵππος ΖΣ: om. vulg. 2 A.-W.: τοῦ PSY: καὶ ἐκ τοῦ vulg.
3 ἐκ A.-W., Diels: ἐκ (non καὶ) Z1*: καὶ ἐκ vulg.
4 ἐν αὐτῶ addit Z.
6 secl. Rackham.

* Empedocles, fr. 79 (Diels).
female are separate; one animal is male and another female, though they are identical in species, just as men and women are both human beings, and stallion and mare are both horses. In plants, however, these faculties are mingled together; the female is not separate from the male; and that is why they generate out of themselves, and produce not semen but a fetation—what we call their "seeds." Empedocles puts this well in his poem, when he says:

So the great trees lay eggs; the olives first . . . ,

because just as the egg is a fetation from part of which the creature is formed while the remainder is nourishment, so from part of the seed is formed the growing plant, while the remainder is nourishment for the shoot and the first root. And in a sort of way the same happens even in those animals where male and female are separate; for when they have need to generate they cease to be separate and are united as they are in plants: their nature desires that they should become one. And this is plain to see when they are uniting and copulating [that one animal is produced out of the two of them].

The natural practice of those animals which emit no semen is to remain united for a long time, until (the male) has "set" the fetation: those Insects which copulate are an example of this. Other animals, however, remain united until the male has introduced from those "parts" of himself which he inserts one which will "set" the fetation but will take a longer time to do so: the blooded animals illustrate this. The former sort remain in copulation

^ See 732 a 29.
^ The use of "part" here to refer to semen is a good illustration of the meaning of this term in Aristotle.
20 ἐὰν ὑπὸ τούτων τὸ μᾶλλον εἶναι διαπραγμάτευσιν, ὡστε συνιστήσαι πλείονον· προέμενα  
ἑπεὶ τὸ τοιούτων ἀπολύεται. καὶ ἀτεχνώς ἔσοικε 
τὰ ζῷα ὡσπερ φυτὰ εἶναι διαιρετά, οἷον εἰ τις 
κάκεινα, ὥστε σπέρμα εξενεγκειεν, διαλύεται καὶ 
χωρίζειν εἰς τὸ ἐνυπάρχον θῆλυ καὶ ἄρρην.

Καὶ ταῦτα πάντα εὐλόγως ἡ φύσις δημιουργεῖ.

25 τῆς μὲν γὰρ τῶν φυτῶν οὐσίας οὐθὲν ἐστὶν ἄλλο 
ἐργόν οὐδὲ πράξεως οὐδεμία πλῆθν ἡ τοῦ σπέρματος 
γένεσις, ᾠδὴ ἐπεὶ τούτῳ διὰ τοῦ θήλεος γίνεται 
καὶ τοῦ ἀρρενος συνέδυσεσμένων, μίξας ταύτα 
διεθηκε μετ’ ἀλλήλων· διὸ ἐν τοῖς φυτοῖς ἀχώριστον τὸ θῆλυ καὶ τὸ ἄρρην. ἀλλὰ περὶ μὲν φυτῶν

30 ἐν ἑτέρῳς ἐπέσκεπται, τοῦ δὲ ζῷον οὐ μόνον τὸ 
γεννηθαὶ ἐργόν (τούτῳ μὲν γὰρ κοινὸν τῶν ζωντῶν 
πάντων), ἀλλὰ καὶ γνώσεως τινος πάντα μετέχουσι, 
τὰ μὲν πλείονος, τὰ δὲ ἐλάττονος, τὰ δὲ πάμπαν 
μικρῶς. Αἰσθητὰ γὰρ ἔχουσιν, ἡ δ’ αἰσθησις 
γνώσεως τις. ταύτης δὲ τὸ τίμιον καὶ ἀτιμον πολὺ 

35 διαφέρει σκοποῦσι πρὸς φρόνησιν καὶ πρὸς τὸ τῶν 
ἀψύχων γένος. πρὸς μὲν γὰρ τὸ φρονεῖν ὡσπερ 
οὐθὲν εἶναι δοκεῖ τὸ κοινωνεῖν ἀφῆς καὶ γεύσεως 
μόνον, πρὸς δὲ ἀναίοθησιαν ἐκλειστοτέρα ἀγαπητῶν 
γὰρ ἄν δόξει καὶ ταύτης τυχεῖν τῆς γνώσεως 
ἀλλὰ μὴ κείσθαι τεθεός καὶ μὴ ὅν... διαφέρει δ’

1 προέμενα conicet Platt: projeμενα vulg.
2 ἀναίοθησιαν] φυτῶν ἡ λίθον Z, unde φυτῶν ἡ λίθον addunt 
A.-W.; pro πρὸς... ἐκλειστοτέρα inter ergo istud animal et necib 
est differentia mirabilis Σ (θαμνάσιον πρὸ βελτιστον Ζ*).

a Cf. above, 717 a 20.
for a fair part of a day; whereas semen takes several days to "set" fétations, and when the creatures have emitted this they free themselves. Indeed, animals seem to be just like divided plants: as though you were to pull a plant to pieces when it was bearing its seed and separate it into the male and female present in it.

In all her workmanship herein Nature acts in every particular as reason would expect. A plant, in its essence, has no function or activity to perform other than the production of its seed; and since this is produced as the result of the union of male with female, Nature has mixed the two and placed them together, so that in plants male and female are not separate. Plants, however, have been dealt with in another treatise; here we are concerned with animals, and generation is not the only function which an animal has—that is a function common to all things living. All animals have, in addition, some measure of knowledge of a sort (some have more, some less, some very little indeed), because they have sense-perception, and sense-perception is, of course, a sort of knowledge. The value we attach to this knowledge varies greatly according as we judge it by the standard of human intelligence or the class of lifeless objects. Compared with the intelligence possessed by man, it seems as nothing to possess the two senses of touch and taste only; but compared with entire absence of sensibility it seems a very fine thing indeed. We should much prefer to have even this sort of knowledge to a state of death and non-existence. Now it is by sense-perception that animals

b See 732 a 13, n. With this passage (731 a 29-b 3) cf. the whole Protrepticus passage there referred to.
731 b

5 αἰσθῆσει τὰ ζῷα τῶν ζώντων μόνον. ἐπεί δὲ ἀνάγκη καὶ ζῆν, ἐὰν ἢ ζῶον, ὅταν δεήσῃ ἀποτελεῖν τὸ τοῦ ζώντος ἔργον, τότε συνδύαζεται καὶ μεγαλύνεται καὶ γίγνεται ὑστερανεὶ φυτών, καθάπερ εἴπομεν.

Tὰ δὲ ὀστρακόδερμα τῶν ζῴων μεταξὺ ὅντα τῶν ζῷων καὶ τῶν φυτῶν, ὡς ἐν ἀμφοτέρους ὅντα τοῖς γένεσιν, οὐδετέρων ποιεῖ τὸ ἔργον· ὡς μὲν γὰρ φυτὸν ὁκ ἔχει τὸ θῆλυ καὶ τὸ ἄρρην καὶ οὐ γεννᾶ εἰς ἑτέρον, ὡς δὲ ζῷον οὐ φέρει εἷς αὐτοῦ καρπὸν ὑστερὰ τὰ φυτὰ, ἀλλὰ συνιστάται καὶ γεννᾶται ἐκ τῶν συντάσσεως γενεεῖδος καὶ ὑγρᾶς. ἀλλὰ περὶ μὲν τῆς τοῦτων γενεσεως ὑστερον λεκτέον.

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1 ἐὰν] ὅ ἂν A.-W. 2 φυτὸν Ζ.: φυτὸν ὅν vulg.

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a i.e., to reproduce itself, because τὸ θρηστικόν, which all
GENERATION OF ANIMALS, I. xxiii.

differ from the creatures which are merely alive; since, however, if it be an animal, its attributes must of necessity include that of being alive, when the time comes for it to accomplish the function proper to that which is alive, then it copulates and unites and becomes as it were a plant, just as we have said.

The Testacea stand midway between animals and plants and so, as being in both groups, perform the function of neither: as plants, they do not have male and female and so they do not generate by pairing; as animals they bear no fruit externally like that borne by plants; but they take shape and are generated out of a certain earthy and fluid coagulation. The manner of generation of these creatures, however, must be described later.

living things must possess, is also τὸ γεννητικὸν ἑτέρον οἷον αὐτό (735 a 17, 18).

b In Bk. III, ch. 11.
731 b 18 I  To δὲ θὴλυ καὶ τὸ ἄρρεν ὅτι μὲν εἰσιν ἀρχαι
gενέσεως εὑρίσκει πρῶτον, καὶ τὶς η δύναμις καὶ
20 ὁ λόγος τῆς οὐσίας αὐτῶν· διὰ τι δὲ γίνεται καὶ ἔστι τὸ μὲν θὴλυ τὸ δ' ἄρρεν, ὡς μὲν ἐξ ἀνάγκης καὶ
tου¹ πρῶτου κινοῦντος καὶ ὀποίας ὑλῆς² προϊόντα πειράσθαι δεῖ φράξειν τὸν λόγον, ὡς δὲ
diὰ τὸ βέλτιον καὶ τὴν αἰτίαν τὴν ἑνεκά τινος,
ἀνωθὲν³ ἔχει τὴν ἁρχήν· ἐπεὶ γὰρ ἐστὶ τὰ μὲν
25 ἄῤῥα καὶ θεία τῶν ὄντων, τὰ δ' ἐνδεχόμενα καὶ
εἶναι καὶ μὴ εἶναι, τὸ δὲ καλὸν καὶ τὸ θείον αἰτίον
ἀεὶ κατὰ τὴν αὐτοῦ φύσιν τοῦ βελτίονος ἐν τοῖς
ἐνδεχόμενοις, τὸ δὲ μὴ ἄῤῥα ἐνδεχόμενον ἐστὶ καὶ

¹ τὸ τοῦ Ζ. ² καὶ . . . ὑλῆς fortasse secludenda.
³ ἀπὸ τοῦ παντὸς addit P, Aldus (= ἀνωθὲν).
I have already said that the male and the female are principles of generation, and I have also said what is their dynamis and the logos of their essence. As for the reason why one comes to be formed, and is, male, and another female, (a) in so far as this results from necessity, 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, i.e., on account of the final cause (the Cause "for the sake of which"), the principle is derived from the upper cosmos.

What I mean is this. Of the things which are, some are eternal and divine, others admit alike of being and not-being, and the beautiful and the divine acts always, in virtue of its own nature, as a cause which produces that which is better in the things which admit of it; while

* And this principle Aristotle proceeds to explain at once, since it is really beyond the normal scope of the present treatise which is concerned chiefly with the "motive" and "material" causes of generation. ἄνωθεν (cf. τὸ ἄνω σῶμα, App. B §26) = via the "heavens" from the Unmoved Mover, "God." The best commentary on the passage which follows is afforded by Aristotle’s own statements in other treatises, of which the pertinent passages will be found in App. A (esp. §§ 12-18), and I have therefore thought it unnecessary to provide full annotations here.

* Cf. Met. 1013 a 22 πολλῶν γάρ καὶ τοῦ γνῶναι καὶ τῆς κινήσεως ἀρχὴ τάγαθον καὶ τὸ καλὸν.
eînai (καὶ μῆ eînai) καὶ μεταλαμβάνειν καὶ τοῦ χείρονος καὶ τοῦ βελτίωνος, βέλτιων δὲ ψυχή μὲν σώματος, τὸ δ' ἐμψυχον τοῦ ἄψυχον διὰ τὴν ψυχὴν, καὶ τὸ εἶναι τοῦ μῆ εἶναι καὶ τὸ ἥν τοῦ μῆ ἥν, διὰ ταύτας τὰς αἰτίας γένεσις ἰζων ἐστὶν· ἐπεὶ γὰρ ἀδύνατος ή φύσις τοῦ τοιοῦτου γένους ἀίδιος εἶναι, καθ' ὅν ἐνδέχεται τρόπον, κατὰ τούτον ἐστὶν ἀίδιον τὸ γινόμενον. ἀριθμῷ μὲν οὖν ἀδύνατον, ή γὰρ οὐσία τῶν οὖν ἐν τῇ καθ' ἐκαστὸν τοιοῦτον δ' εἶπερ ἦν, ἀίδιον ἄν ἦν· εἴδει δ' ἐνδέχεται. διὸ γένος ἀεὶ ἀνθρώπων καὶ ἰζων ἐστὶ καὶ φυτῶν. ἐπεὶ δὲ τούτων ἄρχῃ τὸ θῆλυ καὶ τὸ ἀρρέν, ἐνεκα τῆς γενέσεως ἄν εἶν τὸ θῆλυ καὶ τὸ ἀρρέν ἐν τοῖς οὖσιν ἐκάτερον τούτων. βελτίωνος

a i.e., this is the Final Cause, which can be equated with "the better," as opposed to the mere mechanical sort of causation. See above 731 b 23.

b The reader may at first be confused in this passage owing to the fact that Aristotle uses ἀίδιος in two senses: (a) in the true and full sense, as applicable to the ἄφθαρτα and θεία, as in line 731 b 25, in which sense it can be applied only to the things which ὅν ἐνδέχεται εἶναι καὶ μῆ εἶναι, i.e., which always are; but then he goes on to use it in a modified sense (b), and applies it to that which ἐνδέχεται εἶναι καὶ μῆ εἶναι, i.e., to τὸ γινόμενον, and says that τὸ γινόμενον is ἀίδιον in the way which is open to it. (Aristotle seems to regard this extension of the use of ἀίδιος as justifiable, since, as he states in the passage of De anima quoted in App. Α (§ 17), τὰ γινόμενα, although they are not eternal, do partake in eternity.) These two modes of being ἀίδιον he then describes more exactly as ἀίδιον ἀφθαρσίαν (the eternity of individual identity) and ἀίδιον εἴδει (the eternity of specific
that which is not eternal admits of being (and not-being), and of acquiring a share both in the better and in the worse; also, Soul is better than body, and a thing which has Soul in it is better than one which has not, in virtue of that Soul; and being is better than not-being, and living than not living. These are the causes on account of which generation of animals takes place, because since the nature of a class of this sort is unable to be eternal, that which comes into being is eternal in the manner that is open to it. Now it is impossible for it to be so numerically, since the "being" of things is to be found in the particular, and if it really were so, then it would be eternal; it is, however, open to it to be so specifically. That is why there is always a class of men, of animals, of plants; and since the principle of these is "the male" and "the female," it will surely be for the sake of generation that "the male" and "the female" are present in the individuals which are male and female. And as the form). Hence, in the present sentence τοιούτον means ἀρθρόν ἄδιαν; and the sense of the statement is that if an animal really were ἀρθρόν ἄδιαν, its οὐσία would be ἄδιος, i.e., ἄφθαρτος; in other words, it would no longer be a φθαρτὸν or a γυνώμενον. The translation might be expanded as follows to bring out the meaning: "Now it is impossible for it to be so numerically, since the "being" of things is in the particular i.e., in the individual concrete object consisting of matter and form; and obviously no such particular φθαρτὸν —animal or plant—can be numerically eternal; and if it really were so, then it would be eternal in the full and proper sense of the term, viz., it would be ἄφθαρτον, and no longer a γυνώμενον at all; it is, however, open to it to be eternal specifically.” It is useful to note that at Met. 999 b 33 Aristotle states that there is no difference between the terms ἀρθμός ἐν and καθ' ἐκαστὸν (τὸ ἀρθμός ἐν ἢ τὸ καθ' ἐκαστὸν λέγειν διαφέρει οὐδὲν).—See further, App. A §§ 15-18.
δὲ καὶ θειοτέρας τὴν φύσιν ούνης τῆς αὐτίας τῆς
κυνούσης πρώτης, ἦ 9 λόγος ὑπάρχει καὶ τὸ εἴδος,
τῆς ὕλης, βέλτιον καὶ τὸ κεχωρίσθαι τὸ κρείττον
tοῦ χείρονος. διὰ τοῦτ' ἐν ὁσιο ἐνδέχεται καὶ
cαθ' ὁσαι ἐνδέχεται, κεχωρίστατο τοῦ θήλεος τὸ
ἀρρεν. βέλτιον γὰρ καὶ θειότερον ἦ ἀρχὴ τῆς
kινήσεως [ἡ ἄρρεν ὑπάρχει] 2 τοῖς γυνομένοις. ὕλη
δὲ τὸ 3 θήλυ. συνέρχεται δὲ καὶ μέγνυται πρὸς
tὴν ἐργασίαν τῆς γενέσεως τῷ θήλει τὸ ἄρρεν·
αὐτὴ γὰρ κοινὴ ἀμφοτέροις.

[Κατὰ μὲν οὖν τὸ μετέχειν τοῦ θήλεος καὶ τοῦ
ἀρρένου ἡ ἦ, διὸ καὶ τὰ φυτὰ μετέχει ζωῆς· κατὰ
dὲ τὴν αἰσθήσεων τὸ τῶν ζωῶν ἐστὶ γένος. τούτων
dὲ σχεδὸν ἐν πάσι τοῖς πορευτικοῖς κεχωρίστατο τὸ
θήλυ καὶ τὸ ἄρρεν διὰ τὰς εἰρημένας αἰτίας· καὶ
tούτων τὰ μέν, ᾠσπέρ ἐλέξθη, προέτει σπέρμα,
tὰ δ' οὐ προέτει ἐν τῷ συνδυασμῷ. τούτου δ'
αἰτίον ὅτι τὰ τιμιώτερα καὶ αὐταρκέστερα τὴν
φύσιν ἐστίν, ὡστε μεγέθους μετεληφθέναι. τοῦτο
d' οὐκ ἀνευθυνὸν ἄρρενον κινεῖσθαι δυνάμεως, τὸ δὲ
θερμὸν κινητικὸν. διότερ, ὡς ἐπὶ τὸ πᾶν βλέ-

1 ἦ Peck: ἦ vulg.
2 om. S.
4 vv. 11-23 secludenda.

a Cf. 716 a 5.
b i.e., the Material Cause. Cf. 716 a 5.
c See Introd. §§ 1 ff., 10, 50.
d This paragraph seems to be out of place, consisting of various remarks which are irrelevant here. Cf. 715 a 18 ff., and parts of Bk. I, ch. 23.

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proximate motive cause,\(^a\) to which belong the logos and the Form, is \textit{better} and more divine in its nature than the Matter,\(^b\) it is \textit{better} also 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 \textit{better} and more divine in that it is the principle of movement\(^c\) for generated things, while the female serves as their matter. The male, however, comes together with the female and mingles with it for the business of generation, because this is something that concerns both of them.

\(^d\)[Thus things are alive in virtue of having in them a share of the male and of the female, and that is why even plants have life. The class of animals, however, is \textit{what it is} in virtue of its power of sense-perception.\(^e\) In practically all animals which can move about the male and the female are found separate, and the causes are the ones which have been stated; and, as was said,\(^f\) some of them emit semen during copulation, some do not. The reason for this is that the higher animals are more self-sufficient in their nature, and so are large in size: this cannot be so without heat of Soul, since of necessity the larger a thing is, the greater the power required to move it, and heat acts as a motive power. Hence, if we take

\(^a\) Cf. \textit{P. A.} 666 a 34 τὸ \mu̱n γὰρ ζῷον \alphaἰσθήσει \αρισταί, and 651 b 4, 653 b 22. Aristotle seems to have perceived early the importance of this point, as it occurred in his early work \textit{Protrepticus.} See Iamblichus, \textit{Protrepticus} 7 (44. 9 Pistelli; 37. 9 Walzer, \textit{Aristot. Dial. Frag.}), a passage which according to Jaeger (\textit{Aristotle}, 69) comes from Aristotle's \textit{Protrepticus}: ἀλλὰ \mu̱ν τὸ γε ζῆν τῷ \alphaἰσθάνεσθαι διακρίνεται τοῦ \mu̱ν ζῆν, and with that whole passage cf. 731 a 29–b 3 above.

\(^b\) Bk. I, ch. 17.
732a ἕαντας εἰπεῖν, τὰ ἐναίμα μείζω τῶν ἀναίμων καὶ τὰ πορευτικὰ τῶν μονώμων ἥνων· ἀπερ προῖεται σπέρμα διὰ τὴν θερμότητα καὶ τὸ μέγεθος.]

Καὶ περὶ μὲν ἄρρενος καὶ θήλεος, δι’ ἥν αἳταιν

25 ἐστὶν ἐκάτερον, εἰρηταί.

Τῶν δὲ ἥνων τὰ μὲν τελεσιουργεῖ καὶ ἐκπέμπει θύραξ ὁμοίον ἐαυτῷ, οἶον ὡσα ἥνωτοκεὶ εἰς τούμφανες, τὰ δὲ ἀδιάρθρωτον ἐκτίκτει καὶ οὐκ ἀπειληφός τὴν αὐτοῦ μορφήν. τῶν δὲ τοιούτων τὰ μὲν ἐναίμα ὄστοκεῖ, τὰ δ’ ἀναίμα (ἡ ὄστοκει ἡ) σκωληκοτοκεῖ. διαφέρει δ’ ὄσον καὶ σκώληξ. ὅσον

30 μὲν γάρ ἐστὶν ἐξ οὗ γίνεται τὸ γινόμενον ἐκ μέρους, τὸ δὲ λοιπὸν ἐστὶν τροφὴ τῶν γυνομένων, σκώληξ δ’ ἐξ οὗ τὸ γινόμενον ὅλου ὅλον γίνεται.

τῶν δὲ εἰς τὸ φανερὸν ὁμοίον ἀποτελούντων ἥνων καὶ ἥνωτοκούντων τὰ μὲν εὐθῆς ἐν αὐτοῖς ἥνωτοκεί, οἶον ἄνθρωπος καὶ ἰππος καὶ βοῦς καὶ τῶν

35 θαλαττῶν δὲ δελφῖς καὶ τάλλα τὰ τοιαῦτα, τὰ δ’ ἐν αὐτοῖς ὄστοκήσαντα πρῶτον οὕτω ἥνωτοκεῖ θύραξ, οἶον τὰ σελάχη καλούμενα. τῶν δ’ ἥνωτοκούντων τὰ μὲν τέλειον προῖεται τὸ ὄσον, οἶον ὀρνιθες καὶ ὡσα τετράποδα ὄστοκει καὶ ὡσα ἄποδα, οἶον σαῦρα καὶ χελώναι καὶ τῶν ὀφεων τὸ πλεῖστον

5 γένος (τὰ γὰρ τούτων ὡς ὅταν ἔξελθη, οὐκέτι λαμβάνει αὐξήσεω), τὰ δ’ ἀτελῆ, οἶον οἳ τ’ ἰχθύες

1 Platt. 2 δὲ om. PSY.

a See Introd. §§ 74 ff.
b Cf. 752 a 27, 758 b 10 ff., and H. A. 489 b 6 ff. The distinction which Aristotle makes here is that between the utilization of yolk as the raw material of embryonic develop-
a general view, we may say that blooded animals are larger than bloodless, and mobile ones larger than stationary; and they are the ones which emit semen on account of their heat and their size.] We have now stated the Cause why each of the two, male and female, is. Some animals bring their young to perfection, and bring forth externally a creature similar to themselves—e.g., those which are externally viviparous; others produce something which is unarticulated and has not yet assumed its proper shape. In the latter class those which are blooded lay eggs, those which are bloodless produce (either eggs or) larvae. The difference between an egg and a larva is this: an egg is something from part of which the new creature is formed, while the remainder is nourishment for it; whereas in the case of the larva, the whole of it is used to form the whole of the offspring. Of the animals which produce externally a perfected creature similar to themselves, i.e., the Vivipara, some are internally viviparous from the outset (as man, horse, ox; and of sea-creatures, the dolphin and the other animals of that sort), others are internally oviparous at the first stage, and thereafter are externally viviparous (as what are called Selachia). Of oviparous animals, some lay their eggs in a perfected state (as birds, oviparous quadrupeds and footless animals, e.g., lizards and tortoises, and the great majority of the serpents ')—eggs which once they are laid do not grow any more; others lay their eggs in an imperfect, and the utilization of tissue-disintegration products in metamorphosis. The embryo feeds upon its yolk, but the pupa feeds upon itself.

The various methods of generation. 

a The viper is the exception; see below, line 21.
καὶ τὰ μαλακόστρακα καὶ τὰ μαλάκια καλούμενα·

tοῦτων γὰρ τὰ ἥδα αὐξάνεται ἐξελθόντα.

Πάντα δὲ τὰ ζωοτοκοῦντα [ἡ ζωοτοκοῦντα] ἑναίμα

ἔστιν, καὶ τὰ ἑναίμα ἡ ζωοτοκεῖ ἡ ψωτοκεῖ, ὡσα
10 μὴ ὅλως ἀγονά ἐστιν. τῶν δὲ ἀναίμων τὰ ἐντομά

σκωληκοτοκεῖ, ὡσα ἡ ἐκ συνδυασμοῦ γίνεται ἡ
αὐτὰ συνδυάζεται. ἔστι γὰρ ἑναία τοιαῦτα τῶν
ἐντόμων ἡ γίνεται μὲν αὐτόματα, ἔστι δὲ θήλεα
καὶ ἀρρενα, καὶ ἐκ συνδυαζομένων γίνεται τι
αὐτῶν, ἄτελες μὲντοι τὸ γιγνόμενον· ὡσα δ' αἰτία

εἰρηται πρῶτον ἐν ἐτέρωσ.

15 Συμβαίνει δὲ πολλῆ ἐπάλλαξις τοῖς γένεσιν.

οὐτε γὰρ τὰ δίποδα πάντα ζωοτοκεῖ (οἱ γὰρ ὀρνίθες

ψωτοκοῦσιν) οὐτε ψωτοκεῖ πάντα (ὁ γὰρ ἄνθρωπος

ζωοτοκεῖ), οὐτε τὰ τετράποδα πάντα ψωτοκεῖ

(ἄππος γὰρ καὶ βοῦς καὶ ἄλλα μυρία ζωοτοκεῖ)

οὔτε ζωοτοκεῖ πάντα (σαῦροι γὰρ καὶ κροκόδιλοι

καὶ ἄλλα πολλὰ ψωτοκοῦσιν). οὔτε ἐν τῷ πόδας

ἐχειν ἡ μὴ ἐχειν διαφέρει· καὶ γὰρ ἀποδα ζωοτοκεῖ,

ὅτι οἱ ἑχοῦσι καὶ τὰ σελάχη, τὰ δὲ ψωτοκεῖ, οἶον

τὸ τῶν ἱχθύων γένος καὶ τὸ τῶν ἄλλων ὕφεων·

καὶ τῶν πόδας ἑχόντων καὶ ψωτοκεῖ πολλὰ καὶ

ζωοτοκεῖ, οἶον τὰ εἰρημένα τετράποδα. καὶ ἐν

25 αὐτοῖς δὲ ζωοτοκεῖ καὶ πόδας ἑχοῦσα, οἶον ἄνθρω-

πος, καὶ ἀποδα, οἶον φάλαινα καὶ δελφίς. ταύτη

μὲν οὖν οὐκ ἔστι διελεῖν, οὔτε αἰτίον τῆς διαφορᾶς

1 seclusit Platt (idem Sus.).

2 σαῦροί PSYZ*: σαῦροι Ob, vulg.

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*a Cf. 718 b 8 and note there.  
*b See 721 a 3 ff. 
*c Aristotle may have in mind the method of dichotomy, against which he inveighs elsewhere (see P.A. 642 b 5 ff., 136
fect state, as the Fishes, and the Crustacea and the Cephalopods as they are called, whose eggs do grow in size after they are laid.\footnote{\textsuperscript{a}}

All animals that are viviparous [or oviparous] are blooded, and animals that are blooded are either viviparous or oviparous, apart from those which are completely infertile. Of bloodless animals, Insects produce a larva; this holds good both for those which are formed as a result of copulation and those which themselves copulate.\footnote{\textsuperscript{b}} (A note of explanation: there are certain Insects which, although formed by spontaneous generation, nevertheless are male and female, and as a result of their copulation something is formed, though it is imperfect: the cause of this has already been stated elsewhere.)

Actually there is a good deal of overlapping between the various classes. Bipeds are not all viviparous (birds are oviparous) nor all oviparous (man is viviparous); quadrupeds are not all oviparous (the horse and ox and heaps of others are viviparous), nor all viviparous (lizards and crocodiles and many others are oviparous). Nor does the difference lie even in having or not having feet: some footless animals are viviparous (as vipers, and the Selachia), some are oviparous (as the class of fishes, and the rest of the serpents); and of the footed animals many are oviparous, many viviparous (e.g., the quadrupeds already mentioned). There are footed animals which are internally viviparous (as man), and footless ones also (as the whale and dolphin). So we find no means here for making a division \footnote{\textsuperscript{c}}: the cause of this difference and my note there), as used, though for a different purpose, by Plato in \textit{Sophist} and \textit{Politics} (e.g., the division into \textit{τὸ πεζὸν} and \textit{τὸ νευτικὸν} at \textit{Sophist} 220 \textit{α}).

\footnote{\textsuperscript{a}}

\footnote{\textsuperscript{b}}

\footnote{\textsuperscript{c}}}
732 b

taúthis outhev twn poleutikwn orgánwv, allh zwo-
tokei méν τa tellewtera tijn fýswv twn zówv kai
30 metéxonta katharowteras arxh
outhev gar zwotokei
en autoi, μη dechomeven to pneúma kai anapnévov.
tellewtera de tâ thermodera tijn fýswv kai úgrótera
ei kai μη geowdi. tís de thermodéthos tís fysikís
øròs ó pleýmwn, òsow enammos ëstiv òlows méν gar
ta ëxonta pleýmova twn μh ëxontov thermodéra,
35 touwtow ði autów tâ ùsoufoun ëxonta μhde sti-
phron μhdiðígaímov allë enamwon kai malaków.
òstper de tò mev zówv telleiov, ò de skwlyh kai
tò wòn òtelèes, ouwsw to telleiov ek toû telleistéron
غنيσθαι πέφυκεν. τâ de thermodéra méν dia to
ëxein pleýmova, xwrôtera de tîn fûsw, ἥ tâ ψw-
5 xrótera méν úgrótera de, tâ méν ñotokei telleio
wòn, tâ ðì ñotokîsanta zwootokei ën autoís. oî
méν gar ñrinihes kai tâ folidwta dià méν ther-
modéthta telleisourgyouði, dià de xwrôthta ñotot-
kouði, tâ de selákh thrmâ méν ÿttov touwtw,
úgrâ de mállon, òste metéxei ÿmfotérovn kai gar
10 ñotokei kai zwootokei ën autoís, ñotokei méν òti
ψwkrá, zwootokei ðì òti úgrâ. ñotikón gar to
úgrón, porrwotatw de toû ëmpwçou to xwrôv. èpete
ðì ouste pterwta ouste folidwta ouste lepidwta
ëstiv, ðì ñmheía xwrâs mállon kai geowdous fûsews,


a See Introd. § 38. b Not a living creature.
138
does not lie in any of the organs of locomotion. No; those animals are viviparous which are more perfect in their nature, which partake of a purer "principle"; in other words, no animal is internally viviparous unless it draws in breath—respires. The more perfect animals are those which are by their nature hotter and more fluid and are not earthy. (The test of natural heat is the presence of the lung, provided it has blood in it. Speaking generally, animals which have a lung are hotter than those that have none, and of the former those are hotter whose lung is not spongy nor compact nor poorly supplied with blood, but well supplied with blood and soft.) And since an actual animal is something perfect whereas larvae and eggs are something imperfect, Nature's rule is that the perfect offspring shall be produced by the more perfect sort of parent. Those animals which are hotter (as their having a lung indicates), though of a more solid\(^a\) consistency, or are colder but more fluid, either (a) are oviparous and lay a perfect egg, or (b) first lay an egg and then are viviparous internally. Thus, birds and the animals with horny scales, on account of their heat, produce something perfect, but on account of their solidity it is an egg only\(^b\); the Selachia are less hot than these are, but more fluid; hence they share in the characteristics of both—they are oviparous because they are cold creatures, and internally viviparous because they are fluid (the reason being that fluid matter is conducive to life, whereas solid matter and the living organism are at opposite poles); and as they have neither feathers nor horny plates nor scales, which are signs of a constitution that tends to be solid and earthy, the egg which they produce is
μαλακόν τὸ ψόν γεννώσων· ὅσπερ γὰρ οὐδ' ἐν 15 αὐτῷ, οὐδ' ἐν τῷ ψώ ϑετοπολάζει τὸ γεγρον. καὶ ὅν ὑπερ γὰρ ἃν ὕν ὸκν προβολῆν.

Τὰ δὲ ψυχρὰ καὶ ἄρρα μάλλον ὢστοκεῖ μέν, ἀτέλες δὲ τὸ ψόν, καὶ σκληρόδερμον δὲ διὰ τὸ γεγρα ἤναι καὶ ἀτέλες προίσθαι, ἃνα σώζηται

20 φυλακῆν ἔχου τὸ ὄστρακώδες. οἱ μὲν οὖν ἵχθυες λεπιδωτοὶ ὄντες καὶ τὰ μαλακόστρακα γεγρα ὀντα σκληρόδερμα τὰ ψά γεννᾶ. τὰ δὲ μαλάκια, ὅσπερ αὐτὰ γλυκάρχα τὴν τοῦ σώματος ἐστὶ φύσιν, οὕτως σώζει ἀτελή προϊέμενα τὰ ψά· προῖσθαι γὰρ γλυ-

σχρότητα περὶ τὸ κύπημα πολλῆν. τὰ δ' ἔντομα 25 πάντα σκωληκοτοκεῖ. ἐστὶ δ' ἀπαντὰ ἀναίμα τὰ ἔντομα, διὸ καὶ σκωληκοτοκοῦντα θύραζε. τὰ δ' ἀναίμα οὐ πάντα σκωληκοτοκεῖ ἀπλῶς· ἐπαλλάτ-

τουσι γὰρ ἄλληλος [τὰ τ' ἔντομα] τὰ σκωλη-

κοτοκοῦντα καὶ τὰ ἀτελεῖς τίκτοντα τὸ ψόν, οἷον οἱ τ' ἵχθυες οἱ λεπιδωτοὶ καὶ τὰ μαλακόστρακα 30 καὶ τὰ μαλάκια. τούτων μὲν γὰρ τὰ ψά σκω-

ληκώδη ἐστίν (ἀὔξησιν γὰρ λαμβάνει θύραζε), ἐκείνων δ' οἱ σκώληκες γίνονται προϊόντες ἄφω-

ειδεῖς· ὅν δὲ τρόπον, ἐν τοῖς ὑστεροι διοριοῦμεν. 

Δεῖ δὲ νοήσαι ὡς εἴ καὶ ἐφεξῆς τὴν γένεσιν ἀποδίδουσιν ἡ φύσις. τὰ μὲν γὰρ τελεώτερα καὶ θερμότερα τῶν χῶν τέλειον ἀποδίδωσι τὸ τέκνον κατὰ τὸ ποιόν (κατὰ δὲ τὸ ποσὸν ὀλως οὕθεν τῶν

1 αὐτὰ P: αὐτὸ vulg.  
2 καὶ τὰ PSYS.  
3 seclusi.  
4 τὰ ἔντομα καὶ τὰ σκωληκοτοκοῦντα ZΣ: τὰ τ' ἔντομα vulg.  
5 τελειώτατα καὶ θερμότατα P.

a Bk. III, ch. 9.
a soft one: the earthy substance does not come to the surface in the egg any more than it does in the creature which lays it. And that is why they lay their eggs internally: if the eggs emerged they would be destroyed through lack of protection.

Animals that tend to be cold and solid lay eggs, it is true, but their egg is imperfect, and it has a hard covering (a) because the animals themselves are earthy and (b) because it is in an imperfect state when laid, and the shelly exterior serves as a protection to keep it safe. Thus fishes, being scaly, and Crustacea, being earthy, produce eggs with a hard covering; while the Cephalopods, which also lay imperfect eggs, keep them safe by a method in accordance with the sticky nature of their own bodies; they exude a large amount of sticky substance over the fetation. Insects all produce larvae. Now all Insects are bloodless, and that actually is why they are externally larva-producing. But it is not true that all bloodless animals are larva-producing without qualification, because there is overlapping as between the larva-producing animals and those that produce imperfect eggs (e.g., the scaly fishes, the Crustacea and the Cephalopods), since the eggs of the latter are larva-like, in that they grow bigger after they have been laid externally, while the larvae of the former, as they develop, become egg-like: we shall explain later how this happens.8

We should notice how well Nature brings generation about in its several forms: they are arranged in a regular series, thus: (1) The more perfect and hotter of the animals produce their young in a perfect state so far as their quality is concerned (no animal brings forth young that are perfect in size, because
733b

ζῶνεν· πάντα γὰρ γενόμενα λαμβάνει αὐξήσεων), καὶ
gεννᾷ δὴ ταύτα ζῶα ἐν αὐτοῖς εὐθὺς. τὰ δὲ δεύ-
5 τερα ἐν αὐτοῖς μὲν οὔ γεννᾷ τέλεια εὐθὺς (ζωοτοκεῖ
γὰρ ψωτοκήσαντα πρῶτον), θύραζε δὲ ζωοτοκεῖ.
tὰ δὲ ζῶον μὲν οὔ τέλειον γεννᾶ, ὕπον δὲ γεννᾶ,
καὶ τούτο τέλειον τὸ ὑόν. τὰ δ' ἔτι τούτων ψυ-
χροτέραν έχοντα τὴν φύσιν ὕρον μὲν γεννᾶ οὔ
τέλειον δὲ ὑόν, ἀλλ' ἐξω τελειώταται, καθάπερ τὸ
10 τῶν λεπιδωτῶν ἱχθύων γένος καὶ τὰ μαλακόστρακα
καὶ τὰ μαλάκια. τὸ δὲ πέμπτον γένος καὶ ψυχρό-
taton οὐδ' ψωτοκεῖ ἐξ αὐτοῦ, ἀλλὰ καὶ το' τοιούτων
ἐξω συμβαίνει πάθος αὐτῷ, ὦσπερ εἰρήτατ. τὰ
gὰρ ἐντομα σκωληκοτοκεῖ τὸ πρῶτον· προελθὼν δ' ἁ-
ώδης γίνεται δ' σκάλης (ἡ γὰρ χρυσαλλίς κα-
15 λομενή δύναμιν ψοῦ ἐχει). εἰτ' ἐκ τούτων γίνεται
ζῶον, ἐν τῇ τρίτῃ μεταβολῇ λαβόν τὸ τῆς γενέσεως
τέλος.

Τὰ μὲν οὖν οὐ γίνεται τῶν ζῶον ἀπὸ σπέρματος,
ωσπερ ἑλέχθη καὶ πρότερον· τὰ δ' ἐναιμά πάντα
γίνεται ἀπὸ σπέρματος, ὡσα ἐκ συνδυασμοῦ γί-
20 νται, προϊμένου τοῦ ἀρρενοῦ εἰς τὸ θῆλυ γονὴν,
ὅς εἰσέλθουσι τὰ ζῶα συνίστασι καὶ λαμβάνει
τὴν οἰκείαν μορφήν, τὰ μὲν ἐν αὐτοῖς τοῖς ζῶοις
ὁσα ζωοτοκεῖ, τὰ δ' ἐν ὕροις [καὶ σπέρματι καὶ
τοιαύταις ἄλλαις ἀποκρίσεων].

Περὶ δὲν ἐστὶν ἀπορία πλείων, πῶς ποτὲ γίνεται ἐκ

1 τοῦ Bekker per hypoth. err.
2 seclusit Platt (om. Σ), sed monet quaedam de plantis
fortasse excidisse.

a Above, 733 a 31.
they all grow in size after they have been produced), and these young which they generate are living creatures inside them from the outset. (2) The second class do not generate perfect animals within themselves from the outset: although they are viviparous, they lay eggs first of all; externally however they are viviparous. (3) Others produce not a perfect animal, but an egg, which is perfect. (4) Those whose constitution is still colder than this produce an egg, but it is not a perfect one: it reaches its perfection outside the parent. Examples are the scaly fishes, the Crustacea and the Cephalopods. (5) The fifth class of creatures, which are the coldest of all, do not even lay an egg directly themselves, but the formation of their egg takes place outside the parent, as has been said. What happens is that Insects first produce a larva, then the larva develops till it becomes egg-like (what is called the chrysalis is really equivalent to an egg); then out of this an animal is formed, and it is not until this third stage in its series of changes that it reaches the end and perfection of its generation.

There are, then, some animals which are not formed from semen, as I have in fact said already. All blooded ones, however, are formed from semen, so many as are formed as the result of copulation, that is to say, the male emits semen into the female, and upon the entry of the semen the young animals are "set" and constituted and assume their proper shape; with the viviparous animals this stage takes place within the parent, with others in the eggs [and seeds and other such secretions].

And on this subject we are confronted by no small How is the

\[ \text{Lit., "has the } \text{dynamis of an egg"}: \text{ see Introd. § 26.} \]
The discussion which follows shows that Aristotle fully appreciated the greatest problem of embryological theory, a problem which gave rise to centuries of controversy. Does the embryo contain all its parts in little from the beginning, unfolding like a Japanese paper flower in water ("pre-formation"), or is there a true formation of new structures as it develops ("epigenesis")? Aristotle was an epigenesist, but he was not vindicated till the time of C. F. Wolff and K. E. von Baer, at the end of the 18th and the beginning of the 19th century. The history of the controversy will be found in J. Needham's History of Embryology and A. W.
How, we ask, is any plant formed out of the seed, or any animal out of the semen? That which is formed by means of a process must of necessity be formed (a) out of something (b) by something (c) into something. "Out of something." This of course is the material or matter. Some animals have their primary matter within themselves, having derived it from the female parent, e.g., those animals which are produced not viviparously but out of larvae or eggs. Others derive it from the mother for a considerable time by being suckled. These are the animals which are produced viviparously not externally only but also internally. So then, that "out of which" the parts are formed is material of this sort. The problem now before us however is not Out of what, but, By what, are they formed? Either something external fashions them, or else something present in the semen or seminal fluid; and this is either some part of Soul, or Soul, or something which possesses Soul. Now it would appear unreasonable to suppose that anything external fashions all the individual parts, whether they be the viscera or any others, because unless it is in contact it cannot set up any movement, and unless it sets up a movement no effect can be produced upon anything by it. Hence it follows that there must be something already present inside the fertilisation itself, which is either a part of it or separate from it.

Meyer's The Rise of Embryology. Like many erroneous theories, preformationism contained some truth, for we know to-day that the course of the embryo's development is predetermined by its genetic constitution.

*b* Cf. 729 a 33 note.

e This excludes the Selachia.

άλλο τι εἶναι κεχωρισμένον ἀλογον. γεννηθέντος γὰρ τοῦ ζῶου πότερον φθείρεται ἡ ἐμμένει; ἀλλ’ οὐδὲν τοιοῦτον φαίνεται ἐνὸν ὁ οὐ μόριον τοῦ ὀλου ἡ φυτοῦ ἡ ζῶου ἐστίν. ἀλλὰ μὴν καὶ τὸ φθείρεσθαι 10 γε ποιήσαν εἴτε πάντα τὰ μέρη εἴτε τινὰ ἀτοπον. τὰ λοιπὰ γὰρ τὶ ποιήσει; εἰ γὰρ ἐκεῖνο μὲν τὴν καρδίαν, εἰτ’ ἐφθάρῃ, αὐτὴ δ’ ἔτερον, τοῦ αὐτοῦ λόγου ἡ πάντα φθείρεσθαι ἡ πάντα μὲνεν. σώζεται ἄρα. αὐτοῦ ἄρα μόριον ἐστιν, δ’ εὐθὺς ἐνυπάρχει ἐν τῷ σπέρματι. εἰ δὲ δὴ μὴ ἐστὶ τῆς ψυχῆς 15 μηθέν ό μή τοῦ σώματος ἐστιν ἐν τινι μορίως, καὶ ἐμμένον αὐ τι εὔη μόριον εὐθὺς.

Τὰ ὀδὸν ἀλλὰ πῶς; ἡ γὰρ τοῦ ἀμα πάντα γίγνεται τὰ μόρια, οἶνον καρδία πλεύμων ἡπαρ ὑπαρ ὑπαιρμῶς καὶ τῶν ἀλλων ἕκαστον, ἡ ἔφεξῆς, ὠσπερ ἐν τοῖς καλουμένοις Ὄρφεως ἐπεστὶ εκεῖ γὰρ 20 ὁμοίως φησὶ γίγνεσθαι τὸ ζῶον τῇ τοῦ δικτύου πλοκῆ. ὅτι μὲν οὖν οὐχ ἀμα, καὶ τῇ αἰσθῆσει ἐστὶ φανερον τὰ μὲν γὰρ φαίνεται ἐνότα ἡ ἐς τῶν μορίων, τὰ δ’ οὐ. ὅτι δ’ οὐ διὰ μικρότητα οὐ φαίνεται, δῆλον μείζων γὰρ τὸ μέγεθος οὖν ὁ πνεύμων τῆς καρδίας ὑστερον φαίνεται τῆς καρδίας 25 ἐν τῇ ε viện ἀρχῆς γενέσει. ἐπει δὲ τὸ μὲν πρότερον τὸ δ’ ὑστερον, πότερον θάτερον ποιεῖ θάτερον, καὶ

\[a\] It would be inconsistent to say that the disappearance was arrested at some arbitrary stage in the process.

\[b\] Apart from rational Soul, the connexion is reciprocal; and Aristotle often remarks that there is no part of the body which has no Soul in it; see 726 b 22 and 735 a 6 ff.

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To suppose it is some other thing, and separate from it, is not reasonable. If it were, the question arises: When the animal's generation is completed, does this something disappear, or does it remain within the animal? We cannot detect any such thing, something which is in the plant or the animal and yet is no part of the organism as a whole. And again, to say that it fashions all the parts or some parts of the organism and then disappears is ridiculous. If it fashions only some of the parts, what will fashion the rest? Supposing it fashions the heart, and then disappears, and the heart fashions some other part: to be consistent we must say that either all the parts disappear or all the parts remain. It must, then, persist. And therefore it must be a part of the whole, existing in the semen from the outset. And if it is true that there is no part of the Soul which is not in some part of the body, then it must also be a part which contains Soul from the outset.

How, then, are the other parts formed? Either they are all formed simultaneously—heart, lung, liver, eye, and the rest of them—or successively, as we read in the poems ascribed to Orpheus, where he says that the process by which an animal is formed resembles the plaiting of a net. As for simultaneous formation of the parts, our senses tell us plainly that this does not happen: some of the parts are clearly to be seen present in the embryo while others are not. And our failure to see them is not because they are too small; this is certain, because although the lung is larger in size than the heart it makes its appearance later in the original process of formation. Since one part, then, comes earlier and another later, is it the case that A fashions B and that it is there on
έστι διὰ τὸ ἐχόμενον, ἣ μᾶλλον μετὰ τόδε γίνεται τόδε; λέγω δὲ οἷον οὐχ ἡ καρδία γενομένη ποιεῖ τὸ ἡπαρ, τοῦτο δὲ ἔτερον τι, ἀλλὰ τόδε μετὰ τόδε, [ὡσπερ μετὰ τὸ παῖς ἀνήρ γίνεται], 1 ἀλλ' οὖχ ὑπ' 30 ἐκεῖνου. λόγος δὲ τούτου, ὅτι ὑπὸ τοῦ ἐντελεχείας οὐντος τὸ δυνάμει όν γίνεται ἐν τοῖς φύσει ἡ τέχνη γινομένοις, ὥστε δέοι ἂν τὸ εἴδος καὶ τὴν μορφὴν ἐν ἐκείνῳ εἶναι, οἷον ἐν τῇ καρδίᾳ τοῦ τοῦ ἢπατος. καὶ ἄλλως δ' ἀτοπος καὶ πλασματίας ὁ λόγος. ἀλλὰ μὴν καὶ τὸ ἐν τῷ ὁπέρματι εὐθὺς ἐνυπάρχειν

35 τι μόριον τοῦ ζῶου ἡ φυτοῦ γεγενημένον, εἴτε δυνάμενον ποιεῖν τὰλλα εἴτε μή, ἀδύνατον, εἰ πάν ἐκ ὁπέρματος καὶ γονῆς γίνεται. δήλον γὰρ ὅτι ὑπὸ τοῦ τὸ ὁπέρμα ποιήσαντος ἐγένετο, εἴπερ εὐθὺς ἐνυπάρχει. ἀλλὰ ὁπέρμα δεῖ γενεσθαι πρῶτον, καὶ τούτ' ἔργον τοῦ γεννώτος. οὐθὲν ἄρᾳ οἷον τε μόριον ὑπάρχειν. οὐκ ἄρᾳ ἔχει τὸ ποιοῦν τὰ μόρια ἐν αὐτῷ. ἀλλὰ μὴν οὐδ' ἔξω ἀνάγκη δὲ τούτων εἶναι ϑάτερον.

5 Πειρατέον δὴ ταῦτα λύειν· οὕσως γὰρ τὸ τῶν εἰρημένων ἐστὶν οὐχ ἀπλοῦν, οἷον πῶς ποτε ὑπὸ τοῦ ἔξω οὐκ ἐνδέχεται γίνεσθαι. ἐστὶ μὲν γὰρ ὡς ἐνδέχεται, ἐστὶ δ' ὡς οὖ· τὸ μὲν οὖν τὸ ὁπέρμα

1 seclusi; velit secludere Platt.

a As argued already, 734 a 2 ff.

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account of B which is next to it, or is it rather the
case that B is formed after A? I mean, for instance,
not that the heart, once it is formed, fashions the
liver, and then the liver fashions something else;
but that the one is formed after the other [just as a
man is formed after a child], not by it. The reason
of this is that, so far as the things formed by nature
or by human art are concerned, the formation of
that which is potentially is brought about by that
which is in actuality: so that the Form, or con-
formation, of B would have to be contained in A;
e.g., the Form of the liver would have to be in the
heart—which is absurd. And there are other ways
too in which the theory is absurd and fondly in-
vented. But besides, for any part of the animal
or plant to be present from the outset ready formed
within the semen or seed, whether it has the power
to fashion the other parts or not—even this is impos-
sible if everything is formed out of semen or seed;
because it is plain that it was formed by that which
-fashioned the semen if it is present within the semen
from the outset; but semen must be formed before
(any part), and that is the business of the parent.
Therefore no part can be present within the semen.
Therefore it does not contain in itself that which
fashions the parts. And yet this cannot be external
to the semen either: and it must be either ex-
ternal to it or inside it.

Well, we must endeavour to solve this difficulty.
Maybe there is some statement of ours, made without
qualification, which ought to be qualified: e.g., if we
ask, in what sense exactly is it impossible for the parts
to be formed by something external? we see that
in one sense it is possible, though in another it is not.
It will be noticed that the passage which follows sounds surprisingly modern; this is largely due to the great emphasis which Aristotle here gives to the rôle played by the Efficient (or Motive) Cause.—See however App. B § 5.

\[\text{Cf. 741 b 9; and G. & C. II, ch. 10 and 11. At Mech. 848 a, there is a description of the mechanism by which these may have been worked.}\]

\[\text{кине́так} ("is set in movement") has been suggested for \(\gammaιγνέтαι\) ("comes to be"). But perhaps \(\gammaιγνέθαι \epsilon\nuεργέια\) is the inceptive form of \(\epsilonιναι \epsilon\nuεργέια\), as in the phrase \(\οντος \epsilon\nuεργέια\), line 21 below.\]
Now it makes no difference whether we say "the semen" or "that from which the semen comes," in so far as the semen has within itself the movement which the generator set going. And 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 automatons, 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. The cases then are parallel: just as with the automaton (1) in one way it is the external agency which is causing the thing's movement—viz., not by being in contact with it anywhere now, but by having at one time been in contact with it, so too that from which the semen originally came, or that which fashioned the semen, (causes the embryo's movement)—viz., not by being in contact with it still, but by having once been in contact with it at some point; (2) in another way, it is the movement resident within (which causes it to move), just as the activity of building causes the house to get built.

It is clear by now that there is something which fashions the parts of the embryo, but that this agent is not by way of being a definite individual thing, nor is it present in the semen as something already perfected to begin with.

To answer the question, How exactly is each of the parts formed? we must take first of all as our

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*a* i.e., development; see Introd. §§ 47 ff.

*b* Cf. above, 730 b 8.

*c* τόσον τι: cf. Met. 1030 a 7 τό τόσον τι ταύτα ὄνομα ὑπάρχει μόνον. A τόσον τι is often equated with an ὄνομα. Also cf. P.A. 641 b 31 γένεσις μὲν γὰρ τὸ σπέρμα, ὄνομα δὲ τὸ τέλος.
ARISTOTLE

734 b

φύσει γίγνεται ἡ τέχνη, ὑπ' ἐνεργείᾳ ὄντος γίνεται ἐκ τοῦ δυνάμει τοιούτου. τὸ μὲν οὖν σπέρμα τοιοῦτον, καὶ ἔχει κίνησιν καὶ ἀρχὴν τοιαύτην, ὥστε πανομένης Κῆς κινήσεως γίνεσθαι ἑκαστὸν 25 τῶν μορίων καὶ ἐμψυχον. οὐ γὰρ ἐστὶ πρόσωπον μὴ ἔχον ψυχήν, οὐδὲ σάρξ, ἀλλὰ φθαρέντα ῥμωνομένως λεχθῆσεται τὸ μὲν εἶναι πρόσωπον τὸ δὲ σάρξ, ὥσπερ κἂν εἰ ἐγίγνετο λίθνα ἡ ξύλινα. ὀμα 20 δὲ τὰ ὁμοιομερῆ γίνεται καὶ τὰ ὀργανικά· καὶ ὥσπερ οὐδὲ ἀν πέλεκυν οὐδ' ἄλλο ὀργανον φησαμεν ἂν ποιήσαι τὸ πῦρ μόνον, οὔτως οὐδὲ πόδα 30 οὐδὲ χείρα. τὸν αὐτὸν δὲ τρόπον οὐδὲ σάρκα· καὶ γὰρ ταύτης ἔργων τὶ ἔστιν. σκληρὰ μὲν οὖν καὶ μαλακὰ καὶ γλύσχρα καὶ κραύρα, καὶ οὐσα ἄλλα τοιαῦτα 2 πάθη ὑπάρχει τοῖς ἐμψυχοις μορίοις, θέρμοτησι καὶ ψυχρότησι ποιήσειν ἂν, τὸν δὲ λόγον ὥ ἡδὴ τὸ μὲν σάρξ τὸ δ' ὀστοῦν, οὐκέτι, ἀλλ' ἡ κίνησις 35 ἡ ἀπὸ τοῦ γεννήσαντος τοῦ ἐντελεχεία ὄντος ὁ ἐστὶ δυνάμει τὸ 3 ἐξ οὐ γίνεται, ὥσπερ καὶ ἐπὶ τῶν γυνο-

1 quieverit Σ: λυνομένης coni. Platt.
2 τοιαῦτα P, om. vulg.

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a Cf. below, 734 b 36 and 735 a 4. Also see Introd. §§ 34 ff.
b i.e., the principle of movement.
c If the text is sound, this can only refer to the original “movement” imparted by the generating parent which produced the semen; and this would be comparable with the initial movement imparted to the automaton mentioned above.

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starting-point this principle. Whatever is formed either by Nature or by human Art, say X, is formed by something which is X in actuality out of something which is X potentially.\(^a\) Now semen, and the movement and principle \(^b\) which it contains, are such that, as the movement ceases \(^c\) each one of the parts gets formed and acquires Soul. (I add "acquires Soul," because there is no such thing as face, or flesh either, without Soul in it; and though they are still said to be "face" and "flesh" after they are dead, these terms will be names merely ("homonyms"),\(^d\) just as if the things were to turn into stone or wooden ones.) And the formation of the "uniform" parts\(^e\) and of the instrumental parts goes on simultaneously. And as in speaking of an axe or any other instrument, we should not say that it was made solely by fire, so we should not say this about a foot or a hand (in the embryo), nor, similarly, of flesh either, because this too is an instrument with a function to perform. As for hardness, softness, toughness, brittleness and the rest of such qualities which belong to the parts that have Soul in them—heat and cold may very well produce these, but they certainly do not produce the logos\(^f\) in direct consequence of which one thing is flesh and another bone; this is done by the movement which derives from the generating parent, who is in actuality what the material out of which the offspring is formed is potentially.\(^g\) Exactly the same happens with things

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\(^a\) See note on 726 b 24 (and 721 a 3). They have merely the name in common with the living face and flesh, but not the essential nature. Cf. line 34 below.

\(^b\) See Introd. § 19. Note that the non-uniform parts are here called the instrumental parts.

\(^c\) See Introd. § 10.
μένων κατὰ τέχνην· σκληρὸν μὲν γὰρ καὶ μαλακὸν
tὸν σίδηρον ποιεῖ τὸ θερμὸν καὶ τὸ ψυχρόν, ἀλλὰ
ξίφος ἡ κίνησις ἡ τῶν ὄργανων, ἔχουσα λόγον τὸν
τῆς τέχνης. ἡ γὰρ τέχνη ἀρχὴ καὶ εἴδος τοῦ
gυνομένου, ἀλλ’ ἐν ἐτέρῳ· ἡ δὲ τῆς φύσεως κίνησις
ἐν αὐτῷ ἀφ’ ἐτέρας οὕσα φύσεως τῆς ἐχούσης τὸ
5 εἴδος ἐνεργεία. πότερον δ’ ἔχει ψυχὴν τὸ σπέρμα
ἡ οὖ; ὁ αὐτὸς λόγος καὶ περὶ τῶν μορίων· οὕτε
gὰρ ψυχὴ ἐν ἄλλῳ οὐδεμία ἔσται πλὴν ἐν ἐκείνῳ
οὗ γ’ ἔστιν, οὕτε μόριον ἔσται μὴ μετέχον ἀλλ’ ἡ
ὀμωνύμως, ὥσπερ τεθνεώτος ὀφθαλμός. δὴν
οὐν ὦτι καὶ ἔχει καὶ ἔστι δυνάμει. ἐγγυτέρω δὲ
10 καὶ πορρωτέρω αὐτὸ αὐτοῦ ἐνδέχεται εἶναι δυνάμει,
ὥσπερ ὁ καθεύδων γεωμέτρης τοῦ ἐγρηγοροτός
πορρωτέρω, καὶ οὕτος τοῦ θεωροῦντος. ταύτης μὲν
οὐν οὐθέν μόριον αὐτοῦ τῆς γενέσεως, ἀλλὰ τὸ
πρῶτον κινήσαν ἔξωθεν. οὐθέν γὰρ αὐτὸ ἐαυτὸ
γεννᾷ· ὅταν δὲ γένηται, αὐξεῖ ἡδή αὐτὸ ἐαυτὸ.
15 διόπερ πρῶτον τι γίγνεται, καὶ οὐχ ἀμα πάντα.
τούτῳ δὲ γίγνεσθαι ἀνάγκη πρῶτον, δ’ αὐξήσεως
ἀρχήν ἔχει· εἴτε γὰρ φυτὸν εἴτε ζώον, ὡμοίως τούτῳ
πάσῳ ὑπάρχει τὸ θρηπτικὸν. τούτῳ δ’ ἐστὶ τὸ

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a See Introd. § 11.  
b See above, 734 b 25.  
c See note, 726 b 24.  
d The argument now resumes from line 4 above.  
e Cf. De anima 416 b 16, and context.
formed by the processes of the arts. Heat and cold soften and harden the iron, but they do not produce the sword; this is done by the movement of the instruments employed, which contains the logos of the Art; since the Art is both the principle and Form of the thing which is produced; but it is located elsewhere than in that thing, whereas Nature's movement is located in the thing itself which is produced, and it is derived from another natural organism which possesses the Form in actuality. As for the question whether the semen possesses Soul or not, the same argument holds as for the parts of the body, viz., (a) no Soul will be present elsewhere than in that of which it is the Soul; (b) no part of the body will be such in more than name unless it has some Soul in it (e.g., the eye of a dead person). Hence it is clear both that semen possesses Soul, and that it is Soul, potentially. And there are varying degrees in which it may be potentially that which it is capable of being—it may be nearer to it or further removed from it (just as a sleeping geomter is at a further remove than one who is awake, and a waking one than one who is busy at his studies). So the cause of this process of formation is not any part of the body, but the external agent which first set the movement going—for of course nothing generates itself, though as soon as it has been formed a thing makes itself grow. That is why one part is formed first, not all the parts simultaneously. And the part which must of necessity be formed first is the one which possesses the principle of growth: be they plants or animals, this, the nutritive, faculty is present in all of them alike (this also is the faculty

1 Cf. below, 735 a 22, 740 a 19 ff.
γεννητικὸν ἐτέρου οἴον αὐτό· τούτῳ γὰρ παντὸς
φύσει τελείου ἔργου καὶ ζῴου καὶ φυτοῦ. ἀνάγκη
20 δὲ διὰ τὰς, ὅτι ὅταν τι γένηται, αὐξάνεσθαι ἀνά-
γκη. ἐγέννησε μὲν τοὺς τὸ συνώνυμον, οἷον ἀνθρωπος ἄνθρωπον, αὔξεται δὲ δι' ἑαυτοῦ. ἕαυτὸν
ἀρα τί ὃν αὔξει.2 εἰ δὴ ἐν τι καὶ τούτῳ πρῶτον,3
τούτῳ ἀνάγκη γίγνεσθαι πρῶτον. ὥστε εἰ ἡ καρδία
πρῶτον ἐν τοῖς ζῴοις γίγνεται, ἐν δὲ τοῖς μὴ ἔχουσι
25 καρδίαν τὸ ταύτη ἀνάλογον, ἐκ ταύτης ἀν ἐι ἡ
ἀρχη τοῖς ἔχουσι, τοῖς δ' ἅλλοις ἐκ τοῦ ἀνάλογον.
Τί μὲν οὖν ἐστιν αὐτοῦν ὡς ἀρχή τῆς περὶ ἕκα-
στον γενέσεως, κινοῦν πρῶτον καὶ δημιουργοῦν,
εἰρηται πρὸς τὰ διαπορρηθέντα πρώτερον.

II 30 Περὶ δὲ τῆς τοῦ σπέρματος φύσεως ἀπορήσειν
ἀν τις. τὸ γὰρ σπέρμα ἐξέρχεται μὲν ἐκ τοῦ ζῷου
παχῦ καὶ λευκοῦ, ψυχόμενον δὲ γίνεται ύγρὸν
ωσπερ ύδρω, καὶ τὸ χρῶμα ύδατος. ἀτόπον δὴ ἂν

1 ἕαυτὸ Peck: αὐτό vulg.
2 ἕαυτὸ . . . αὔξει] ἐστιν ἀρα τί δ' αὔξει Z.
3 πρῶτον om. PS: A.-W. coni. ἐν τι τοῦτο, καὶ τοῦτο ἀνάγκη.

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a Cf. De anima 415 a 26 ff., and for identity of nutritive and generative faculty, 416 a 18 ff., and note on 744 b 36
below.
b See note on 721 a 3.
c This seems to be the meaning of this phrase; cf. the
twice-repeated remark above, that once a thing has been
brought into being, it makes itself grow: Aristotle now says,
"now that it is making itself grow, it is something—but
what? Some one thing—it is so far just that one thing which
is able to cause growth, which contains the principle of
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of generating another creature like itself, since this is a function which belongs to every animal and plant that is perfect in its nature.\textsuperscript{a} The reason why this must of necessity be so is that once a thing has been formed, it must of necessity grow. And though it was generated by another thing bearing the same name \textsuperscript{b} (e.g., a man is generated by a man), it grows by means of itself. So then, since it makes itself grow, it is something \textsuperscript{c}: and if indeed it is some one thing, and if it is this first of all, then this must of necessity be formed first. Thus, if the heart is formed first in certain animals (or the part analogous to the heart, in those animals which have no heart), we may suppose that it is the heart (or its analogue) which supplies the principle.\textsuperscript{d}

The queries raised earlier have now been dealt with. We have answered the question, What is the cause (in the sense of principle) of the generation of each individual—what is that which first sets it in movement and fashions it?

A puzzle which may now be propounded is, What II is the nature of Semen? Semen when it leaves the animal is thick and white, but when it cools it becomes fluid like water and is of the colour of water. This nutritive Soul, viz., the heart. And that is why the heart is the first thing to be formed.\textsuperscript{e} Cf. 740 a 21 (where there is no need to alter the text).

\textsuperscript{d} The meaning of this passage seems to be that the semen, though it must have (and be) Soul, can have (and be) Soul potentially only; and the realizing of this potentiality, which is the process of formation or generation (of which the parent is the agent), goes on gradually—thus, the first part of the Soul to be formed, generated, or realized, is the part which produces growth (τὸ θεραπευτικὸν), and with it the part of the body in which that part of the Soul resides, viz., the heart. (See 763 b 25, n.)
δόξειεν· οὐ γὰρ παχύνεται ὑδωρ θερμῷ, τὸ δὲ ἐσωθὲν ἐκ θερμοῦ ἐξέρχεται παχύ, ψυχόμενον δὲ γίνεται ὕγρὸν. καίτοι πήγνυται γε τὰ ὑδατώδη.

35 τὸ δὲ σπέρμα οὐ πήγνυται τυθέμενον ἐν τοῖς πάγοις ὑπαίθριον, ἀλλὰ ὑγραῖνεται, ὡς ὑπὸ τοῦ ἐναντίου παχύνθεν. ἀλλὰ μὴν οὐδὲ ὑπὸ θερμοῦ παχύνεσθαι εὔλογον. ὅσα γὰρ γῆς πλεῖον ἔχει, ταῦτα συνιστάται καὶ παχύνεται ἔφομενα, οἷον καὶ τὸ γάλα. ἔδει οὖν ψυχόμενον στερεοῦσθαι. νῦν δὲ οὐθὲν γίνεται στερεὸν, ἀλλὰ πάν ὦσπερ ὑδωρ. ἢ μὲν οὖν ἀπορία αὐτῇ ἐστὶν. εἰ μὲν γὰρ ὑδωρ, τὸ ὑδωρ

5 οὐ φαίνεται παχυνόμενον ὑπὸ τοῦ θερμοῦ, τὸ δὲ ἐξέρχεται παχύ καὶ θερμὸν καὶ ἐκ θερμοῦ τοῦ σώματος· εἰ δὲ ἐκ γῆς ἡ μικτὸν γῆς καὶ ὕδατος, οὐκ ἔδει ὕγρὸν πάν γίνεσθαι καὶ ὑδωρ. ἢ οὐ πάντα τὰ συμβαίνοντα διηρήκαμεν; οὐ γὰρ μόνον παχύνεται τὸ ἔξ ὕδατος καὶ γεώδους συνιστάμενον

10 ὕγρόν, ἀλλὰ καὶ τὸ ἔξ ὕδατος καὶ πνεῦματος, οἷον καὶ ὁ ἄφρος γίνεται παχύτερος καὶ λευκός, καὶ ὁ ὁμοίως ἀν ἐλάττους καὶ ἀδηλότερα καὶ πομφόλυγες ἤσι, τοσοῦτοι καὶ λευκότερος καὶ στιφρότερος ὁ ὁγκος φαίνεται. τὸ δὲ αὐτὸ καὶ τὸ ἐλαιον πάσχει· παχύνεται γὰρ τῷ πνεῦματι μιγνύμενον διὸ καὶ

15 τὸ λευκαίνομενον παχύτερον γίνεται, τοῦ ἐνόντος ὑδατώδους ὑπὸ τοῦ θερμοῦ διακρινομένου καὶ γι-

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1 εἰ δὲ γῆς P, A.-W.
may seem strange, because water is not thickened by heat, yet semen is thick when it leaves the inside of the animal, which is hot, and becomes fluid when it cools. Moreover, watery substances freeze, but semen does not freeze when exposed to frost in the open air; it becomes fluid, which suggests that it was heat that thickened it. And yet it is not very probable that it is thickened by heat, because it is substances that contain a large proportion of earth which “set” and thicken when boiled—milk, for example; hence it ought to solidify when it cools, but in fact it does not solidify at all; the whole of it becomes fluid like water. This then is the puzzle. Suppose that semen is water. Water is never observed to be thickened by heat; whereas semen is both thick and hot, and the body it comes from is hot. Or suppose it consists of earth, or is a mixture of earth and water. In that case the whole of it ought not to become fluid and turn to water. Perhaps then after all we have not distinguished all the cases that occur. Other fluids thicken beside those which are composed of water and earthy matter, viz., those composed of water and pneuma,* for instance, foam, which becomes thicker, and white; and the smaller and more microscopic the bubbles are, the whiter and more compact is the appearance of the bulk. Oil behaves in the same way; it thickens when it gets mixed with pneuma; and that is why (oil) when it becomes whiter is thickening, since the watery substance in it is separated out from

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*a Pneuma is defined below (736 a 1) as “hot air”; see, however, 736 b 35 ff. below. Rather than attempt a misleading or inadequate translation of the word (e.g., spirit, breath), I have decided to keep the original term, as elsewhere. See further, Appendix B.
This is no doubt galena (lead sulphide), the chief ore found in the Attic mines at Laurium, although these were more famous for their silver output. The reference to the mixing of the ore with water and oil, which heretofore seems to have passed unnoticed, must imply an early process of "flotation," a stage which follows the mechanical crushing of the ore and precedes the metallurgical extracting of the metal, its object being to separate the metalliferous from the non-metalliferous constituents of the ore by means of the production of a froth. The first practically successful
it by the heat and becomes pneuma. Lead ore, too, when it gets mixed with water and oil, increases its bulk, and whereas it was fluid and black it becomes thick and coherent and white. The reason is that pneuma gets mixed in with it, and this produces the increase of bulk and lets the whiteness show through, precisely as it does with foam, and also with snow (because snow too is a foam). Even water itself when it gets mixed with oil becomes thick and white, the reason being that some pneuma is left behind in it owing to the friction of mixing, and also that oil itself contains a good deal of pneuma—for of course shininess is a quality of pneuma, not of earth or water. And that too is why oil floats on the surface of water; air is contained in it, as though in a vessel, and this air buoys it up and causes it to float; thus the air is the cause of its lightness. Further, in time of cold and frost, oil thickens, but does not freeze. Its failure to freeze is due to its heat—because the air is hot and is impervious to frost. But it thickens because the air is coagulated and compressed [as] by the cold. These reasons explain the behaviour of semen as well. It is coherent and white when it comes forth from within, because it contains a good deal of hot pneuma owing to the internal heat of the animal.

attempt at flotation in modern times was made by the brothers Elmore at the Glasdir gold-mine in Wales (patent 1898), though suggestions for the use of oil had been made by William Haynes of Holywell some years earlier (patent 1860). For details see S. J. Truscott, Text-book of Ore-dressing; T. A. Rickard, Man and Metals, id., Concentration by Flotation (which includes two essays on the flotation of galena at Broken Hill, N.S.W.). The term στριφός corresponds exactly to the “thick coherent froth” mentioned by Truscott (op. cit. 392, etc.). For a full account of the mines at Laurium see E. Ardaillon, Les Mines du Laurion (1897).
35 μόν, ἐξελθὼν ᾧ ὅταν ἀποπνεύσῃ τὸ θερμὸν καὶ ὁ ἄγρ γυνή, ὕγρον γίνεται καὶ μέλαν· λειπεῖται γὰρ τὸ υδωρ καὶ εἷς τι μικρὸν γεώδεις, ὄσπερ ἐν φλέγματι, καὶ ἐν τῷ σπέρματι ξηραινομένῳ.

736 a

"Εστι μὲν οὖν τὸ σπέρμα κοινὸν πνεύματος καὶ ὕδατος, τὸ δὲ πνεύμα ἐστὶ θερμὸς ἀγρ. διὸ ὕγρον τὴν φύσιν, ὅτι εἶς ὕδατος. Κτησίας γὰρ ὁ Κνίδιος ᾧ περὶ τοῦ σπέρματος τῶν ἐλεφάντων εὑρηκε, φανερὸς ἐστὶν ἐφευρμένος. φησὶ γὰρ οὔτω 5 σκληρύνεσθαι ξηραινόμενον ὡστε γίνεσθαι ἡλέκτρῳ ὅμουν. τοῦτο δ' οὐ γίνεται μᾶλλον μὲν γὰρ ἐτέρου ἐτέρου σπέρμα γεωδέστερον ἀναγκαῖον εἶναι, καὶ μᾶλιστα τοιούτον ὅσοις πολὺ γεώδεις ὑπάρχει κατὰ τὸν ὁγκὸν τὸν τοῦ σώματος. παχὺ δὲ καὶ λευκὸν διὰ τὸ μεμίχθαι πνεῦμα. καὶ γὰρ 10 λευκὸν ἐστὶ τὸ σπέρμα πάντων. Ἡρόδοτος γὰρ οὐκ ἀληθῆ λέγει, φάσκων μέλαιναν εἶναι τὴν τῶν Αἰθιόπων γονῆν, ὃσπερ ἀναγκαῖον ὅν τῶν τὴν χρόσιν μελάνων εἶναι πάντα μέλαινα, καὶ ταῦθ' ὀρῶν καὶ τοὺς ὀδόντας αὐτῶν ὀντας λευκούς. αὕτων δὲ τῆς λευκότητος τοῦ σπέρματος ὅτι ἐστὶν ή γονὴ 15 ἀφρός. ὁ δ' ἀφρός λευκόν, καὶ μᾶλιστα τὸ εἶ

1 ἐξελθὼν Peck: ἐξελθόντος vulg.

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a See 725 a 15 ff.

b Ktesias of Knidos in Caria, a contemporary of Xenophon, belonged to an old medical family, and was physician to the Persian king Artaxerxes Mnemon (405-362 B.C.). His chief work was his Περσικά, in 23 books, containing the history of the East down to 398-397 B.C. Most of his zoological matter, however, seems to have been contained in his Ινδικά, judging from this reference and three others in the History of Animals. Abridgements of both these works by Photius are extant.

c Herodotus III. 101.

d The view that semen was foam was held by Diogenes of

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Later, when it has lost its heat by evaporation and the air has cooled, it becomes fluid and dark, because the water and whatever tiny quantity of earthy matter it may contain stay behind in the semen as it solidifies, just as happens with phlegma.

Semen, then, is a compound of pneuma and water (pneuma being hot air), and that is why it is fluid in its nature; it is made of water. Ktesias of Knidos is obviously mistaken in his statement about the semen of elephants: he says that it gets so hard when it solidifies that it becomes like amber. It does not. It is, of course, true that one semen must of necessity be earthier than another, and the earthiest will be in those animals which, for their bodily bulk, contain a large amount of earthy matter; but semen is thick and white because there is pneuma mixed with it. What is more, it is white in all cases. Herodotus is incorrect when he says that the semen of Ethiopians is black, as though everything about a person with a black skin were bound to be black—and this too in spite of their teeth being white, as he could see for himself. The cause of the whiteness of semen is that it is foam, and foam is white, the whitest being that Apollonia; see Vindicianus, § 1 (Diels, Vorsokr. 64 B 6) Alexander Amator veri (= Φυλαλήθης) . . . libro primo De seminali spumam sanguinis eius essentialiam dixit Diogenis placitis consentiens; and cf. § 3. See Jaeger’s discussion of the subject in Diokles von Karystos, 198-211. Cf. also Hippocrates, π. γονής κτλ. 1 (vii. 470 Littre) ἀποκρίνεται ἀπὸ τοῦ ὕγρου ἀφρέωντος τὸ ἰχυρότατον. In modern times a similar idea has been put forward, e.g., by Bütschli (Untersuchungen über mikroskopische Schäume und das Protoplasma, Leipzig, 1892), who “thought of protoplasm as a foam, or rather as an emulsion composed of two liquids, one in the form of droplets, the other as lamellae [i.e., films] between the droplets” (Heilbrunn, An Outline of General Physiology, 1938, p. 25).
ολιγίστων συγκείμενων μορίων καὶ οὔτω μικρῶν ύποπερ ἐκάστησις ἀοράτου τῆς πομφόλυγος οὐσίας, ὅπερ συμβαίνει καὶ ἕπτο τοῦ ὑδατος καὶ τοῦ ἐλαιοῦ μυγνυμένων καὶ τριβομένων, καθάπερ ἐλέχθη πρότερον.

′Εστι δὲ οὖν τούς ἀρχαίους λανθάνειν ἀφρώδης
20 ἡ τοῦ σπέρματος οὕσα φύσις· τὴν γοῦν κυρίαν θεὸν τῆς μίξεως ἀπὸ τῆς δυνάμεως ταύτης προσηγόρευσαν.

′Η μὲν οὖν αὐτία τῆς λεχθείσης ἀπορίας εὑρήται, φανερὸν δὲ ὅτι διὰ τοῦτο οὖν ἐπήγνυται· ὁ γὰρ ἀκρὸ ἀπηκτὸς.

ΙΙΙ Τούτου δὲ ἐχόμενον ἐστὶν ἀπορήσαι καὶ εἰπεῖν,
25 εἰ τῶν προιέμενων εἰς τὸ θῆλυ γοῦν μηθεὶν μόριον ἐστὶ τὸ εἰσελθόν τοῦ γνυμομένου κυμάτως, ποῦ τρέπεται τὸ σωματόωδες αὐτοῦ, εἴπερ ἐργάζεται τῇ δυνάμει τῇ ἐνούσῃ ἐν αὐτῷ. διορίσαι δὲ τὸ πότερον μεταλαμβάνει τὸ συνιστάμενον ἐν τῷ θῆλει ἀπὸ τοῦ εἰσελθόντος τῇ οὖθεν, καὶ περὶ ψυχῆς 30 καθ’ ἦν λέγεται ζῷον (ζῷον δ’ ἐστὶ κατὰ τὸ μόριον τῆς ψυχῆς τὸ αἰσθητικόν) πότερον ἐνυπάρχει τῷ σπέρματι καὶ τῷ κυμάτι ἦ οὐ, καὶ πόθεν. οὕτε γὰρ ὡς ἀψυχον ἀν θεία τις τὸ κύμα κατὰ πάντα τρόπον ἐστερημένον ζωῆς· οὖδὲν γὰρ ἦττον τὰ τε

1 ἐστὶν καὶ PSY, Galen. 2 τοὶ Btf. 3 δὲ P: τε vulg.

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b See note on meaning of κύμα, Introd. § 56.
which consists of the tiniest particles, so small that each individual bubble cannot be detected by the eye. An instance of such a foam, mentioned earlier, is that produced by the mechanical mixing of water and oil.

That the natural substance of semen is foam-like was, so it seems, not unknown even in early days; at any rate, the goddess who is supreme in matters of sexual intercourse was called after foam.

We have now given the reason which solves the puzzle that was stated. And this also shows, incidentally, why semen does not freeze: it is because air is impervious to frost.

The next puzzle to be stated and solved is this. Take the case of those groups of animals in which semen is emitted into the female by the male. Supposing it is true that the semen which is so introduced is not an ingredient in the fetation which is formed, but performs its function simply by means of the dynamis which it contains. Very well; if so, what becomes of the physical part of it? First of all we shall have to decide (a) whether that which takes shape within the female does or does not incorporate into itself any portion of that which was introduced (from the male); and (b) whether Soul—and it is in virtue of Soul that an animal has the name of "animal": it is in fact in virtue of the sentient part of Soul that it is an animal—whether Soul is or is not in the semen and in the fetation to begin with, and if so where it comes from. No one, of course, would maintain that the fetation is quite without Soul, completely devoid of life in every sense,
35 φυτῶν, καὶ γόνυμα μέχρι τιμός ἐστιν. ὁτι μὲν οὖν τὴν θρεπτικὴν ἐξουσίαν ψυχῆν, φανερὸν (ὅτι δὲ ταύτην πρῶτον ἀναγκαίον ἐστὶ λαβεῖν, ἕκ τῶν περὶ ψυχῆς διωρισμένων ἐν ἄλλως φανερόν) προϊόντα δὲ καὶ τὴν αἰσθητικὴν, καθ' ἥν ζωῶν. οὐ γὰρ ἀμα γίνεται ζωῶν καὶ ἀνθρώπου οὐδὲ ζωῶν καὶ ἕπος, ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων ζωῶν. ὦστατον γὰρ γίνεται τὸ τέλος, τὸ δ' ἵδιον ἐστὶ τὸ ἐκάστου τῆς 5 γενέσεως τέλος. διὸ καὶ περὶ νοῦ, πότε καὶ πῶς μεταλαμβάνει καὶ πόθεν τὰ μετέχοντα ταύτης τῆς ἀρχῆς, ἔχει τ' ἀπορίαν πλείστην, καὶ δεὶ προθυμεῖσθαι κατὰ δύναμιν λαβεῖν καὶ καθ' ὅσον ἐνδέχεται.

Τὴν μὲν οὖν θρεπτικὴν ψυχὴν τὰ σπέρματα καὶ τὰ κυήματα τὰ (ἀ)χωρίστα δὴ λοι τὰ δυνάμει μὲν 10 ἔχουσα θετεόν, ἐνεργεία δ' οὐκ ἔχουσα, πρὶν ἡ3 καθάπερ τὰ χωρὶζόμενα τῶν κυημάτων ἐλκεῖ τὴν τροφήν καὶ πολεῖ τὸ τῆς τοιαύτης ψυχῆς ἐργον. πρῶτον μὲν γὰρ ἀπαντ' ἐοικε ἥν τὰ τοιαύτα

1 ὦστατον P: ὦστερον vulg.
2 Buiss.: δυτα χωρίστα Platt.
3 πλὴν εἶ Platt.

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a e.g., wind-eggs, Bk. III.
b De anima, Bk. II, ch. 4; and see 735 a 13 ff. above.
c These are two instances of the rule that there are definite stages in the development or formation of living things. Nutritive Soul (the mark of a living thing) is acquired before sentient Soul (the mark of an animal), just as the formation of an animal precedes the formation of any particular species of animal. Cf. von Baer’s “biogenetic law,” that the character of the class is acquired before that of the genus, and that of the genus before that of the species. (K. E. von Baer, 166
for the semens and the fetations of animals are just as much alive as plants are, and up to a point they are fertile.\textsuperscript{a} Thus it is clear that they possess nutritive Soul (\textit{vide} my remarks on Soul in another treatise \textsuperscript{b} for an explanation of why nutritive Soul must of necessity be acquired first). It is while they develop that they acquire sentient Soul as well, in virtue of which an animal is an animal—I say, "while they develop," for it is not the fact that when an animal is formed at that same moment a human being, or a horse, or any other particular sort of animal is formed, because the end or completion is formed last of all, and that which is peculiar to each thing is the end of its process of formation.\textsuperscript{c} That is why it is a very great puzzle to answer another question, concerning Reason. At what moment, and in what manner, do those creatures which have this principle of Reason acquire their share in it, and where does it come from? This is a very difficult problem which we must endeavour to solve, so far as it may be solved, to the best of our power.

As regards nutritive Soul, then,\textsuperscript{d} it is clear that we must posit that semens and fetations which are not separated \textit{(from the parent)} possess it \textit{potentially}, though not \textit{in actuality}—\textit{i.e.}, not until they begin to draw the nourishment to themselves and perform the function of nutritive Soul, as fetations which get separated \textit{(from the parent)} do; for to begin with it seems that all things of this sort live the life of a

\textit{"Uber Entwicklungs geschichte der Thiere, Beobachtung und Reflexion (1828), i. 224, Scholion V (1) Dass das Gemeinsame einer grössern Thiergruppe sich früher im Embryo bildet, als das Besondere, \textit{et seqq.}}\textsuperscript{f}

\textsuperscript{a} The solution begins by resuming the argument from 736 a 32-34.  
\textsuperscript{b} e.g., seeds of plants.
This elaborate scheme of possibilities is not really so overwhelming as it looks, though the argument would have been more lucid if Aristotle had explicitly named the several sorts of Soul involved. It will be seen, however, that of the first three possibilities, the last, (c), is the operative one; in fact, it is nutritive Soul which the material of the female (more specifically, the fetation) possesses (see 736 a 32 ff., 737 a 23 ff.); thus it remains for the other two, sentient and rational Souls, to be supplied by the male (Aristotle explains in ch. 5 below that the reason why a fetation can grow yet is unable to develop fully into an animal is that it lacks sentient Soul, which only the male can supply). Hence in the second series of possibilities it is again the last one, (c), which is the operative one: sentient Soul is present inside the male (i.e., the semen), and it remains that rational Soul comes into being inside the male (i.e., the semen) from some outside source, for it alone is not affected by the two considerations which preclude the entry from outside of the other parts of Soul, whose activity...
And it is clear we should follow a similar line also in our statements about sentient Soul and rational Soul, since a thing must of necessity possess every one of the sorts of Soul potentially before it possesses them in actuality. And necessity requires either (a) that none of them exists previously, and that they all come to be formed in (the fethion) ; or (b) that they are all there beforehand ; or (c) that some of them are there and some are not ; and further, that they come to be formed in the material supplied by the female either (a) without having entered in the semen of the male or (b) after having so entered—that is, having come from the male, and if so, then that either (a) all of them or (b) none of them or (c) some of them come to be formed within the male from some outside source.\(^a\) Now the following considerations plainly show that they cannot all be present beforehand. Clearly, those principles whose activity is physical cannot be present without a physical body—there can, for example, be no walking without feet\(^b\); and this also rules out the possibility of their entering from outside, since it is impossible either that they enter by themselves, because they are inseparable (from a physical body), or that they enter by transmission in some body, because the is essentially physical (see also below, 737 a 9 f.). Thus, sentient Soul, and a fortiori rational Soul, are supplied by the male, through the semen, to the material provided by the female. Aristotle does not, however, give any fuller solution than this to his own “very difficult puzzle” how and when rational Soul, which is thus supplied in a potential state by the male, is actualized in the offspring.

\(^a\) Aristotle takes the “locomotive Soul,” the highest of the “parts” or “faculties” of Soul apart from “rational Soul,” and shows that this cannot enter by itself; a fortiori therefore none of the lower “parts” can do so.
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736 b
to gar sperma perittwma metaballoousis tis
trophi estin. leipetai de tov nound monon thurse
epieisinenai kal theion einai monon: outhe gar auton
ti energeia kouwenei somatikh energeia.

30. Pasis mwn ouv phusikes dynameis eteron soma
eoike kekouinwnekeinai kal theisteron twn kalou-
mewn stoiacheion. ws de diaphereousi timotetpi ai
phuxai kal atimia allhexwv, outw kal etoiavi
diafreseis physeis. pantwv mwn gavr en tw spermati
enuparkei, oiper poiei gonyma einai ta spermatata,

737 a
to kaloumenon thermon. touto de ou pur oude
toiavti dynameis estin, alla to emperilaambanom-
menon ev tw spermati kal ev tw aprewdes pneuma
cal et ev tw pneumati physeis, analogon ousa tw
twn astrow stoiachei. dio pur mewn outhev gean

1 de Platt, Zeller, Bfl.: de vulg. 2 ev P: om. vulg.

a i.e., it is not a body possessing the parts necessary in
order to give effect to the activities involved, such as legs for
walking. Cf. P. A. 641 b 31 geneis mon ev gar to sperma, ouoia
deto telos.
b Cf. De anima 413 a 4 ff.
c Cf. 762 a 20. d See 736 a 13 ff.

e This is the so-called “fifth element,” (i.e., over and
above the four “elements” found in the sublunary regions,
viz., earth, air, fire, and water), though Aristotle’s own name
for it is “the first of the elements” (to prwton twv stoiacheion,
De caelo 298 b 6, to prwton sowma, 270 b 21), owing to its
pre-eminent qualities. The arguments for its existence will
be found in De caelo, Bk. 1; it is ungenerated, indestruct-
semen is a residue of the nourishment that is undergoing change.\textsuperscript{a} It remains, then, that Reason alone enters in, as an additional factor, from outside, and that it alone is divine, because physical activity has nothing whatever to do with the activity of Reason.\textsuperscript{b}

Now so far as we can see, the faculty of Soul of every kind has to do with some physical substance which is different from the so-called "elements" and more divine than they are; and as the varieties of Soul differ from one another in the scale of value, so do the various substances concerned with them differ in their nature. In all cases the semen contains within itself that which causes it to be fertile—what is known as "hot" substance,\textsuperscript{c} which is not fire nor any similar substance, but the pneuma which is enclosed within the semen or foam-like stuff,\textsuperscript{d} and the natural substance which is in the pneuma; and this substance is analogous to the element which belongs to the stars.\textsuperscript{e} That is why fire does not generate any animal,\textsuperscript{f} and we find no animal taking shape either in fluid or solid substances while they are under the influence of fire; whereas the heat of the sun\textsuperscript{g} does effect generation, and so does the heat of animals.

\textsuperscript{a} See App. A §§ 7 ff., B §§ 17-17.
σπέρματος, ἀλλὰ κἂν τι περίττωμα τύχῃ τῆς φύ- 
5 σεως ὑπὸ ἑτερον, ὀμοι ἔχει καὶ τοῦτο ζωτικὴν 
ἀρχὴν. ὅτι μὲν οὖν ἡ ἐν τοῖς ζωοὶς θερμότης οὔτε 
πῦρ οὔτε ἀπὸ πυρὸς ἔχει τὴν ἀρχήν, ἐκ τῶν τοι- 
ουτῶν ἔστι φανερὸν.

Τὸ δὲ τῆς γονῆς σῶμα, ἐν ὦ συναπέρχεται [τὸ 
10 σώματος, ὥσπερ ἐμπεριλαμβάνεται τί θεῖον (τοιοῦ- 
τος δ’ ἐστὶν ὁ καλούμενος νοῦς), τὸ δ’ ἀχώριστον, 
τοῦτο τὸ σῶμα3 τῆς γονῆς διαλύεται καὶ πνευμα-
τοῦται, φύσιν ἔχον ὑγρὰν καὶ ὑδατῶδη. διότι 
οὓς δεῖ ζητεῖν ἀεὶ θύραξ αὐτὸ ἐξείναι, οὐδὲ μόριον 
οὐθέν εἶναι τῆς συντάσσους μορφῆς, ὡσπερ οὐδὲ τὸν 
15 ὁπὸν τὸ τὸ γάλα συνιστάντα· καὶ γὰρ οὕτως 
μεταβάλλει καὶ μόριον οὐθέν ἐστὶ τῶν συνιστα-
μένων ὀγκών.

Περὶ μὲν οὖν ψυχῆς, πῶς ἔχει τὰ κυνήματα καὶ ή 
γονῆ καὶ πῶς οὐκ ἔχει, διώρισται· δυνάμει μὲν γὰρ 
ἔχει, ἐνεργεῖα δ’ οὐκ ἔχει.4

Τὸ δὲ σπέρματος οὕτως περιττώματος καὶ κυ-

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2 τὶ P: τὸ vulg.
3 σῶμα A.-W.: σπέρμα vulg. 4 haec seclusit Platt.

"The "ultimate nourishment." Cf. 726 b 1 ff., and P.A. 650 a 34, 651 a 15, 678 a 8 ff. This is nourishment in its final form, viz., blood.
and not only the heat of animals which operates through the semen, but also any other natural residue which there may be has within it a principle of life. Considerations of this sort show us that the heat which is in animals is not fire and does not get its origin or principle from fire.

Consider now the physical part of the semen. (This it is which, when it is emitted by the male, is accompanied by the portion of soul-principle and acts as its vehicle. Partly this soul-principle is separable from physical matter—this applies to those animals where some divine element is included, and what we call Reason is of this character—partly it is inseparable.) This physical part of the semen, being fluid and watery, dissolves and evaporates; and on that account we should not always be trying to detect it leaving the female externally, or to find it as an ingredient of the fetation when that has set and taken shape, any more than we should expect to trace the fig-juice which sets and curdles milk. The fig-juice undergoes a change; it does not remain as a part of the bulk which is set and curdled; and the same applies to the semen.

We have now determined in what sense fetations and semen have Soul and in what sense they have not. They have Soul potentially, but not in actuality.

As semen is a residue, and as it is endowed with the same movement as that in virtue of which the body grows through the distribution of the ultimate nourishment, when the semen has entered the uterus it "sets" the residue produced by the female and imparts to it the same movement with which it is itself endowed. The female's contribution, of course, is a residue too, just as the male's is, and
περίττωμα, καὶ πάντα τὰ μόρια ἔχει δυνάμει, ἐνεργεῖα δ᾽ οὐθέν. καὶ γὰρ τὰ τοιαῦτ᾽ ἔχει μόρια
dυνάμει, ὧ διαφέρει τὸ θῆλυ τοῦ ἄρρενος. ὥσπερ
gὰρ καὶ ἐκ πεπηρωμένων ὀτὲ μὲν γίνεται πεπηρω-
μένα ὀτὲ δ᾽ οὐ, οὕτω καὶ ἐκ θήλεος ὀτὲ μὲν θῆλυ
ὀτὲ δ᾽ οὐ, ἄλλ᾽ ἄρρεν. τὸ γὰρ θῆλυ ὥσπερ ἄρρεν
ἐστὶ πεπηρωμένον, καὶ τὰ καταμήνια σπέρμα, οὐ
cαθαρὸν δὲ. ἐν γὰρ οὐκ ἔχει μόνον, τὴν τῆς ψυχῆς
ἀρχήν. καὶ διὰ τοῦτο ὅσοι υπηνέμα γίνεται τῶν
ζώων, ἀμφοτέρων ἔχει τὰ μέρη τὸ συνιστάμενον
ὡν, ἀλλὰ τὴν ἀρχὴν οὐκ ἔχει, διὸ οὐ γίνεται
ἐμψυχὸν. ταύτην γὰρ τὸ τοῦ ἄρρενος ἐπιφέρει
σπέρμα. ὅταν δὲ μετάσχη τοιαύτης ἀρχῆς τὸ
περίττωμα τὸ τοῦ θήλεος, κύμα γίνεται.

1 [Τοῖς δ᾽ ὕγροῖς μὲν σωματώδεσι δὲ θερμαινο-
μένοις περισταται, καθάπερ ἐν τοῖς ἐψήμασι 
χομένοις τὸ περίξηρον. πάντα δὲ τὰ σώματα
συνέχει τὸ γλύσχρον· ὦπερ καὶ προῖόθι καὶ 
μείζονι γυγομένοις ἢ τοῦ νεύρου λαμβάνει φύσις, ἢπερ
συνέχει τὰ μόρια τῶν ζώων, ἐν μὲν τοῖς οὖσα 
νεύρον, ἐν δὲ τοῖς τὸ ἀνάλογον. τῆς δ᾽ αὐτῆς
5 μορφῆς ἐστὶ καὶ δέρμα καὶ 

1 vv. 34–b 7 secluserunt A.-W.

*Other attempts to bring out the meaning of this
word would include "imperfectly developed," "under-
developed," "malformed," "mutilated," "congenitally
disabled."

1 i.e., as appears later, sentient Soul (ch. 5).
i.e., as above (ll. 23-25), potentially.
contains all the parts of the body potentially, though none in actuality; and "all" includes those parts which distinguish the two sexes. Just as it sometimes happens that deformed offspring are produced by deformed parents, and sometimes not, so the offspring produced by a female are sometimes female, sometimes not, but male. The reason is that the female is as it were a deformed male; and the menstrual discharge is semen, though in an impure condition; i.e., it lacks one constituent, and one only, the principle of Soul. This explains why, in the case of the wind-eggs produced by some animals, the egg which takes shape contains the parts of both sexes, but it has not this principle, and therefore it does not become a living thing with Soul in it; this principle has to be supplied by the semen of the male, and it is when the female's residue secures this principle that a fetation is formed.

When substances which are fluid but also corporeal are heated, an outer layer forms round them, just as we find a solid layer forming round things that have been boiled, as they cool. All bodies depend on something glutinous to hold them together; and as their development proceeds and they become larger, this glutinous character is acquired by the substance known as sinew, which holds the parts of animals together (in some it is actual sinew which does this, in others its counterpart). Skin, blood-vessels, membrane and all that class of substances are of the

Or, "it becomes a fetation," i.e., a perfect fetation; see 737 a 10.

The following paragraph, which consists partly of remarks taken from elsewhere, is irrelevant here.

Sometimes, as here, "counterpart" could be represented by the modern term "analogue"; cf. P.A. 653 b 36.
Το τοιούτον γένος· διαφέρει γάρ ταύτα τῷ μᾶλλον καὶ ἢπτον καὶ ὀλως¹ ὑπεροχῇ καὶ ἐλλείψει.]

IV. Τῶν δὲ ζώων τὰ μὲν ἀτελεστέραν ἔχουτα τὴν φύσιν, ὅταν γένηται κύτταρα τέλειον ζῶον δὲ μὴν τέλειον, θύραζε προῖται· δι᾽ ὡς δ᾽ αύτίας ἐνρήται πρότερον. τέλειον δ᾽ ἴθι τὸτε ἑστὶν, ὅταν τὸ μὲν ἀρρεν ἢ τὸ δὲ θῆλυ τῶν κυνημάτων, ἐν ὕσσοις ἑστὶν αὕτη ἡ διαφορά τῶν γυνομένων· ἐνα γὰρ οὕτε θῆλυ γεννᾶ ὀὐτ' ἀρρεν, ὥσα μηδὲ αὐτὰ γίνεται ἐκ θῆλεος καὶ ἀρρενος μηδὲ ἐκ ζῶων μηνομένων. καὶ περὶ μὲν τῆς τούτων γενέσεως ὑστερον ἐρούμεν.

Τα δὲ ζωοτοκοῦντα ἐν αὐτοῖς τὰ τέλεια τῶν ζώων, μέχρι περ ἂν οὗ γεννησῇ ζῶον καὶ θύραζε ἐκπέμψῃ, ἔχει συμφύσεις ἐν αὐτοῖς² τὸ γυνόμενον ζῶον.

"Ὅσα δὲ θύραζε μὲν ζωοτοκεῖ, ἐν αὐτοῖς δ᾽ ψωτοκεῖ τὸ πρῶτον, ὅταν γεννησῇ τὸ φῶν τέλειον, τούτων ἔνιοι μὲν ἀπολύεται τὸ φῶν ὑστερ τῶν θύραζε ψωτοκοῦντων, καὶ τὸ ζῶον ἐκ τοῦ φῶν γίνεται ἐν τῷ θῆλει, ἔνιοι δ᾽ ὅταν καταναλωθῇ ἢ ἐκ τοῦ φῶν τροφῆ, τελειοῦται ἀπὸ τῆς υστέρας, καὶ διὰ τοῦτο οὐκ ἀπολύεται τὸ φῶν ἀπὸ τῆς υστέρας. ταϊτην δ᾽ ἔχουσι τὴν διαφορὰν οἵ σελαχώδεις ἤχοις, περὶ δὲ υστερον καθ᾽ αὐτὰ λεκτέον.

Νῦν δ᾽ ἀπὸ τῶν πρῶτων ἀρκτεόν πρῶτον. ἐστι

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1 ὀλως PS: ὀλως εν vulg.
2 αὐτοῖς Rackham: αὐτῷ vulg.

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a Cf. P.A. 644 a 17, and note there; also Introd. § 70.
b For the meaning of "perfect" animals, see below, 737 b 15, 16, and the fuller definition given at 732 b 28 ff.
c i.e., a "perfect" egg; for another sense, see 776 b 1.
d For Selachia, see Bk. III, ch. 3.
same stamp; they differ only by the "more and less," or putting it generally, by excess and deficiency."

So far as those animals whose nature is more imperfect are concerned, as soon as a perfect fetation has been formed, though it is not so far a perfect animal, they expel it. The reasons for this I have already stated. A fetation is perfect by the time it is either male or female. (This applies to those animals whose offspring have this distinction of sex, for there are some which generate offspring that are neither male nor female; these are the animals which are not themselves produced by male and female parents—not produced in fact as the result of the copulation of a pair of animals. We will speak later of the way in which these are generated.)

The perfect animals, the ones which are internally viviparous, retain within themselves the animal which is forming, and it remains joined to them until it is brought to birth and expelled.

With regard to those which are internally oviparous in the first stage although they are externally viviparous, the egg, when it has been perfectly formed, in some cases (a) is released, just as it is in the externally oviparous animals, and the animal is produced out of the egg inside the female; in other cases (b), when the nourishment in the egg has been used up, the supply for the creature's perfecting is derived from the uterus; and that is why the egg is not released from the uterus. This distinguishing feature belongs to the Selachian fishes, which will have to receive special mention later.

For the present, however, we must begin first of all with the animals that come first. These are the
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737 b
dε τὰ τέλεια ζώα πρῶτα, τοιούτα δὲ τὰ ζωοτο-
κοῦντα, καὶ τούτων ἄνθρωπος πρῶτον.

'Ἡ μὲν οὖν ἀπόκρισις γίνεται πάσι τού ὀστέρμα-
τος ὁσπερ ἀλλού τινὸς περιττόματος. φέρεται
γὰρ έκαστον εἰς τὸν οἶκεῖον τόπον οὐθὲν ἀποβια-
30 ζωμένον τοῦ πνεύματος, οὐδ' ἄλλης αἰτίας τοιαύτης
ἀναγκαζούσης, ὁσπερ τινὸς φασίν, ἐλκείω τὰ αἰδοῖα
φάσκοντες ὁσπερ τὰς σκινάς, τῶν τε πνεύματι βια-
ζωμένων, ὁσπερ εὔδεχόμενον ἀλλοθί ποὺ πορευ-
θήναι μὴ βιασμένων ἥ ταύτην τὴν περίττωσιν
ἡ τὴν τῆς ὕγρας ἥ ἕηρᾶς τροφῆς, ὅτι τὰς ἐξόδους
35 αὐτῶν ἥθροισμένω τῶν πνεύματι συνεκκρίνουσιν.
τούτῳ δὲ κοινὸν κατὰ πάντων ὃσα δεὶ κινήσαι, διὰ
γὰρ τὸ τὸ πνεῦμα κατασχεῖν ἡ ἀγχύς ἐγγίνεται.
ἐπεὶ καὶ ἄνευ ταύτης τῆς βίας ἐκκρίνεται τὰ περι-
ττώματα καὶ καθεύδουσι, ἀν ἄνετοι τε καὶ πλῆρεις
περιττώματος οἱ τόποι τῦχωσιν οὕτως. ομοίων δὲ
καὶ ἐὰ τις φαῖν τοῖς φυτοῖς ὑπὸ τοῦ πνεύματος
5 ἐκάστοτε τὰ ὀστέρματα ἀποκρίνεσθαι πρὸς τοὺς
τόπους πρὸς οὓς εἰσόθεν φέρειν τὸν καρπὸν. ἀλλὰ
τούτου μὲν αὖτιον, ὁσπερ εὔρηται, τὸ πάσιν εἶναι
μόρια δεκτικὰ τοῖς περιττόμασι τοῖς ἵ ἄχριστοις
(καὶ τοῖς χρησίμοιοι) [ὁιὸν τῇ τῇ ἕηρᾶ καὶ τῇ
ὕγρα, καὶ τῷ αἵματι τὰς καλομενάς φλεβᾶς].

738 a
10 Τοὺς μὲν οὖν θήλεις περὶ τῶν τῶν υστερῶν τόπον,
σχιζομένων ἀνωθὲν τῶν δύο φλεβῶν, τῆς τε με-

1 ἦ P: om. vulg.
2 ἦ P: om. vulg.
3 supplevi, cetera seclusi; vid. p. 562, infra.

a Cf. Hippocrates, π. ἄρχ. ἱητρικῆς 22 (i. 626-628 Littré),
where the action of the bladder, the head and the uterus in
drawing fluid to themselves is compared to the action of
σκύα.

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perfect animals, which means the viviparous ones; and the first of these is Man.

In all of them the semen is secreted in precisely the same way as any other residue. Each of the residues is carried to its proper place without the exertion of any force from the pneuma and without compulsion by any other cause of that sort, although some people assert this, alleging that the sexual parts draw the residue like cupping-glasses and that we exert force by means of the pneuma, as though it were possible for the seminal residue or for the residue of the liquid or of the solid nourishment to take any other course unless such force were exerted. The reason given for this view is that our discharge of these residues is accompanied by the collecting of the pneuma (the holding of the breath). But this is a phenomenon which is common to all cases where something has to be moved, because holding the breath is the way in which the required strength is obtained. Besides, even without the exertion of this force residues are actually discharged during sleep, if the places concerned are relaxed and full of residue. Such statements are on a par with saying that the seeds of plants are on each occasion secreted to the places where they commonly bear their fruit by means of pneuma. No, the real reason for this, as has been said, is that in all animals there are parts for the reception of the residues, both for the useless (and for the useful ones)—[e.g., both for the solid and the fluid; and for the blood there are the blood-vessels as they are called].

The region of the uterus in females.—Higher up in the body the two blood-vessels, the Great Blood-

\[\text{This phrase is an interpolation. See p. 562.}\]
γάλης καὶ τῆς ἀορτῆς, πολλαὶ καὶ λεπταὶ φλέβες τελευτῶσιν εἰς τὰς υστέρας, ὅποι ὑπερπληρουμένων ἐκ τῆς τροφῆς, καὶ τῆς φύσεως διὰ ψυχρότητα πέττειν οὖ δυναμένης, ἐκκρίνεται διὰ λεπτοτάτων
15 φλεβῶν εἰς τὰς υστέρας, οὓς δυναμένων διὰ τὴν στενοχωρίαν δέχεσθαι τὴν υπερβολὴν τὸν πλήθους, καὶ γίνεται τὸ πάθος οἷον αἰμορροῖς. ἀκριβῶς μὲν οὖν ἡ περίοδος οὐ τέτακται ταῖς γυναιξῖ, βουλεῖται δὲ φθινότων γίνεσθαι τῶν μηνῶν εὐλόγως. ψυχρότερα γὰρ τὰ σῶματα τῶν ζῶνων ὅταν καὶ τὸ
20 περιέχον συμβαίνῃ γίγνεσθαι τοιοῦτον, αἱ δὲ τῶν μηνῶν σύνοδοι ψυχραὶ διὰ τὴν τῆς σελήνης ἀπόλευσιν, διότερ καὶ χειμερίους συμβαίνει τὰς συνόδους εἶναι τῶν μηνῶν μᾶλλον ἡ τὰς καταστίτας. μεταβεβληκότος μὲν οὖν εἰς αἷμα τοῦ περιττώματος βουλεῖται γίγνεσθαι τὰ καταμήνια κατὰ τὴν εἰρη-
25 μένην περίοδον, μὴ πεπεμμένου δὲ κατὰ μικρὸν ἀεὶ τι ἀποκρίνεται. διὸ τὰ λευκὰ μικρὰ ἐτὶ καὶ παι-
δίως οὖσι γίνεται τοῖς θηλεῖσι. μεταράξουσι μὲν οὖν ἀμφότεραι αὐταί αἱ ἀποκρίσεις τῶν περιττω-
μάτων τὰ σώματα σώζουσιν, ἀτε γυνομείνης καθ-
άρσεως τῶν περιττωμάτων ἀ τοῦ νοσεῖν αὐταί
30 τοῖς σώμασιν. μὴ γυνομείνων δὲ ἡ πλειόνων γυνο-
μένων βλάπτει ποιεῖ γὰρ ἡ νόσους ἡ τῶν σωμάτων καθαίρεσιν, διὸ καὶ τὰ λευκὰ συνεχῶς γυνόμενα καὶ πλεονάζοντα τὴν αὐξήσιν ἀφαιρεῖται τῶν παιδίων.
'Εξ ἀνάγκης μὲν οὖν ἡ περίττωσις αὐτῇ γίνεται

1 μικρός ἐτὶ μικρὰ σημεία Ζ.

* i.e., the vena cava and the whole venous system, and the aorta and the whole arterial system.

* The moon has no real connexion with menstruation. Various notions on this subject will be found in H. M. Fox, 180
vessel and the Aorta,\textsuperscript{a} branch out into many fine blood-vessels, which terminate in the uterus. When these are overfull of nourishment (which owing to its own coldness the female system is unable to concoct), it passes through these extremely fine blood-vessels into the uterus; but owing to their being so narrow they cannot hold the excessive quantity of it, and so a sort of haemorrhage takes place. In women the period is not accurately fixed, but it tends to happen when the moon is waning,\textsuperscript{b} which is what we should expect, since the bodies of animals are colder when their environment is colder, and the time of new moon is a cold time on account of the disappearance\textsuperscript{c} of the moon: the same thing explains why the end of the month is stormier than the middle.\textsuperscript{d}

When the residue has changed into blood, the menstrual discharge tends to occur in accordance with the period just mentioned; but when the residue has not been concocted, small quantities are secreted from time to time, and this is why "whites" occur in females, even while they are still quite small children. These two secretions of residue, if moderate in amount, keep the body in a sound condition, because they constitute an evacuation of the residues which cause disease. If they fail to occur, or occur too plenteously, they are injurious, producing either diseases or a lowering of the body; and that is why continuous and abundant discharge of "whites" prevents young girls from growing.

Thus the production of this residue by females is,

\textsuperscript{c} i.e., complete waning.
\textsuperscript{d} See 777 b 35, n.
tois thelesi dia tas eirnmenas autias: mi' dynamenvhs
35 te gar pettein ths fusesos anagnike perittwma gignesba mi' monon ths akrhstou trophi, alla kai ev tais fleibon, uperballean te plthronun1 kata tase lepstatatas flebas. 'eneka de tov beltineos kai tov telous 'h fuses katarhetai pros ton topou tauton ths gevesews xarwn, opws oion 'emelle toiovtou genvetai eteron. 'hde gar uparchei dunamei ge ev toniovtou oion per esti somatos apokriseis.

5 Tois men oivn thelesin apasen anagkaion gignesba perittwma, tois men aiymatiwois pleioun, kai tautwn anbrowpou pleistou: anagnk de kai tois allois athroiZesbai tina suostaen eis ton ustekon topou. to de' autiou, oti tois th aiymatiwos pleioun kai tautwn oti pleisaton tois anbrowpois, eirhetai proteron.

10 Toi de' ev men tois thelesi pasin uparxein perittwma toiovtou, ev de tois arresei mi' pasin, evna gar ou proieteian gonyhn, all' 'osper ta proieieva2 th' ev th' gonyh kivhseie dhamourgyi to suvostameno en ths ev tois thelesin ulhs, outw ta touiauta [en]3 th' ev autois kivhseie ev to moriow tautw, oben

15 apokrinetai to to sperma, tauto poiexi kai suvosthseis. touto de' estin o topous o peri to upozuma pasi tois ekhouen' arkh gar ths fusesos 'h kardia kai

1 plthronunta Z: plthronunta vulg.
2 proieieva PS: proeiremenva vulg.
3 secluserunt A.-W.

a Se., from the useful nourishment, viz., blood.
b At 727 a 21 ff., and 728 a 30 ff.
c This sentence has been remodelled in the translation, since in the Greek the construction is not carried through.
on the one hand, the result of *necessity*, and the reasons have been given: The female system cannot effect concoction, and therefore of necessity residue must be formed not only from the useless nourishment, but also a in the blood-vessels, and when there is a full complement of it in those very fine blood-vessels, it must overflow. On the other hand, in order to serve the *better* purpose, the End, Nature diverts it to this place and employs it there for the sake of generation, in order that it may become another creature of the same kind as it would have become, since even as it is, it is *potentially* the same in character as the body whose secretion it is.

In all female animals, then, some residue must of necessity be formed: a greater amount of it in the blooded ones, and the greatest of all in human beings, though some substance must of necessity collect in the region of the uterus in the other animals too. The reason why a larger amount is produced in the blooded animals, and the largest amount of all in human beings, has already been stated.¹

But although a residue of this sort occurs in all females, it does not occur in all males. Why is this?² Some males do not emit semen, but, just as the ones which emit semen fashion the creature that is taking shape out of the material supplied by the female by the agency of the movement resident in the semen, so these fashion it into shape by the agency of the movement which resides in that part of themselves whence the semen is secreted; they produce this same effect of causing the material to set.³ (The part to which I refer is the region around the diaphragm in all those animals which have one, because

¹ Cf. above, 736 a 27 and references there given.
τὸ ἀνάλογον, τὸ δὲ κάτω προσθήκη καὶ τοῦτον χάριν. αὐτιον δὴ τοῦ τοῖς μὲν ἀρρεσι μὴ πᾶσιν εἶναι περίττωμα γεννητικον, τοῖς δὲ θήλεσι πᾶσιν,
20 ὅτι τὸ ζώον σῶμα ἐμψυχόν ἐστιν. ἀεὶ δὲ παρέχει τὸ μὲν θῆλυ τῆν ψυχήν, τὸ δ' ἀρρεν τὸ δημιουργοῦν.
ταύτην γὰρ αὐτῶν φαμέν ἐσχεν τὴν δύναμιν ἐκάτερον, καὶ τὸ εἰναι τὸ μὲν θῆλυ τὸ δ' ἀρρεν τούτο. ὥστε τὸ μὲν θῆλυ ἀναγκαὶον παρέχειν σῶμα καὶ ὠγκον, τὸ δ' ἀρρεν οὐκ ἀναγκαὶον οὔτε γὰρ τὰ
25 ὀργανα ἀνάγκη ἐνυπάρχειν ἐν τοῖς γυγομένοις οὔτε τὸ ποιοῦν. ἐστὶ δὲ τὸ μὲν σῶμα ἐκ τοῦ θῆλεος, ἡ
25 δὲ ψυχή ἐκ τοῦ ἀρρενος. ἡ γὰρ ψυχή οὕσια σώματος τινός ἐστιν. καὶ διὰ τούτο ὅσα τῶν μη
30 ὀμογενῶν μίγνυται θῆλυ καὶ ἀρρεν (μίγνυται δὲ ἄν
30 ὅσοι οἱ χρόνοι καὶ ἑγγύς αἱ κυήσεις, καὶ τὰ μεγέθη
35 τῶν σωμάτων μη πολύ διέστηκεν), τὸ μὲν πρώτον κατὰ τὴν ὀμοιότητα γίγνεται κοινὸν ἀμφοτέρων, οἶνον ὑπὸ γεννόμενα ἐξ ἀλώπεκον καὶ κυνὸς καὶ
35 πέρδικος καὶ ἀλεκτρυνόνος, προϊόντος δὲ τοῦ χρόνου καὶ ἐξ ἐτέρων ἐτέρα γεννόμενα τέλος ἀποβαίνει
35 κατὰ τὸ θῆλυ τὴν μορφήν, ὡσπερ τὰ σπέρματα τὰ
35 ξενικά κατὰ τὴν χώραν. αὐτὴ γὰρ ἡ τὴν ψυχήν
35

a Or "reality." Cf. De anima 415 b 7 ff., where the Soul is said to be the Cause and principle of the body (a) as the source of its movement, (b) as its Final Cause, that "for the sake of which" the body exists, (c) as being the essence of living bodies. The last is explained thus: the cause (or ground) of the being of anything is its essence; the being of living things is to live; and the Cause and principle of their being and living is Soul. Cf. also Aristotle's repeated
the first principle of any natural creature's system is
the heart or its counterpart, while the lower parts
are an appendage added for the sake of that.) Why
does this generative residue, then, not occur in all
males, although it occurs in all females? The answer
is that an animal is a living body, a body with Soul
in it. The female always provides the material, the
male provides that which fashions the material into
shape; this, in our view, is the specific characteristic
of each of the sexes: that is what it means to be
male or to be female. Hence, necessity requires that
the female should provide the physical part, i.e., a
quantity of material, but not that the male should do
so, since necessity does not require that the tools
should reside in the product that is being made, nor
that the agent which uses them should do so. Thus
the physical part, the body, comes from the female,
and the Soul from the male, since the Soul is the
essence of a particular body. On this account,
when a male and a female of different species copulate
(which happens in the case of animals whose periods
are equal and whose times of gestation run close,
and which do not differ widely in physical size), the
first generation, so far as resemblance goes, takes
equally after both parents (examples are the offspring
of fox and dog, and of partridge and common fowl),
but as time goes on and successive generations are
produced, the offspring finish up by taking after the
female as regards their bodily form, just as happens
when seeds are introduced into a strange locality—
the plants take after the soil, the reason being that

statements that no part of the body can be such in anything
but name unless it has Soul in it; see also P. A. 641 a 25 ff.
Viz., the so-called Laconian hound; see H. A. 607 a 3.
παρέχουσα καὶ τὸ σῶμα τοῖς σπέρμασίν ἔστιν. καὶ
dιὰ τούτο τοῖς μὲν θήλεσι τὸ μόριον τὸ δεκτικὸν οὐ
πόρος ἔστιν, ἀλλ' ἐξουσί διάστασιν αἱ ὅστεραι τοῖς ἅ' ἀρρεσὶ πόροι τοῖς σπέρμα προϊμένοις, ἀναμει δ' οὖν τοιοῦ.
Τῶν δὲ περιττώματων ἕκαστον ἀμα ἐν τε τοῖς
οικείοις τόποις ἐστὶ καὶ γίγνεται περίττωμα: πρό-
tερον δ' οὖθεν, ἀν μὴ τι βία πολλῇ καὶ παρὰ φύσιν.
5 Δι' ἢν μὲν οὖν αἰτίαν ἀποκρίνεται τὰ περιττώ-
ματα τὰ γενητικὰ τοῖς ζύῳσι, εἴρηται.
"Ὅταν δ' ἔλθῃ τὸ σπέρμα ἀπὸ τοῦ ἄρρενος τῶν
σπέρμα προϊμένων, συνιστήσαι τὸ καθαρώτατον τοῦ
περιττώματος—τὸ γὰρ πλεῖστον ἄχρηστον καὶ ἐν
tοῖς καταμμίοις ἐστὶν υγρὸν (ὅν)¹, ὀσπερ καὶ τῆς
10 τοῦ ἄρρενος γονῆς τὸ υγρότατον. καὶ τῆς εἰς ἀπαξ
προέσεως [καὶ]² ἡ προτέρα τῆς υστέρας ἁγὸνος
μᾶλλον τοῖς πλεῖστοις: ἐλάττω γὰρ ἔχει θερμότητα
ψυχικήν διὰ τὴν ἀπεβίαν, τὸ δὲ πεπημένον πάχος
ἔχει καὶ σεσωμάτωται μᾶλλον.
"Ὅσας δὲ μὴ γίνεται θύραζε τις πρόσεις, ἡ τῶν
gυναικῶν ἡ τῶν ἄλλων ζῴων, διὰ τὸ μὴ ἐνυπάρχει
15 ἄχρηστον περίττωμα πολὺ ἐν τῇ ἀποκρίσει τῆς
tουαίτη, τοσούτων ἐστὶ τὸ ἐγγυνώμονον ὃσον τὸ
ὑπολειπόμενον τοῖς θύραζε προϊμένοις ζῷοις, ὃ
συνιστήσαι τοῦ ἄρρενος δύναμις ἡ ἐν τῷ σπέρματι

¹ <ὅν> supplevi. ² seclusi.

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¹ See Bk. I. 718 a 10 ff.
² Cf. Hippocrates, p. σαρκῶν 13 (viii. 600 Littré) ἡ δὲ τροφὴ ἐσπέραν ἀφίκηται ἐς ἕκαστον, τοιαύτῃ ἀπέδωκε τὴν εἰδένην ἔκαστον ἀκοία περ ἤν.
³ The "concoction" of the semen in viviparous land-
animals takes place actually during copulation (see 717 b 24
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the soil provides the material—i.e., the physical body—for the seeds. And on this account the part in females which receives the semen is not a passage, but it—i.e., the uterus—is fairly wide, whereas the males that emit semen have passages only, and these have no blood in them.  

It is only when it occupies its own proper place that each of the residues becomes that particular residue; before that time none of them can do so without great violence exerted contrary to nature.

We have now given the reason for the secretion of the generative residues in animals.

In those species which emit semen, when the semen from the male has entered, it causes the purest portion of the residue to "set"—I say "purest portion," because the most part of the menstrual discharge is useless, being fluid, just as the most fluid portion of the male semen is, and in most cases the earlier discharge during any one emission is less fertile than the later, because it has less soul-heat owing to its being unconcocted, whereas that which has been concocted is thicker and has more body in it.

In those cases (whether women or other female animals) where there is no external discharge (due to there being no large amount of useless residue in the generative secretion), the amount of stuff which is produced within them corresponds in quantity to that which remains behind in those animals which discharge externally. This stuff gets "set" by the dynamis of the male (a) present in the semen which and 718 a 5 above), which explains the phenomenon here mentioned. In fishes and serpents the semen is already concocted before the time of copulation (ibid.).
τῷ ἀποκρινομένῳ, ἢ, εἰς τὸ ἄρρεν ἐλθόντος τοῦ ἀνάλογον μορίου ταῖς ὑστέραις, ὅσπερ ἐν τισὶ τῶν 20 ἐντόμων φαίνεται συμβαίνον.

"Οτι δ' ἡ γυνομένη ὑγρότης μετὰ τῆς ἡδονῆς τοῖς θῆλεσιν οὐδὲν συμβάλλεται εἰς τὸ κύμα, εἰρήται πρότερον. μάλιστα δ' ἂν δοξείει, ὅτι καθάπερ τοῖς ἄρρεσι, γίγνεται καὶ ταῖς γυναιξί νῦκτωρ ὁ καλούσιν ἐξονειρώτευν. ἀλλὰ τοῦτο σημεῖον οὐθέν. γι' 25 νεται γὰρ καὶ τοῖς νέοις τῶν ἄρρενων τοῖς μέλλουσι μὲν μηθέν δὲ προϊμένους, ἢ τοῖς ἔτι1 προϊμένους ἄγονον.

"Ανευ μὲν οὖν τῆς τοῦ ἄρρενος προεύσεως ἐν τῇ συννοσίᾳ ἀδύνατον συλλαβεῖν, καὶ ἄνευ τῆς τῶν γυναικείων περιπτώσεως ἡ θύραζε προελθόντῃς ἡ ἐντὸς ικανῆς οὔσης. οὐ συμβαίνουσης μέντοι τῆς 30 εἰώθυναις γίγνεσθαι τοῖς θῆλεσιν ἡδονῆς περὶ τὴν ὁμιλίαν τὴν τοιαύτην συλλαμβάνουσιν, ἂν τῦχῃ οὗ τόπος ἄργων2 καὶ καταβεβηκών καὶ ὑστέραν ἐντός.3 ἀλλ' ὡς ἐπὶ τὸ πολὺ συμβαίνει ἐκεῖνως διὰ τὸ μὴ συμμεμφικέναι τὸ στόμα γυνομένης τῆς ἐκκρίσεως, μεθ' ἦς εἰώθη γίγνεσθαι καὶ τοῖς ἄρρεσιν 35 ἡ ἡδονή καὶ ταῖς γυναιξίν. οὔτω δ' ἔχοντος εὐνοεῖται μᾶλλον καὶ τῷ τοῦ ἄρρενος σπέρματι.

'Η δ' ἄφεσις οὐκ ἐντὸς γίγνεται, καθάπερ οὐονται τινες (οτενὸν γὰρ τὸ στόμα τῶν υστερῶν), ἀλλ' εἰς τὸ πρόσθεν, οὔτε τῷ θῆλυ προίτεται τὴν ἐν ἐνίας αὐτών ἰκιμάδα γυνομένην, ἐνταῦθα καὶ τὸ ἄρρεν προίτεται [ἐάν τις ἐξεκμασῇ].4 - ὅτε μὲν οὖν μὲνει

1 ἔτι προϊμένους corr. P: ἐπιπροϊμένους vulg.
3 ἐντός P: ἐγγὺς vulg.
4 seel. A.-W., Platt.
is secreted, or (b) when the part of the female analogous to the uterus is inserted into the male (as is observed to take place in certain insects).\footnote{Cf. 738 b 12.}

I have said already \footnote{Bk. I, ch. 20.} that the fluid which is produced in females and accompanies sexual excitement contributes nothing at all to the fation. The strongest reason for believing that it does is that the phenomenon of night effusions occurs in women just as in men; but this is no proof at all, because it occurs with young men who come almost to the point but in fact emit nothing, and also with those who as yet emit infertile semen.

Conception cannot occur without (a) an emission from the male during copulation and without (b) the presence of the menstrual residue either externally discharged or available in sufficient quantity internally. Conception takes place, however, even if the pleasure which women usually experience during sexual intercourse fails to occur, if the part concerned happens to be in heat and the uterus has descended within. Generally, however, pleasure does occur, because when the secretion, which is usually accompanied by pleasure in man and woman alike, takes place, the \textit{os uteri} has not closed, and in these conditions a better passage is afforded for the semen of the male.

The discharge does not (as some suppose) take place within the uterus, because the \textit{os uteri} is narrow. The discharge of the male takes place in front of it, at precisely the same spot where the female discharges the moisture which is produced in some instances.\footnote{Cf. 727 b 33 ff.} Sometimes it remains in this place,
739 b

tούτον ἔχον1 τὸν τόπον,2 ὅτε δὲ, ἂν τὐχῇ συμ-
μέτρως ἔχουσα καὶ θερμῇ διὰ τὴν κάθαρσιν ἡ ὑ-
5 στέρα, εἴσω σπᾶ. σημείων δὲ· καὶ γὰρ τὰ πρόσθετα3
ὔγρα προστεθέντα ἀφαιρεῖται ξηρά. ἔτι δὲ ὁσα
tῶν ζῷων πρὸς τῷ ὑποζώματι ἐχει τὰς υστέρας,
kαθάπερ ὀρνις καὶ τῶν ἰχθυῶν οἱ ζωοτοκοῦντες,
ἀδύνατον ἐκεῖ μὴ σπάσθαι τὸ στέρμα, ἀλλὰ ἀφεθέν
ἐλθεῖν. ἔλκει δὲ τὴν γονήν ὁ τόπος διὰ τὴν θερ-
10 μότητα τὴν ὑπάρχουσαν. καὶ ἡ τῶν καταμηνίων
δὲ ἐκκρίσεις καὶ συνάθροισις ἐμπυρεύει θερμότητα
ἐν τῷ μορίῳ τούτῳ, [ὦστε]4 καθάπερ τὰ κωνικά5
tῶν ἀγγείων, όταν θερμῷ διακλυσθῇ, σπᾶ τὸ ὕδωρ
eis αὐτὰ καταστρεφομένου τοῦ στόματος. καὶ
tοῦτον μὲν τὸν τρόπον γίγνεται σπάσις, ὡς δὲ τινες
15 λέγουσιν, τοῖς ὀργανικοῖς πρὸς τὴν συνουσίαν μο-
ρίως οὗ γίνεται κατ’ οὐθένα τρόπον. ἀνάπαλν δὲ
συμβαίνει καὶ τοῖς λέγουσι προϊσθαί καὶ τὴν γυ-
ναίκα σπέρμα. προϊσμέναις γὰρ ἡξω συμβαίνει
tαῖς υστέραις πάλιν εἰσω σπᾶν, εἴπερ μικθῆσεται
τῇ γονῇ τῇ τοῦ ἄρκενος. τὸ δὲ οὕτω γίγνεσθαι
20 περίεργον, ἡ δὲ φύσις οὐθέν ποτει περίεργον.
"Ὅταν δὲ συστῇ ἡ ἐν ταῖς υστέραις ἀπόκρυσις
tοῦ θέλεω υπὸ τῆς τοῦ ἄρκενος γονῆς, παρα-
πλήσιον πουούσης ὑπὲρ ἐπὶ τοῦ γάλακτος τῆς
πυετίας· καὶ γὰρ ἡ πυετία γάλα ἐστὶ θερμότητα
ζωτικῆν ἔχον, ἡ τὸ ὁμοίων εἰς ἐν ἀγεί καὶ συνίστησι,

1 ἔχον Y: ἔχοντα vulg. 2 τόπον Platt: τρόπον vulg.
3 πρόσθετα P: πρόσθεν vulg. 4 ὥστε seclusi.
5 κωνικά Platt: ἀκόνιτα vulg.: vās quod non est plenum
Σ (=κενά ?).

a Cf. 728 a 31 ff.
sometimes, if the uterus happens to be in a suitable condition and hot owing to the evacuation of the menses, the uterus draws it in. Evidence for this is the fact that pessaries though wet when applied are dry when removed. Also, in those animals (such as birds and viviparous fishes) whose uterus is close by the diaphragm there is no alternative: the semen must be drawn in; it cannot enter at the moment of discharge. This region, in virtue of the heat present in it (the discharge and aggregation of the menstrual fluid also produce fiery heat in this part) draws up the semen in the same way that conical vessels which have been washed out with something warm draw water up into themselves when they are turned mouth downwards. And that is the way in which the semen is drawn in; it is certainly not done, as some allege, by the parts that are instrumental in copulation.a We find the situation reversed in the theory that the woman as well as the man emits semen, since if the uterus emits any semen outside itself, it will have to draw it back inside again if it is to mingle with the semen of the male. Such a performance is superfluous, and Nature does nothing which is superfluous.

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.b Rennet is milk which contains vital heat, as semen does, and this integrates the homogeneous substance and makes it "set." As the

a Cf. 755 a 18. This is a remarkable intuition of the essential rôle played by ferment action in embryonic development. Cf. also Job x. 10 "Hast thou not poured me out as milk, and curdled me like cheese? Thou hast clothed me with skin and flesh, and knit me together with bones and sinews" (R.V.).
25 καὶ ἡ γονὴ πρὸς τὴν τῶν καταμηνών φύσιν ταῦτα πέπονθεν · ἡ γὰρ αὐτὴ φύσις ἐστὶ γάλακτος καὶ καταμηνῶν. συνιόντος δὴ τοῦ σωματώδους ἐκ-κρίνεται τὸ υγρόν, καὶ περιστάνται κύκλῳ ἡπραμο-μένων τῶν γενηῶν ὑμένες, καὶ ἐξ ἀνάγκης καὶ ἐνεκά τινος· καὶ γὰρ θερμαίνομένων ἡπραίνεσθαι
30 ἀναγκαῖον τὰ ἐσχατα καὶ ψυχομένων, καὶ δεὶ μὴ ἐν υγρῷ τὸ ξύον εἶναι ἄλλα κεχωρισμένον. κα-λοῦνται δὲ τούτων οἱ μὲν ὑμένες τὰ δὲ χόρια, διαφέροντα τῷ μάλλον καὶ ἤττου· ὁμοίως δὲ ἐνυπάρ-χουσιν ἐν τε τοῖς ψυτοκοῖς ταῦτα καὶ τοῖς ἑφω-τόκοις.

"Ὅταν δὲ συντῆ τὸ κύμα ἡδην, παραπλῆσιον
35 ποιεῖ τοῖς σπειρομένοις. ἡ μὲν γὰρ ἄρχὴ καὶ ἐν τοῖς σπερμασίν ἐν αὐτοῖς ἐστὶν ἡ πρώτη· ὅταν δ' αὐτὴ ἀποκριθῇ ἐνοῦσα δυνάμει πρότερον, ἀπὸ ταύ-της ἀφίεται δ' τε βλαστῶς καὶ ἡ βίζα. αὐτὴ δ' ἐστὶν ἡ τὴν τροφὴν λαμβάνει· δεῖται γὰρ αὐξήσεως τὸ φυτόν. ὡς καὶ ἐν τῷ κυματὶ τρόπον τινὰ πάντων ἐνοῦτων τῶν μορίων δυνάμει ἡ ἅρχη πρὸ ὑδόου μάλιστα ἐνυπάρχει. διὸ ἀποκρίνεται πρῶτον ἡ καρδία ἐνεργεία. καὶ τούτο οὐ μόνον ἐπὶ τῆς
5 αἰσθήσεως δῆλον (συμβαίνει γὰρ οὕτως), ἀλλὰ καὶ ἐπὶ τοῦ λόγου. ὅταν γὰρ ἀπ' ἀμφοῖν ἀποκριθῇ, δεῖ αὐτὸ αὐτὸ διοικεῖν τὸ γενόμενον, καθάπερ ἀπ-

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1 ταῦτα P: τοῦτο vulg. 2 δὴ A.-W., Ob*: δὲ vulg.

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ν φύσις, as often, refers specially to the substance of the thing. The substance of milk and the menstrual fluid is identical, because they are both residues of the useful nourishment.
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 the same as 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 mem-
branes form all round its outer surface. (This is the
result of _necessity_; but also it is to serve a _purpose_: 
(a) Necessity ordains that the extreme surface of a
thing should solidify when heated as well as when
cooled; (b) it is requisite that the young animal
should not be situated in fluid but well away from it.)
Some of these are called membranes; some _choria_
and they differ by the "more and less." They are
found in Ovipara and Vivipara alike.

Once the fetation has "set," it behaves like seeds
sown in the ground. The first principle (of growth)
is present in the seeds themselves too, and as soon
as this, which at first was present _potentially_, has
become distinct, a shoot and a root are thrown
out from it, the root being the channel by which
nourishment is obtained, for of course the plant
needs material for growth. So too in the fetation,
in a way all the parts are present _potentially_, but
the first principle has made the most headway,
and on that account the first to become distinct in
_actuality_ is the heart. This is plain not only to
the senses (for after all it is a matter of fact), but
also to the reason. Once the fetation which has
been formed is separate and distinct from both the
parents, it must manage for itself, just like a son who
has set up a house of his own independently of his

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^a^ See also _H.A._ Bk. VI, ch. 3.
^b^ See 737 b 7, n., and Introd. § 70.
οικοσθέν τέκνων ἀπὸ πατρός. ὥστε δεῖ ἀρχὴν ἔχειν, ἢ καὶ ὤστεν ἡ διακόσμησις τοῦ σῶματος γίνεται τοῖς ζῴοις. εἰ γὰρ ἐξωθεὶν ποτ' ἐσται καὶ ὦστεν ἐνεσομένη, οὐ μόνον διαπορήσειν ἀν τις τὸ πότε, ἀλλ' ὁτι ἀνάγκη, ὅταν ἐκαστὸν χωρίζηται τῶν μορίων, ταύτῃ ὑπάρχει πρῶτον, εξ ἢ καὶ ἡ αὐξήσις ὑπάρχει καὶ ἡ κίνησις τοῖς ἄλλοις μορίοις. διόπερ οὖσι λέγουσιν, ὦστεν Δημόκριτος, τὰ ἔξω πρῶτον διακρίνεσθαι τῶν ζῴων, ὦστεν 15 δὲ τὰ ἐντός, οὐκ ὀρθῶς λέγουσιν, ὦστεν ἐνυλίων ἡ λιθίνων ζῴων. τὰ μὲν γὰρ τοιαῦτ' οὐκ ἔχει ἀρχὴν ὅλως, τὰ δὲ ζώα πάντ' ἔχει καὶ ἐντὸς ἔχει. διὸ πρῶτον ἡ καρδία φαίνεται διωρισμένη πάσι τοῖς ἐναίμοις· ἀρχὴ γὰρ αὐτῇ καὶ τῶν ὁμοιομερῶν καὶ τῶν ἀνομοιομερῶν. ἦδη γὰρ ἀρχὴν ταὐτὴν 20 ἄξιον ἀκούσαι τοῦ ζῶου καὶ τοῦ συστήματος, ὅταν δέσται τροφῆς· τὸ γὰρ δὴ ὅν1 αὐξᾶνεται. τροφῆ δὲ ζῶου ἡ ἐσχάτη αἷμα καὶ τὸ ἀνάλογον. τούτων δ' ἄγγειον αἱ φλέβες· διὸ ἡ καρδία καὶ τούτων

1 ὅν] ζῷον Y.

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a See Diels, Vorsokr. 5 68 A 145.
b See Introd. § 19.
c The point is that by this time the fetus is definitely constituted—it is an individual—it exists, and that which exists can correctly be said to have an ἀρχή. Also, that which exists needs nourishment, and in animals nourishment means blood, of which the heart is the ἀρχή. (As Aristotle says elsewhere, 735 a, the heart supplies the principle of growth, and the nutritive faculty of Soul operates through the heart.) This, then, is why, as soon as the fetus is definitely constituted, the heart is formed—otherwise no growth could take place.
d It is unnecessary to read ζῷον for ὅν: ὅν gives better point to the argument, with which compare the passage 194.
father. That is why it must have a first principle, from which also the subsequent ordering of the animal’s body is derived. Otherwise, supposing this principle is to come in at some moment from outside and take up its position inside later on, then we may well be puzzled at what moment this is to happen, and also we may point out that of necessity the first principle must be present at the outset, at the time when each of the parts is being separated from the rest, since the growth and movement of the other parts are derived from it. That is why those people are wrong who, like Democritus, hold that the external parts of animals become distinct first, and then the internal ones. They might be speaking of animals carved out of wood or stone, the sort of things which have no first principle at all, whereas living animals all have such a principle, and it is inside them. On this account in all blooded animals it is the heart which can first be seen as something distinct, as this is the first principle both of the “uniform” and of the “non-uniform” parts—since this is justifiably designated as first principle of the animal or organism from the moment when it begins to need nourishment, for of course that which exists grows, and, for an animal, the ultimate form of nourishment is blood or its counterpart. Of these fluids the blood-vessels are the receptacle, and therefore

735 a 13-26 (where again the reading with ὅν should be kept in 735 a 22). Here the point is clearly made that, once a thing has come into being (γένηται), it must of necessity grow. See also note on 744 b 36.

* The blood-vessels distribute the “ultimate nourishment” to the parts of the body, which, as Aristotle says (743 a 1), are moulded round them like a wax figure round a core or foundation, and are formed out of them.
ἀρχή. δήλον δὲ τούτο ἐκ τῶν ἱστοριῶν καὶ τῶν ἀνατομῶν.

Εσπε χών ἔναν μὲν ἢδη ζώον ἄτελες δὲ, ἀλλ' ἐν άναγκαίων λαμβάνειν τὴν τροφήν· διὸ χρήται τῇ ὑστέρᾳ καὶ τῇ ἐχούσῃ, ὀστερ γὰρ φυτῶν, τοῦ λαμβάνειν τροφήν, ἐφες ἀν τελεωθῇ πρὸς τὸ εἶναι ἡδη ζώον δυνάμει πορευτικόν. διὸ ἐκ τῆς καρδίας τόσ δύο φλέβας πρῶτον ἢ φύσις ὑπέγραψεν· ἀπὸ δὲ τούτων φλέβια ἀπηρτηται πρὸς τὴν ὑστέραν ὁ 30 καλούμενος ὀμφαλός. ἔστι γὰρ ὁ ὀμφαλὸς φλέβη, τοὺς μὲν μία, τοὺς δὲ πλεῖον τῶν ζώων. περὶ δὲ ταύτας κέλυφος δερματικὸν [ὁ καλούμενος ὀμφαλός] διὰ τὸ δείσθαι σωτηρίας καὶ σκέπης τὴν τῶν φλεβῶν ἀσθένειαν. αἱ δὲ φλέβες οἰνοὶ βίζαι πρὸς 35 τὴν ὑστέραν συνάπτουσι, δι' ἄν λαμβάνει τὸ κύμα τὴν τροφήν. τούτων γὰρ χάριν ἐν ταῖς ὑστέραις μὲν τὸ ζώον, ἀλλ' ὅγχος ὡς Δημόκριτος φησιν, ὅνα διαπλάτηται τὰ μόρια κατὰ τὰ μόρια τῆς ἐχούσης. τούτο γὰρ ἐπὶ τῶν ὠστοκούντων φανερόν· ἐκεῖνα γὰρ ἐν τοῖς ωοῖς λαμβάνει τὴν διάκρισιν, κεχωρι-σμένα τῆς μήτρας.

Ἀπορήσειε δ' ἂν τις, εἰ τὸ αἷμα μὲν τροφῆ ἐστίν, ἢ δὲ καρδία πρώτη γίνεται ἐναιμός ὁδοία, [τὸ δ' αἷμα τροφῆ,] ἢ δὲ τροφῆ θύραθεν, πόθεν εἰσήλθεν 5 ἡ πρώτη τροφή; ἡ τούτ' οὐκ ἀληθές, ὡς πάσα

1 πρῶτας Ρ. 2 seclusit Bekker.
3 secluserunt A.-W.; pro τὸ δ' αἷμα . . . θύραθεν et sanguis est ex extrinseco Σ.

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a H. A. Bk. III, ch. 3.
b Or, "sketches in," "traces out." Cf. 743 b 20, and a different metaphor at 743 a 2.
c Cf. 745 b 25 ff. d See Diels, Vorsokr. 68 A 144.

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the heart is the first principle of them as well. This is clearly brought out in the *Researches* and in the *Dissections*.

Now since the fetation 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, just as a plant makes use of the earth, in order to get its nourishment, until such time as it is sufficiently perfected to be a *potentially* locomotive animal. That is why Nature prescribes first of all the two blood-vessels that run from the heart; and attached to these are some small blood-vessels which run to the uterus, forming what is known as the umbilicus, the umbilicus *c* being of course a blood-vessel—a single blood-vessel in some animals, and consisting of more numerous ones in others. Round these blood-vessels there is a skin-like integument, because the blood-vessels being weak need a protective covering to keep them safe and sound. The blood-vessels join on to the uterus as though they were roots, and through them the fetation gets its nourishment. And that of course is the reason why the young animal stays in the uterus (not as Democritus *a* alleges, in order that its parts may be moulded after the fashion of the parts of its mother). This is manifest in the case of the Ovipara, whose parts become distinct in the egg, *i.e.*, after they have been separated from the matrix.

Here is a puzzle which may be raised. If (1) the blood is nourishment, (2) the heart is the first thing to be formed, and when formed contains blood, and (3) the nourishment comes from outside, from whence did the first nourishment *e* enter? Well, perhaps

* e *i.e.*, the blood which is in the heart to begin with.
740 b

θύραθεν, ἀλλ' εὐθὺς, ὥσπερ ἐν τοῖς τῶν φυτῶν σπέρμασιν ἐνεστὶ τι τοιοῦτον τὸ φαινόμενον πρῶτον γαλακτώδες, οὕτω καὶ ἐν τῇ ὕλῃ τῶν ζῴων τὸ περίττωμα τῆς συστάσεως τροφῆς ἐστιν.

'Ἡ μὲν οὖν αὐξήσις τῷ κυήματι γίνεται διὰ τοῦ ὀμφαλοῦ τὸν αὐτὸν τρόπον ὀντερ διὰ τῶν μιξῶν τοῖς φυτοῖς [καὶ τοῖς ζῴοις αὐτοῖς, ὅταν ἀπολυθῶσιν, ἐκ τῆς ἐν αὐτοῖς τροφῆς] 1· περὶ δὲν ὑστερον λεκτέουν κατὰ τοὺς οἰκείους τῶν λόγων καίρους. ἡ δὲ διάκρισις γίγνεται τῶν μορίων οὐχ ὡς τινες ὑπολαμβάνουσι, διὰ τὸ πεφυκέναι φέρεσθαι τὸ ὅμοιον πρὸς τὸ ὁμοίουν (πρὸς γὰρ πολλαῖς ἄλλαις αἰσ ὁ λόγος οὗτος ἔχει δυσχερείας, συμβαίνει χωρίς ἐκαστὸν γίνεσθαι τῶν μορίων τῶν ὁμοιομερῶν, οἷον ὡστά καθ' αὐτὰ καὶ νεῦρα, καὶ τὰς σάρκας καθ' αὐτάς, εἰ τις ἀποδέξιατο ταύτην τὴν αἰτίαν), ἀλλ' ὅτι τὸ περίττωμα τὸ τοῦ θήλεος δυνάμει τοιοῦτον ἐστιν οἷον φύσει τὸ ζῷον, καὶ ἐνεστὶ δυνάμει τὰ μόρια, ἐνεργεία δ' οὐθὲν, διὰ ταύτην τὴν αἰτίαν γίγνεται ἐκαστὸν αὐτῶν, καὶ ὅτι τὸ ποιητικὸν καὶ τὸ παθητικὸν, ὅταν θίγονσιν, ὅν τρόπον ἐστὶ τὸ μὲν ποιητικὸν τὸ δὲ παθητικὸν (τὸν δὲ τρόπον λέγω τὸ ὡς καὶ οὐ καὶ ὃτε), εὐθὺς τὸ 25 μὲν ποιεῖ τὸ δὲ πάσχει. ὅλην μὲν οὖν παρέχει τὸ

1 seclusi: suspicatus est Platt: τὸν αὐτὸν . . . τροφῆς om. Σ.

a This phrase seems to be an interpolation, connected perhaps with II. 29-31 below.

b This commonplace of thought in Greek philosophy and medicine is a pseudo-scientific form of a proverbial maxim (cf. "birds of a feather"), specially alluring to the Greeks. Cf. especially Hippocrates, π. φύσος παιδίου, ch. 17 init. and fin. (vii. 496-498 Littré). See quotation in note on 742 a 1. 198
after all it is not true to say that all the nourishment comes from outside. In the seeds of plants there is some nutritive matter, which at first has a milky appearance; and it may be that in the same way, in the material of the animal, the residue left over from its construction is present as nourishment for it from the outset.

So then, the fetation's growth is supplied through the umbilicus in the same way that a plant's growth is supplied through its roots [and also as that of animals is, when they have been separated, from the nourishment which is in themselves]. Of these matters we shall have to speak later at the appropriate occasions in our discussions. As for the differentiation of the various parts: this is not due, as some suppose, to any natural law that "like makes its way to like." This theory involves quite a number of difficulties, one being that if you accept it as stating a valid reason, it follows that each of the "uniform" parts, such as bones, and sinews, and flesh, is formed separately, each one all on its own. The true reason why each of these parts is formed is that the residue provided by the female is potentially the same in character as the future animal will be, according to its nature; and although none of the parts is present in actuality in that residue, they are all there potentially. A further reason is this. When a pair of factors, the one active and the other passive, come into contact in the way in which one is active and the other passive (by "way" I mean the manner, the place, and the time of the contact), then immediately both are brought into play, the one acting, the other being acted upon. In this case, it is the female which provides the matter, and the male which provides the
θηλυ, τὴν δ' ἀρχὴν τῆς κινήσεως τὸ ἀρρεν. ὡσπερ
de τὰ ὑπὸ τῆς τέχνης γινόμενα γίνεται διὰ τῶν
ὄργανων, ἔστι δ' ἀληθέστερον εἶπείν διὰ τῆς κινή-
sεως αὐτῶν, αὕτη δ' ἑστὶν ἡ ἐνέργεια τῆς τέχνης,
ἡ δὲ τέχνη μορφή τῶν γινομένων ἐν ἄλλῳ, οὕτως
30 ἡ τῆς θερμοτηκῆς ψυχῆς δύναμις, ὡσπερ καὶ ἐν
αὐτοῖς τοῖς ζῴων καὶ τοῖς φυτοῖς ὑστερον ἐκ τῆς
tροφῆς ποιεῖ τὴν αὐξήσιν, χρωμένη οἰκον ὄργανοις
θερμότητι καὶ ψυχρότητι (ἐν γὰρ τούτοις ἡ κάινης
ἐκείνης, καὶ λόγω τινὶ ἐκαστὸν γίνεται), οὕτω καὶ
ἐξ ἀρχῆς συνύστησι τὸ φύσει γιγνόμενον. ἡ γὰρ
35 αὐτὴ ἑστὶν ὑλὴ ἢ αὐξάνεται καὶ ἐξ ἡς συνύσταται
tὸ πρῶτον, ὡστε καὶ ἡ ποιούσα δύναμις ταύτῳ [τῷ
ἐξ ἀρχῆς· μείζων δὲ αὐτῇ ἑστὶν]. εἰ όν πρὸ ἄυτη
ἑστὶν ἡ θερμικὴ ψυχή, αὕτη ἑστὶ καὶ ἡ γεννώσα·
kαὶ τοῦτ ἑστὶν ἡ φύσις ἡ ἐκάστον, ἐνυπάρχουσα
καὶ ἐν φυτοῖς καὶ ἐν ζῴων πάσιν. τὰ δ' ἄλλα
μόρια τῆς ψυχῆς τοῖς μὲν ὑπάρχει τοῖς δ' οἷς
ὑπάρχει τῶν ζῴων. 2

Ἐν μὲν οὖν τοῖς φυτοῖς οὐ κεχώρισται τὸ θήλυ
5 τοῦ ἀρρενος· ἐν δὲ τοῖς ζῴων ἐν οἷς κεχώρισται,
V προσδεῖται τὸ θήλυ τοῦ ἀρρενος. 3 καὶ τοῖς ἀπο-

1 seclusi. μείζων . . . ἑστὶν seel. A.-W., qui et tauto τῷ
ὲξ ἀρχῆς γεννήσαντι ἑστὶν: Btf. τῇ ἑξ ἀρχῆς [μ. . . . ἐ].
2 ζώντων Peck: ζώων vulg., cf. 731 a 31, ubi PY ζώων
pro ζώντων: in quibusdam corporibus quae vivunt Σ.
3 τὸ θήλυ τοῦ ἀρρενος Peck, docente Platt: τοῦ θήλεος τὸ
ἀρρεν vulg.

a Cf. 734 b 36 ff. and P.A. 640 a 32.
b See App. B §§ 6, 9, 15.
c Cf. Phys. 192 b 21 ff. ὡς οὖσα τῆς φύσεως ἀρχῆς τινος καὶ
αἰτίας τοῦ κινεῖσθαι καὶ ἥρεμειν . . . 32 φύσιν δὲ ἐχει ὁσα τοιαύτην
200
principle of movement. Now the products which are formed by human art are formed by means of instruments, or rather it would be truer to say they are formed by means of the movement of the instruments, and this movement is the activity, the actualization, of the art, for by "art" we mean the shape of the products which are formed, though it is resident elsewhere than in the products themselves. The dynamis of the nutritive Soul behaves in the same way. Just as, in the independently existing animal or plant, this Soul, which uses heat and cold as its instruments (for it is in these that its movement subsists, each several thing being formed according to some definite logos), at a later stage produces growth out of the nourishment supplied, so in precisely the same way at the very outset, this Soul, while the natural object is being formed, causes it to be set and constituted; since, as the matter from which the object derives its growth is identical with that out of which it was originally set and constituted, so too the dynamis which fashions the object is identical. If, then, this is the nutritive Soul, this it is which also generates the object. And this part of Soul it is which is the "nature" of each several object, being present alike in plants and in animals one and all, whereas the other parts of Soul, while present in some living things, are absent from others.

Now in plants the female is not separate from the male; in certain of the animals, however, it is separate, and here, in addition, it has need of the male. And yet anyone might well raise the puzzle,
741 a  

ρήσειεν ἀν διὰ τὴν αἰτίαν. ἐὰν περ ἔχει τὸ θήλυ τὴν αὐτὴν ψυχὴν καὶ ἡ ὀλη τὸ περιπτώμα τὸ τοῦ θῆλεός ἐστι, τί προσδείται τοῦ ἀρρενος, ἀλλ' οὐκ αὐτὸ ἐξ αὐτοῦ γεννᾷ τὸ θήλυ; αὔτιον δ' ὅτι 10 διαφέρει τὸ ζῷον τοῦ φυτοῦ αἰσθήσει: ἀδύνατον δὲ πρόσωπον ἡ χείρα ἡ σάρκα εἶναι ἡ ἄλλο τι μόριον μὴ ἐνούσης αἰσθητικῆς ψυχῆς, ἡ ἐνέργειά ἡ δυνάμει, καὶ ἡ πτη ἡ ἀπλῶς. ἔσται γὰρ οἶνον νεκρὸς ἡ νεκροῦ μόριον. εἰ οὖν τὸ ἄρρην ἐστὶ τὸ τῆς τουαύτης ποιητικῆς ψυχῆς, ὅπου κεχώρισται 15 τὸ θῆλυ καὶ τὸ ἄρρην, ἀδύνατον τὸ θῆλυ αὐτὸ ἐξ αὐτοῦ γεννᾶν ζῷον· τὸ γὰρ εἰρημένον ἢν τὸ ἄρρεν' εἶναι· ἐπει ὅτι γ' ἔχει λόγον ἡ λεχθείσα ἀπορία, φανερὸν ἐπὶ τῶν ὀρνίθων τῶν τὰ ὑπηνέμα τικτόντων, ὅτι δύναται μέχρι γε τίνος τὸ θῆλυ γεννᾶν. ἔτι δ' ἔχει καὶ τοῦτο ἀπορίαν, πῶς τις αὐτῶν τὰ 20 ὑδα φήσει ζῆν. οὔτε γὰρ οὕτως ὡς τὰ γόνιμα ὑδα ἐνδέχεται (ἐγίγνετο γὰρ ἂν ἐξ αὐτῶν ἐνεργείᾳ ἐμψυχον) οὔθ' οὕτως ὁσπερ ξύλον ἡ λίθος. ἔστι γὰρ καὶ τούτων τῶν ὑδών φθορά τις ὡς μετεχόντων τρόπων τινὰ ζωῆς πρότερον. δῆλον οὖν ὅτι ἔχει τινὰ δυνάμει ψυχῆν. ποίαν οὖν ταύτην; ἀνάγκη 25 ὅτι τὴν ἐσχάτην. αὐτὴ δ' ἔστιν ἡ θρεπτικὴ· αὐτὴ

1 ἄρρεν S: ἄρρεν vulg.

a Cf. 732 a 13, n.
b The production of sentient Soul.
GENERATION OF ANIMALS, II. v.

to what cause this is due. Granted that the female possesses the same Soul (as the male) and that the residue provided by the female is the material (for the fation), why has the female any need of the male in addition? Why does not the female accomplish generation all by itself and from itself? The reason is that there is a difference between animal and plant: the animal possesses sense-perception. It is impossible for any part of the body whatever (face, hand, flesh, etc.) to exist unless sentient Soul is present in it, whether in actuality or potentially, whether in some qualified sense or without qualification. Otherwise what we have will be on a par with a dead body or a dead limb. Thus, if the male is the factor which produces the sentient Soul in cases where male and female are separate, it is impossible for the female all by itself and from itself to generate an animal; because the faculty just mentioned is the essence of what is meant by “male.” Still, it is not at all unreasonable to raise the puzzle we have stated, as is shown by the instance of those birds which lay wind-eggs: this proves that up to a point the female is able to generate. But there is a puzzle here too: In what sense are we to say that these eggs are alive? We cannot say that they are alive in the same sense as fertile eggs, for in that case an actual living creature would hatch out from them; nor are they on a par with wood and stone, because these eggs go bad just as fertile ones do, and this seems to indicate that to start with they were in some way alive. Hence it is clear that potentially they possess Soul of a sort. What sort, then? The lowest, it must be, obviously; and this is nutritive Soul, because this it is which is present
γάρ ὑπάρχει πάσων ὁμοίως ζώοις τε καὶ φυτοῖς. 
διὰ τί ὡς ὁυκ ἀποτελεῖ τὰ μόρια καὶ τὸ ζῷον; 
ἐπεὶ δὲι αἰσθητικὴν αὐτὰ ἔχειν ψυχὴν οὐ γάρ ἔστιν ὁμοίως φυτοῦ τὰ μόρια τῶν ζῴων. 
διὸ δεῖται τῆς τοῦ ἄρρενος κοινωνίας: κεκώρισται γάρ ἐν τούτοις τὸ ἄρρεν. ὁπερ καὶ συμβαίνει τὰ γὰρ ὑπηνέμα 
γίνεται γόνυμα, ἕαν ἐν τινι καρβῷ τὸ ἄρρεν ἐπο-
χεύσῃ. ἀλλὰ περὶ μὲν τῆς τούτων αὐτίας ὠστερον 
διορισθῆσται.

Εἰ δὲ ἐστὶ τι γένος ὁ βῆλυ μὲν ἐστὶν, ἄρρεν δὲ 
μὴ ἔχει κεκωρισμένον, ἐνδέχεται τοῦτοι ζῷον εἰς 
αὐτοῦ γενναῖ. ὁπερ ἁξιοπιστώς μὲν οὐ συνώπται 
μέχρι γε τοῦ κὼν, ποιεὶ δὲ διοτάξειν [ἐνα] ἐν τῷ 
γένει τῶν ἰχθύων τῶν γὰρ καλομεμένων ἐρυ-
θρώνων ἄρρην μὲν οὐθεὶς ὁππταί πω, θῆλεια δὲ καὶ 
κυμάτων πλήρεις. ἀλλὰ τούτων μὲν οὔπω πείραν 
ἐξομεν ἁξιοπιστον, οὔτε δὲ θῆλεα οὔτε ἄρρενα καὶ 
ἐν τῷ τῶν ἰχθύων γένει ἐστίν, οἶδον αἱ τ᾽ ἐγχέλεις 
καὶ γένος τι κεστρέων περὶ τούς τελματιαίους πο-
ταμῶς. ἐν ὥσοις δὲ κεκώρισται τὸ βῆλυ καὶ τὸ 
ἄρρεν, ἄδυνατον αὐτὸ καθ᾽ αὐτὸ τὸ βῆλυ γενναῖ εἰς

1 ἀνευ ὁχείας addit P.  2 [ἐνα] Hackforth.
alike in all animals and plants. Why then does this Soul fail to bring the parts to their completion and so produce an animal? Because the parts of an animal are bound to possess sentient Soul, since they are not on a par with those of a plant; and that is why the male is required to take its share in the business (the male being separate from the female in such animals). The facts bear this out: wind-eggs become fertile if the male treads the female within a certain period. However, the cause of these things will be fully determined later on.

If there is any class of animal which is female and has no separate male, it is possible that this generates offspring from itself. This has not so far been reliably observed, it is true, but some instances in the class of fishes give cause to suspect that it may be the case. Thus, of the fish known as erythrinus not a single male specimen has so far been observed, whereas female ones have been, full of fetations. But although with regard to these we have no reliable proof so far, there are also in the class of fishes some which are neither male nor female: e.g., eels, and one sort of cestreus which frequents marshland rivers. In all animals, however, where the male and female are separate, the female is unable by itself to generate offspring indicate that they are descended from an original deep-water fish. See additional note, p. 565.

* This cannot be the grey mullet (Mugil capito, Cuv.), but is probably a species of Muraena or Gymnotus. In P.A. 696 a 5, Aristotle speaks of a cestreus found in the lake at Siphai in Boeotia, on the south coast, near Thespiae (now Tipha). Cf. also the reference at 763 b 1 to Pyrrha, where there was a lagoon which was apparently one of Aristotle's favourite spots for studying animals.
741 b

télos: τὸ γὰρ ἄρρεν μάτην ἢν ἢν, ἢ δὲ φύσις οὐδὲν
5 ποιεῖ μάτην. διότερ εὖ τοῖς τοιοῦτοις ἂεὶ τὸ ἄρρεν
ἐπιτελεῖ τὴν γένεσιν. ἐμποιεῖ γὰρ τούτῳ τὴν αἰ-
θητικὴν ψυχὴν, ἢ δὴ αὐτοῦ ἢ διὰ τῆς γονῆς.
ἐνυπαρχόντων δ')) ἐν τῇ ὑλῇ δυνάμει τῶν μορίων,
ὅταν ἄρχῃ γένηται κινήσεως, ὥσπερ ἐν τοῖς αὐτο-
μάτοις θαύμασι, συνείρεται τὸ ἐφεξῆς· καὶ δ' ὑπο-
10 λονταί λέγειν τινὰς τῶν φυσικῶν, τὸ ᾗν ἐφεροῦσαι εἰς
τὸ ὁμοιον,” λεκτεόν οὐχ ὡς τόπον μεταβάλλοντα
τὰ μόρια κινεῖσθαι, ἄλλα μένοντα καὶ ἀλλοιούμενα
μαλακότητι καὶ σκληρότητι καὶ χρώματι καὶ ταῖς
ἄλλαις ταῖς τῶν ὁμοιομερῶν διαφοραῖς, γινόμενα
15 ἐνεργεία τὸ ὑπήρχει οὐντα δυνάμει πρότερον. γίν-
νεται δὲ πρῶτον ἢ ἄρχῃ. αὐτῇ δ') ἐστὶν ἢ καρδία
τοῖς ἐναίμονι, τοῖς δ') ἄλλοις τὸ ἀνάλογον, ὥσπερ
eἰρηται πολλάκις. καὶ τούτῳ φανερὸν οὐ μόνον
κατὰ τὴν αἴσθησιν, ὅτι γίνεται πρῶτον, ἄλλα καὶ
περὶ τὴν τελευτήν· ἀπολείπει γὰρ τὸ ζήν ἐντεθεὶν
20 τελευταῖον, συμβαίνει δ') ἐπὶ πάντων τὸ τελευταῖον
γινόμενον[1] πρῶτον ἀπολείπειν, τὸ δὲ πρῶτον τελευ-
ταῖον, ὥσπερ τῆς φύσεως διαυλοδρομοῦσις καὶ

11 γενόμενον Ρ.

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a i.e., the matter provided by the female.
b See note on 734 b 10.
c φυσικν in, sometimes φυσιολόγοι, a term used by Aristotle
to describe the early writers on φύσις, i.e., nature, or the
nature (stuff) of the universe and its contents. They include
the so-called “early philosophers,” and apparently also
Hippocrates, as here (see note on 740 b 14). Several of the
pre-Socratic philosophers had made use of this principle in
various connexions.—See also pp. xvi f.
d Cf. above, 740 b 14.
e See Introd. § 48.
f See App. B §§ 4-6, 9-10.
and bring it to completion: if it could, the existence of the male would have no purpose, and Nature does nothing which lacks purpose. Hence in such animals the male always completes the business of generation—it implants sentient Soul, either acting by itself directly or by means of semen. As the parts of the animal to be formed are present potentially in the matter, \(^a\) once the principle of movement has been supplied, one thing follows on after another without interruption, just as it does in the "miraculous" automatic puppets. \(^b\) And the meaning of the statement, made by some of the physiologists, \(^c\) about like "making its way to like," \(^d\) must be taken to be not that the parts of the body "move" \(^e\) in the sense of changing their position, but that while remaining in the same position they undergo "alteration" \(^f\) as regards softness, hardness, colour, and the other differences which belong to the uniform parts; that is, they become in actuality what previously all along they had been potentially. The first to be formed is the "principle," which in blooded animals is the heart and in the others the counterpart of the heart, as I have said many times over. There can be no doubt about this, because our senses tell us that it is the first thing formed; but the truth of it is confirmed by what happens when the creature dies: the heart is the place where life fails last of all; and we find universally that what is the last to be formed is the first to fail, and the first to be formed is the last to fail. \(^g\) It is as though Nature were a runner, covering a double course there and back, and retracing her

\(^a\) Cor primum vivens ultimum moriens: cf. Ebstein et al., Mitt. zur Gesch. der Medizin und Naturw. 19 (1920), 102, 219, 305.
ARISTOTLE

741 b

...ἀνελυπτομένης ἐπὶ τὴν ἀρχὴν οὗθεν ἦλθεν. ἦστι γὰρ ἢ μὲν γένεσις ἐκ τοῦ μὴ ὄντος εἰς τὸ ὅν, ἢ δὲ φθορᾶ ἐκ τοῦ ὄντος πάλιν εἰς τὸ μὴ ὅν.

VI 25  Γίνεται δὲ μετὰ τὴν ἀρχήν, ἀστερ ἐλέξθη, τὰ ἐντὸς πρότερον τῶν ἐκτὸς. φαίνεται δὲ πρότερα τὰ μέγεθος ἔχοντα τῶν ἐλαττόνων, οὐδὲ ἐνα γεγονόμενα πρότερον. πρῶτον δὲ τὰ ἄνω διαρθροῦται τοῦ διαζώματος, καὶ διαφέρει μεγέθει τὸ δὲ κάτω καὶ ἐλαττὸν καὶ ἀδιοριστότερον. καὶ τοῦτο γίγνεται ἐν πάσιν, ὅσοις τὸ ἄνω καὶ τὸ κάτω διώρισται, πλὴν ἐν τοῖς ἐντὸμοις· τοῦτων δὲ ἐν τοῖς σκωληκοτοκουμένοις ἐπὶ τὸ ἄνω ἢ αὐξήσις γίνεται· τὸ γὰρ ἄνω ἐξ ὑπαρχῆς ἐλαττὸν. ἀδιοριστὸν δὲ καὶ τὸ ἄνω καὶ τὸ κάτω τοῖς μαλακίοις τῶν πορευτικῶν μόνοις. τὸ δὲ λεξθὲν συμβαίνει καὶ ἐπὶ τῶν 35 φυτῶν, τὸ προτερεῖν τῇ γενέσει τὸ ἄνω κύτος τοῦ κάτωθεν· τὰς γὰρ βίτας πρότερον ἀφιάσε τὰ σπέρματα τῶν πτόρθων.

Διορίζεται δὲ τὰ μέρη τῶν ζῴων πνεύματι, οὐ μέντοι οὔτε τῷ τῆς γεννώσσης οὔτε τῷ αὐτοῦ,

\(^{a}\) See 740 a 12 ff.

\(^{b}\) Aristotle’s observations are quite correct. Cf. the theories of C. M. Child on axial gradients, physiological dominance (cf. Aristotle’s own use of κύριος, 742 a 34 below), etc., conveniently discussed by J. Huxley and G. R. de Beer in Elements of Experimental Embryology. See also 742 b 14.

\(^{c}\) According to Aristotle (I.A. 705 a 29 ff.), the distinction between the upper and lower portions of animals and plants is determined by function, and not by position relative to the earth and the sky. The “upper” portion is that from which is received the distribution of nourishment and material for growth; and the extremity towards which the nourishment and growth penetrate is the “lower” extremity. Thus, as 208
steps towards the starting-point whence she set out. The process of formation, genesis, starts from not-being and advances till it reaches being; that of decay starts from being and goes back again till it reaches not-being.

After the "principle" is formed, the other parts are formed, the internal ones earlier than the external, as I have said.\(^a\) The larger parts become visible, however, earlier than the smaller ones, although some of them are not in fact formed earlier. First the parts above the diaphragm become articulated, and these are larger in size, whereas that which is below is smaller and less clearly defined.\(^b\) This happens in all cases where the upper and the lower portions\(^c\) are definite and distinct, except Insects: in those Insects which are produced as larvae, the increase occurs towards the upper part, as this is smaller to begin with. The only locomotive animals in which there is no definite distinction between the upper and lower portions are the Cephalopods.\(^d\) What has been said here applies to plants as well: the formation of the upper portion precedes that of the lower: seeds send out their roots before their shoots.\(^e\)

Now the parts of animals are differentiated by means of \textit{pneuma}\(^f\); but this is not the \textit{pneuma} of the mother, nor that of the creature itself, as some of he says (705 b 6), in plants, the roots are the "upper" portion, since it is through their roots that plants get their nourishment, just as animals do through the mouth. \textit{Cf.} the end of the present paragraph, 741 b 34 ff.; also the passage in \textit{P.A.} 686 b 21 ff.

\(^a\) Because (720 b 18, \textit{P.A.} 684 b 15, 685 a 1) their back-part is drawn up on to the front-part, their tail-end is bent right over to meet the front, and in consequence the residual vent is brought close to the mouth.

\(^b\) See note on 741 b 30.

\(^c\) See App. B §§ 7 ff.
καθάπερ τινὲς τῶν φυσικῶν φασίν. φανερῶν δὲ τούτῳ ἐπὶ τῶν ὄρνιθων καὶ τῶν ἱχθυῶν καὶ τῶν ἐντόμων. τὰ μὲν γὰρ χωρισθέντα τῆς γεννώσης γίνεται ἐξ ὕος, ἐν ὦ λαμβάνει τὴν διάρθρωσιν· τὰ δὲ ὀλῆς οὐκ ἀναπνεύσεως, σκωληκοτοκεῖται δὲ καὶ ὕποκεῖται τὰ δὲ ἀναπνεύσεων καὶ ἐν τῇ μήτρᾳ λαμβάνουσα τὴν διάρθρωσιν οὐκ ἀναπνεύσεως πρὶν ἢ ὥσπερ μάλλον λάβη τέλος. διαρθροῦται δὲ καὶ οὕτως καὶ τὰ ἐμπροσθεν μόρια πρὶν ἀναπνεύσει. ἐτὶ δ' ὡσαυτός πολυσχίδη τῶν τετραπόδων, οἷον κύων λέων λύκως ἀλώπηξ θώς, πάντα τυφλὰ γεννᾶ, καὶ δίεισται τὸ βλέφαρον γενομένων ὑστερον. ὡστε δὴ λογος ὅτι τὸν αὐτὸν τρόπον καὶ ἐν τοῖς ἄλλοις πάσι, καθάπερ καὶ τὸ ποιόν, καὶ τὸ ποσόν γίνεται δυνάμει προοπάρχων, ἐνεργεία δ' ὑστερον, ὑπὸ τῶν αὐτῶν αἰτίων ὑφ' ὦντο καὶ τὸ ποιόν διορίζεται, καὶ γίγνεται δύο καὶ 10 ἐνός. ὑπεύρημα δ' ὑπάρχειν ἀναγκαῖον, ὅτι ὑγρὸν καὶ θερμόν, τοῦ μὲν ποιοῦτος, τοῦ δὲ πάσχοντος.

Τῶν δ' ἄρχαιων τινὲς φυσιολόγων τί μετὰ τί γίγνεται τῶν μορίων ἐπειράθησαν λέγειν, οὐ λιαν ἐμπειρικῶς ἔχοντες τῶν συμβαίνοντων. τῶν γὰρ

1 δὲ Ρ: γὰρ vulg.

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a See note on 741 b 10. e.g., Hippocrates, τ. φύσιος παιδίων 17 (vii. 496-498 Littré) ἡ δὲ σαρξ αὐξομένη ύπὸ τοῦ πνεύματος ἀρθροῦται, καὶ ἔρχεται ἐν αὐτῇ ἐκατον τὸ ὄμοιον ὅς τὸ ὄμοιον ... διαρθροῦται ύπὸ τῆς πνεύσης ἐκαστα, φυσικών γὰρ διόστατα ἔξυμπαντα κατὰ συγγένειαν. Cf. also ch. 19. According to this treatise the embryo both received nourishment and breathed through the umbilicus (cf. chh. 13, 15).
b Viz.: birds.
c Viz., fishes and insects.
d Viz., Vivipara.
the physiologers \(^a\) allege. This point is clear in the case of birds, fishes, and insects: thus, some \(^b\) of these are formed out of an egg, after separation from the mother, and it is in the egg that they get their articulation; and some animals \(^c\) do not breathe at all, but are produced as larvae or as eggs; others, \(^d\) which both breathe and get their articulation within the uterus, do not however breathe until their lungs have reached completion: with them, both the lungs and the preceding parts become articulated before they breathe. Further, the polydactyloous quadrupeds (such as the dog, the lion, the wolf, the fox and the jackal) all bring forth their young blind, and the eyelid does not separate until some time after birth. Hence it is clear that, with regard to all the other parts as well, the same holds: just as the characteristics of quality are there potentially to begin with and later on are formed in actuality, so too those of quantity are formed—by the same causes as those by which the characteristics of quality are differentiated, and two things are formed out of a single one.\(^e\) As for pneuma, its presence is the result of necessity, because liquid substance and hot substance are present, one being active and the other being acted upon.\(^f\)

Some of the early physiologers endeavoured to describe the order in which the various parts are formed, but they were none too well acquainted with what actually happens. As with everything else, so

\(^{e}\) *e.g.*, two eyelids; an example of a potential duality being actualized.—See also App. B § 7, n.

\(^{f}\) *i.e.*, the pneuma is not ἐπεισακτον, but σύμφυτον, derived from within, and hence can serve as an "instrument" (see 789 b 3 ff.) charged with a specific "movement" (see Introd. § 68, and App. B, esp. § 32).
μορίων, ὡσπερ καὶ ἐπὶ τῶν ἄλλων, πέφυκεν ἄτερον
20 ἀτέρου πρῶτον. τὸ δὲ πρῶτον ἑάτη πολλαχῶς
ἐστὶν. τὸ τε γὰρ ὡ ἑνεκά καὶ τὸ τούτου ἑνεκά
διαφέρει, καὶ τὸ μὲν τῇ γενέσει πρῶτον ἀυτῶν
ἐστι, τὸ δὲ τῇ οὐσίᾳ. δύο δὲ διαφοράς ἔχει καὶ
τὸ τούτου ἑνεκά. τὸ μὲν γὰρ ἐστὶν ὃθεν ἡ κίνησις,
tὸ δὲ ὃ χρῆται τῷ οὐ ἑνεκά. λέγω δ' οἶον τὸ τε
25 γεννητικὸν καὶ τὸ ὀργανικὸν τῷ γεννωμένῳ· τούτων
γὰρ τὸ μὲν ὑπάρχειν δεῖ πρῶτον, τὸ ποιητικὸν,
οίον τὸ διδάξαν3 τοῦ μανθάνοντος, τοὺς δ' αὐλοὺς
ὑπέρτων τοῦ μανθάνοντος αὐλεῖν· περίεργον γὰρ μὴ
ἐπισταμένοις αὐλεῖν ὑπάρχειν αὐλοὺς. τρώγων δ' ὁντων,
ἑνὸς μὲν τοῦ τέλους, δ' λέγομεν εἰναι οὐ
ἑνεκα, δευτέρου δὲ τῶν τούτου ἑνεκα τῆς ἀρχῆς
30 τῆς κινητικῆς καὶ γεννητικῆς (τὸ γὰρ ποιητικὸν
καὶ γεννητικὸν, ἢ τοιαῦτα, πρὸς τὸ ποιουμένον
ἐστὶ καὶ γεννωμένον), τρίτου δὲ τοῦ χρησίμου καὶ
ὡ χρῆται τὸ τέλος, πρῶτον μὲν ὑπάρχειν ἀναγκαῖον
τὶ μόριον ἐν ὡ δ' ἡ ἁρχὴ τῆς κινήσεως (καὶ γὰρ
ἐνθὺς τούτο4 μορίον ἐστὶ τοῦ τέλους ἐν καὶ κυ-
35 ρικτατον), ἐπειτὰ μετὰ τούτῳ τὸ ὀλον καὶ τὸ τέλος,
τρίτων δὲ καὶ τελευταίων τὰ ὀργανικὰ τοῦτοις μέρῃ
πρὸς ἐνίας χρήσεις. ὡστ' εἰ τι τοιοῦτον ἐστὶν,

1 τούτου PS: οὗ vulg.
2 γεννωμένῳ Z: γεννωμένῳ vulg.
3 διδάξαν Richards.
4 fort. τούτῳ τὸ (Z1*) scribendum, et mox ἐν<εκα>.

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a Cf. Met. 1035 b 18 ff.
b This will be modified in a moment, when Aristotle sub-
divides this heading. Some of the things which are for the
sake of the End are posterior to it in point of formation.
c By this, as appears from 742 b 13, 14 below, is meant the
"upper portion," the head and trunk.

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with the parts of the body: one is, by nature, prior to another. But the term "prior" at once comprises a variety of meanings. E.g., take the difference between (a) that for the sake of which a thing is, and (b) that thing which is for its sake: of these, one (b) is prior in point of formation, while the other (a) is prior in point of being or reality. Further, "that which is for the sake of the End" comprises two divisions: (i) that whence the movement is derived and (ii) that which is employed by the End; or, in other words, (i) something which generates, and (ii) something which serves as an instrument for what is generated. Of the two, the productive factor must exist prior to the other: e.g., a teacher must exist prior to a learner, while pipes are posterior to the person who is learning to play them: it is superfluous for people who cannot play pipes to possess them. So we have these three things: (1) the End, which we describe as being that for the sake of which (other things are); (2) the things which are for the sake of the End, viz., the activating and generative principle (second, because the existence of that which is productive and generative, qua such, is relative to what it produces and generates); (3) the things which are serviceable, which can be and are employed by the End. Thus, first of all there must of necessity exist some part in which the principle of movement resides (for of course this is a part of the End, and the supreme controlling part of it); after that comes the animal as a whole, i.e., the End; third and last of all come the parts which serve these as instruments for various employments. If it is true, then, that there is a part

Or perhaps "this," referring only to the "End."
742 b ὃπερ ἀναγκαῖον ὑπάρχειν ἐν τοῖς ζῷοις, τὸ πάσης ἔχον τῆς φύσεως ἀρχὴν καὶ τέλος, τοῦτο γίνεσθαι πρῶτον ἀναγκαῖον, ἦ μὲν κινητικὸν, πρῶτον, ἦ δὲ μόριον τοῦ τέλους, μετὰ τοῦ ὀλοῦ. Ὁστε τῶν μορίων τῶν ὀργανικῶν ὁσα μὲν ἐστὶ γεννητικὰ τὴν 5 φύσιν, ἀεὶ πρῶτον δεῖ ὑπάρχειν αὐτὰ (ἀλλον γὰρ ἕνεκα ἐστιν ὡς ἄρχη), ὅσα δὲ μὴ τουαῦτα τῶν ἀλλον ἕνεκα, ὑστερον. διὸ οὐ βάδιον διελεῖν πότερα πρῶτερα τῶν μορίων, ὅσα ἀλλον ἕνεκα, ἥ οὖ ἕνεκα ταῦτα. παρεμπίπτει γὰρ τὰ κινητικὰ τῶν μορίων πρῶτον ὄντα τῇ γενέσει τοῦ τέλους, τὰ δὲ κινη- 10 τικὰ πρὸς τὰ ὀργανικὰ διελεῖν οὐ βάδιον. καίτοι κατὰ ταύτην τὴν μέθοδον δεῖ ζητεῖν τί γίνεται μετὰ τί: τὸ γὰρ τέλος ἐνὶον μὲν ὑστερον, ἐνὶον δὲ πρῶ- τερον. καὶ διὰ τοῦτο πρῶτον μὲν τὸ ἔχον τὴν ἄρχην γίνεται μόριον, εἰτ' ἐχόμενον τὸ ἅνω κύτος. διὸ τὰ περὶ τὴν κεφαλὴν καὶ τὰ ὀμματα μέγιστα 15 κατ' ἄρχας φαίνεται τοῖς ἐμβρύοις, τὰ δὲ κάτω τοῦ ὀμφαλοῦ, οἷον τὰ κάλα, μικρὰ τοῦ γὰρ ἅνω τὰ κάτω ἕνεκεν, καὶ οὔτε μόρια τοῦ τέλους οὔτε γεννητικὰ αὐτοῦ.

Οὐ καλῶς δὲ λέγουσιν οὔδὲ τοῦ διὰ τὶ τὴν

1 ὡς P: ὡς ἢ vulg. 2 οὖ] ὁν P.

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a i.e., generative of other parts, as the heart is.

b Or, reading ἥ ἄρχη, “just as the first principle is for the sake of the End.”
of this kind—a part which contains the first principle and the End of the animal's whole nature—which must of necessity be present in an animal, then this part must of necessity be formed first of all—formed first, *qua* activating, though formed along with the whole creature, *qua* being a part of the End. Thus, those instrumental parts which are in their nature generative⁵ must always be there themselves prior to the rest, because they are *for the sake of* something else, as being a first principle ⁶; those parts which, although they are *for the sake of* something else, are not generative, come later. That is why it is not easy to determine whether those parts are "prior" which are *for the sake of* something else, or that part *for whose sake* these others are present. The activating parts intrude themselves into the picture, because in formation they are prior to the End; and it is not easy to determine as between the activating and the instrumental parts. Still, this is the line we must follow in trying to find out the order in which they are formed; for the End, though it comes after some of them, is prior to others. And on this account the part which contains the first principle is the first to be formed; then follows the upper portion of the body; and that is why in embryos we see that the parts round the head and eyes are the largest at the outset, while the parts below the umbilicus, for instance the legs, are small. The reason is that the lower portions are for the sake of the upper portion, and they are not parts of the End ⁷ nor are they concerned in generating it.

People who say, like Democritus of Abdera, that

⁵ See above, 742 a 35, 743 b 13, 14. They are merely useful adjuncts, enabling it to move about, etc.

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742 b

άνάγκην, ὃσιν λέγονσιν ὅτι οὕτως ἂεὶ γίνεται, καὶ
20 ταῦτην εἶναι νομίζουσιν ἁρχὴν ἐν αὐτοῖς, ὥσπερ
Δημόκριτος ὁ Ἀβδηρίτης, ὃτι τοῦ μὲν [ἂν καὶ]
ἀπείρου οὐκ ἐστὶν ἁρχῆ, τὸ δὲ διὰ τῇ ἁρχῇ, τὸ δὲ ἂεὶ ἀπείρου, ὡστε τὸ ἐρωτάν τὸ διὰ τῇ περὶ τῶν
tουτῶν τινὸς τοῦ ἁρχῆν εἶναι φησὶ τοῦ ἀπείρου
ἁρχῆν. καὶ τοι τοῦτον τὸν λόγον, καθ’ ὅν
25 ἀξιοῦσι τὸ διὰ τῇ μὴ ἁρχῆν, οὕθενος ἀπόδειξις
ἐστὶ τῶν ἁδικῶν· φαίνεται δ’ οὕτως πολλῶν, τῶν
μὲν γνωμένων ἂεὶ τῶν δ’ ὄντων, ἐπεὶ καὶ τὸ τρί-
γωνον ἔχειν δυσὶν ὀρθαῖς ἵσαι ἂεὶ καὶ τὸ τῆς
diάμετρον ἀσύμμετρον εἶναι πρὸς τὴν πλευρὰν
ἁδικὸν, ἀλλ’ ὀμοιός ἐστὶν αὐτῶν αὐτίον τι καὶ ἀπὸ-
30 δειξις. τὸ μὲν οὖν μὴ πάντων ἀξιοῦν ἁρχῆν ἁρχῆν
λέγεται καλῶς, τὸ δὲ τῶν ὄντων ἂεὶ καὶ γνωμένων
πάντων οὐ καλῶς, ἀλλ’ ὀσια τῶν ἁδικῶν ἁρχῆν
tυγχάνουσιν οὕσιν· τῆς γὰρ ἁρχῆς ἄλλη γνώσις καὶ
οὐκ ἀπόδειξις. ἁρχῆ δ’ ἐν μὲν τοῖς ἀκινήτοις τὸ

1 secl. en Platt.

a Cf. Met. 1011 a 13 ἀποδείξεως γὰρ ἁρχῆ οὐκ ἀπόδειξις ἐστὶν. Also Anal. Post. 90 b 24 ff. οἱ ἁρχαὶ τῶν ἀποδείξεων ὀρισμοὶ, ὡς ὅτι οὐκ ἐσούν ἀποδείξεις ἰδεούσκε τοὺς πρότερον ή ἐσούναι αἱ ἁρχαὶ ἀποδεικταὶ καὶ τῶν ἁρχῶν ἁρχαὶ . . . ὀρισμοὶ 
μὲν γὰρ τοῦ τῇ ἐστι καὶ οὐσίας. See also 72 b 20 ff.; also Met. 1013 a 15 (one of the definitions of ἁρχῆ) ἐτὶ ὅδεν γνωστὸν τὸ πρᾶγμα πρῶτον, καὶ αὐτῇ ἁρχῆ λέγεται τοῦ πρᾶγ-
ματος, οἶνον τῶν ἀποδείξεων αἱ ὑποθέσεις. In Eth. N. 1142 a 26 it is said to be "intelligence" (νοῦς) which apprehends definitions that cannot be proved by reasoning. Aristotle also
speaks there of "the sort of intuition" (αἰσθησις) where-
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"this is how they are always formed," and regard this as a starting-point (first principle) in these cases, make a mistake, nor do they even succeed in stating the necessity involved in the cause. Their argument is this: What is limitless has no starting-point; but the cause is a starting-point, and what is always is limitless; therefore (says Democritus) to ask for a cause in connexion with anything of this kind (sc., anything that always is) is the same as trying to discover a starting-point in something that is limitless. Yet on this line of argument, on the strength of which they undertake to dispense with trying to discover the cause, there will be no demonstration of any single one of the "eternal" things. It is obvious, however, that demonstrations of many of these (some of them things which always come to be, some things which always are) do in fact exist. For instance, the angles of a triangle are always equal to two right angles, and the diagonal of a square is always incommensurable with the side; in both of these cases we have something "eternal," yet there is a cause for them and they are demonstrable. Thus it is right to say that we cannot undertake to try to discover a starting-point (a first principle) in all things and everything; but it is not right to deny the possibility in the case of all the things that always are and that always come to be; it is impossible only with the first principles of the eternal things, for of course the first principle does not admit of demonstration, but is apprehended by another mode of cognition. a Now with those things that are "immutable," the first principle is by we perceive that the ultimate figure in mathematics is a triangle. Again (1143 b 1) in demonstrations, νοος apprehends the immutable (ἀκύνητα) and primary definitions.
ARISTOTLE

742 b

tί ἐστιν, ἐν δὲ τοῖς γνωμένοις ἡγη πλείους, τρόπον
35 δ' ἄλλον καὶ οὐ πᾶσαι τὸν αὐτόν· ἀλλ' μία τὸν
ἀριθμόν, οδειν ἡ κίνησις ἐστιν. διὸ πάντα τὰ
ἔναμα καρδίαν ἔχει πρώτον, ὥσπερ ἐλέχθη κατ'
ἀρχᾶς· ἐν δὲ τοῖς ἄλλοις τὸ ἀνάλογον γίνεται τῇ
καρδίᾳ πρῶτον.

743 a

'Εκ δὲ τῆς καρδίας αἱ φλέβες διατετανται καθ-
ἀπερ οἱ τοὺς κανάβους γράφοντες ἐν τοῖς τοῖχοις·
tά γὰρ μέρη περὶ ταῦτα ἐστίν, ἀτε γνώμενα ἐκ τούτων. ἡ
dὲ γένεσις ἐστιν [ἐκ]5 τῶν ὦμοιο-
5 μερῶν ὑπὸ ψύξεως καὶ θερμότητος· συνισταται
gὰρ καὶ πήγινται τὰ μὲν ψυχρῷ τὰ δὲ θερμῷ.
περὶ δὲ τῆς τούτων διαφορᾶς εἴρηται πρότερον ἐν
ἐτέροις, ποία λυτὰ υγρῷ καὶ πυρί, καὶ ποία ἄλυτα
ὑγρῷ καὶ ἀτηκτα πυρί. διὰ μὲν οὖν τῶν φλεβῶν
καὶ τῶν ἐν ἐκάστοις πόρων διαπιδύουσα ἡ τροφή,
10 καθάπερ ἐν τοῖς ὦμοιοις κεραμίοις τὸ ὑδωρ, γίνονται

1 Peck: διατεταμέναι vulg.
2 om. SS, Platt: ἡ coni. A.-W.

The term "immutable" is often used by Aristotle in connexion with mathematics, as here.—"Essence," lit., "the
' what is it?'", the essential definition or nature of the thing.
198 a 16 f. "in the case of the immutable things, e.g., in
mathematics, where ultimately all is referred back to defini-
tions, τὸ διὰ τί ('why ') is referred back to τὸ τὶ ἐστὶ ('what,'
the essence of the thing')." The essence is directly perceived,
not demonstrated. (See previous note.)

This is one of the definitions given in Met. 1013 a 4—
that from which, being present within it, a thing first comes
into being (οἶνον πρῶτον γίνεται ἐνπάρχοντος).
He has repeated it almost continuously.

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the essence 

but as soon as we begin to deal with those things that come into being through a process of formation, we find there are several first principles —principles, however, of a different kind and not all of the same kind. Among them the source whence the movement comes must be reckoned as one, and that is why the heart is the first part which all blooded animals have, as I said at the beginning; in the other animals it is the counterpart of the heart that is formed first.

Beginning at the heart, the blood-vessels extend all over the body. They may be compared to the skeleton models which are traced out on the walls of buildings, since the parts are situated around the blood-vessels, because they are formed out of them. The formation of the uniform parts is effected by the agency of cooling and heat; some things are "set" and solidified by the cold and some by the hot. I have spoken previously elsewhere of the difference between these, and I have stated what sort of things are dissoluble by fluid and by fire, and what sorts are not dissoluble by fluid and cannot be melted by fire. Resuming then: As the nourishment oozes through the blood-vessels and the passages in the several parts (just as water does when it stands in unbaked

\[\text{Cf. H.A. 515 a 35. Hesychius's and Photius's definitions of} \ kα\v v\a b\o u \text{describe them as the woodwork around which modellers, when they begin their modelling, mould the wax or plaster. There is a similar passage in} \text{Parts of Animals, though without mention of this term (654 b 29): there Aristotle speaks of a "hard and solid core or foundation" round which the figure is modelled; though in that case he is speaking of the bones. There seems to be no justification for interpreting} \ k\a v\a b\o u \text{as a mere outline or sketch; nor would such a meaning fit the passage.} \text{Cf. 764 b 31.}} \]

\[\text{Cf. Meteorologica, Bk. IV, chh. 7-10. Cf. also 762 a 31.} \]
σάρκες ἢ τὸ ταύτας ἀνάλογον, ὑπὸ τοῦ ψυχροῦ συνιστάμεναι, διὸ καὶ λύονται ὑπὸ πυρὸς. ὃσα δὲ ἔγρα ἐὰν τῶν ἀνατελλόντων, ὀλύγην ἔχοντα ψυγ- ῥότητα καὶ θερμότητα, ταῦτα δὲ ψυχόμενα ἐξατμί-
ζοντος τοῦ υγροῦ μετὰ τοῦ θερμοῦ γίνεται σκληρὰ 15 καὶ γεώδη τὴν μορφήν, οἷον ὄνυχες καὶ κέρατα καὶ ὀπλαὶ καὶ ρύγχυ; διὸ μαλάττεται μὲν πυρὶ, τήκεται δὲ οὐθέν, ἀλλ’ ἐνια τοὺς ὑγροῖς, οἷον τὰ κελύφη τῶν ψῶν.

Ὑπὸ δὲ τῆς ἔντος θερμότητος τὰ τε νεῦρα καὶ τὰ ὀστὰ γίνεται, ἐξηραινομένης τῆς ψυγρότητος. διὸ καὶ ἄλυτα ἐστὶ τὰ ὀστά ὑπὸ τοῦ πυρὸς, καθάπερ 20 κέραμος· οἷον γὰρ ἐν καμάνω, ὁπνημένα ἐστὶν ὑπὸ τῆς ἐν τῇ γενέσει θερμότητος. αὐτὴ δὲ οὔτε ὁ τι ἔτυχε ποιεῖ σάρκα ἢ ὀστοῦν, ὀὐθ’ ὀποῦ ἔτυχεν, ὀὐθ’ ὀπότε ἔτυχεν, ἀλλὰ τὸ πεφυκὸς καὶ οὐ' πέφυκε καὶ ὅτε πέφυκεν. οὔτε γὰρ τὸ δυνάμει ὡν ὑπὸ τοῦ μὴ τῆς ἐνέργειαν ἐχόντος κυνητικοῦ ἐστι, οὔτε τὸ τὴν 25 ἐνέργειαν ἔχον ποιήσει ἐκ τοῦ τυχόντος, ὥσπερ οὔτε κυβωτόν μὴ ἐκ ξύλου ὁ τέκτων ποιήσειν ἄν, οὔτ’ ἀνευ τούτου κυβωτὸς ἐστι, ἐκ τῶν ξύλων.

Ἡ δὲ θερμότης ἐνυπάρχει ἐν τῷ σπερματικῷ περιττόματι τοσαύτην καὶ τοιαύτην ἔχουσα τὴν κίνησιν καὶ τὴν ἐνέργειαν, ὁσὶ σύμμετρος εἰς ἐκαστὸν τῶν μορίων. καθ’ ὥσον δ’ ἂν ἐλλείπῃ 30 ἡ ὑπερβάλλῃ, ἡ χεῖρον ἀποτελεῖ ἡ ἀνάπηρον τὸ γυνόμενον, παραπλησίως τοῖς ἔξω συνισταμένοις

1 ἐστίν P : om. vulg. 2 ὀποῦ P : ὀπη vulg. 3 οὐθ’ ὀπότε ἔτυχεν P : om. vulg. 4 ὥ P : ἕ vulg.
GENERATION OF ANIMALS, II. vi.

earthenware), flesh, or its counterpart, is formed: it is the cold which "sets" the flesh, and that is why fire dissolves it. As the nourishment wells up, the excessively earthy stuff in it, which contains but little fluidity and heat, becomes cooled while the fluid is evaporating together with the hot substance, and is formed into parts that are hard and earthy in appearance, e.g., nails, horns, hoofs and bills; hence, these can be softened, but not one of them can be melted, by fire; though some, e.g., eggshell, can be melted by fluids.

The sinews and bones are formed, as the fluidity solidifies, by the agency of the internal heat; hence bones (like earthenware) cannot be dissolved by fire; they have been baked as it were in an oven by the heat present at their formation. This heat, however, to produce flesh or bone, does not work on some casual material in some casual place at some casual time; material, place and time must be those ordained by Nature: that which is potentially will not be brought into being by a motive agent which lacks the appropriate actuality; so, equally, that which possesses the actuality will not produce the article out of any casual material. No more could a carpenter produce a chest out of anything but wood; and, equally, without the carpenter no chest will be produced out of the wood.

This heat resides in the seminal residue, and the movement and the activity which it possesses are in amount and character correctly proportioned to suit each several part. If they are at all deficient or excessive, to that extent they cause the forming product to be inferior or deformed. The same is true of things that are "set" by heat elsewhere than in
diā tīs ἐφήσεως πρὸς τροφῆς ἀπόλαυσιν ἢ τινα ἀλλήν ἐργασίαν. ἀλλ' ἐνταῦθα μὲν ἢμεῖς τὴν τῆς
θερμότητος συμμετρίαν εἰς τὴν κάνησιν παρασκευά-
ζομεν, ἐκεῖ δὲ δίδωσιν ἢ φύσις ἢ τοῦ γεννῶντος.
35 τοῖς δὲ αὐτομάτως γνωμένοις ἢ τῆς ὁρᾶς αὐτὶα
κάνησις καὶ θερμότης.
'Η δὲ ψυξις στέρησις θερμότητος ἐστιν. χρηται
δ' ἀμφοτέροις ἢ φύσις ἐχοισι μὲν δύναμιν εξ
ἀνάγκης ὡστε τὸ μὲν τοδὶ τὸ δὲ τοδὶ ποιεῖν, ἐν
μέντοι τοῖς γνωμένοις ἑνεκά τινος συμβαίνει τὸ
μὲν ψύχειν αὐτὸν τὸ δὲ θερμαίνει, καὶ γίνεσθαι
τῶν μορίων ἕκαστον, τὴν μὲν σάρκα μαλακὴν τῇ
μὲν ἐξ ἀνάγκης πουόντων τοιαύτην τῇ δ' ἑνεκά
5 τινος, τὸ δὲ νεύρων ξηρὸν καὶ ἔλκτον, τὸ δ' ὀστοῦν
ξηρὸν καὶ θραυστόν. τὸ δὲ δέρμα ξηραυνομένης
τῆς σαρκὸς γίνεται, καθάπερ ἐπὶ τοῖς ἐφήμασιν ἢ
καλουμένη γραῦς. οὐ μόνον δὲ διὰ τὸ ἐσχατον
συμβαίνει αὐτοῦ ἢ γένεσις, ἀλλὰ καὶ διότι ἐπι-
πολάζει τὸ γλύσχρον διὰ τὸ μὴ δύνασθαι ἑξατμίζειν.
10 ἐν μὲν οὖν τοῖς ἄλλοις αὐχμηρὸν τὸ γλύσχρον (διὸ
ὀστρακοδέρμα καὶ μαλακόστρακα τὰ ἐσχατά ἐστὶ
tῶν ἀναίμων ζώων), ἐν δὲ τοῖς ἀναίμως τὸ γλύσ-
χρον λυπαρώτερον ἐστιν. καὶ τούτων ὁσα μὴ γεώθη
tὴν φύσιν ἔχει λίαν, ἀθροίζεται τὸ πιμελόδες ὑπὸ
tὴν τοῦ δέρματος σκέπην, ὡς τοῦ δέρματος γν-
15 νομένου ἐκ τῆς τοιαύτης γλυσχρότητος. ἔχει γὰρ
tινα γλυσχρότητα τὸ λυπαρὸν. πάντα δὲ ταῦτα,
καθάπερ εἰπομεν, λεκτέον γίνεσθαι τῇ μὲν ἐξ
ἀνάγκης τῇ δ' οὐκ ἐξ ἀνάγκης ἀλλ' ἑνεκά τινος.

\[a\] Cf. 767 a 17 ff.
\[b\] i.e., the change required to be effected; see Introd. § 48.
\[c\] See Introd. § 8.
the uterus; e.g., things which we boil to make them pleasant for food, or for any other practical purpose. The only difference is that in this case the correct proportion of heat to suit the movement is supplied by us, whereas in the other, it is supplied by the nature of the generating parent. With those animals that are formed spontaneously the cause responsible is the movement and heat of the climatic conditions.

Heat and cooling (which is deprivation of heat) are both employed by Nature. Each has the faculty, grounded in necessity, of making one thing into this and another thing into that; but in the case of the forming of the embryo it is for a purpose that their power of heating and cooling is exerted and that each of the parts is formed, flesh being made soft—as heating and cooling make it such, partly owing to necessity, partly for a purpose,—sinew solid and elastic, bone solid and brittle. Skin is formed as the flesh solidifies, just as scum or "mother" forms on boiled liquids. Its formation is due not merely to its being on the outside, but also to the fact that glutinous substance remains on the surface because it cannot evaporate. In blooded animals the glutinous substance is more fatty than in bloodless ones, in which it is dry, and on this account the outer parts of the latter are testaceous or crustaceous. In those blooded animals whose nature is not excessively earthy, the fat collects under the protective covering, the skin, which seems to indicate that the skin is formed out of this sort of glutinous substance, since of course grease is to some extent glutinous. We are to say, then, as already stated, that all these things are formed partly as a result of necessity, partly also not of necessity but for a purpose.
Πρώτον μὲν οὖν τὸ ἄνω κύτος ἀφορίζεται κατὰ τὴν γένεσιν, τὸ δὲ κάτω προϊόντος τοῦ χρόνου
20 λαμβάνει τὴν αὐξήσιν εν τοῖς ἐναίμοις. Ἀπαντᾷ δὲ ταῖς περιγραφαῖς διορίζεται πρότερον, ὦστερον δὲ
λαμβάνει τὰ χρώματα καὶ τὰς μαλακότητας καὶ τὰς σκληρότητας, ἀτεχνώς ὅπερ ἂν ὑπὸ ζωγράφου τῆς φύσεως δημιουργούμενα. καὶ γὰρ οἱ γραφεῖς ὑπογράφαντες ταῖς γραμμαῖς οὕτως ἐναλείφουσι
25 τοῖς χρώμασι τῷ ζῷον.

Διὰ μὲν οὖν τὸ τῆν ἀρχήν εν τῇ καρδίᾳ τῶν ἀισθήσεων εἶναι καὶ τοῦ ζῴου παντὸς αὐτὴ γίνεται πρώτον. διὰ δὲ τὴν θερμότητα τῆς ταύτης, ἢ τελευτῶσιν αἱ φλέβες ἄνω, τὸ ψυχρὸν συνίστησιν ἀντιστροφον τῇ θερμότητι τῇ περὶ τὴν καρδίαν τὸν 30 ἐγκέφαλον. διόπερ τὰ περὶ τῆς κεφαλῆς λαμβάνει συνεχῆ τὴν γένεσιν μετὰ τὴν καρδίαν, καὶ μεγέθει τῶν ἄλλων διαφέρει· πολὺς γὰρ καὶ ὑγρὸς εὖ ἀρχῆς ὁ ἐγκέφαλος.

Ἐχει δ' ἀπορίαν τὸ περὶ τοὺς ὀφθαλμοὺς συμβαίνον τῶν ζῴων. μέγιστοι μὲν γὰρ εὖ ἀρχῆς φαίνονται καὶ πεζοὶ καὶ πλωτοὶ καὶ πτηνοῖς, 35 τελευταῖοι δὲ γίνονται τῶν μορίων· εὖ τῷ μεταξὺ γάρ χρόνως συμπίπτουσιν. αἰτίων δ' ὅτι τὸ τῶν ὀφθαλμῶν αἰσθητήριον ἐστὶ μὲν, ὦσπερ καὶ τὰ ἄλλα αἰσθητήρια, ἢ ποὺρων· ἀλλὰ τὸ μὲν τῆς ἀφῆς καὶ γεύσεως εὐθὺς ἐστὶν η ἃ σώμα ἡ τοῦ σώματος τι τῶν ζῴων, ἢ δ' ἀφρητοὺς καὶ ἡ ἀκοή πόροι συνάπτοντες πρὸς τὸν ἄερα τὸν θύραθεν, πλήρεις συμφώτον πνεύματος, περαίνοντες δὲ πρὸς τὰ

744 a

1 ὡσπερ . . . αἰσθητήρια fort. secludenda; suspic. est Platt. μὲν ἐστὶν Λ. pro ἐστὶ μὲν; πολλὰ P pro τὰ ἄλλα.

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Now the upper portion of the body is the first to be marked off in the course of the embryo's formation; the lower portion receives its growth as time goes on. (This applies to the blooded animals.) In the early stages the parts are all traced out in outline; later on they get their various colours and softnesses and hardresses, for all the world as if a painter were at work on them, the painter being Nature. Painters, as we know, first of all sketch in the figure of the animal in outline, and after that go on to apply the colours.

As the source of the sensations is in the heart, the heart is the first part of the whole animal to be formed; and, on account of the heat of the heart, and to provide a corrective to it, the cold causes the brain to "set," where the blood-vessels terminate above. That is why the regions around the head begin to form immediately after the heart and are bigger than the other parts, the brain being large and fluid from the outset.

The development of the eyes is something of a puzzle to the student. In birds, beasts, and fishes alike, the eyes are from the outset very large in appearance, yet they are the last of all the parts to be completely formed, since they shrink up in the meantime. The reason is that the sense-organ of the eyes is indeed, like the other sense-organs, set upon passages; but whereas the sense-organ of touch and of taste is just the animal's body or some portion of the body, and smell and hearing are passages full of connate pneuma, connecting with the outer air and terminating at the small blood-vessels around

\[\text{a Cf. note, 740 a 28.} \quad \text{b Cf. H.A. 561 a 19 ff.} \quad \text{c See App. B §§ 26 ff.} \]
φλέβια τὰ περὶ τὸν ἐγκέφαλον τείνοντα ἀπὸ τῆς 5 καρδιάς· ὃς ὁ φθαλμὸς σῶμα μόνον ἱδιον ἔχει τῶν αἰσθητηρίων. ἔστι δὲ υγρὸν καὶ ψυχρὸν, καὶ οὐ προὐπάρχον ἐν τῷ τόπῳ καθάπερ καὶ τὰ ἄλλα μόρια δυνάμει, ἐπείτα ἐνεργείᾳ γινόμενα ὑστερον· ἀλλ' ἀπὸ τῆς περὶ τὸν ἐγκέφαλον υγρότητος ἀπο-
10 κρίνεται τὸ καθάρωτατον διὰ τῶν πόρων οἱ φαι-
νονται φέροντες ἀπ' αὐτῶν πρὸς τὴν μῆνιγγα τὴν
περὶ τὸν ἐγκέφαλον. τούτου δὲ τεκμήριον ὀυτὲ
γὰρ ἄλλο μόριον υγρὸν καὶ ψυχρὸν ἑστὶν ἐν τῇ
κεφαλῇ παρὰ τὸν ἐγκέφαλον, τὸ τ' ὤμα ψυχρὸν
καὶ υγρὸν. ἔξ ἀνάγκης οὖν ὁ τόπος λαμβάνει
15 μέγεθος τὸ πρῶτον, συμπίπτει δ' ὑστερον. καὶ
gὰρ περὶ τὸν ἐγκέφαλον συμβαίνει τὸν αὐτὸν τρό-
πον· τὸ πρῶτον υγρὸς καὶ πολὺς, ἀποπνέοντος δὲ
καὶ πεττομένου σωματοῦ τε μᾶλλον καὶ συμ-
πίπτει καὶ ὁ ἐγκέφαλος [καὶ τὰ σώματα] 1 καὶ τὸ
μέγεθος τὸ τῶν ὦμμάτων. ἔξ ἀρχής δὲ διὰ μὲν τὸν
20 ἐγκέφαλον ἢ κεφαλὴ μεγίστη, διὰ δὲ τὸ υγρὸν τὸ
ἐν τοῖς ὦμμασι οἱ ψθαλμοὶ μεγάλοι φαίνονται.
tελευταῖοι δὲ λαμβάνουσιν τέλος διὰ τὸ καὶ τὸν
ἐγκέφαλον συνύστασθαι μόλις· ὦψε γὰρ παύεται τῆς
ψυχρότητος καὶ τῆς υγρότητος ἐπὶ πάντων μὲν τῶν
ἐχόντων, 2 μάλιστα δ' ἐπὶ τῶν ἀνθρώπων. διὰ γὰρ
25 τούτο καὶ τὸ βρέγμα τῶν ὦστῶν γίνεται τελευ-
ταῖον· ᾧγὰρ γὰρ γεγενημένων θύραζε τῶν ἐμβρύων

1 om. S, seclusit Bekker: καὶ τὰ ὦμματα Platt, om. καὶ τὸ
μέγεθος τὸ τῶν ὦμμάτων.
2 τῶν ἐχόντων P: habentibus magnum cerebrum Σ: om.
vulg.
the brain which extend thither from the heart, the
eye, by way of contrast, is the only one of the
sense-organs which has a special "body" of its
own. It is fluid and cold; and, unlike the other
parts, which are present in their places potentially
to begin with and later on come to be formed in actuality, this one is not there at the start, but it
is produced by the purest part of the liquid around
the brain being secreted off through those passages which are to be observed leading from the eyes to the
membrane around the brain. A sure sign of this is
that beside the brain there is no part in the head
except the eye which is cold and fluid. Hence it
is due to necessity that this region gets large at first
but shrinks later on; because the same happens
to the brain: at first this is fluid and large, but
as evaporation and concoction proceed it becomes
more solid and shrinks; so does the size of the
eyes. From the outset the head is very large, on
account of the brain, and the eyes, as we see, are
large on account of the fluid in them. But the
eyes are the last of all to reach their completion,
because the brain (on which they depend) does not "set" at all easily; it is quite late before it ceases
to be so cold and fluid; and this is true of all animals
that have a brain, especially of man. That is why
the bregma is the last of the bones to be formed: even after the embryos are brought to birth, this

\[\text{\textsuperscript{a}}\]
Aristotle's knowledge that the eye is an offshoot from the
brain, and does not originate in the position which it finally occupies, is indeed remarkable.

\[\text{\textsuperscript{b}}\]
These are no doubt the optic nerves.

\[\text{\textsuperscript{c}}\]
 Cf. P.A. 653 a 34 and H.A. 491 a 31. This is the bone
which finally grows over the space at the top of the skull
known as the "anterior fontanelle."
μαλακόν ἐστι τοῦτο τῷ ὅστοιν τοῖς παιδίοις. ἂντιον δὲ τοῦ μάλιστ' ἐπὶ τῶν ἀνθρώπων τοῦτο συμβαίνειν, ὅτι τὸν ἐγκέφαλον ύγρότατον ἔχουσι καὶ πλείστον τῶν ψών, τούτου δ' ἂντιον ὅτι καὶ 30 τὴν ἐν τῇ καρδίᾳ θερμότητα καθαρωτάτην. δηλοὶ δὲ τὴν εὐκρασίαν ἡ διάνοια. φρονιμώτατον γάρ ἐστὶ τῶν ψῶν ἀνθρώπων. ἀκρατὴ δὲ καὶ τὰ παιδία μέχρι πόρρω τῆς κεφαλῆς ἐστὶ διὰ τὸ βάρος τὸ περὶ τὸν ἐγκέφαλον. ὅμοιως δὲ καὶ τῶν μορίων ὅσα δεῖ κινεῖν. ἡ γὰρ ἄρχη τῆς κινήσεως ὑπὲρ κατὰ τῶν ἀνωθεν καὶ τελευταίων, ὦσπερ τῶν κάλων. τοιούτων δ' ἐστὶ μόριον τὸ βλέφαρον. ἐπεὶ δ' οὔθεν ποιεῖ περίεργον οὔδε μάτην ἡ φύσις, δῆλων ὡς οὔδε ύστερον οὔδε πρότερον. ἐσται γὰρ τὸ γεγονός ἡ 2 μάτην ἡ περίεργον. ὦσθ' ἄμ' ἀνάγκη τὰ βλέφαρα διαχωρίζεσθαι τὲ 3 καὶ δύνασθαι κινεῖν. ὑπὲρ μὲν οὖν διὰ τὸ πλῆθος τῆς περὶ τὸν ἐγκέφαλον πέπεσες τελευταία δὲ διὰ τὸ σφόδρα κρατοῦσα τῆς κινήσεως εἶναι τὸ κινεῖν καὶ τὰ 5 οὕτως πόρρω τῆς ἄρχης καὶ ἀπεψυγμένα τῶν μορίων. δηλοὶ δὲ τὰ βλέφαρα τοιαύτην ἔχοντα τῆν φύσιν. ἂν γὰρ καὶ ὁποιονδ' ἄρος γένηται περὶ τῆς κεφαλῆς δι' ὑπνὸν ἡ μέθην ἡ ἄλλο τὰ τῶν τοιούτων, ό δυνάμεθα τὰ βλέφαρα αἴρειν, οὕτω βάρος αὐτῶν ἐχόντων μικρὸν.

1 τοῖς παιδίοις P: τῶν παιδίων vulg.
2 ἡ P: om. vulg.
3 τὲ PS: om. vulg.

a εὐκρασία. For κράσις see Introd. § 40; and cf. P.A. 673 b 26 and Hippocrates, π. διάνοιας I. 35.
b See Introd. §§ 11, 51.
bone is still soft in the case of children. The reason why this occurs especially in man is that in man the brain is more fluid and greater in volume than in any other animal, and the reason of this, in its turn, is that the heat in the heart is purest in man. The fineness of the blend in man is shown by his possession of intellect: there is no other animal which is so intelligent. Even children however for a considerable period lack full control over their heads. This is due to the weight of the brain, and the same may be said of those parts of the body which have to be moved. It is quite late before the principle of movement gets control over the upper parts; and its control over those parts (such as the legs) whose movement is not closely connected with it is achieved last of all. Another such part is the eyelid. Now, as Nature does nothing that is superfluous or pointless, it is plain that she will not do anything too late or too soon, for in that case what was done would be either pointless or superfluous. Therefore the separation of the eyelids and the ability to move them must coincide in time. Thus the completion of the formation of the eyes comes late, because of the large amount of concoction required by the brain, and it comes last, after all the other parts, because the movement must be very strong and powerful in order to move parts which are so far away from the first principle, and so much subjected to cold. That such is the nature of the eyelids is shown by the fact that even if a very little heaviness affects the head through sleep or intoxication or anything of that sort, we are unable to raise the eyelids although their weight is very slight.

\[c\] Viz., of movement, i.e., the heart.
ARISTOTLE

10 Περὶ μὲν οὖν ὄφθαλμῶν ἐφηται πῶς γίνονται καὶ
di’ ὃ τι, καὶ διὰ τῶν αἰτίαν τελευταίαν λαμβάνουσι
τὴν διάρθρωσιν.

Τῶν δὲ ἄλλων γίνεται μορίων ἐκαστὸν ἐκ τῆς
tροφῆς, τὰ μὲν τιμωτάτα καὶ μετευληφότα τῆς κυ-
ρωτάτης ἀρχῆς ἐκ τῆς πεπεμμένης καὶ καθαρωτά-
της καὶ πρώτης τροφῆς, τὰ δὲ ἀναγκαῖα μόρια καὶ
15 τούτων ἐνεκεν ἐκ τῆς χείρονος καὶ τῶν ύπολειμ-
μάτων καὶ περιπτώματων. ὥσπερ γὰρ οἰκονόμος
ἀγαθός, καὶ ἡ φύσις οὐθὲν ἀποβάλλει εἰσὶν ἐξ
ων ἐστὶ ποιήσαι τι χρηστόν. ἐν δὲ ταῖς οἰκο-
νομίαις τῆς γνωμένης τροφῆς ἡ μὲν βελτίστη τέ-
tακται τοῖς ἐλευθέροις, ἡ δὲ χεῖρων καὶ τὸ πε-
20 ρήττωμα ταύτης (τοῖς) ὁικέταις, τὰ δὲ χείρωτα καὶ
tοῖς συντρεφομένοις διδόσαι ζῷους. καθάπερ οὖν
εἰς τὴν αὐξήσιν ὁ θύραθεν ταύτα ποιεῖ νοῦς, ὦτως
ἐν τοῖς γινομένοις αὐτοῖς ἡ φύσις ἐκ μὲν τῆς καθ-
αρωτάτης υλῆς σάρκας καὶ τῶν ἄλλων αἰσθητη-
ρίων τὰ σώματα συνίστησιν, ἐκ δὲ τῶν περιτ-
25 τωμάτων ὅστα καὶ νεῦρα καὶ τρίχας, ἐτί δ’ ὄνυχας
καὶ ὀπλάς καὶ πάντα τὰ τουαῦτα· διὸ τελευταία
tαύτα λαμβάνει τὴν σύστασιν, ὅταν ἦδη γίγνεται
περίττωμα τῆς φύσεως.

Ἡ μὲν οὖν τῶν ὅστων φύσις ἐν τῇ πρώτῃ συ-
στάσει γίνεται τῶν μορίών ἐκ τῆς σπερματικῆς
30 περιττώσεως, καὶ τῶν ζωῶν αὐξανομένων ἐκ τῆς
· φυσικῆς τροφῆς λαμβάνει τὴν αὐξήσιν, ἐξ ὥσπερ
tὰ μόρια τὰ κύρια, ταύτης μεντοί αὐτῆς τὰ ὑπο-

1 supplevit Richards.

a i.e., blood.
b Cf. the regular distinction between “the better” and “necessity.”
c The sense-organ of touch.

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This concludes our discussion about the eyes. We have said how they are formed, and why, and what is the reason that they are the last of all the parts to be articulated.

Each of the remaining parts is formed out of the nourishment. The most honourable ones, those which have a share in the supreme controlling principle, are formed out of the first of the nourishment, which has been concocted and is purest; the "necessary" parts, which exist for the sake of those just mentioned, are formed out of inferior nourishment, out of the leavings and the residues. Like a good housekeeper, Nature is not accustomed to throw anything away if something useful can be made out of it. In housekeeping the best of the food available is reserved for the freemen; the residue left over from this as well as the inferior food goes to the servants, and the worst of all goes to the domestic animals. Here then is an instance of a mind, external to them, acting so as to provide for their growth. In the same way Nature is at work within the creatures themselves that are being formed, and constructs flesh and the bodily parts of the other sense-organs out of the purest of the material, whereas out of the residues she constructs bones and sinews and hair, and also nails and hoofs and all such things, which means that they have to wait till Nature has some residue to hand, and that is why they are the last to be constructed.

The bones, then, are formed during the first stage of construction out of the seminal residue, and as the animal grows they grow too. Their growth is derived from the natural nourishment, which is the same as that which supplies the supreme parts; only they
744 b ἔλειμματα καὶ τὰ περιττωματικά. γίνεται γὰρ ἐν παντὶ τὸ πρῶτον καὶ τὸ δεύτερον τῆς τροφῆς τὸ μὲν θρεπτικὸν τὸ δ' αὐξητικὸν, θρεπτικὸν μὲν 35 ὑπὸ τὸ εἶναι παρέχεται τῷ τε ὅλῳ καὶ τοῖς μορίοις, αὐξητικὸν δὲ τὸ εἶσ μέγεθος ποιοῦν τὴν ἐπίδοσιν· περὶ δὲ ὑστερον διοριστέοι μᾶλλον. τὸν αὐτὸν δὲ τρόπουν τοῖς ὀστοῖς καὶ τὰ νεῦρα συνίσταται καὶ ἐὰν τῶν αὐτῶν, ἐὰν τῆς σπερματικῆς περιττώσεως καὶ τῆς θρεπτικῆς. ὄνυχες δὲ καὶ τρίχες καὶ ὀπλαὶ καὶ κέρατα καὶ ρύγχη καὶ τὰ πλῆκτρα τῶν ὀρ- νίθων, καὶ εἰ τι τοιοῦτον ἐπέραν ἐστὶ μόριον, ἐκ τῆς ἐπικτήτου τροφῆς καὶ τῆς αὐξητικῆς, ἦν τε παρὰ τοῦ θήλεος ἐπικτάται καὶ [τῆς]2 θύραθεν. διὰ τούτο 5 τὰ μὲν ὀστά μέχρι τῶν λαμβάνει τὴν αὔξησιν· ἔστι γὰρ τι πάσι τοῖς ζώοις πέρας τοῦ μεγέθους, διὸ καὶ τῆς τῶν ὀστῶν αὔξησεως. εἰ γὰρ τοῦτ' ἐλεγεῖν αὔξησιν ἀεί, καὶ τῶν ζώων ὅσα ἔχει ὀστοῦν ἦ τὸ ἀνάλογον, ἡμᾶς ἐδέχετο ἄν ἐως ἔξη· τοῦ γὰρ μεγέθους ὀρός ἐστὶ ταῦτα τοῖς ζώοις. δ' ἦν μὲν 10 οὖν αἰτίαν οὐκ ἀεὶ λαμβάνουσιν αὔξησιν λεκτέον ύστερον· τρίχες δὲ καὶ τὰ συγγενῆ τούτοις, ἐως ἄν

1 τῆς Ζ.: καὶ τῆς vulg.  2 seclusi.

The functions of “nutritive Soul” (see above, 735 a 17, and De anima 415 a 25) are to generate, and to make use of nourishment; it is the same ὁμοιός of the Soul which generates and which nourishes (De anima 416 a 19). In the passage which there follows, a distinction is made between being nourished (τρέφεσθαι) and growing (αὔξανεσθαι). At 416 b 11, Aristotle says that “nourishment” is not identical with “that which is growth-promoting”; thus, in so far as the living thing (the creature “with Soul in it”) is of a certain quantity, the food is “growth-promoting” (i.e., increases its quantity); but in so far as the creature is a particular thing, an individual “being,” the food is “nourishment,” because
get merely the leavings and the residues of it. In every instance, of course, there is nourishment of two grades present: (1) "nutritive," that is to say, which provides both the whole and the parts with being; (2) "growth-promoting," that is to say, which causes increase of bulk. These will have to be more particularly distinguished later on. The sinews are constructed in the same way as the bones, and out of the same materials, viz., the seminal or "nutritive" residue. As for nails, hair, hoofs, horns, bills, cocks' spurs and any other such part, these are formed out of the supplementary or "growth-promoting" nourishment, this additional nourishment being obtained from the female, and from outside. On this account, the bones continue growing only up to a certain point, for as all animals have a limit to their size, this involves a limit to the growth of the bones. If the bones continued growing for ever, then every animal which contains any bone or the counterpart of bone would go on growing as long as it lived, because the bones set the limit for an animal's size. We shall have to explain later on why the bones do not continue growing for ever. Hair and similar things, on the other hand, continue growing so long

it maintains the creature's being. And it is also "productive of generation"—not, of course, of the generation of the creature which is getting the nourishment, for its "being" is already there, but of another creature similar to it (416 b 15-17). It thus appears that the business of "nutrition" is concerned with the maintenance of a living creature's being, and with the generation of new ones' being: "growth-promotion" is concerned with increasing the bulk of that which already has being—and this is precisely the distinction which Aristotle employs in the present passage.

b e.g., the os sepiae, the "pen" of calamaries, the cartilaginous spines of Selachia (sharks, etc.) (P. A. 654 a 20, 655 a 23).
745 a

υπάρχωσιν, αυξάνονται, καὶ μᾶλλον ἐν νόσοις καὶ τῶν σωμάτων γηρασκόντων καὶ φθινόντων διὰ τὸ λείπεσθαι περίττωμα πλείον ἐλάττωνος εἰς τὰ κύρια δαπανωμένου διὰ τὸ γῆρας καὶ τὰς νόσους, 15 ἐπεὶ γ’ ὅταν ὑπολείπη καὶ τοῦτο διὰ τὴν ἕλικιαν, καὶ αἱ τρίχες ὑπολειπούσιν. τὰ δ’ ὅστα τούναντιον

αὐξάνονται δ’ αἱ τρίχες καὶ τεθνεῶτων, οὐ μέντοι γίνονται γ’ εἰς ὑπαρχῆς.

Περὶ δ’ ὁδόντων ἀπορήσειεν ἀν τις. εἰσὶ γὰρ τὴν 20 μὲν φύσιν τὴν αὐτὴν ἔχοντες τοῖς ὁστοῖς, καὶ γίνονται ἐκ τῶν ὁστῶν, ὀνυχες δὲ καὶ τρίχες καὶ κέρατα καὶ τὰ τοιαῦτα ἐκ τοῦ δέρματος, διὸ καὶ συμμεταβάλλουσιν τὸ δέρματι τὰς χρώσις· λευκά τε γὰρ καὶ μέλανα γίνονται καὶ παντοῦ ἐξακολουθεῖ τῇ τοῦ δέρματος χρώσιν, οἱ δ’ ὁδόντες οὐθέν· ἐκ γὰρ τῶν ὁστῶν εἰσιν, ὡς τῶν ζώων ἔχει ὁδόντας καὶ 25 ὁστὰ. αὐξάνονται δὲ διὰ βίου μόνοι τῶν ἀλλῶν ὁστῶν· τοῦτο δὲ δῆλον ἐπὶ τῶν παρακλινόντων ὁδόντων τὴν ἀφήν τὴν ἀλλήλων. αὐτίνω δὲ τῆς αὐξήσεως, ὡς μὲν ἑνεκά του, διὰ τὸ ἐργον· ταχὺ γὰρ ἀν κατετρίβοντο μὴ γυνομένης τυνὸς ἐπιρρύσεις, ἑπεὶ καὶ νῦν ἐνίοτε γηράσκονσι, τοῖς βρω- 30 τικοῖς μὲν μὴ μεγάλους δ’ ἐχουσι, κατατρίβοιται πάμπαν· πλείον γὰρ λόγῳ καθαυροῦνται τῆς αὐ- ξήσεως. διὸ καὶ τοῦτο εὖ μεμηχάνηται πρὸς τὸ

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a In the case of rabbits, etc., it may happen that a tooth in the upper jaw and one in the lower grow outwards and thus continue growing indefinitely, so that finally the animal is unable to eat at all.

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as they are there at all, and they grow more during diseases, and when old age advances, and when the body is wasting. This is because old age and diseases mean that less (nourishment) is expended on the supreme parts of the body and therefore more residue is left over; though when even this begins to fail through age, the hair follows suit. With the bones, the reverse occurs: they waste away along with the body and its parts. Hair actually continues to grow after life is extinct, though it will not begin growing where it does not already exist.

Teeth may present a puzzle. They possess the same nature as the bones and are formed out of the bones; nails, hair, horns and the like, however, are formed out of the skin, and that is why they change their colour along with the skin: they turn white and black and all shades according to the colour of the skin. The teeth do none of this, because they are formed out of the bones (this applies of course only to such animals as have both teeth and bones). They are unique among bones in that they continue growing all through life, as is clear in the case of teeth which take an oblique direction and fail to come into contact with each other. The reason for their growth, the purpose for the sake of which they grow, is to discharge their special function: they would soon be worn down unless the loss were made good in some way, since even as it is, in some aged animals which eat a great deal but have small teeth, they are quite worn away, because their growth is not proportionate to their loss. And so here too Nature has produced

\[ L. \& S. \text{ translate "unless there were some means of saving them"}; \]  
\[ \text{but Scot translates si non crescerent consumerentur cito nisi esset materia ex qua crescent.} \]
745 a

συμβαίνον ἡ φύσις· συνάγει γὰρ εἰς τὸ γῆρας καὶ τὴν τελευτην τὴν ὑπόλευσιν τῶν ὀδόντων. εἰ δ' ἦν μῦρετής ὁ βίος ἡ χιλετής, παμμεγέθεις τ' ἀν 35 ἐδεί γίνεσθαι τοὺς ἐξ ἀρχῆς καὶ φύσεθαι πολλάκις·
καὶ γὰρ εἰ συνεχῇ τὴν αὐξήσιν εἴχον, ὅμως ἄν ἀχρηστοὶ λεαινόμενοι πρὸς τὴν ἐργασίαν ἠσαν. οὐ μὲν οὖν ἑνεκα λαμβάνουσι τὴν αὐξήσιν, εἴρηται·
συμβαίνει δὲ μηδὲ τὴν αὐτὴν ἐχειν φύσιν τοῖς ἀλλοις ὡστοῖς τοὺς ὀδόντας· τὰ μὲν γὰρ ἐν τῇ 5 πρώτῃ συνατάσει γίνεται πάντα καὶ οὕθεν ύστερον,
οἱ δ' ὀδόντες ύστερον. διὸ καὶ πάλιν δύνανται φύσεθαι ἐκπεσόντες· ἀπτονται γὰρ, ἀλλ' οὐ συμ-
πεφύκασι τοῖς ὡστοῖς. ἐκ μέντοι τῆς τροφῆς τῆς εἰς τὰ ὅστα διαδιδομένης γίνονται, διὸ τὴν αὐτὴν 1
ἐχουσι φύσιν, καὶ τότε ὅταν ἐκεῖνα ἔχει ἥδη τὸν 10 ἀριθμὸν τῶν αὐτῶν. τὰ μὲν οὖν ἄλλα ζῶα ἐχοῦσι
γίνεται ὀδόντας καὶ τὸ ἀνάλογον τοῖς ὀδοίσιν, ἐὰν μὴ τι γίγνηται παρὰ φύσιν, διὰ τὸ ἀπολύσθαι τῆς
γενέσεως τετελεσμένα τοῦ ἀνθρώπου μᾶλλον· δ' ὀδ' ἀνθρώπος, ἂν μὴ τι συμβή παρὰ φύσιν, οὐκ ἔχων.
δι' ἦν δ' αὐτίαν οἱ μὲν γίνονται τῶν ὀδόντων καὶ 15 ἐκπίπτονσιν, οἱ δ' οὐκ ἐκπίπτονσιν, ύστερον λε-
χθησεται.

Διότι δ' ἐκ περιττόματος ἐστὶ τὰ τουαῦτα τῶν μορίων, διὰ τοῦτ' ἀνθρώπος ψιλότατον τε κατὰ τὸ
σῶμα τῶν ζωῆς πάντων ἐστὶ καὶ ὄνυχας ἐλαχί-
στους ἐχει ὡς κατὰ μέγεθος· ἐλάχιστον γὰρ ἔχει

1 αὐτὴν Bekker, per hypothetae errorem.

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a Bk. V, ch. 8.  

b i.e., hair, nails, etc.
an excellent device to suit the case, in making the failure of the teeth coincide with the time of old age and the close of life. If life went on for 10,000 or even 1000 years, the teeth would have had to be quite enormous to begin with, and they would have had to grow afresh many times over; not even continuous growth would have sufficed to prevent them being ground down and becoming useless for their work. We have now described the purpose for the sake of which the teeth grow. And yet as a matter of fact the teeth do not possess the same nature as the rest of the bones, because the bones, without exception, are all formed during the first stage of the embryo's construction, whereas the teeth are formed later; and that, too, is why a fresh set of teeth is able to grow after the old ones have fallen out: although they are in touch with the bones, they are not all of a piece with them. Still, they are formed out of the nourishment which is distributed to the bones (which is why they possess the same nature), and at a time when the bones have already attained their full complement. All the animals except man already have their teeth (or the counterpart of teeth) when they are born—unless it be that something unnatural occurs—because when they are released from their process of formation they are more fully perfected than man; man however when born has no teeth—unless something unnatural occurs. We shall explain later on why some of the teeth are formed and fall out and why some do not fall out.

The reason why man's body is more naked than that of any single one of the other animals, and why he has the smallest nails in proportion to his size, is this. Parts of this sort are made of residue; now
περίττωμα γεώδες, ἐστι δὲ περίττωμα μὲν τὸ
20 ἀπεπτυγμένον, τὸ δὲ γενόμεν ἐν τοῖς σώμασι πάντων
ἀπεπτητατον.

Πῶς μὲν οὖν ἐκαστὸν συνίσταται τῶν μορίων,
εἰρηταί, καὶ τὶ τῆς γενέσεως αὐτίων.

VII "Εχει δὲ τὴν αὐξήσιον τὰ ζωοτοκοῦμενα τῶν
εμβρύων, ὡσπερ ἐλέχθη πρότερον, διὰ τῆς τοῦ
ὄμφαλοῦ προσφύσεως. ἐπεὶ γὰρ ἔνεισιν ἐν τοῖς
25 ζῴῳσι καὶ ἡ θρεπτικὴ δύναμις τῆς ψυχῆς, ἀφισιῶν
ἐνθὺς οἷον βίζαν τῶν ὄμφαλον εἰς τὴν ύστεραν.
ἐστι δὲ ὁ ὄμφαλος ἐν κελύφει φλέβες, τοῖς μὲν
μείζοσι πλείους, οἷον βοῦ καὶ τοῖς τουότοις, τοῖς
δὲ μέσοις δύο, μία δὲ τοῖς ἔσχάτοις. διὰ δὲ τούτου
λαμβάνει τὴν τροφὴν αἰματικῆν, αἱ γὰρ ύστεραι
30 πέρατα φλεβῶν πολλῶν εἰσιν. τὰ μὲν οὖν μὴ
ἀμφωδοντα πάντα, καὶ τῶν ἀμφωδοντων ὅσων ἡ
ὑστέρα μὴ μίαν φλέβα μεγάλην ἔχει διατείνουσαν
ἀλλ’ ἀντὶ μιᾶς πυκνᾶς πολλάς, ταῦτα ἐν ταῖς
ὑστέραις ἔχει τὰς καλουμένας κοτυληδόνας, πρὸς
41 ὁ ὄμφαλος συνάπτει καὶ προσπέφυκεν ἀποτε-
τανται γὰρ αἱ φλέβες αἱ διὰ τοῦ ὄμφαλον ἐνθὲν
καὶ ἐνθὲν καὶ σχίζονται πάντη κατά τὴν ύστεραν. ἦ
δὲ περαιόναι, ταύτη γίγνονται αἱ κοτυληδόνες,2
τὸ μὲν περιφερές ἐχουσαὶ3 πρὸς τὴν ύστεραν, τὸ
35 δὲ κοιλον πρὸς τὸ ἐμβρύων. μεταξὺ δὲ τῆς ύστερας
καὶ τοῦ ἐμβρύου τὸ χόριον καὶ οἱ ύμένες εἰσιν. αἱ

1 ὡς Platt, O b*: δ Ρ.
2 πρὸς ὡς ὁ ὄμφαλος . . . γίγνονται αἱ κοτυληδόνες ΡΟ b*Σ: om. vulg.
3 ἐχουσαὶ Z et corr. Ρ: ἐχοῦσας vulg.

a See 740 a 24 ff.
b Not quite the same as the modern use of the term. Aristotle uses it to mean the pits in the modified wall of the
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it is unconcocted substance which constitutes residue, and the most unconcocted substance in animals' bodies is the earthy substance, and man has a smaller amount of earthy residue than the other animals.

We have now described how each of the parts takes shape, and what is the cause of their formation.

In viviparous animals, as stated earlier, the embryo obtains its growth through the umbilical attachment. Since the nutritive faculty of the Soul, as well as the others, is present in animals, it immediately sends off the umbilicus, like a root, to the uterus. The umbilicus consists of blood-vessels in a sheath. In the larger animals, such as the ox and the like, it contains numerous blood-vessels, in medium-sized animals, two, and in the smallest, one. Through this the embryo gets its nourishment, i.e., blood; the uterus being the terminus of many blood-vessels. The cotyledons (as they are called) are present in the uterus (a) of all those animals which have no front teeth in the upper jaw, and (b) of those which have teeth in both jaws and also have a cluster of blood-vessels running right through the uterus instead of a single large one. The umbilicus is connected up to these cotyledons and firmly attached to them; for the blood-vessels which pass through the umbilicus extend in both directions and branch out all over the uterus, and it is at their terminal points that the cotyledons are formed. Their convex side is towards the uterus, their hollow side towards the embryo. Between the uterus and the embryo are the chorion and the membranes. As the embryo grows and uterus into which the villi of the outer membrane of the embryo fit. For the meaning attached to the term by Diocles, see Wellmann, reference in note on 746 a 19 below.
ARISTOTLE

746 a
de kotelhdones avxanomene ou kai telenumne ou tou embruvou ginontai elaptous, kai telos afanizontai telenwenthos. Eis touto gar proektithetai tois embruvous h fousis tis aymatikyn trophiyn tis usteras osper eis maoustous, kai dia to abroigei5 sathai kata1 mikron en polhwn oion ezanbhma kai phlegmasia ginetai to swma to tis kotelhdonos. Eois men an othen elatton h to embruvon, ou dynamenon polhyn lamvanein trophiyn, deilai eisai kai meizones, avxhentos de sumpistouswin.

Ta de polla twv kolobwn zwnw kai amfwdontwn 10 ouk exei kotelhdonas2 en taia usterais, alla o omfalos eis fleba teinei miai, auti de tetei dia tis usteras exousa megethous. Epei de ta men monotoka ta de polutoka twv touwtwn esti zwnw, kai ta pleioi twv embruvon tov autov exei tropon twu eni. Dei de tauta theorein ek to taivn 15 paradieumantwn twv en taia anatomaies kai twv en taia eistorias yegrapmewn. Peftika gar ta zwva ek tou omfalou, o de omfalos ek tis flebos, efeexis allhlos, wsteperanei par' ochetov twn fleba reousan. Peri de ekastov twv embruyon oui thv umenes kai to xoiron estin.

Oi de legonites trephesai ta paidia en taia 20 usterais dia tou sarkidion ti bdallein ouk orhws

1 kata P: kai kata vulg.
2 kotelhdonas P: kotelhdon vulg.

a Here seems to mean "hornless."

b Aetius ascribes a similar theory to Democritus and Epicurus (Aet. 5. 16; see Diels, Vorskr.5 68 A 144); Censorinus (De die natali 6, 3; Diels 38 A 17) to Diogenes and Hippocrates. Cf. Hippocrates, π. sarkidón 6 (viii. 592 240
approaches its completion the cotyledons become smaller, and finally when it is completed they disappear. Nature lays in a store of the blood-like nourishment for the embryos in this part of the uterus, as it were into breasts, and the body of the cotyledon becomes as it were an eruption or an inflammation owing to the fact that the numerous cotyledons gradually get compacted together. While the embryo is fairly small, and unable to take much nourishment, they are large and plainly visible, but when it has grown they shrink up.

The great majority of the "stunted" animals, and of those that have front teeth in both jaws, have no cotyledons in their uterus, but the umbilicus extends to meet a single blood-vessel, which is a large one and extends throughout the uterus. Some of these animals produce one at a birth, others several; but what occurs when there is only one embryo occurs also when there are more. All this should be studied with the help of the illustrative diagrams given in the Dissections and Researches. The embryos are attached each to its umbilicus, and the umbilicus is attached to the blood-vessel; they are arranged one after the other along the stream of the blood-vessel as it might be along a runnel in the garden; and there are membranes and a chorion around each embryo.

Those people who say that children are nourished in the uterus by means of sucking a bit of flesh are Littre). The view that the embryo sucked the "cotyledons" was held by Diocles of Carystus (Wellmann, Fragmentsammlung der sikelischen Ärzte, Diocles fr. 27, 10 ff.); and according to Jaeger (Diokles von Karystos, 166), Aristotle's detailed treatment of the subject of cotyledons here is due to the fact that Diocles was associated with him in the Lyceum.
λέγονσιν: ἐπὶ τὴν γὰρ τῶν ἄλλων ζώων ταύτων συνεβαινέν ἂν, νῦν δ' οὐ φαίνεται (θεωρῆσαι γὰρ τοῦτο ράδιον διὰ τῶν ἀνατομῶν)· καὶ περὶ ἀπαντα τὰ ἐμβρύα καὶ τὰ πτηνὰ καὶ τὰ πλωτὰ καὶ τὰ τῶν πεζῶν ὁμοίως λεπτοὶ περιέχουσιν υμένες χω-25 ρίζοντες ἀπὸ τῆς ὑστέρας καὶ τῶν ἐγγυνομένων υγρῶν, ἐν οἷς οὔτ' αὐτοὶ ἐνεστὶ τοιούτων οὐθὲν, οὔτε διὰ τούτων οὐθενὸς ἐνδέχεται ποιεῖσθαι τὴν ἀπόλαυσιν· τὰ δ' ψυτοκούμενα πάντα οὐτί λαμβάνει τὴν αὐξησιν χωρισθέντα τῆς μήτρας ζω, φανερόν.

Γίνεται δὲ ὁ συνδυασμὸς τοῖς ζώοις κατὰ φύσιν 30 μὲν τοῖς ὁμογενεσισί, οὐ μὴν ἀλλὰ καὶ τοῖς μὲν σύνεγγυοις τὴν φύσιν ἔχουσιν, οὐκ ἀδιαφόροις δὲ τῷ εἴδει, εάν τὰ τε μεγέθη παραπλήσια ἢ καὶ οἱ χρόνοι ὑσοὶ ὡσι τῆς κυήσεως. σπάνια μὲν οὖν γίνεται τὰ τοιαῦτα ἐπὶ τῶν ἄλλων, γίνεται δὲ καὶ ἐπὶ κυνῶν καὶ ἀλπετέκων καὶ λύκων (καὶ θώων)3. 35 καὶ οἱ Ἰνδικοὶ δὲ κύνες ἐκ θηρίου τινὸς κυνώδους γεννώνται καὶ κυνός. καὶ ἐπὶ τῶν ὀρύθων δὲ τῶν ὀχευτικῶν ὄππει τοὺτο συμβαίνουν, οἷον ἐπὶ περιδίκων καὶ ἀλεκτρίδων· καὶ τῶν γαμμανίδων οἱ ιέρακες δικοῦσιν οἱ διαφέροντες τῷ εἴδει μίγνυσθαι πρὸς ἀλλήλους· καὶ ἐπὶ ἄλλων δὲ τινῶν ὁρφεών ἔχει τῶν αὐτῶν τρόπον. ἐπὶ δὲ τῶν θαλαττιῶν οὐθέν ἄξιόλογον εὕρεται, δικοῦσι δὲ μάλιστα

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1 τε P: om. vulg. 2 σύνεγγυος SL*: ἐγγυος vulg. 3 Btf.; vid. p. 563.

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* Cf. H.A. 607 a 4 ff. “they say too that the ‘Indian dog’ is the offspring of a tiger and a bitch; not the first cross, but the offspring at the third generation.” There seems to 242
mistaken. If this were true, the same would occur in the other animals, but it is not found to do so, as can be easily observed by means of dissections. Also, all embryos alike, whether they be of animals that fly or swim or walk, have round them fine membranes which separate them from the uterus and from the fluids which are formed there; and there is nothing of the sort in these membranes nor can the embryos get the benefit of anything whatever through them. As for embryos that are produced by means of eggs, it is of course obvious that in all cases their growth takes place outside the uterus, after they have been separated from it.

The partners in copulation are naturally and ordinarily animals of the same kind; but beside that, animals that are closely allied in their nature, and are not very different in species, copulate, if they are comparable in size and if their periods of gestation are equal in length. Although such crossing is infrequent among the majority of animals, it occurs among dogs, foxes, wolves (and jackals); the Indian dog\(^a\) also is produced from the union of a dog with some wild doglike beast. It has also been observed to occur among those birds that are salacious, e.g., partridges and common fowls. A case among the crook-taloned birds is that of the hawks, different species of which copulate, as it appears; and the same occurs among certain other birds. We have no trustworthy observation of its occurrence among sea-animals; but there is a strong suspicion that the *rhinobates* as it is called is produced by the copu-

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\(^a\) Cf. too the "Laconian hound," 738 b 31.
οἱ μνοβάται καλούμενοι γίνεσθαι ἐκ ρίνης καὶ βάτου συνδυαζομένων. λέγεται δὲ καὶ τὸ περὶ τῆς Λιβύης παρουσιαζόμενον, ὅσις ἂν τι τῆς Λιβύης τρεφούσης καινόν, διὰ τὸ μίγνυσθαι καὶ τὰ μὴ ὁμόφυλα ἀλλήλους λεχθῆναι τοῦτο. διὰ γὰρ τὴν ὁπάννον τὸν ὑδατος ἀπαντώντα πάντα πρὸς ὀλύγους τόπους τοὺς ἔχοντας νάματα μίγνυσθαι καὶ τὰ μὴ ὁμογενῆ.

Τὰ μὲν οὖν ἄλλα τῶν ἐκ τοιαύτης μιξεώς γνωμένων συνδυαζόμενα φαίνεται πάλιν ἀλλήλοις καὶ μιγνύμενα καὶ δυνάμενα τὸ τε θῆλυ καὶ τὸ ἄρρεν γεννᾶν, οἱ δὲ ὀρέις ἄγονοι μόνοι τῶν τοιούτων. οὔτε γὰρ ἐξ ἀλλήλων οὔτε ἄλλους μιγνύμενοι γεννώσων. ἐστὶ δὲ τὸ πρόβλημα καθόλου μὲν, διὰ τίν’ αἰτίαν ἄγονον ἢ ἄρρεν ἢ θῆλυ ἐστίν. εἰσὶ γὰρ καὶ γυναῖκες καὶ ἀνδρεὶς ἄγονοι, καὶ τῶν ἄλλων ζώων ἐν τοῖς γένεσιν ἐκάστοις, οἴον ἐν ὑπόσι καὶ προβάτοις.

20 ἄλλα τούτο τὸ γένος ὅλων ἄγονον ἐστὶ, τὸ τῶν ἦμιόνων. τὰ δὲ αἰτία τῆς ἄγονίας ἐπὶ μὲν τῶν ἄλλων πλεῖον συμβαίνει: καὶ γὰρ ἐκ γενετής, ὅταν πηρωθοῦσι τοὺς τόπους τοὺς πρὸς τὴν μέξων χρησίμους, ἄγονοι γίνονται καὶ γυναῖκες καὶ ἀνδρεῖς, ὡστε τὰς μὲν μὴ ἠβαν τοὺς δὲ μὴ γενεῖαν, ἀλλὰ εὐνοούσας διατελεῖν ὑπατος: τοῖς δὲ προϊσύσῃς τῆς ἥλικίας ταύτων συμβαίνει πάσχειν, ὅτε μὲν δ’ εὐτροφίαν τῶν σωμάτων (ταῖς μὲν γὰρ πιστεύειν

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"The batos is a flat-fish (P.A. 695 b 27, 696 a 26), called by Thompson (translation of H.A. 566 a 27) the "skate," by Platt, a "ray." The rhine is called by Thompson the "angel-fish" (note on H.A. 540 b 11), by Platt, a "shark." At H.A. 566 a 27 ff. Aristotle again refers to the rhinobates as a cross between these two fishes, and says that it has the head and foreparts of the batos and the hindparts of the rhine. 244"
luation of the rhine and the batos. Also, the origin of the proverb about Libya, to the effect that "Libya is always bringing forth something new," is said to be that there animals of different species unite, since owing to the fact that as there is very little water they all meet together at the few places where springs are to be found, and so animals of different species unite.

It is known that with one exception all the animals which are produced as a result of such unions copulate with each other and unite in their turn and are able to produce young of both sexes. Mules are the one exception. They are sterile and do not generate either by union with each other or with other animals. It is, of course, a general problem why any particular male or female is sterile: there are men and women who are sterile, and there are instances in the several kinds of animals, e.g., horses and sheep. But with the mules we have a whole race which is sterile. Leaving this exception for the moment: elsewhere the causes of sterility are numerous. (a) Men and women alike are sterile from birth if they are deformed in the regions employed for copulation; as a result, the men do not grow a beard but remain as eunuchs, while the women do not reach puberty; (b) others become sterile as they advance in age, sometimes (i) because they have put on too much flesh: in men Platt thinks the rhinobates is the angel-fish; Thompson offers the opinion that it is "probably the modern genus Rhinobatus"; Platt says "it certainly did not belong to the modern genus of that name."

b For this proverb and its explanation, cf. the similar passage H.A. 606 b 19 ff. Platt suggests that a mutilated passage in Hippocrates, π. δερων υβατων τοπων 12 fin., contained a statement on this subject.
γυνομέναις τοῖς δ' εὐεκτικωτέροις εἰς τὸ σώμα καταναλίσκεται τὸ περίττωμα τὸ σπερματικὸν, καὶ
tαῖς μὲν οὐ γίνεται καταμήνινα τοῖς δὲ γονή], ὅτε
30 δὲ διὰ νόσον οἱ μὲν ύγρὸν καὶ ψυχρὸν προίστρωμα, ταῖς
dὲ γυναιξὶν αἱ καθάρσεις φαίλαι καὶ πλήρεις
νοσηματικῶν περιττωμάτων. πολλοῖς δὲ καὶ πολλαῖς
dὲ διὰ πηρώματα τούτο συμβαίνει τὸ πάθος
περὶ τὰ μόρια καὶ τοὺς τόπους τοὺς περὶ τὴν
όμιλαν χρησίμους. γίνεται δὲ τὰ μὲν ἱστὰ τὰ δ' ἀνίσα
τῶν τοιούτων, μάλιστα δὲ διατελοῦσιν
35 ἄγονα (τὰ)¹ κατὰ τὴν πρώτην σύστασιν τοιαῦτα
γενόμενα· γίνονται γὰρ γυναικὲς τε ἀρρενωποί καὶ
ἄνδρες θηλυκοί, καὶ ταῖς μὲν οὐ γίνεται τὰ κατα-
μήνια, τοῖς δὲ τὸ σπέρμα λεπτὸν καὶ ψυχρὸν.
dιότερ εὐλόγως βασανίζεται ταῖς πείραις τὸ γε
τῶν ἄνδρῶν, εἰ ἄγονον, ἐν τῷ ύδατι· ταχὺ γὰρ
5 διαχείται τὸ λεπτὸν καὶ ψυχρὸν ἐπιπολῆς, τὸ δὲ
γόνυμον εἰς βυθὸν χωρεῖ· θερμὸν μὲν γὰρ τὸ πε-
πεμμένον ἐστι, πέπεπται δὲ τὸ συνεστηκὸς καὶ
πάχος ἔχον. τὰς δὲ γυναίκας βασανίζουσι τοῖς τε
προσθέτωσι, εάν δικωνόταί αἱ ὑσμαῖ πρὸς τὸ
pνεῦμα τὸ θύραζε κάτωθεν ἄνω, καὶ τοῖς ἐγχρί-
10 στοις εἰς τοὺς ὀφθαλμοὺς χρώμασιν, ἂν χρωματί-
ζωσὶ τὸ ἐν τῷ στόματι πτύελον. ταῦτα γὰρ οὐ
συμβαίνοντα δηλοὶ τὸ σῶμα τοὺς πόρους δὲ ὅτι
ἀποκρίνεται τὸ περίττωμα συγκεκυμένους ἑχειν
καὶ συμπεφυκότας. ὃ τε γὰρ περὶ τοὺς ὀφθαλμοὺς
tόπος τῶν περὶ τὴν κεφαλῆν σπερματικῶτατός

¹ τὰ supplevi: post σύστασιν P.

And therefore might be expected to rise.
who are too well fed and in women who are too fat the seminal residue is used up for the benefit of the bodily system, so that no semen is formed in the men and no menstrual discharge in the women; sometimes (ii) because of disease; the semen which the men emit is fluid and cold, and the discharges of the women are poor and full of morbid residues. But in very many cases, in both sexes, this drawback is due to deformities in the parts and regions employed for intercourse. Some of these deformities are curable, some are not; those, however, who have become deformed during the original constitution of the embryo, have a special tendency to remain infertile throughout; thus, masculine-looking women are produced in whom the menstrual discharges do not occur, and effeminate men whose semen is thin and cold. On this account the water-test is quite a fair one for infertility in the male semen, because the thin, cold semen quickly diffuses itself on the surface, whereas the fertile semen sinks to the bottom; for though it is true that a substance which has been concocted is hot, yet that which has been set and compacted and possesses thickness has certainly undergone concoction. Women are tested (a) by means of pessaries: the test is whether the scent of the pessary penetrates upwards from below to the breath which is exhaled from the mouth; (b) by means of colours rubbed on to the eyes, the test being whether they colour the saliva. If the required result is not forthcoming, it is proved that the passages of the body through which the residue is secreted have got obstructed and have closed up, for of all the regions in the head the eyes are the most seminal,

b As is shown by its sinking. Cf. 765 b 2.
15 ἐστιν. δὴλοι δ' ἐν¹ ταῖς ὀμιλίαις μετασχηματιζό-
μενος ἐπιδήλως μόνος, καὶ τοῖς χρωμένοις πλείο-
σιν ἀφροδισίοις ἐνδίδοσι τὰ ὀμιλατα φανερῶς.
αὕτην δ' ὅτι ἡ τῆς γονής φύσις ὀμιλίας ἔχει τῇ
tοῦ ἐγκεφαλοῦν ὑδατώδης γάρ ἐστὶν ἡ ὑλή αὐτῆς,
ἡ δὲ θερμότης ἐπίκτητος. καὶ αἱ σπερματικαὶ
20 καθάρσεις ἀπὸ τοῦ ὑποζώματος εἰσὶν, ἡ γὰρ ἀρχὴ
tῆς φύσεως ἐντεῦθεν, ὡστε δικνείσαθαι πρὸς τὸν
θώρακα τὰς κινήσεις ἀπὸ τῶν ἄρθρων· αἱ δ' ἐκ
tοῦ θώρακος ὀσμαί ποιοῦσιν αἰσθητῶς διὰ τῆς
ἀνατυνῆς.

Ἐν μὲν οὖν τοῖς ἀνθρώπωις καὶ τοῖς ἄλλοις
gένεσι, ὡσπερ εἰρηται πρότερον, κατὰ μέρος ἡ

VIII 25 τοιαύτῃ συμβαίνει πήρωσις, τὸ δὲ τῶν ἡμιώνον
gένος ὅλον ἁγονόν ἐστιν. περὶ δὲ τῆς αὐτίας, ὡς
μὲν λέγουσιν Ἐμπεδοκλῆς καὶ Δημόκριτος, λέγουν
ὁ μὲν οὐ σαφῶς, Δημόκριτος δὲ γνωρίμως μάλλον,
οὐ καλῶς εἰρήκασιν. λέγουσι γὰρ ἐπὶ πάντων
ὀμοίως τὴν ἀπόδειξιν τῶν παρὰ τὴν συγγένειαν
30 συνδυαζομένων. Δημόκριτος μὲν γὰρ φησὶ δι-
εφθάρθαι τοὺς πόρους² τῶν ἡμιώνων ἐν ταῖς ὑστε-
ραις διὰ τὸ μὴ ἐκ συγγενῶν γίνεσθαι τὴν ἀρχήν
tῶν ζωῶν. συμβαίνει δ' ἐφ' ἐτέρων ζώων τούτο
μὲν ὑπάρχειν, γεννάν δὲ μὴ δεῖν ἕττον καίτοι χρῆν,
εἴπερ αὕτην τοῦτ' ἢν, ἁγονα καὶ τάλλ' εἶναι τὰ
μυγνύμενα τὸν τρόπον τούτον. Ἐμπεδοκλῆς δ' 35
35 αἰτιάται τὸ μίγμα τὸ τῶν σπερμάτων γίνεσθαι
πυκνόν ἐκ μαλακῆς τῆς γονῆς οὔσης ἐκατέρας·
sυναρμόττειν γάρ τὰ κοΐλα τοῖς πυκνοῖς ἄλληλωι,
as is proved by the fact that this is the only region which unmistakably changes its appearance during sexual intercourse, and those who overfrequently indulge in it have noticeably sunken eyes. The reason is that the nature of the semen is similar to that of the brain; its matter is watery whereas its heat is a mere supplementary acquisition. Also the seminal discharges come from the diaphragm, because the first principle of the natural organism is there, so that the movements initiated in the genital organs penetrate to the chest, and the scents from the chest become perceptible through the breathing.

As I said earlier, this particular deformity occurs in man and in the other kinds of animals to some extent, but with mules it is the whole race that is infertile. What Empedocles has to say about the reason for this is obscure; Democritus is more intelligible; but they are both wrong. They give one omnibus explanation, covering all cases of copulation between animals of different kinds. Democritus says that in mules the genital passages are destroyed in the uterus, because the formation of these animals has its origin in parents of different species. But we find this same situation with other animals, and yet they generate notwithstanding; whereas, if Democritus's explanation was right, all other animals which unite in this way ought to be infertile too. The cause alleged by Empedocles is this: He says the mixture of the seeds becomes dense as a result of the two component portions of semen being both soft; because, the hollows of one fit into the densities of the other, and in

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b See Introd. § 69.
c See 719 a 14.
d See Diels, Vorsokr.68 A 151.
e Diels, Vorsokr.531 B 92; cf. 91; and 31 A 82.
ἐκ δὲ τῶν τοιούτων γίνεσθαι ἐκ μαλακῶν σκληροῦν, ὥσπερ τῷ καττιτέρῳ μιχθέντα τὸν χαλκόν, λέγων οὐτ' ἐπὶ τοῦ χαλκοῦ καὶ τοῦ καττιτέρου τῆν αὐτίαν 5 ὀρθῶς (εἴρηται δ' ἐν τοῖς προβλήμασι περὶ αὐτῶν) οὐθ' ἐλος ἐκ γνωρίμων ποιούμενος τὰς ἀρχάς. τὰ γὰρ κοίλα καὶ τὰ στερεὰ ἀρμόττοντα ἀλλήλοις πῶς ποιεῖ τὴν μίζιν οἶνον οὖν καὶ ὑδατος; τοῦτο γὰρ ὑπὲρ ἡμᾶς ἐστὶ τὸ λεγόμενον· πῶς γὰρ δεῖ λαβεῖν 10 τὰ κοίλα τοῦ οἴνου καὶ τοῦ ὑδάτος, λίαν ἐστὶ παρὰ τὴν αἰσθήσιν. ἔτι δ' ἐπειδὴ συμβαίνει καὶ εἴ 1 ἰππων γίνεσθαι ἰππον καὶ εἴ ὄνων οὖν καὶ εἴ ἰππον καὶ οὖν ἡμίονον, ἀμφέτερος ἄρρενος καὶ θῆλεος ὀποτερουόν ὄντος, διὰ τὰ ἐκ μὲν τούτων γίνεται πυκνὸν οὔτως ὅστ' ἄγονον εἶναι τὸ γενόμενον, ἐκ δ' ἰππον θῆλεος καὶ ἄρρενος ἢ ὄνου 15 θῆλεος καὶ ἄρρενος οὐ γίνεται ἄγονον; καίτοι μαλακῶν καὶ τὸ τοῦ ἄρρενος ἰππον ἐστὶ καὶ τὸ τοῦ θῆλεος, μύγνυται δὲ καὶ ὁ θῆλυς ἰππος καὶ ὁ ἄρρην τῷ ὄνω, καὶ τῷ ἄρρενι καὶ τῷ θῆλει. καὶ διὰ τοῦτο γίνονται ἄγονα εἴ ἀμφότερων, ὡς φησίν, ὅτι εἴ ἀμφοῖν ἐν τι γίνεται (<πυκνόν), 1 μαλακῶν 20 ὄντων τῶν σπερμάτων. ἐδει οὖν καὶ τὸ εἴ ἰππον ἄρρενος καὶ θῆλεος γινόμενον. εἰ μὲν γὰρ θάτερον ἐμίγνυτο μόνον, ἐνήν ἂν λέγεων ὅτι θάτερον αὐτίον τοῦ μὴ γενναῖον ἄνομοιον ὅν 2 τῇ τῷ ὄνου γονῆ· νῦν δ' οἴαπερ οὔσῃ ἐκείνῃ μύγνυται, τοιαύτῃ καὶ τῇ τοῦ

1 πυκνόν supplevi (πυκνόν τι pro ἐν τι Platt): ὅτι . . . σπερμάτων om. Σ.

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such circumstances two softs give rise to one hard, just as bronze mixed with tin does. In the first place, he has got the reason wrong in the case of bronze and tin (see what I have written about this in the Problems),\(^a\) and further, to put the objection generally, the principles from which he starts his argument are not intelligible.\(^b\) How do the hollows and solids by "fitting on to one another" produce "the mixture as of wine and water"? This saying of his is over our heads; it is quite beyond our perception what we are to understand by the "hollows" of wine and water. Further, in point of fact, a horse is the offspring of two horses, an ass of two asses, a mule of a horse and an ass—i.e., its sire is a horse and its dam an ass or vice versa. Why is it then that a horse and an ass produce something so "dense" that the offspring formed is infertile, whereas the offspring resulting from a male and female horse or from a male and female ass is not infertile? After all, the secretion of both the male and of the female horse is "soft," and both sexes of the horse unite with asses of the opposite sex. The reason why in both these cases the offspring produced is infertile, according to Empedocles, is because the one product of the two soft "seeds" is something ("dense"). But then so it ought to be when the two seeds originate from two horses. If only one sex of the horse united with the ass, it would be open to Empedocles to say that the cause of the mule's infertility was the dissimilarity of that one sex to the semen of the ass. In fact, however, there is no difference in quality between the seed of the ass with which it unites (to form a mule)

\(^a\) No such reference can be found.

\(^b\) Cf. Anal. Post. 100 b 9.
συγγενῶς. ἔτι δ' ἡ μὲν ἀπόδειξις κατ’ ἀμφοτέρων εἰρήται ὁμοίως καὶ τοῦ θήλεος καὶ τοῦ ἀρρενοῦ, 25 γεννᾶ δ' ὁ ἄρρην ἐπταέτης ἢν ἡμίόνος, δ' ὡς φασίν ἀλλ’ ἡ θήλεια ἄγονος ὅλως, καὶ αὐτὴ τῷ μὴ ἐκ-τρέφειν εἰς τέλος, ἐπεὶ ἤδη κύμα ἔσχεν ἡμίόνος. Ἡσυς δὲ μᾶλλον ἄν δόξειεν ἀπόδειξις εἶναι πιθανή τῶν εἰρημένων λογικήν. λέγω δὲ λογικὴν διὰ τοῦτο, ὅτι ὅσῳ καθόλου μᾶλλον, πορρωτέρω 30 τῶν οἰκείων ἐστὶν ἄρχων. ἐστὶ δὲ τοιαύτῃ τις. εἰ γὰρ ἐξ ὁμοειδῶν ἀρρενοῦ καὶ θήλεως ὁμοειδές γίνεσθαι πέφυκε τοῖς γεννήσασιν ἄρρεν ἡ θῆλυ, οἴον ἐκ κυνὸς ἀρρενοῦ καὶ θήλεως κύων ἄρρην ἡ θῆλεια, καὶ εἴ ἐτέρων τῷ εἴδει ἐτερον τῷ εἴδει, οἴον εἰ κύων ἐτερον λέοντος, καὶ ἐκ κυνὸς ἀρρενοῦ 35 καὶ λέοντος θήλεως ἐτερον καὶ ἐκ λέοντος ἀρρενοῦ καὶ κυνὸς θήλεως ἐτερον, ὡστ’ ἐπειδὴ γίνεται ἡμίόνος ἄρρην καὶ θῆλυ ἀδιάφορον ὄντες τῷ εἴδει ἀλλήλους, γίνεται δ’ εἰς ἵππου καὶ ὅνου ἡμί-ονος, ἐτερα δ’ ἐστὶ τῷ εἴδει ταῦτα καὶ οἱ ἡμίονοι, ἀδύνατον γενέσθαι εἴς ἡμίόνων ἐτερον γὰρ γένος 5 οὕς οἴον τε διὰ τὸ εἴς ἀρρενοῦ καὶ θήλεως τῶν ὁμοειδῶν ταύτῳ γίνεσθαι τῷ εἴδει, ἡμίόνος δ’ ὅτι

2 ἡμίόνος Peek : μόνος vulg. : Platt omisso (cum S) μόνος scribit mox θήλεια κ’μόνη’.  
3 ὅλως εἰκ ταῦτος PYZ.  
4 corr. δ’ ἀδιάφορον ὄντων vulg.

a They are both “soft,” according to Empedocles.
and the seed of an animal of its own species. Further, Empedocles applies his argument equally to the male and the female. But, people say, the male mule does generate at the age of seven years; it is the female which is totally infertile and that is simply because she fails to bring the nourishing of the fetation to its completion (as instances of fetations in mules have been known to occur).

Still, perhaps an abstract argument might be considered more convincing than those which we have already mentioned. I call it an abstract one, because in so far as it is a more general argument it is further removed from those principles which belong to this particular subject. It goes somewhat like this. In the normal course of nature the offspring which a male and a female of the same species produce is a male or female of that same species—for instance, the offspring of a male dog and a female dog is a male dog or a female dog. Two animals which differ in species produce offspring which differs in species; for instance, a dog differs in species from a lion, and the offspring of a male dog and a female lion is different in species; so is the offspring of a male lion and a female dog. This being so, it follows that as both male and female mules are produced, which of course do not differ in species, and as a mule is the offspring produced by a horse and an ass, both of which are different in species from the mule, it is impossible for any offspring to be produced by mules; the reason being: (a) no offspring of a different species can be produced by them, because the offspring of two animals male and female of the same species belongs itself to that species, nor (b) can a mule be produced, because that is the offspring of a horse and an
ἐξ ἵππου καὶ ὄνου γίνεται ἐτέρων ὄντων τῷ εἶδει ἡ ὣν ἐτέρων τῷ ἐδει τῇ ἐτερων ἡ γίνεσθαι ἡ ὄνον].

οὐτος μὲν οὐν ὁ λόγος καθόλου λίαν καὶ κενὸς. οἱ γὰρ μὴ ἐκ τῶν οἰκείων ἄρχῶν λόγοι κενοί, ἀλλὰ δοκοῦσι εἶναι τῶν πραγμάτων οὐκ ὄντες. οἱ γὰρ ἐκ τῶν ἄρχῶν τῶν γεωμετρικῶν γεωμετρικοῖ, ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων. τὸ δὲ κενὸν δοκεῖ μὲν εἶναι τι, ἐστὶ δ' οὐθέν. οὐκ ἀληθές δὲ, ὅτι πολλὰ τῶν μὴ <ἐξ> ὁμοειδῶν γενομένων γίνεται γόνυμα, καθάπερ ἐλέξθη πρότερον. τούτον μὲν οὖν τὸν τρόπον οὔτε περὶ τῶν ἄλλων δεῖ ζητεῖν

15 οὔτε περὶ τῶν φυσικῶν. ἐκ δὲ τῶν ὑπαρχόντων τῷ γένει τῷ τῶν ἵππων καὶ τῷ τῶν ὄνων θεωρῶν αὖ τις μᾶλλον λάβοι τὴν αἰτίαν, ὅτι πρῶτον μὲν ἐκάτερον αὐτῶν ἐστὶ μονοτόκοιν ἐκ τῶν συγγενῶν ἡ ὄνων, ἐπειτ' οὐ συλληπτικᾶ τὰ θῆλεα ἐκ τῶν ἀρρένων ἂν, διόπερ τοὺς ἰπποὺς διαλείποντες

20 ὁχεύονσι [διὰ τὸ μὴ δύνασθαι συνεχῶς φέρειν]. ἀλλ' ἡ μὲν ἵππος ὁ καταμηνιώδης, ἀλλ' ἐλάχιστον προϊέται τῶν τετραπόδων· ἡ δ' ὁνος οὐ δέχεται τὴν ὁχείαν, ἀλλ' ἐξουρεῖ τῶν γόνων, διὸ μαστιγοῦσιν ἀκολουθοῦντες. ἐτὶ δὲ ψυχρὸν τὸ ἡ ὄνων [ὁ ὁνος] ἐστί, διόπερ ἐν τοῖς χειμερινοῖς οὐ θέλει γίνεσθαι

25 τόπους διὰ τὸ δύσρυγον εἶναι τὴν φύσιν, οὐδὲ περὶ Ἀκτίνας καὶ τὴν ὀμορον χώραν, οὐδὲ περὶ Κελτοὺς τοὺς ὑπὲρ τῆς Ἰβηρίας. ψυχρά γὰρ καὶ αὐτῇ ἡ

1 ἐκ δὲ ... ἡ ὄνων vulg.: eicit Platt.
2 ἐξ supplevi.
3 seclusit Platt: habet vulg., Σ.
4 seclusit Bif.

a Cf. H.A. 577 a 23.
ass, two animals which differ in species [and it was laid down that an animal of a different species is produced by two animals that differ in species]. Now this argument is too general; there is nothing in it, because there is nothing in any argument which does not start from the first principles belonging to the particular subject. Such arguments may appear to be relevant, but in fact they are not. For a geometrical argument, you must start from geometrical principles, and the same applies elsewhere; that which is empty, which has nothing in it, may appear to be somewhat but in fact is nothing at all. But also, this argument is false, because many of the animals that are produced from parents of differing species are fertile, as I have said earlier. No; this method of inquiry is as wrong in natural science as it is elsewhere. We shall be more likely to discover the reason we are looking for if we consider the actual facts with regard to the two species, horse and ass. First, then, both horse and ass, when mated with their own kind, produce only one at a birth; secondly, the females do not on every occasion conceive when covered by the male, and that is why breeders after an interval put the horse to the mare again [because the mare cannot bear it continuously]. Mares do not produce a large amount of menstrual discharge; indeed they discharge less than any other quadruped; she-asses too do not admit the impregnation, but pass the semen out with their urine; and that is why people follow behind, flogging them. Further, the animal is a cold subject; and as it is by nature so sensitive to cold, it is not readily produced in wintry regions, such as Scythia and the neighbouring parts, or the Keltic country beyond Iberia, which is also a
χώρα. διὰ ταύτην δὲ τὴν αὐτήν καὶ τὰ ὀχεῖα ἐπιβάλλουσι τοῖς ὀνοὺς ὡσπερ τοῖς ἵπποις κατ' ἴσημερίαν, ἄλλα περὶ τροπᾶς θερνάς, ὡς ἐν 30 ἀλευνή γίνεται ὄρα τὰ πωλία (ἐν τῇ αὐτῇ γὰρ γίνεται ἐν ἓ ἀν ὀχευθῆ. ἐνιαυτὸν γὰρ κύκλῳ καὶ ἵπποι καὶ ὄνοι). ὅπως δ’ ὡσπερ εἰρηται ψυχροὶ τὴν φύσιν, καὶ τὴν γονήν ἀναγκαῖον εἶναι τοῦ τιούτου ψυχράν. (σημεῖον δὲ τούτου διὰ τούτο γάρ, ἐὰν μὲν ἵππος ἀναβηθῇ ἐπὶ ωχευμένην ὑπὸ ὄνου, οὐ διαφθείρει τὴν τοῦ ὄνου ὀχεῖαν, ὃ δ’ ὄνος 35 ἐὰν ἐπαναβῇ, διαφθείρει τὴν τοῦ ὕππου διὰ ψυχρότητα τὴν τοῦ σπέρματος.) ὅταν μὲν οὖν ἀλλήλους μιχθῶσιν, σώζεται διὰ τὴν ἑπατέρου θερμότητα, θερμότερον γὰρ τὸ ἀπὸ τοῦ ἤππου ἀποκρύνόμενον. ἦ μὲν γὰρ τοῦ ὄνου ψυχρὰ καὶ ἡ υλή καὶ ἡ γονή, ἢ δὲ τοῦ ὕππου θερμοτέρα. ὅταν δὲ 5 μιχθῇ ἡ θερμόν ἐπὶ ψυχρὸν ἢ ψυχρὸν ἐπὶ θερμόν, συμβαίνει αὐτὸ μὲν τὸ ἐκ τούτων κύμα γενόμενον1 σώζεσθαι καὶ ταῦτ’ εἰς ἀλλήλων εἶναι γόνιμα, τὸ δ’ ἐκ τούτων μηκέτι γόνιμον ἀλλ’ ἁγονον εἰς τελειογονίαν.

"Ολος δ’ ὑπάρχοντος ἐκατέρου εὐφυοῦς πρὸς ἁγονίαν, τῷ τε γὰρ ὄνω υπάρχει τὰ ἄλλα τὰ εἰρή-10 μένα, καὶ ἐὰν μὴ μετὰ τὸν βόλον τὸν πρῶτον ἄρξηται γεννάν, οὐκέτι γεννά τὸ παράπαν, οὕτως ἐπὶ2 μικροῦ ἑκεῖ τοῦ3 ἁγονον εἶναι τὸ σώμα τῶν ὄνων. ὁμοίως δὲ καὶ ὁ ὕππος· εὐφυῆς γὰρ πρὸς

1 γεν- PSYZ*: γνυ- vulg.
2 ἐπί om. Z.
3 τοῦ P, Platt: τὸ vulg.

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a i.e., a mare; cf. H.A. 577 a 13, 28.
b According to H.A. 577 a 18, this happens at the age of 2½ years; see also 545 b 20.

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cold quarter. For this reason they do not put the jackasses to the females at the equinox, as is done with horses, but at the time of the summer solstice, so that the asses' foals may be born when the weather is warm. (Since the period of gestation in both horse and ass is a year, the young are born at the same season as that when impregnation takes place.) As has been said, the ass is by nature cold; and a cold animal's semen is, of necessity, cold like itself. (Here is a proof of it. If a horse mounts a female which has been impregnated by an ass, he does not destroy the ass's impregnation; but if an ass mounts her after a horse has done so, he does destroy the horse's impregnation—because of the coldness of his own semen.) Thus when they unite with each other, the impregnation remains intact by reason of the heat resident in one of the two, viz., that of the horse, whose secretion is the hotter. Both the semen from the male and the matter supplied by the female are hotter in the case of the horse; with the ass, both are cold. So when they unite—either the hot one added to the cold, or the cold added to the hot—the result is (a) that the fetation which is formed by them continues intact, i.e., these two animals are fertile when crossed with each other, but (b) the animal formed by them is not itself fertile, and cannot produce perfect offspring.

Besides, both horse and ass have a general natural disposition to be infertile. I have already mentioned several points about the ass, and another is that unless it begins to generate after the first shedding of teeth, it never generates at all; so close does the ass come to being infertile. It is the same with the horse; it is naturally disposed to be infertile; all
τὴν ἀγονίαν, καὶ τοσοῦτον λείπει τοῦ ἄγονος εἶναι ὅσον τὸ γενέσθαι τὸ ἐκ τούτου ψυχρότερον. τοῦτο δὲ γίνεται, ὅταν μιθῇ τῇ τοῦ ὅνου ἀποκρίει. καὶ ὁ ὄνος δὲ ὡσαύτως μικροῦ δεῖν κατὰ τὸν οἰκεῖον συνδυασμὸν ἄγονον γεννᾷ, ὥστε ὅταν προσγενήται τὸ παρὰ φύσιν, εἰ τότε ἐνὸς μόλις γεννητικὸν εξ ἄλληλων ἦν, τὸ ἐκ τούτων ἐτι μᾶλλον ἄγονον καὶ παρὰ φύσιν οὐθένος δεῖσει τοῦ ἄγονον εἶναι, ἀλλ' εξ' ἀνάγκης ἐσται ἄγονον.

20 Συμβαίνει δὲ καὶ τὰ σώματα τὰ τῶν ἡμιόνων μεγάλα γίνεσθαι διὰ τὸ τὴν ἀπόκρισιν τὴν εἰς τὰ καταμηνία τρέπεσθαι εἰς τὴν αὐξήσιν. ἔπει δ' ἐναύσοις ὁ τοκετὸς τῶν τοιούτων, οὐ μόνον συλλαβεῖν δεῖ τὴν ἡμῖνον ἄλλα καὶ ἐκθέσαι τοῦτο δ' ἀδύνατον μὴ γινομένων καταμηνίων. ταῖς δ' ἡμιόνους οὐ γίνεται, ἄλλα τὸ μὲν ἀχρηστὸν μετὰ τοῦ περιττώματος τοῦ ἐκ τῆς κύστεως ἐκκρίνεται (διότερ οὐδὲ τῶν ἄρθρων οἱ ἡμῖνοι οἱ ἁρρενες ὀσφραίνονται τῶν θηλείων, ὥσπερ τάλλα τὰ μέλη νυχα, ἂλλ' αὐτοῦ τοῦ περιττώματος), τὰ δ' ἄλλα τρέπεται εἰς τὴν τοῦ σώματος' αὐξήσιν καὶ τὸ μέγεθος. νἀ τὰ συλλαβεῖν μὲν ἐνδέχεται ποτὲ τὴν 30 θηλείαν, ὅπερ ἤδη φαίνεται γεγονός, ἐκθέσαι δὲ καὶ ἐξενεγκεῖν εἰς τέλος ἀδύνατον. ὁ δ' ἀρρην ποτὲ γεννῆσειν ἂν διὰ τὸ τὸ θερμότερον εἶναι τοῦ θηλεος φύσις τὸ ἄρρεν, καὶ διὰ τὸ μὴ συμβάλ-

1 τοῦ σώματος P, Platt: om. vulg.

These two statements are of course of general validity, 258
that is wanting to make it such is that its secretion should be colder, and this occurs when it is united with that of the ass. In the same way the ass comes within an ace of generating infertile offspring even when it mates with its own kind; so that when there is the additional factor of unnatural mating beside the difficulty it has in producing even a single young one in the normal way, the resultant offspring is still more infertile and unnatural; in fact, it will lack nothing to make it completely infertile, and will be infertile of necessity.

Furthermore, female mules grow large in size. This is because the secretion intended for the menstrual flow is diverted to produce growth. And since the period of gestation in such animals lasts a year, the female mule not only has to conceive but has to nourish the embryo all that time; and this is impossible unless menstrual flow is being produced. None is produced in mules: the unserviceable part of the nourishment is passed out together with the residue that comes from the bladder (which explains why male mules do not smell at the pudenda of the females as the other solid-hoofed animals do, but at the residue itself); the rest of the nourishment is diverted to growth of the body and to size. Hence although it is possible for the female to conceive occasionally—and indeed the fact is established that this has happened—it is impossible for her to nourish an embryo for the full period and bring it to the birth. The male may occasionally generate (a) because the male is by nature hotter than the female, and (b) because the male does not contribute any corporeal and are cited here to explain how the male mule may be able to generate.
Aristotle

748 b

λέσθαι πρὸς τὴν μύξην σῶμα μηδὲν τὸ ἄρρεν. τὸ δὲ ἀποτελεσθὲν γίνεται γίννος. τούτῳ δὲ ἔστιν ἰμῖοις ἀνάππηρος. καὶ γὰρ ἐκ τοῦ ἱπποῦ καὶ τοῦ ὄνου γίνονται γίννοι, ὅταν νοσήσῃ τὸ κύήμα ἐν τῇ ὑστέρᾳ. ἔστι γὰρ ὁ γίννος ὅσπερ τὰ μετάχουρα ἐν τοῖς χοίροις. καὶ γὰρ ἐκεῖ τὸ πηρωθὲν ἐν τῇ ὑστέρᾳ καλεῖται μετάχουροι. γίνεται δὲ τοιόῦτος ὡς ἀν τύχῃ τῶν χοίρων. ὡμοίως δὲ γίνονται καὶ 5 οἱ πυγμαῖοι. καὶ γὰρ οὗτοι πηροῦνται τὰ μέρη καὶ τὸ μέγεθος ἐν τῇ κυήσει, καὶ εἰσὶν ὅσπερ μετάχουρα καὶ γίννοι.

749 a

According to H.A. 577 b 21, a ginnos is the offspring of a mule and a mare; and there, as here, a ginnos is also said to be the diseased offspring of a mare, and is compared with dwarfs and metachoira. Aristotle thus compares the product of the union of mule and mare with the diseased or deformed
ingredient to the mixture. The final result which is produced is a ginnos. This is a deformed mule, for ginnoi are produced also from the horse and the ass when the fetation gets diseased in the uterus, the ginnos being comparable to the metachoirom which occurs among swine, since in that case too it is the offspring which has been deformed in the uterus that is called a metachoirom: any pig may happen to be born thus deformed. Human dwarfs too are formed in a similar way: they too become deformed in their parts and stunted in size during the time of gestation, and thus are comparable with metachoiras and ginnoi.

offspring which sometimes result from the union of male and female of one and the same species. For metachoiras see also 770 b 7.
Although most Ovipara are flying or swimming animals, some of course are πεζά, but by πεζά Aristotle here means viviparous animals only.

* i.e., an egg which does not increase in size after deposition; see below, l. 25.

* i.e., there is no difference of yolk and white.
BOOK III

We have spoken about the sterility of mules, and I about the animals which are viviparous both externally and internally. We now pass on to those blooded animals which are oviparous. The phenomena of generation here are on the one hand similar to those which obtain in the animals that walk, so that the same statement will serve for all of them; on the other hand, these animals exhibit certain differences not only as between themselves, but also when compared with the animals that walk. Their generation is the result of copulation, i.e., of the emission of semen into the female by the male: this applies to all of them, of course. But beyond that there are variations: (a) Birds produce a perfect egg with a hard shell (unless it be deformed by disease). All birds' eggs are of two colours. (b) The Selachian fishes, as I have often repeated, are internally oviparous but bring forth their young alive, after the egg has moved from one position in the uterus to another. Their egg is soft-shelled and of one colour only. The fish known as the fishing-frog is the only one in this class that is not internally viviparous. The cause of this will have to be stated later. (c) All other fishes that are oviparous pro-

\[a\] Probably *Lophius piscatorius*; see 754 a 26, n.
\[b\] At 754 a 25-31.
μὲν προέτειται τὸ ψόν, ἀτελὲς δὲ τούτο. λαμβάνει γὰρ ἐξω τὴν αὔξησιν, διὰ τὴν αὐτὴν αἰτίαν δι’ ἦσον καὶ τὰ ἔσω τελειούμενα τῶν ψών.

Περὶ μὲν οὖν τῶν ύστερῶν, τίνας ἔχουσι διαφόρας καὶ διὰ τίνας αἰτίας, εὗρηται πρότερον. καὶ γὰρ τῶν ἄριστοι ἑξετάσμενα τὰ μὲν ἄνω πρὸς τὸ
30 ὑποζώματι ἔχει τὰς ύστερας, τὰ δὲ κάτω πρὸς τοὺς άρθρους, ἀνω μὲν τὰ σελαχώδη, κάτω δὲ τὰ καὶ ἐν αὐτοῖς ἄριστα καὶ θύραξ, ὅπως ἄνθρωπος καὶ ἵππος καὶ τῶν ἄλλων ἑκαστον τῶν τοιούτων. καὶ τῶν φωτοκούντων τὰ μὲν κάτω, καθάπερ τῶν ἰχθύων οἱ φωτοκούντες, τὰ δ’ ἄνω, καθάπερ οἱ ὀρνιθες.

35 Συνίσταται μὲν οὖν κυνήματά τοῖς ὀρνισι καὶ αὐτόματα, ἀ καλοῦσιν ὑπηνέμα καὶ ζεφύρια τνες, γίνεται δὲ ταῦτα τοῖς μὴ πτητικοῖς μηδὲ γαμφώνυξι τῶν ἀρνιθων, ἀλλα τοῖς πολυγόνοις, διὰ τὸ πολὺ περίττωμα ταῦτ’ ἔχειν (τοῖς δὲ γαμφώνυξιν εἰς τὰς πτέρυγας καὶ τὰ πτερά τρέπεσθαι τὴν
5 τοιαύτην ἀπόκρυσιν, τὸ δὲ σῶμα μικρὸν ἔχειν καὶ Ἐπικόν τε καὶ θερμῶν), τὴν δ’ ἀπόκρυσιν τῆν κατα-μηνώδη καὶ τὴν γονήν περίττωμα εἰναι: ἔτει οὖν καὶ ἢ τῶν πτερῶν φύσις καὶ ἢ τοῦ σπέρματος γίνεται εκ περιττώσεως, οὐ δύναται ἡ φύσις ἐπ’ ἀμφότερα ποικιλεῖν. διὰ τὴν αὐτὴν δὲ ταύτην
10 αἰτίαν2 τὰ μὲν γαμφώνυξα οὔτ’ ὀχυτικά ἐστιν

1 acutum Σ. 2 καὶ post aitian codd. : del. Platt.

a i.e., the cause which controls the growth of the egg to perfection.

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duce an egg of one colour only, but this egg is imperfect—its growth takes place away from the parent, and the Cause concerned \(^a\) is just the same as for those eggs which are perfected within the parent.

I have already spoken about the uterus of these animals; I have said what are the differences they show, and what are the Causes. Thus, some of the viviparous animals (the Selachian fishes) have the uterus high up towards the diaphragm, \(^b\) others (the animals which are both internally and externally viviparous, such as man, horse, and all such animals) have it down by the pudenda. And of the oviparous animals some (such as the oviparous fishes) have it low down, others (such as the birds) have it high up.

Fetations arise in birds spontaneously as well (as in the normal way); some people call them wind-eggs or zephyria. \(^c\) They occur in those birds \(^d\) which are neither good fliers nor crook-taloned but which are prolific. \(^e\) The reason is: (a) these have a great deal of residue, whereas in the crook-taloned birds this secretion is diverted to produce wings and wing feathers and their body is small \(^f\) and solid and hot; and (b) the menstrual secretion and the male semen are residue; therefore, as both feathers and semen alike are formed out of residue, Nature cannot provide a large supply for both purposes. And it is for this same cause that the crook-taloned birds do not indulge much in copulation and are not very prolific,

\(^a\) See note on 717 a 2.
\(^b\) See note on 753 a 22.
\(^c\) i.e., produce a large number of eggs (or young). I use "prolific" throughout to translate πολύγονος and πολυτόκος.
\(^d\) See table of birds, p. 368.
\(^e\) For the smallness of the body of crook-taloned birds (apart from their wings), cf. P.A. 694 a 8 f.
οὔτε πολύγονα, τὰ δὲ βαρέα καὶ τῶν πτητικῶν ὃς ὁ σώματα ὀγκώδη, καθάπερ περιστερᾶς καὶ τῶν τοιούτων. τοῖς μὲν γὰρ βαρέσι καὶ μὴ πτητικοῖς, οἶνον ἀλεκτρόσι καὶ πέρδιξι καὶ τοῖς ἀλλοις τοῖς τοιούτοις, πολὺ γίνεται περίττωμα τοιούτων· διὸ τὰ τε ἀρρενα ἀυτῶν οχευτικὰ καὶ τὰ θήλεα προέται πολλὴν ὑλὴν, καὶ τίκτει τῶν τοιούτων τὰ μὲν πολλὰ τὰ δὲ πολλάκις, πολλὰ μὲν οἶνον ἀλεκτρός καὶ πέρδιξι καὶ στρογγοῦσὶ ὁ Διοτόκος, τὰ δὲ περιστερῶδη πολλὰ μὲν οὐ, πολλάκις δὲ μεταξὺ γὰρ ἐστὶ ταῦτα τῶν γαμφωνύχων καὶ τῶν βαρέων.

20 πτητικὰ μὲν γὰρ ἐστὶν ὡσπερ τὰ γαμφώνυχα, πλῆθος δὲ ἔχει τοῦ σώματος ὡσπερ τὰ βαρέα, ὡστε διὰ μὲν τὸ πτητικὰ εἶναι καὶ ἐνταῦθα τρέπεσθαι τὸ περίττωμα ὀλίγα τίκτουσι, διὰ δὲ τὸ πλῆθος τοῦ σώματος καὶ διὰ τὸ θερμὴν ἔχειν τὴν κοιλίαν καὶ πεπτικωτάτην, πρὸς δὲ τούτοις καὶ διὰ τὸ βαδίως πορίζεσθαι τὴν τροφὴν, τὰ δὲ γαμφώνυχα χαλεπῶς, πολλάκις.

'Οχευτικὰ δὲ καὶ πολύγονα καὶ τὰ μικρὰ τῶν ὄρνεων ἔστι, καθάπερ ἐνίοτε καὶ τῶν φυτῶν· ἡ γὰρ εἰς τὸ σώμα αὐξήσεις γίνεται περίττωμα σπερματικὸν. διὸ καὶ τῶν ἀλεκτρόδων αἱ Ἀδριανικαὶ πολυτόκιστα ταῖς εἴσον· διὰ γὰρ μικρότητα τοῦ σώματος εἰς τὴν τέκνωσιν καταναλίσκεται ἡ τροφή. καὶ αἱ ἀγενεῖς τῶν γενναιῶν πολυτοκώτεραι· ὑγρότερα γὰρ τὰ σώματα τῶν δὲ καὶ ὁγκωδέσ-

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1 τῶν καὶ vulg.: τῶν δὲ Y: αὐτῶν τῶν δὲ PZ: αὐτῶν καὶ Λ.-W.

a Mentioned also at H.A. 558 b 17. Thompson (Glossary², ἀλεκτρύων) considers them as a kind of bantam.

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whereas the heavy birds and those fliers which have bulky bodies (such as pigeons and the like) do so. In those birds which are heavy and are not fliers, such as common fowls, partridges, and the like, a great deal of this residue is formed, and that is why their males copulate frequently and their females emit a great deal of matter; also, some birds of this sort lay many eggs, some lay many times; thus the common fowl, the partridge and the ostrich lay a large number; whereas the pigeon family do not lay a large number, but lay many times, the reason being that the last-named stand midway between the crook-taloned birds and the heavy birds; they are fliers, like the former, and have a bulky body, like the latter. The result is: (1) As they are fliers, the residue is diverted to their wings; hence they lay but few eggs; (2) they are bulky in build, their stomach is hot and very good at concoction, and, in addition, they can easily get their food, whereas the crook-taloned birds have difficulty in getting it; hence they lay often.

Small birds, too, copulate frequently and are very prolific, just as some small plants are: the material which might produce increase of bulk turns into seminal residue. On this account the Adrianic fowls a are extremely prolific; as they are small in size, the nourishment is used up for the production of offspring. Also, low-bred birds are more prolific than high-bred ones, b because their bodies are more

a Thompson’s terms (loc. cit.). The definition of γενναῖος is given at II.1. 488 b 18 ff.: ἐγένεσ μὲν γὰρ ἐστὶ τὸ ἐκ ἀγαθοῦ γένους, γενναῖον δὲ τὸ μὴ ἐξιστάμενον ἐκ τῆς αὐτοῦ φύσεως, whence it appears that γενναῖος = “thoroughbred,” as Thompson there translates it.
749 b
tera, tôn dé ἵσχνότερα καὶ ἔηρότερα: ὁ γὰρ θυμὸς ὁ γενναῖος ἐν τοῖς τοιούτοις γίνεται σώμασι μᾶλλον.
35 ἐτι δὲ καὶ ἡ τῶν σκελῶν λεπτότης καὶ ἀσθένεια συμβάλλεται πρὸς τὸ τὴν φύσιν τῶν τοιούτων ὀχευτικήν εἶναι καὶ πολύγονον, καθάπερ καὶ ἐπὶ τῶν ἀνθρώπων· ἡ γὰρ εἰς τὰ κόλα τροφή τρέπεται τοῖς τοιούτοις εἰς περίττωμα σπερματικόν· ὁ γὰρ ἐκεῖθεν ἀφαιρεῖ ἡ φύσις, προστίθησιν ἐνταῦθα. τὰ
750 a δὲ γαμβώνυχα τὴν βάσιν ἰσχυρὰν ἔχει καὶ τὰ σκέλη πάχος ἔχοντα διὰ τὸν βίον· ὡστε διὰ πάσας ταύτας τὰς αὐτίας οὔτ' ὀχευτικά ἐστιν οὔτε πολύγονα. μάλιστα δὲ ἡ κεγχρίης πολύγονον· μόνον γὰρ σχεδὸν τοῦτο καὶ πίνει τῶν γαμβώνυχων, ἡ δ' ὑγρότης καὶ ἡ σύμφυτος καὶ ἡ ἐπακτὸς σπέρ-
10 ματικὸν μετὰ τῆς ὑπαρχούσης αὐτῆς θερμότητος. τίκτει δ' οὖν' αὐτὴν ἀναλά λιαν, ἄλλα τέτταρα τὸ πλείστον.
Ο δὲ κόκκυς ὀλυγοτόκον ἐστὶν οὐκ ὧν γαμβώνυ-
χος, ὅτι ψυχρὸς τὴν φύσιν ἐστίν (δηλοὶ δ' ἡ δειλία τοῦ ὁρνέου), τὸ δὲ σπέρματικον ζῷον δει θερμόν καὶ ὑγρόν εἶναι. ὅτι δὲ δειλόν, φανερὸν· ὑπὸ τε
15 γὰρ τῶν ὁρνεών διώκεται πάντων καὶ ἐν ἀλλοτρίαις τίκτει νεοττιαίς.
Τὰ δὲ περιστερώδη δύο ὡς τὰ πολλὰ τίκτειν εἶναι· οὔτε γὰρ μονοτόκου εἰσίν (οὐθεὶς γὰρ μονοτόκος ὁρνίς πλὴν ὁ κόκκυς, καὶ οὔτος ἐνίστε διτοκεῖ) οὔτε πολλὰ τίκτουσιν, ἄλλα πολλάκις δύο

a For “solid” and “fluid” see Introd. § 38.
b Cf. the remarks on the chameleon at P. A. 692 Α 22 ff.;
fluid and more bulky, whereas those of the high-bred birds are leaner and more solid, this being the kind of body in which a thoroughbred and high-spirited temper tends rather to make its appearance; also the thinness and weakness of their legs contribute towards making these birds prone to copulation and prolific—and this applies also to human beings: the nourishment which was intended for the legs is in such cases diverted to the seminal residue: what Nature takes away from one place she puts on at the other. The crook-taloned birds, on the other hand, have strong feet, and their legs are thick: this is due to their manner of life; thus on account of all these causes they do not copulate much nor are they very prolific. The kestrel is the most prolific of them, for this is practically the only one of the crook-taloned birds which drinks, and the fluid, both that which is innate and that which it gets from without, is productive of semen when combined with the heat which is present in it. Even this bird does not lay many eggs; four at the most.

The cuckoo lays but few eggs although it is not a crook-taloned bird, because it is cold by nature (as its cowardice clearly shows), whereas an animal that is abundant in semen must be hot and fluid. That it is cowardly is shown by the fact that all other birds chase it and that it lays its eggs in other birds' nests.

Most birds of the pigeon kind usually lay a couple of eggs. They are neither one-egg birds (there is no one-egg bird beside the cuckoo, and this sometimes lays two), nor do they lay a large number; but they

also 650 b 28 (ὁ γὰρ φῶς καταφύξει) and 667 a 17 ff., where a large heart is said to produce cowardice because the heart is so large that the heat is lost in so large a space.
ἐ τρία τὰ πλεῖστα γεννᾶσι, τὰ δὲ πολλὰ δύο
20 οὔτοι γὰρ οἱ ἄριθμοι μεταξὺ τοῦ ἕνος καὶ πολλῶν.
"Ὅτι δὲ τοὺς πολυγόνους τρέπεται εἰς τὸ σπέρμα ἡ τροφή, φανερὸν ἐκ τῶν συμβαίνοντων. τῶν τε γαρ δενδρων τὰ πολλὰ πολυκαρπήσαντα λιαν ἔξ-
αναίνεται μετὰ την φοράν, ὅταν μὴ ὑπολειφθῇ τῷ σώματι τροφῆ, καὶ τὰ ἐπέεια ταύτῳ πάσχειν
25 ἐσικερ, οἴον τὰ τε χεδρόπα καὶ ὁ σύτος καὶ τὰλλα τὰ τοιαύτα: τὴν γὰρ τροφὴν ἀναλίσκουσιν εἰς τὸ σπέρμα πᾶσαν. ἐστὶ γὰρ πολύσπερμον τὸ γένος αὐτῶν. καὶ τῶν ἀλεκτορίδων ἐναι πολυτοκήσασαι λιαν ὄλτως ὀστε καὶ δύο τεκεῖν ἐν ἡμέρᾳ, μετὰ τὴν πολυτοκίαν ἀπέβανον. ὑπέριονοι γὰρ γίνονται
30 καὶ οἱ ὁρνίθες καὶ τὰ φυτὰ· τούτο δ᾽ ἑστὶ τὸ πάθος ὑπερβολή περιττώματος ἐκκρίσεως. αὐτίον δὲ τὸ τοιοῦτον πάθος καὶ τῷ λέοντι τῆς ἁγονίας τῆς ὑστερον· τὸ μὲν γὰρ πρότερον τίκτει πέντε ἡ ἐξ, εἰτα τῷ ὑστερῷ ἔτει τέτταρας, πάλιν δὲ τρεῖς σκύμνως, εἰτα τὸν ἔχόμενον ἄριθμὸν ἔως ἕνος, εἰτ
35 οὔθεν, ὡς ἐξαναλισκομένου τοῦ περιττώματος καὶ ἅμα τῆς ἡλικίας ληχούσης φθίνοντος τοῦ σπέρ-
ματος.

Τίσι μὲν οὖν γίνεται τὰ υπηνέμια τῶν ὁρνίθων,
ἐτὶ δὲ ποιοὶ πολύγονοι καὶ ὁλυγόνοι αὐτῶν, καὶ
diὰ τινας αἵτις, εἰρηται.

Γίνεται δὲ τὰ υπηνέμια, καθάπερ εἰρηται καὶ
πρότερον, διὰ τὸ υπάρχειν ἐν τῷ θῆλε τῆν ὑλὴν
5 τῆς σπερματικῆν, τοῖς δ᾽ ὀρνέωσι μὴ γίνεσθαι τῆν
tῶν καταμηνών ἀπόκρισιν ὃσπερ τοῖς ζωοτόκοις
tοῖς ἐναιμοῖς· πάσι γὰρ τούτοις γίνεται, τοῖς μὲν
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lay often, producing two, or three at the most, generally two, as these numbers are intermediate between one and many.

The actual facts make it clear that in the prolific birds the nourishment is diverted to the semen. Most trees, if they have borne an excessive amount of fruit, wither away when the crop is over, when no nourishment is left over for themselves; annual plants, as it seems, have the same experience, e.g., leguminous plants, corn, and the rest of that sort. The reason is that, as they belong to a kind which produces a great deal of seed, they use up all their nourishment for semen (seed). Some fowls, too, after having laid excessively—as many as two eggs in a day—have died after performing the feat. The birds and plants alike become completely exhausted, and this condition is simply one of excessive evacuation of residue. It is responsible for the sterility which besets the lion in the latter part of its life. To begin with, the lion will produce five or six cubs in a litter, then four the next year, next time three, then two, after that one, and then none at all, which suggests that the residue is being used up and that the semen is diminishing as the prime of life abates.

We have now said which are the birds that produce wind-eggs, and what sorts of birds are prolific and not prolific, together with the causes thereof.

Why are wind-eggs formed? As has been said earlier, their formation is due to the fact that though seminal matter is present in the female, with birds no discharge of the menstrual fluid take place as it does with the blooded Vivipara; in all of the last-named it does take place, and it is greater in some, smaller

\[ a \text{ Cf. 760 b 23.} \]
πλείων, τοῖς δ’ ἐλάττων, τοῖς δὲ τοσαυτῇ τὸ πλῆθος ὡστε ὅσον γε ἐπισημαίνειν. ὁμοίως δ’ οὔδὲ τοῖς ἰχθύσι, καθάπερ¹ τοῖς ὄρνισι. διὸ καὶ τούτοις

10 γίνεται μὲν ἄνευ χειὼς σύστασις κυμάτων, [ὁμοίως καὶ τοῖς ὄρνισι]² ἢττον δ’ ἐπιδήλως· ψυχροτέρα γὰρ ἡ φύσις αὐτῶν. ἡ δὲ γυνομένη τοῖς ζωοτόκοις ἀπόκρισις τῶν καταμηνίων συνίσταται 

τοῖς ὄρνισι κατὰ τοὺς ἰκνομένους χρόνους τοῦ περιττώματος, καὶ διὰ τὸ τὸν τόπον εἶναι θερμὸν

15 τὸν πρὸς τῷ διαζώματι τελείωται τοῖς μεγέθεσιν, πρὸς δὲ τῇ γένεσιν ἀτελῆ καὶ ταῦτα καὶ τὰ τῶν ἰχθύων ὁμοίως ἄνευ τῆς τοῦ ἄρρενος γυνῆς. ἡ δ’ αὐτία τούτων ἐρήπτηκεν πρὸτερον. οὐ γίνεται δὲ τὰ ὑπηνέμα τοῖς πτητικοῖς τῶν ὄρνιθων διὰ τὴν αὐτὴν αὐτίαν δ’ ἠμπερ οὐδὲ πολυτοκεῖ τὰ τοιαῦτα.³ 

τοῖς γὰρ γαμβώνυξιν ὅλιγον τὸ περίττωμα, καὶ

20 προσδέονται τοῦ ἄρρενος πρὸς τὴν ὀρμὴν τῆς τοῦ περιττώματος⁴ ἐκκρίσεως. πλείω δὲ τὰ ὑπηνέμα γίνεται τῶν γυνίμων ψών,⁵ ἐλάττω δὲ τὸ μέγεθος διὰ μίαν αὐτίαν καὶ τὴν αὐτήν· διὰ μὲν γὰρ τὸ ἀτελῆ εἶναι ἐλάττῳ τὸ μέγεθος, διὰ δὲ τὸ τὸ μέγε-

25 θος ἐλάττων πλείω τὸν ἁριβοῦ. καὶ ἢττον δὲ ἢδεα διὰ τὸ ἄπαττότερα εἶναι· εν πάσι γὰρ τὸ πεπεμ-μένων γλυκύτερον.

"Οτι μὲν οὖν οὔτε τὰ τῶν ὄρνιθων οὔτε τὰ τῶν

¹ fort. οὗδε supplendum.
² seel. A.-W.: ὁμοίως om. S, ὄρνισι om. Z.
³ hic lacunam statuit Platt.
⁴ περιττώματος PSY, A.-W., Platt: ἀπέρματος vulg.
⁵ γυνίμων ψών A.-W., ovis convenientibus generationi Σ: γόνω γυνομένων Ζ*, vulg.: γόνων γυ. PSY.

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¹ i.e., to mark that it belongs to a class which exhibits the
in others, and in some just enough to serve as an indication. Similarly, there is no discharge in fishes, any more than in birds: and therefore in fishes too, [just as in birds,] fetations arise without previous copulation, though they are less obvious; that is because their nature is colder. What corresponds to the secretion of the menstrual fluid which occurs in viviparous animals arises in birds at the times proper for that residue, and as the region by the diaphragm is hot these fetations reach perfection in respect of size, though for the purpose of generation they are imperfect, both in birds and fishes, without the semen of the male. The cause of these things has been given earlier. Wind-eggs are not formed in the birds that are fliers; the reason why this is so and why birds of this sort are not very prolific layers is one and the same: in the crook-taloned birds the residue is scanty, and they need the male to give the impulse for the discharge of the residue. The wind-eggs are formed in larger numbers than the ones which are fertile but they are smaller in size; both facts are due to one and the same cause: they are smaller in size because they are imperfect, and they are more in number because their size is smaller. They are less pleasant to eat because they are more unconcocted, for that which has been concocted always makes the more tasty morsel.

Now it has been sufficiently established by observation. A similar remark is made at P.A. 689 b 5 about the stumpy tail of certain animals.

Platt’s assumption of a lacuna here is unnecessary. Although πτητικά and γαμφώνυχα are not simply convertible, all γαμφώνυχα are πτητικά, and clearly Aristotle is here thinking of them as especially good examples of fliers.

The Greek word also connotes “matured,” “ripened.”
750 b

| 30 | οὐχ ὁμοίως, μάλιστα δ᾽ ἐπὶ τῶν ποταμίων ἐώραται [περὶ τούς ἐρυθρίνους] ἐννοι γὰρ εὐθὺς ἔχοντες ὡς φαίνονται, καθάπερ ἐν ταῖς ἱστορίαις γέγραπται περὶ αὐτῶν. ὅλως δ᾽ ἐν γε τοῖς ὀρνισιν οὐδὲ τὰ γυνόμενα διὰ τῆς ὁχείας ὥς θέλει ὡς ἐπὶ τὸ πολὺ λαμβάνειν αὐξήσεων, ἢ ἢ ὁχεύῃται ἡ ὀρνις συνεχώς. τούτου δ᾽ αἰτίων ὅτι
| 35 | καθάπερ ἐπὶ τῶν γυναικῶν τὸ πλησιάζειν τοῖς ἀρρέσι καταστά τὴν τῶν γυναικείων ἀπόκρυσιν (ἐλκεὶ γὰρ τὸ υγρὸν ἡ ύστέρα θερμανθείσα, καὶ οἱ πόροι ἀναστομοῦνται), τοῦτο συμβαίνει καὶ ἐπὶ τῶν ὀρνίθων ἐπιόντος κατὰ μικρὸν τοῦ καταμηνιώδους περιττόματος, δ' θύραξε μὲν οὐκ ἀπο-
| 40 | 5 κρίνεται διὰ τὸ ὀλίγον εἶναι καὶ πρὸς τῷ διαξώματι ἄνω τὰς ύστέρας, συλλεῖβεται δ' εἰς αὐτὴν τὴν ύστέραν. τοῦτο γὰρ αὔξει τὸ ωῦν, ὡσπερ τὰ ἐμβρυα τὰ τῶν ωμοτόκων <τὸ> διὰ τοῦ ὄμφαλου, τὸ ἐπιρρέουν διὰ τῆς ύστέρας, ἐπεὶ ὅταν ἀπαξ ὁχεύητῃ τὰ ὀρνεα, πάντα σχεδὸν ἀεὶ διατελεῖ φῶς
| 45 | 10 ἔχοντα, μικρὰ δὲ πάμπαν. διὸ καὶ περὶ τῶν ὑπηνεμίων τινὲς εἰῶθασι λέγειν ὡς οὐ γιγαντεῖν ἀλλ᾽ ὡς ὑπολειμμάτων ἐκ προτέρας ὁχείας ὄντων. τοῦτο δ᾽ ἐστὶ ψεύδος. ὁππεῖ γὰρ ἰκανῶς καὶ ἐπὶ

1 οὕτε τὰ τῶν ἵθυων om. Y., om. piscium non complem-
2 tur Σ.
3 τοῦ Peck. συμβαίνον post ἐώραται SY.
observation that neither in birds nor in fishes do the 
fetations attain perfection for the purpose of genera-
tion apart from the males; with regard to fetations 
being formed apart from the males in fishes as well, 
this has been observed, though to a less extent, to 
occur, but it has been noticed most in the fresh-
water fishes. Some of them, as we can see, have 
eggs from the very outset, as is recorded in the 
Researches. Speaking generally, in birds at any 
rate even the impregnated eggs usually do not grow 
unless the hen is trodden continually. The reason 
for this is, that, just as in the case of women inter-
course with the males draws down the discharge of 
the menstrual flow (since when the uterus has been 
heated it draws the liquid and the mouths of the 
passages are opened), so with birds: the same thing 
occurs; the menstrual residue advances little by 
little. It is not discharged externally because there 
is not much of it and the uterus is high up towards 
the diaphragm, but it runs down and collects in the 
uterus itself. This liquid, of course, which percolates 
through the uterus, makes the egg grow, just as that 
which passes through the umbilical cord makes the 
embryos of Vivipara grow, for when once the birds 
have been trodden, they all continue almost always 
to have eggs, albeit quite small ones. In view of this, 
some people are in the habit of saying that wind-
eggs are not formed (independently) either, but are 
merely relics of an earlier impregnation. This how-
ever is untrue. It has been sufficiently established by

a The reference to the erythrinus which several mss. have 
at this point is out of place; cf. H.A. 567 a 27.
b At H.A. 567 a 30.
c See above, 739 a 35 ff., esp. b 11 ff.
νεοττών ἀλεκτορίδος καὶ χηνὸς γενόμενα ἀνευ ὀχείας. ἔτι δὲ αἱ πέρδικες αἱ θηλεῖαι, αἳ τ᾽ ἀν-
15 ὀχευτοὶ καὶ αἱ ὀχυμέναι τῶν εἰς τὰς θήρας ἀγο-
μένων, ὀσφρανώμεναι τοῦ ἄρρενος καὶ ἀκούουσαι τῆς φωνῆς αἱ μὲν πληροῦνται αἱ δὲ τίκτουσι παρα-
χρήμα. τοῦ δὲ πάθους αὐτικόν ταῦτὸν ἵππα ἔπι τῶν ἀνθρώπων καὶ τῶν τετραπόδων· ἐὰν γὰρ ὀργώντα
τύχῃ τὰ σώματα πρὸς τὴν ὀμλίαια, τὰ μὲν ἴδοντα τὰ δὲ μικρὰς γενομένης θύεως προίτεσθαι σπέρμα.
20 τὰ δὲ τοιαῦτα τῶν ὀρνέων ὀχευτικὰ καὶ πολύ-
σπέρμα τῆς φύσις ἐστὶν, ὡστε μικράς δέσθαι τῆς κωφησεως, ὅταν ὀργώντα τύχῃ, καὶ γίνεσθαι ταχὺ
tῆν ἐκκρισιν αὐτοῖς, ὡστε τοῖς μὲν ἀνοχεύτοις ὑπηνέμα συνίστασθαι, τοῖς δ᾽ ὀχυμένοις αὐξάνε-
σθαι καὶ τελειοῦσθαι ταχέως.

25 Τῶν δὲ θύραζε φωτοκούντων οἱ μὲν ὀρνιθεῖς προ-
ζεται τὸ ὄν τέλειον, οἱ δὲ ἰχθύες ἀτέλεως, ἀλλ᾽
ἐξω λαμβάνει τὴν αὐξησιν, καθάπερ ἐηρηται καὶ
πρῶτερον. αὐτικὸν δ᾽ ὅτι πολύγονον ἐστὶ τὸ τῶν
ἰχθύων γένος· ἀδύναισον οὖν ἐσω πολλά λαμβάνειν
tέλος, διόπερ ἀποτίκτουσιν ἐξω. ταχεῖα δ᾽ ἡ
30 πρόσεσις· αἱ γὰρ υστέραι πρὸς τοῖς ἀρθροῖς τῶν
θύραζε φωτοκούντων ἰχθύων.

"Εστι δὲ τὰ μὲν τῶν ὀρνίθων δίχροα, τὰ δὲ τῶν
ἰχθύων μονόχροα πάντων. τῆς δὲ διχροίας τὴν
αὐτίκαν ἵδοι τὶς ἂν ἐκ τῆς δυνάμεως ἐκατέρου τῶν
μορίων, τοῦ τε λευκοῦ καὶ τοῦ ὑχροῦ. γίνεται μὲν
γὰρ ἡ ἀπόκρισις ἐκ τοῦ αἴματος [(οὔθεν γὰρ ἀναιμον

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1 ὀσφρανώμεναι P: ὀσφρώμεναι SY: ὀσμώμεναι Z, vulg.
2 πάθους] τάχους Z.

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a Cf. H.A. 560 b 10 ff.
observation that they have been formed in chickens and goslings without impregnation. Again, when the female partridges which are taken out to act as decoy-birds smell the male and hear his note, those which have not been trodden by a male become full of eggs and those which have already been trodden at once lay their eggs. The reason why this happens is the same as in the case of human beings and quadrupeds: if they are in heat, some emit the semen at the mere sight of a female, others at a slight touch. Birds of this sort are by nature inclined to frequent intercourse and have abundance of semen, so that when they are in heat the impulse they need to set them off is small, and emission quickly takes place; the result is that in those which have not been impregnated wind-eggs take shape, and in those which have been impregnated the eggs quickly grow and reach perfection.

In the group of animals which lay their eggs externally, birds produce their eggs in a perfected state, fish in an imperfect state; but fishes' eggs continue and finish their growth apart from the parent, as indeed I have said earlier. The reason for this is that the fish tribe is very prolific; therefore it is impossible for a large number of eggs to reach perfection within the animal; hence they are laid externally. Their discharge is quickly effected, for in the externally oviparous fishes the uterus is near the genital parts.

Birds' eggs are double-coloured, but all fishes' eggs are single-coloured. The cause of the two colours in birds' eggs can be seen from the specific character of each of the two parts, the white and the yolk. The secretion (for the egg) is formed out of the blood
751 b ψοτοκεῖ [ξῶν]),¹ τὸ δ’ αἷμα ὅτι ἐστίν ὑλή τοῖς σώμασιν, ἐφηταὶ πολλάκις. τὸ μὲν οὖν ἐστὶν ἐγγύτερον αὐτοῦ τῆς μορφῆς τῶν [μορίων]² γινομένων, τὸ θερμόν. τὸ δὲ γεωδέστερον τὴν τοῦ σώματος παρέχεται σύστασιν καὶ πορρότερον ἐστιν. διόπερ
5 ὁσα δίχροα ἐστὶ τῶν ψῶν, τὴν μὲν ἀρχήν τὸ ξῦον λαμβάνει ἐκ τοῦ λευκοῦ τῆς γενέσεως (ἐν γὰρ τῷ θερμῷ ἡ ψυχική ἀρχή), τὴν δὲ τροφήν ἐκ τοῦ ωχροῦ. τοῖς μὲν οὖν τὴν φύσιν θερμότερος τῶν ψῶν διακέκριται χωρὶς ἐξ οὗ τε ἡ ἀρχὴ γίνεται καὶ εἰς οὗ τρέφεται, καὶ τὸ μὲν λευκόν ἐστι τὸ δ’
10 ωχρόν, καὶ πλέον ἄει τὸ λευκὸν καὶ καθαρὸν τοῦ ωχροῦ καὶ γεωδόνυς: τοῖς δ’ ἦττον θερμοῖς καὶ υγρότεροις τὸ ωχρόν πλέον καὶ υγρότερον. ὀπερ συμβαίνει ἐπὶ τῶν λυμαίων ὀρνέων. υγρότεροι γὰρ τὴν φύσιν καὶ ψυχρότεροι τῶν πεζευόντων εἰσών ὀρνέων, ὡστε καὶ τὰ ὶδα τῶν τουούτων πολλὴν ἔχει
15 τὴν καλομεῖνην λέκιθον καὶ ἦττον ωχρᾶν διὰ τὸ ἦττον ἀποκεκρίσθαι τὸ λευκὸν. τὰ δ’ ἦδη καὶ ψυχρά τὴν φύσιν τῶν ψωτοκούντων καὶ ἐπὶ υγρά μάλλον (τουούτοι δ’ ἐστὶ τὸ τῶν ἱχθύων γένος) οὔτ’ ἀποκεκριμένον ἔχει τὸ λευκὸν διὰ τε μικρότητα καὶ διὰ τὸ πλῆθος τοῦ ψυχροῦ καὶ γεωδούς.
20 διόπερ γίνεται μονόχροα πάντα τὰ τῶν ἱχθύων,

¹ secl. A.-W., Platt.
² om. Z.

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a The white; because hot substance has to do with Soul; see immediately below, and 762 a 18 ff. and P. A. 652 b 7 ff.

b See 744 b 32 ff. and note.

c For the two sorts of τροφὴ see 744 b 32 ff. Both yolk and white are now known to be nourishment; Harvey demonstrated the unreality of the distinction here made.—Aristotle of course knew nothing of the germinal area on the 278
[(no bloodless animal lays eggs)], the blood, as I have often stated, being the matter for animal organisms. One part of the egg, the hot part,\(^a\) is closer to the form of the developing creatures; the other, the more earthy part, supplies the wherewithal for building up the bodily frame and is further removed from the form.\(^b\) That is why in the case of all double-coloured eggs the young animal gets its "principle" of generation from the white, because hot substance is the place where the soul-principle is to be found, while it gets its nourishment from the yolk.\(^c\) With those animals, therefore, whose nature tends to be hotter than others we find there is a clear distinction between the part from which the "principle" is formed and the part from which the nourishment is derived: the one is white, the other yellow, and there is always more of the pure, white part than there is of the earthy, yellow part. With the animals that are less hot and more fluid, there is more yolk in the egg and it is more fluid. This occurs in the case of the marsh-birds, since they are more fluid and colder in their nature than the land-birds, so that the eggs of such birds contain a great deal of what is called yolk (\(\lambda\epsilon\kappa\theta\iota\ho\)) and it is less yellow, because the white is less distinctly separated from it. Pass on a further stage to those oviparous animals which are cold in their nature and also still more fluid (the fish tribe answers to this description), and in their eggs the white is not distinct at all; this is due to their small size and to the abundance of the cold and earthy matter. And that is why all fishes' eggs are single-yolk; and it was again Harvey who demonstrated that the "cicatricula" was the point of origin of the embryo, "the first Principle of the Egg."
καὶ ὥς μὲν ωχρὰ λευκά, ὡς δὲ λευκὰ ωχρά. τὰ
dε τῶν ὀρνέων καὶ τὰ ὑπηνέμα ἐχει ταῦτην τὴν
dιχροιαν, ἐχει γὰρ ἐξ οὐ ἐκάτερον ἔσται τῶν
μορίων, καὶ οἶδεν ἡ ἀρχὴ καὶ οἶδεν ἡ τροφὴ, ἀλλὰ
tαῦτ' ἀτελή καὶ προσδεόμενα τοῦ ἄρρενος· γίνεται
25 γὰρ τὰ ὑπηνέμα γόνιμα, ἕαν ἐν τίνι καιρῷ ὀχυρθῇ
ὑπὸ τοῦ ἄρρενος. οὐκ ἔστι δὲ τῆς διχροίας αὐτιῶν
tοῦ ἄρρεν καὶ τὸ θῆλυ, ὡς τοῦ μὲν λευκοῦ ὄντος
ἀπὸ τοῦ ἄρρενος, τοῦ δ' ωχροῦ ἀπὸ τοῦ θῆλεος·
ἀλλ' ἀμφοῦ γίνεται ἀπὸ τοῦ θῆλεος, ἀλλὰ τὸ μὲν
ψυχρόν τὸ δὲ θερμὸν· ἐν ὦσοι μὲν οὖν ἔστὶ πολὺ
tὸ θερμὸν, ἀποκρίνεται, ἐν ὦσοις δ' ὀλγοῦν, οὐ
30 δύναται· διὸ μονόχροα τὰ κυήματα, καθάπερ εἴρη-
tαι, τὰ τῶν τοιούτων. ἡ δὲ γονὴ συνύστησιν1 μόνον;
καὶ διὰ τούτο τὸ μὲν πρῶτον φαίνεται λευκὸν καὶ
μικρὸν τὸ κύμα ἐν τοῖς ὀρνίσι, προϊόν δὲ ωχρὸν
ἀπαν, συμμεγενούν ἀεὶ πλείονοι αἰματώδους·
tέλος δ' ἀποκρυμμένου τοῦ θερμοῦ κύκλῳ περι-
ϊσταται τὸ λευκὸν, ὡσπερ υγροῦ ζέοντος, ὀμοίως
πάντῃ· τὸ γάρ λευκὸν φύει μὲν υγρὸν, ἔχει δ' ἐν
αὐτῷ τὴν θερμότητα τῆς ψυχικῆν· διὸ κύκλῳ
ἀποκρίνεται, τὸ δ' ωχρὸν καὶ γεώδες ἐντός. κἂν
5 πολλὰ συνεράσας τις ὃ ἡς κύστιν ἢ τι τοιοῦτον
ἔβη πυρὶ μὴ2 θάττονα ποιοῦντι τὴν τοῦ θερμοῦ

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1 συνύστησιν Peck: συνέστησε vulg.: συνέστη δὲ S.
2 μὴ om. Z.

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*It is of course the hot substance which constitutes the white.*

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coloured—they are white, judged by the colour of ordinary yolk; yellow, judged by ordinary white. Not only the eggs but also the wind-eggs of birds have this double colouring, because they contain that out of which each of the two parts is to come (the part from which the “principle” arises and that from which the nourishment is derived), although they are imperfect, i.e., they lack the male factor; since, as we know, wind-eggs become fertile if they are impregnated by the male within a certain time. The cause of the double colouring is not the two different sexes (as if the white were derived from the male and the yolk from the female); both alike are derived from the female, and the real difference is that one is cold and the other hot. So then, in cases where a good deal of the hot constituent is present, the hot substance is separated from the cold; but if there is not much of it this cannot occur; and that is why the fetations of such animals are single-coloured, as I have said. All that the semen does is to “set” the fetations, and that is why in birds the fotation is small and white in appearance at first, but completely yellow as it advances and more bloodlike matter is continually being mixed in with it; finally, as the hot substance separates off, the white takes up its position around on the outside evenly in every direction, just as when a liquid boils. (I make this comparison), because the white (a) is in its nature liquid, and (b) contains in itself the soul-heat. Therefore it separates off (and arranges itself) all round (on the outside), while the yellow earthy part separates off within. Also, if anyone pours a number of eggs together into a bladder or some such receptacle and then boils them up by means of a fire which does not
κάνησιν ἡ τὴν ἐν τοῖς ψοίς διάκρισιν, ὡσπερ ἐν ἕνιōυ, ἀντίστοιοι ψόν, καὶ τὸ ἐκ πάντων τῶν ψόν σύστημα τὸ μὲν όξρον ἐν μέσῳ γίνεται, κύκλῳ δὲ τὸ λευκόν.

Διότι μὲν οὖν τὰ μὲν μονόχροα τὰ δὲ δίχροα τῶν ψόν, εἶρηται:

Αποκρίνεται δ’ ἐν τοῖς ψοίς ἡ τοῦ ἀρρενοῦ ἀρχὴ καθ’ ὅ προσπέφυκε τῇ υστέρᾳ τὸ ψόν, καὶ γίνεται δὴ ἀνόμοιον τὸ τῶν διχρῶν ψόν, καὶ οὐ πάμπαν στρογγύλου ἀλλ’ ἐπὶ θάτερα δρύτερον, διὰ τὸ διαφέρειν δεὶν3 τῷ λευκῷ ἐν ὧν ἦχει τὴν ἀρχήν. διότερον διαφέρειν ταύτη τῷ ψόν ἦ

καὶ διὰ τοῦτο ἐξέρχεται υστέρον τοῦ ψοί τὸ δεῦ’ τὸ γάρ προσπέφυκός υστέρον ἐξέρχεται, κατὰ τὴν ἀρχήν δὲ προσπέφυκεν, ἐν τῷ οὔσεῖ δ’ ἡ ἀρχή. τῶν αὐτῶν δ’ ἦχει τρόπον καὶ ἐν τοῖς τῶν φυτῶν σπέρμασιν προσπέφυκε γὰρ ἡ ἀρχή τοῦ σπέρματος τὰ μὲν ἐν τοῖς κλάδοις, τὰ δ’ ἐν τοῖς κελύφεσι, τὰ δ’ ἐν τοῖς περικαρπίοις. δῆλον δ’ ἐπὶ τῶν χεδροπών γὰρ συνήπται τὸ διθυρὸν τῶν κυάμων καὶ τῶν τουούτων σπερμάτων, ταύτῃ προσπέφυκεν ἡ δ’ ἀρχή ενταῦθα τοῦ σπέρματος.

Απορρήσειε δ’ ἂν τὶς περὶ τῆς αὐξήσεως τῶν ψόν, τίνα τρόπον ἐκ τῆς υστέρας συμβαίνει. τὰ μὲν γὰρ ζώα διὰ τοῦ ὀμφαλοῦ λαμβάνει τὴν τρο-

1 <οὔτω> Rackham. 2 deίν del SY. 3 <τῦ> Peck.

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a Cf. H.A. 560 a 30 ff.
b Cf. 767 b 17 ff. et passim.
c That is, the “big” end, which is the first to leave the hen when laid. Platt remarks that Aristotle must have been a “little-endian,” for the germ always floats up to the top whichever way the egg is placed.

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cause the movement of the heat to be faster than the separation in the eggs, the yolk settles in the middle and the white round the outside of it; i.e., the same happens with the conglomerated mass composed of all those eggs as with one single egg.

We have now stated why some eggs are single-coloured and others double-coloured.

In eggs the place where the "principle" derived from the male becomes separate and distinct is the point where the egg is attached to the uterus, and that gives us the reason why the shape of double-coloured eggs is unsymmetrical, i.e., not perfectly round but more pointed at one end; the reason is that that part of the white in which the principle is situated must be different. And that is why the egg-shell is harder at that place than it is at the bottom: the "principle" has to be protected and safeguarded. That also is why the pointed end of the egg comes out last: for of course the part that comes out last is the part that is fastened, which is the part where the "principle" is, which is the pointed end. The same arrangement obtains in the seeds of plants. In some plants the "principle" of the seed is fastened on to the twig, in others on to the husk, in others on to the pericarp. This is clear in the leguminous plants. The seeds of beans and plants of that sort are fastened on at the point where the two cotyledons are joined; and that is where the "principle" of the seed is.

A puzzle may be raised about how eggs grow—how, it may be asked, do they derive their growth from the uterus? Animals, of course, obtain their nourishment through the umbilical cord; but by
phi'n, ta' d' pha di'a tinos; epeidh'iper oux woster oi skoulhkes auta di' auton lamba'nei tyn a'xhswn. e'i d' este ti di' ou prospafukhe, touto poi trepetai teleolwenteis; ou gar suvez'erchetai, kathaper o'

30 omfalos tois z'wous1 gingetai gar to peri' d'osttrakov teleolwenteis. to mewn ou oirh'menon orh'was zhtetai: lanhanei d' oti to ginomeon d'osttrakon to prwton malakos umh'n estin, alla teleolwenteis gingetai skleron kai kradron, ou'tou symeretrous o'st' e'x-
erchetai me'n esti malakon (p'ouon gar an pareixe

35 ti'to'menon), e'xelthon d' eu' bios thegnwsai psch'bein, suvezatimw'ontos tov u'gro' tachy d' olugr'tta, leipomenede to yew'dous. toutou dhi ti tov umenos kat' ar'has omfaloudes esti kata to og', kai apekei esti mikron o'twn oion avlos. fanevon d' estin ev tois ekbol'mois ton mikro'n o'mon. e'v

5 gar brexh'hi' all'ouw pie' wigwsasa ek'bali' h' ornis, esti a'imatodeis te fa'wetai to k'd'ma kai '
hon di' eaxtoo' stolon mikron omfalodh'. mei-
zonos de' ginomeon perite'wetai2 m'allon ou'tos kai elap'town gingetai. teleolwenteis de' to og' tov o'mou touto sy'mbainei to peras. upo de' touto o' entos

10 umh'n, de' orizei to leu'kon kai to og'ron apo toy-
tou. teleolwenteis d' apolwetai o'lon to og'non, kai

1 fortasse z'wotokou'menous vel z'wotokoi scrundum.
2 pera'netai' Z. pro kai elap'town . . . peras et efficieuntur iva citrina, et maxime arup complementum. et eum complementur accidit ut sit emissio Sigma.

a See 732 a 32 and note there. Cf. also 758 b 13 ff.
b i.e., the young of viviparous animals. Perhaps we should read "<the young of viviparous> animals."
c This is a reference to the chalazae, the function and development of which are obscure.
what means do eggs get theirs? (The possibility
that they are themselves their own means of growth,
as larvae are, a may be ruled out.) If there is some-
thing by means of which the egg is fastened on, what
happens to it when the egg has reached its perfec-
tion? It does not come out along with the egg, as
the umbilical cord does in the case of animals, b
because when the egg has reached perfection, the
shell is formed which envelops it. Well, this is a
question which it is quite right to ask; but those who
ask it fail to notice that the shell as it forms is at first
a soft membrane, and that it is only when the egg
has been perfected that it becomes hard and brittle;
and this adjustment is so well timed that it is still soft
when it leaves the bird (otherwise it would be painful
to lay), but as soon as it has left the bird it cools, and
that makes it set hard, for the fluid part quickly
evaporates, being very small in quantity, while the
earthy part remains behind. Now at the outset a
portion of this membrane, at the pointed end of an
egg, is like an umbilical cord, and while the egg is
still small, it sticks out like a pipe. It can be clearly
seen in small, aborted eggs: if the hen is drenched
(with cold water) or chilled in some other way and
so drops (the fetation) before its time, the fetation
still has a blood-like appearance and has a small
tail, c like an umbilical cord, running through it; as
the fetation gets larger, this tail gets twisted round
more and becomes smaller; when (the fetation) has
reached its complete development, this terminus
finishes up as the pointed end of the egg. Under-
neath this is the inner membrane, which acts as a
boundary between it on the one side and the white
and the yolk on the other. When the development
οὐ φαίνεται εὐλόγως ὁ ὀμφαλός· αὐτοῦ γὰρ ἐστὶν τοῦ ἔσχατον τὸ ἀκρον.

'Ἡ δ' ἔξοδος τοῦναντίον γίνεται τοῖς ψωίς ἡ τοῖς ζωοτοκουμένοις· τοῖς μὲν γὰρ ἔπι κεφαλῆν καὶ τὴν ἀρχήν, τῷ δ' ψώ γίνεται ἡ ἔξοδος οἰον ἐπὶ πόδας. 15 τούτου δ' αὐτίνον τὸ εἰρημένον, ὅτι προσπέφυκε κατὰ τὴν ἀρχήν.

'Ἡ δὲ γένεσις ἐκ τοῦ ψώ εὐμβαίνει τοῖς ὀρνισιν ἐπωφαζοῦσης καὶ συμπεπτούσης τῆς ὀρνιθος, ἀποκρινομένου μὲν τοῦ ψώου ἐκ μέρους τοῦ ψώ, τὴν δ' αὐξήσαν λαμβάνοντος καὶ τελειομένου ἐκ τοῦ λοιποῦ μέρους, ἡ γὰρ φύσις ἀμα τὴν τε τοῦ ψώου 20 ὑλὴν ἐν τῷ ψώ τίθησι καὶ τὴν ἰκανὴν τροφήν πρὸς τὴν αὐξήσιν· ἐπεὶ γὰρ οὐ δύναται τελεοῦν ἐν αὐτῇ ἡ ἀρνις, συνεκτίκτει τὴν τροφὴν ἐν τῷ ψώ. τοῖς μὲν γὰρ ζωοτοκουμένοις ἐν ἀλλῳ μορίῳ γίνεται ἡ τροφῆ, τὸ καλούμενον γάλα, ἐν τοῖς μαστοῖς· τοῖς δ' ὀρνισι τοῦτο ποιεῖ ἡ φύσις ἐν τοῖς ψώις, τοῦτον 25 ναυτίον μέντοι ἡ οὖ τε ἀνθρώπου οἷονται καὶ Ἀλκμαίων φησίν ὁ Κροτωνιάτης· οὐ γὰρ τὸ λευκὸν ἐστὶ γάλα, ἀλλὰ τὸ ωχρόν· τοῦτο γὰρ ἐστὶν ἡ τροφὴ τοῖς νεοττοῖς· οἱ δ' οὗνται τὸ λευκὸν διὰ τὴν ὀμουσίητα τοῦ χρώματος. 30 Γίνεται μὲν οὖν ἐπωφαζοῦσης, καθάπερ εἰρημέναι, τῆς ὀρνιθος ὁ νεοττός· οὐ μὴν ἀλλὰ κἂν ἡ ἡμέρα

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a The heart.  
b See 744 b 32 ff.  
c See pp. xvii. f.  
d See 751 b 7, n.
of the fætation is complete, the whole egg is released, and, as we should expect, nothing is to be seen of the umbilical cord, because it is the tip of the extreme end of the egg.

Eggs and the young of viviparous animals come out facing opposite ways; the latter come out with the head and the "principle" first; the egg comes out as it were feet first. And the reason I have stated: it is because the egg is fastened at the point where the "principle" is.

The formation of birds out of the egg is effected by Incubation. The mother's sitting on the eggs and helping to concoct them. One part of the egg yields the substance out of which the animal is constituted, the remaining part provides the substance whereby it grows and is perfected; Nature puts both in the egg — the material for making the animal, and sufficient nourishment for its growth, since the hen cannot bring the young to perfection within herself, and therefore when she lays an egg she lays the creature's nourishment in it as well. The nourishment for the young of viviparous animals, what we call milk, is formed in the breasts, a different part of the body altogether; but for birds Nature provides this inside their eggs. The truth about it, however, is the reverse of what is commonly supposed and what is asserted by Alcmeon of Crotona. It is not the white of the egg that is the milk, but the yolk, because it is the yolk that is the nourishment for the chicks. These people suppose that the white is, owing to the similarity of colour.

The formation of the chick, then, as I have said, is effected by the mother-bird's sitting upon the egg; notwithstanding, if the climate is well-tempered or
ARISTOTLE

752 b

753 a

Τὸν αυτὸν δὲ τρόπον γίνεται τὰ τῶν ὀρνίθων ὡς καὶ τὰ τῶν ζῴων τῶν τετραπόδων καὶ γὰρ σκληρόδερμα καὶ δίχροα, καὶ πρὸς τῷ διαζώματι συνίσταται καθάπερ καὶ τὰ τῶν ὀρνίθων, καὶ ταλλὰ ταύτα πάντα συμβαίνει καὶ ἑντὸς καὶ ἐκτὸς, ὡστε τὸν τεκεῖν μόνον, τοῖς δὲ καὶ περὶ τὴν τελέωσιν, ὡσα δὲ φρονιμῶτερα, καὶ περὶ τὴν ἐκτροφήν. τοῖς δὲ ἡδὴ μάλιστα κοινωνοῦσι φρονήσεως καὶ πρὸς τελεωθέντα γίνεται συνήθεια καὶ φιλία, καθάπερ τοῖς τε ἀνθρώποις καὶ τῶν τετραπόδων ἐνίοις, τοῖς δὲ ὀρνισὶ μέχρι τοῦ γεννῆσαι καὶ ἐκ-15 θρέψαι. διὸπερ καὶ μὴ ἐπωάζουσι αἱ θηλείαι, ὅταν

1 τῶν ΠΖ: τὴν τῶν vulgar. 2 δὲ ἡδὴ Ζ: δὲ δὴ vulgar.

a Cf. H.A. 559 a 1 ff., where “non-fliers” such as partridges and quails are said to “lay their eggs on the ground and to cover them over.” Another “non-flier,” the ostrich, was believed by the author of Job (xxxix. 14) to behave in a 288
the situation where they happen to be is sunny, the eggs of birds as well as of oviparous quadrupeds get fully concocted without incubation (for all these quadrupeds lay their eggs on the ground, and they get concocted by the heat in the earth; any oviparous quadrupeds which visit their eggs and sit on them do so rather for the sake of protecting them than for any other reason).

The eggs of quadrupeds are formed in the same way as birds’ eggs. They are hard-shelled, and double-coloured, take shape up towards the diaphragm (as birds’ eggs do), and present the same features in every other respect both externally and internally; so that studying the cause of any of them is the same as studying the cause of them all. Only, whereas the eggs of quadrupeds, being so strong, get fully concocted by the agency of the climate, birds’ eggs, being more fragile, need the mother-bird. It looks as though Nature herself desires to provide that there shall be a feeling of attention and care for the young offspring. In the inferior animals this feeling which she implants lasts only until the moment of birth; in others, until the offspring reaches its perfect development; and in those that have more intelligence, until its upbringing is completed. Those which are endowed with most intelligence show intimacy and attachment towards their offspring even after they have reached their perfect development (human beings and some of the quadrupeds are examples of this); birds show it until they have produced their chicks and brought them up; and on this account hen birds which have laid eggs but omit similar way: “she leaveth her eggs on the earth, and warmeth them in the dust” (R.V.).
ARISTOTLE

753 a  
tékwos, diatíthentai χειρον, ὡσπερ ἕνος τινος στερισκόμεναι τῶν συμφύτων.

Τελεούτα τι ἐν τοῖς ψωίς τὰ ξαφα θάττουν ἐν ταῖς ἀλεειναις ἡμέραις· συνεργάζεται γὰρ ἡ ὀρα· καὶ γὰρ ἡ πέφις θερμότης τίς ἐστιν. ἢ τε γὰρ γῆ
20 συμπέπτει τῇ θερμότητι, καὶ ἡ ἐπιφάλουσα ταύτῳ τούτῳ ὀδρὶ προσεγχεῖ γὰρ τὸ ἐν αὐτῇ θερμόν. καὶ διαφθείρεται δὲ τὰ φῶς καὶ γίνεται τὰ καλούμενα οὐριά μᾶλλον κατὰ τὴν θερμήν ὄραν εὐλόγωσι· ὡσπερ γὰρ καὶ οἱ οἴνοι ἐν ταῖς ἀλέαις ἐξύνονται ἀνατρεπομένης τῆς ἔλυσος (τούτῳ γὰρ αὐτοῖς τῆς 25 διαφθορᾶς), καὶ ἐν τοῖς ψωίς ἡ λεκίθος· τούτῳ γὰρ ἐν ἀμφιτέρῳ τὸ γεώδες, διὸ καὶ ἀναβολοῦται οἱ οἶνοι μεγνυμένης τῆς ἔλυσος, καὶ τὰ διαφθειρόμενα ὀφαὶ τῆς λεκίθου.

Τοῖς μὲν οὖν πολυτόκοις συμβαίνει τὸ τουτοῦτον εὐλόγωσ (οὗ γὰρ ράδιον τήν ἀμφότερον πᾶσιν ἀποδιδόναι θερμασίαν, ἀλλά τοῖς μὲν ἐλλείπειν τοῖς
30 δὲ πλεονάζειν, καὶ ἀναβολοῦν οἶνον σήπουσαν), τοῖς δὲ γαμμαίνουσιν ὀλιγοτόκοις οὕσων οὔδεν ἔδωκεν ήττον συμβαίνει τούτῳ· πολλάκις μὲν γὰρ καὶ τοῖν ἄδειν θάτερον οὐριον γίνεται, τὸ δὲ τρίτον ὡς εἶπεν ἄει· θερμὰ γὰρ ὄντα τὴν φύσιν οἶνον ὑπερζεύει ποιεῖ τήν
35 ψυστῆτα τὴν ἐν τοῖς ψωίς. ἔχει γὰρ δὴ καὶ τὴν φύσιν ἐναντίαν τὸ τε ὀχρὸν καὶ τὸ λευκὸν. τὸ μὲν γὰρ ὀχρὸν ἐν τοῖς πάγοις πῆγανται, θερμαίνομενον δὲ ψυστῆται· διὸ καὶ συμπεττόμενον ἐν τῇ

1 θερμότητος coni. A.-W. 22 2 δοξολογισθείσα SY.

According to H.A. 560 a 5 ff., ouria is a name given to wind-eggs produced chiefly in summer, zephyria (see 749 b 1) to those produced in spring. 6 Cf. 735 a 34 ff.

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to sit on them, deteriorate in their condition, as though they were being deprived of one of their natural endowments.

Animals reach their perfect development in the eggs quicker when the days are sunny, for then the climate takes a share in the work, concoction being a form of heat: the earth helps in concocting them with its heat, and the sitting bird does exactly the same—she infuses her own heat into them as well. Eggs get spoilt and ouria (as they are called) are produced in the hot season more often than at any other, as is to be expected. In hot, sunny weather wines turn sour because the sediment gets stirred up—this is what is really responsible for their being spoilt—and the same happens with the yolk in eggs. Sediment and yolk are the earthy part in each respectively, and as a result of this earthiness wine becomes turbid when the sediment mixes up with it, and these spoilt eggs also become turbid when the yolk does the same.

It is only to be expected that this should happen in the case of prolific animals, because it is not easy to provide all the eggs with their proper amount of heat; some will get too little, and some too much; and too much heat will make them turbid, by causing them to putrefy, as it were. Nevertheless, the same thing occurs with the crook-taloned birds, although they lay but few eggs; out of two eggs, one will often turn rotten (ourion), and pretty well always one out of three. They are hot in their nature, and they cause the fluid in the eggs as it were to boil over. The yolk and the white, of course, are of an opposite nature to each other. Yolk congeals in frosty weather, and becomes fluid when heated; hence it
Aristotle’s observation that the yolk liquefies is quite correct. The white loses water, partly by evaporation through the shell, and partly to the growing embryo via the yolk-sac and the yolk.

Perhaps this should be emended to read “when it is

1 secl. Platt, sed fortasse sanandum: et propter hoc fit molle (μαλακόν scribendum pro μάλλον?) quando calefit. cum ergo acciderit ei humiditas ex superfluitate humiditatum corruppetur Σ.

2 peri codd.*: om. Bekker.
becomes fluid when it is concocted in the earth or by means of incubation, and in that condition it becomes nourishment for the animals that are taking shape. When subjected to fire, or roasted, it does not become hard, because it is by its nature earthy in the same way that wax is; and that is the reason why, when eggs are overheated, [unless they are from a liquid residue] they become serous, and turn rotten (ouria). The white, on the other hand, does not congeal as a result of frost, but tends rather to become fluid (I have given the reason earlier); and when subjected to fire, it becomes solid. This is why, when it is concocted in connexion with the generation of the young animals, it thickens; for it is the white out of which the animal forms and develops, while the yolk becomes nourishment for it, and is the source from which the parts as they are formed at the various stages derive their growth. That, too, is why the yolk and the white are kept distinct and separate from each other by membranes, as having a different nature from each other. For an exact account of how these stand to one another both at the beginning of the process of generation and during the process of the young animals' formation, also for an account of the membranes and umbilical cords, what is written in the Researches should be studied; for our present inquiry it is sufficient that thus much should be clear, viz., that once the heart has been formed (this comes first of all) and the Great Blood-vessel has been marked off from it, two umbilical cords extend from heated, it becomes soft; and so when it is subjected to fluid, it turns rotten owing to the excess of fluidity (cf. 753 a 34, above).

* H.A. 561 a 3—562 b 2; but the description there is no fuller.
τῆς φλεβὸς τείνουσιν, ὁ μὲν εἰς τὸν ὑμένα τὸν περιέχοντα τὸ ὕχρον, ὁ δὲ ἐτεροσ εἰς τὸν ὑμένα τὸν χοροεἰδῆ, ὁ δὲ κύκλῳ περιέχει τὸ ἐκ τοῦ ὕχρου τροφήν, διὰ μὲν οὖν θατέρου λαμβάνει τὴν ἕκ τοῦ ὕχρου τροφήν, 25 τὸ δὲ ὕχρον γίνεται πλέον· ὑγρότερον γὰρ γίνεται θερμαίνόμενον, δει γὰρ τὴν τροφήν σωματώδη οὕσαν ὑγράν εἶναι καθάπερ τοὺς φυτοὺς, ζῇ δὲ τὸ πρῶτον καὶ τὰ ἐν τοῖς φῶς γιγνόμενα καὶ τὰ ἐν τοῖς ζῷοις φυτοῦ βίον· τοῖς περικέναι γὰρ ἐκ τινὸς λαμβάνει τὴν πρώτην αὐξήσων καὶ τροφήν. ὁ δὲ

30 ἐτεροσ ὀμφαλὸς τείνει εἰς τὸ περιέχον χόριον. δει γὰρ ὑπολαβεῖν τὰ φωτοκούμενα τῶν ζῴων πρὸς μὲν τὸ ὕχρον ὀντὸς ἔχειν [τὸν νεοτὸν] ὄσπερ πρὸς τὴν μητέρα τὰ ζωοκούμενα ἐμβρυα, ὅταν ἐν τῇ μητρὶ ᾐ, ἐπεὶ γὰρ οὐκ ἐκτρέφονται γε ἐν τῇ μητρὶ τὰ φωτοκούμενα, ἐκλαμβάνει τὸ μέρος 35 αὐτῆς· πρὸς δὲ τὸν ἐξωτάτω ὑμένα τὸν αἰματώδη ὃς πρὸς τὴν υστέραν. ἀμα δὲ περὶ τὸ ὕχρον καὶ τὸ χόριον τὸ ἀνάλογον τῇ υστέρα τὸ ὀστρακον τοῦ ψοῦ περιστέφικεν, ὄσπερ ἄν εἰ τὶς περιθείη περὶ τὸ ἐμβρυον αὐτὸ καὶ περὶ τὴν μητέρα ὀλην. ἔχει δὲ οὔτως, διότι δεῖ τὸ ἐμβρυον ἐν τῇ υστέρᾳ 5 εἶναι καὶ πρὸς τῇ μητρὶ. ἐν μὲν οὖν τοῖς ζωο- 

τοκουμένοις ἡ υστέρα ἐν τῇ μητρὶ ἐστιν, ἐν δὲ τοῖς

1 χοροεἰδῆ vulg. 2 seclusit Sus.

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1 Aristotle's two umbilical cords here are (1) the yolk-sac stalk and (2) the allantois. See figure, p. 369.
2 See above, 753 b 2, n.
3 Cf. Harvey, "An egge is, as it were, an exposed womb; wherein there is a substance concluded, as the Representative and Substitute or Vicar of the breasts."

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this blood-vessel, one to the membrane which surrounds the yolk, the other to the chorion-like membrane which surrounds the animal on all sides; this one goes round inside the membrane of the shell. Through one of these cords the embryo receives the nourishment from the yolk; and the yolk increases in bulk, becoming more fluid as it is heated, since the nourishment, being corporeal, must be available in fluid form, just as it must for plants, and the embryos that are in process of formation, either within the egg or within the uterus, are to begin with living the life of a plant, since their first growth and nourishment they obtain through being fastened on to something. The other umbilical cord extends to the chorion which surrounds the embryo. In the case of the animals that are produced oviparously, we should think of them (a) as having the same relationship to the yolk as the viviparously formed embryos have to the mother, so long as they are within the mother; for since the nourishment of the oviparously formed embryos is not completed within the mother, when they leave her they take a part of her out with them; (b) as having the same relationship to the outermost—the blood-like—membrane as the other embryos have to the uterus. Also, the eggshell which encloses the yolk and the chorion gives the egg an envelope analogous to the uterus: it is as though you were to envelop both a viviparously produced embryo itself and its mother entire. The reason why this is so is that the embryo must be in the uterus, i.e., in contact with the mother. Very well then: in the case of the viviparously produced animals, the uterus is in the mother; but with the oviparously produced ones
ARISTOTLE

754 a

φωτοκομένοις ἀνάπαλν, ἃσπερ ἃν εἰ τις ἐποιεῖ τὴν μητέρα ἐν τῇ υστέρα εἶναι· τὸ γὰρ ἀπὸ τῆς μητρὸς γινόμενον [ἡ τροφή] 1 τὸ ωχρὸν ἐστίν. αὐτίον δ’ ὅτι ἡ ἐκτροφή οὐκ ἐν τῇ μητρὶ ἐστίν.

10 Αὐξανομένων δὲ πρότερον ὁ ὀμφαλὸς συμπίπτει ὁ πρός τὸ χόριον, διότι ταύτη δεῖ τὸ ζώον ἐξελθεῖν, τὸ δὲ λοιπὸν τοῦ ωχροῦ καὶ ὁ ὀμφαλὸς ὁ εἰς τὸ ωχρὸν υστέρον· δεῖ γὰρ ἐχεῖν τροφὴν εὐθὺς τὸ γενόμενον· οὐτε γὰρ ἀπὸ τῆς μητρὸς τυθεῖται, δι’ αὐτοῦ τε οὐκ εὐθὺς δύναται πορίζεσθαι τὴν τροφῆν· διόπερ ἐντὸς εἰσέρχεται τὸ ωχρὸν μετὰ τοῦ ὀμφαλοῦ, καὶ περιφύεται ἡ σάρξ.

Τὰ μὲν οὖν ἐκ τῶν τελείων ὃν γινόμενα θύραζε τοῦτον γίγνεται τὸν τρόπον ἐπὶ τε τῶν ὀρνίθων καὶ τῶν τετραπόδων, ὅσα φωτοκεῖ τὸ ωφὸν τὸ σκληροδέρμου. διάδηλα δὲ ταύτα μᾶλλον ἐπὶ τῶν μειζόνων· ἐν γὰρ τοῖς ἐλάττωσιν ἁφανῇ διὰ μι-

20 κρότητα τῶν ὄγκων ἐστίν.

11 "Ετι δ’ ἐστὶν φωτόκον τὸ τῶν ἰχθύων γένος.

Τούτων δὲ τὰ μὲν ἤχουντα κάτω τὴν υστέραν αὔτες ωὸν τίκτει διὰ τὴν πρότερον εἰρημένην αἰτίαν, τὰ δὲ καλούμενα σελάχη τῶν ἰχθύων ἐν 25 αὐτοῖς μὲν φωτοκεῖ τέλειον ωὸν ἔξω δὲ ἰχθυκεῖ, πλὴν ἔνος δὲν καλοῦσι βάτραχον· οὕτος δ’ φωτοκεῖ θύραζε τέλειον ωὸν μόνος. αἰτία δ’ ἡ τοῦ σώματος φύσις· τὴν τε γὰρ κεφαλὴν πολλαπλασίαν ἔχει τοῦ λοιποῦ σώματος, καὶ ταύτην ἀκανθώδῃ καὶ σφόδρα

1 seclusit Sus.

a See 718 b 23.

b Lophius piscatorius does not conform to the habits of the Selachians because it is not in fact a Selachian; Aristotle wrongly includes it among them.

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it is the other way round—the mother is in the uterus, as you might say, because in this case that which comes from the mother [the nourishment] is the yolk. The reason is that the embryo's period of nourishment does not reach completion within the mother.

As the embryos grow, the first of the umbilical cords to collapse is the one which connects to the chorion, because that is the point at which the young animal will have to make its way out; the rest of the yolk and the cord which connects to it collapse later, because the young animal must have nourishment immediately it is hatched, as it is neither nursed by its mother nor able immediately to get nourishment by means of itself. That is why the yolk goes inside it together with the umbilical cord and the flesh grows round it.

Such is the manner in which animals which are brought to birth out of perfect eggs are produced in the case of those birds and fishes which lay a hard-shelled egg. The points mentioned are to be seen more clearly in the larger animals; in the smaller ones they are not so obvious owing to the small bulk of the animals.

Another member of the Ovipara is the tribe of III fishes.

Those fishes whose uterus is low down lay an imperfect egg. The cause of this I have stated previously. The Selachian fishes as they are called produce a perfect egg internally though they are externally viviparous, except for one which they call the fishing-frog; this is the only one that lays a perfect egg externally. The cause of this is the nature of its body. Its head is several times as large as the rest of its body, and, besides that, spiny and extremely
τραχείαν: ώστε\(^1\) διότερο οὖδ’ ύστερον εἰσδέχεται τοὺς νεοττοὺς, οὖδ’ ἐξ ἀρχῆς ἥτοικει· τὸ γὰρ μέγεθος καὶ ἡ τραχύτης τῆς κεφαλῆς ᾧστερ καὶ εἰσελθεῖν κωλύει, οὕτω καὶ ἐξελθεῖν. ἐπεὶ δὲ μαλακοδερμὸν ἐστὶ τὸ ὅνω τὸ τῶν σελαχῶν (οὐ γὰρ δύνανται σκληρύνειν καὶ ἔηραινει\(^2\) τὸ πέριξ· ψυχροτεροί γὰρ τῶν ὀρνίθων εἰσίν), τὸ τῶν βατράχων ὅνω μόνον στερεῶν ἐστὶ καὶ στιφρῶν πρὸς τὴν ἔξω 35 σωτηρίαν, τὰ δὲ τῶν ἄλλων ύγρὰ καὶ μαλακά τὴν φύσιν· σκεπάζεται γὰρ ἐντὸς τῷ σώματι τῷ τῆς ἔχουσης.

'Ἡ δὲ γένεσις ἐκ τοῦ ψοῦ τοῖς τε βατράχοις ἐξω τελειουμένοις καὶ τοῖς ἐντὸς ἡ αὐτή, τούτοις δὲ καὶ τοῖς τῶν ὀρνίθων τῇ μὲν ὀμοίᾳ τῇ δὲ διάφορος 5 ἐστιν. πρῶτον μὲν γὰρ οὐκ ἔχουσι τὸν ἐτερον ὀμφαλόν τὸν εἰς τὸ χώριον τείνοντα, ὁ ἐστιν ὑπὸ τὸ περιέχου ὀστρακόν, τοῦτον δ’ αἰτίον ὃτι τὸ πέριξ ὀστρακόν οὐκ ἔχουσι· οὐδὲν γὰρ αὐτοῖς χρήσιμον· σκεπάζει γὰρ ἡ μῆτηρ, τὸ δ’ ὀστρακόν ἐστὶ τοῖς ἔκτικτομένοις ψοῖς ἀλεωρὰ πρὸς τὰς θύραθεν βλάβας. ἐπειθ’ ἡ γένεσις ἐξ ᾧκρου μὲν ἐστὶ τοῦ 10 ψοῦ καὶ τούτοις, ἀλλ’ οὐχ ἢ προσπέφυκε πρὸς τὴν ὕστεραν· οἱ γὰρ ὀρνίθες ἐκ τοῦ ὀξέος γίνονται, ταύτῃ. δ’ ἢν ἡ τοῦ ψοῦ πρόσφυσις. αἰτίον δ’ ὅτι τὸ μὲν τῶν ὀρνίθων χωρίζεται τῆς ὑστέρας, τῶν δὲ τοιούτων οὐ πάντων ἀλλὰ τῶν πλείστων πρὸς τῇ

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\(^1\) ώστε PZ: om. vulg.

\(^2\) καὶ ἔηραινει PZΣ: om. vulg.

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\(^a\) In several of the Selachia the young have the habit of swimming into the mouth of the parent for shelter. This
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rough; so that the reason why it does not take its young ones in afterwards is also the reason why it does not produce them alive at the outset: just as the size and roughness of its head prevents them from going in, so also it prevents them from coming out. Since, then, the egg of the Selachia has a soft shell (because they cannot make the envelope hard and solid, being colder creatures than birds are), the egg of the fishing-frog is the only one that is hard and stout, so as to keep it safe in the outside world; the others' eggs are liquid and soft in nature, because they are inside the mother and get their shelter from her body.

The process of generation out of the egg is the same both for the fishing-frogs, which are perfected externally, and for those Selachia which are perfected internally; and as between the latter and the birds, it is partly similar, partly dissimilar. First of all, they lack the second umbilical cord which extends to the chorion under the surrounding shell, and the reason for this is that they have not got this shell round them, as it is no use to them, their shelter being provided by the mother; whereas for eggs that are laid externally the shell is there to act as a protection against injury from without. Secondly, with these, as with birds, the process of generation originates from the extremity of the egg, though not at the place where it is attached to the uterus. A bird's development begins from the pointed end, which is the place where the egg was attached, the reason being that a bird's egg becomes separated from the uterus, whereas the eggs of most, though not all, may be the foundation of this remark; cf. also H.A. 565 b 24 ff.
Ἀριστοτέλειον τὸ ἠθέλον ἤπειρον 〈δ’ν〉. Ἡ ἐπὶ 15 ἀκρωθὲν ἀναδιάλεικται ἐπὶ τῶν ὁρνίθων καὶ τῶν ἄλλων ἠθέλον ἵνα προσπέφυκέ τινί ἠθέλον· ὡς ἔλεγεν καὶ ὡς τῶν ὁρνίθων, καὶ τελος πρὸς τὴν ἠθέλον· ὡς ἔλεγεν καὶ ὡς τὰ ὀμφαλὸν ἠθέλον προσπέφυκέ τῶν ἥδη τελείων.

20 Ἀποφήσεις ἐμ’ ὁμ’ ὑμῖν πιθανὸν καὶ ὑμῖν εἰδοὺς κατὰ τοῦτο καὶ τοὺς ἱχθύσιν. αὕτινα δ’ ὅτι τὰ μὲν τῶν ὁρνίθων ἀπειρωθέντα προσπέφυκέ τοῖς ἔργοις καὶ τὸ ὕστερον, τὰ δὲ τῶν ἱχθύων μονόχρωμα, καὶ πάντῃ μεμικευμένον τὸ τοιοῦτον, ὥστε οὕθεν κωλύει ἐξ ἐναντίας ἔχει τὴν ἀρχήν. οὐ γὰρ 25 μόνον κατὰ τὴν προσφυσιν ἐστὶ τοιοῦτον ἀλλὰ καὶ καταντικρύ, τὴν δὲ τροφήν ράδιον ἐλκευν ἐκ τῆς ἡσύχασε τοῖς τισὶν ἀπὸ ταύτης τῆς ἀρχῆς. δῆλον δ’ ἐπ’ τῶν μὴ ἀπολυμένων ὁμοίων ἐν  ἐν ἐν τὸν σελαχῶν οὐκ ἀπολύεται τῆς ἡσύχασε τὸ ὕστερον, ἀλλ’ ἐχόμενον μεταχωρεῖ κατὰ πρὸς τὴν 30 ἡσύχασε, ἐν ὁμ’ τελεωθέν τὸ ἠθέλον ἠθέλον πρὸς τὸν ὁμφαλὸν ἐκ τῆς ἡσύχασε ἀνηλικυμένον τοῦ ὕστερον. φανερὸν οὖν ὅτι καὶ πρότερον ἐτείνον οὐκ ὅροι

1 〈δ’ν〉 coni. Platt.
2 〈ὁμοίων〉 Peck; cf. infra v. 27 ubi ὁμοίων om. Z.
3 ράδιων Y, leviter Σ: ράδιον vulg.
4 ἐν om. Z.

a As in the "smooth dogfish"; see note on 754 b 34, below.
b Excluding, of course, the statement immediately pre-
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fishes of this class remain attached to the uterus even when they are perfect. As the young animal develops at the extremity, the egg gets used up (just as in the case of birds and the other eggs that have been released from the uterus), and at the final stage, by which the animal has reached its perfect development, the umbilical cord remains attached to the uterus. The like holds good in the case of those Selachia whose eggs have been released from the uterus, there being some whose egg is released as soon as it is perfected.

In view of what has been said, the puzzle may be raised why the processes of generation in birds and fishes differ in this respect. The reason is that in birds' eggs the white and the yolk are separate, whereas fishes' eggs are single-coloured, the contents being mixed up together throughout, so that there is nothing to prevent the "principle" in them being at the opposite end; the egg is of similar composition both at the end where it is fastened and at the opposite end, and it is easy for it to draw the nourishment out of the uterus by means of passages which lead from this principle. This can clearly be seen in those eggs which do not get released, for in the case of some of the Selachia the egg does not get released from the uterus, but remains connected as it proceeds downwards to produce the young alive. In these cases, the young animal, after it has reached its perfect development, retains its umbilical cord joined to the uterus when the egg has been consumed. Thus it is plain that during the earlier stages also, while the embryo develops at the extremity. He means the embryo develops at the extremity. The process is similar ("like"), not identical.

\[\text{Differences as between Birds and Selachia.}\]

That of the "fishing-frog; but see 754 a 26, n."
The remarkable description of the placentoid structure in the embryo of this species will be found in *H.A.* 565 b 2 ff. The structure is similar both in form and function to the placenta of a mammal, although its origin is not the same. It was rediscovered by Johannes.
the creature was still enveloped in the egg, the passages extended to the uterus. This occurs, as we have said, in the smooth dogfish.\(^a\)

I have now mentioned the respects in which the process of generation of fishes differs from that of birds, and also the causes thereof. Otherwise, they both follow the same course. The fishes have one of the two umbilical cords, just as the birds have (in birds it connects with the yolk, in fishes with the entire egg, because the fish’s egg is all single-coloured and lacks the distinction into white and yolk), and they obtain their nourishment by means of this; as it gets consumed the flesh in like manner encroaches upon it and grows round it.

I have now described the manner of formation of those fishes which produce a perfect egg internally and are viviparous externally.

The majority of the remaining fishes are externally oviparous; and all of them except the fishing-frog produce an imperfect egg. The reason for this exception I have given earlier.\(^b\) I have also given the reason why the others produce imperfect eggs.\(^c\)

So far as the process of formation is concerned, the development from the egg follows the same lines as the internally oviparous Selachia, except that they start very small and grow very quickly, and the outside of the egg is harder. The growth of the egg is like (that of) larvae, for those animals which produce larvae produce something small to start with, which


\(^a\) At 754 a 26.  
\(^b\) At 718 b 8.  
\(^c\) At 718 b 8.
καὶ οὐ διὰ πρόσφυσιν οὐδεμίαν. τὸ δ’ αὐτῶν παραπλήσιον ὅπερ ἐπὶ τῆς ζύμης· καὶ γὰρ η ἔκ μικρὰς μεγάλη γίνεται τοῦ μὲν στερεωτέρου ὑγραινομένου, τοῦ δ’ ὑγρὸν πνευματομένου. δὴ-
20 μουργεῖ δὲ τοῦτο ἡ τοῦ ψυχικοῦ θερμοῦ φύσις ἐν τοῖς ἔωις, ἐν δὲ ταῖς ἔχει ἀνάγκης μὲν διὰ ταύτην τὴν αἰτίαν (ἐχεῖ γὰρ περίττωμα ζυμώδες), χάριν δὲ τοῦ βελτίωνος·

diὰ τοῦτο γὰρ καὶ μικρὰ πάμπαν ἀποκρινεῖ· καὶ ταχείαν λαμβάνει τὴν αὔξησιν, μικρὰ μὲν διὰ τὸ στενοχωρη ὧν ὑστέραν εἶναι πρὸς τὸ πλῆθος τῶν ψών, ταχὺ δ’ ὅπως μὴ χρονιζόντων ἐν τῇ

gενέσει περὶ τὴν αὔξησιν φθείρηται τὸ γένος, ἐπει-

25 ὑπὲρ τὴν αὔξησιν διὰ τὴν τῶν ψών πολυτοκίαν

tούτων. διὰ τοῦτο γὰρ καὶ μικρὰ πάμπαν ἀποκρι-

νεῖ· καὶ ταχείαν λαμβάνει τὴν αὔξησιν, μικρὰ μὲν
diὰ τὸ στενοχωρη τὴν ὑστέραν εἶναι πρὸς τὸ πλῆθος
tῶν ψών, ταχὺ δ’ ὅπως μὴ χρονιζόντων ἐν τῇ
gενέσει περὶ τὴν αὔξησιν φθείρηται τὸ γένος, ἐπει-

30 καὶ νῦν τὰ πολλὰ φθείρεται τῶν ἐκτικτομένων

κυημάτων. διότι πολὺγονον ἐστὶ τὸ γένος τὸ
tῶν ἱκθύων· ἀναμάχεται γὰρ ἡ φύσις τῷ πλῆθει
tὴν φθοράν. εἰσὶ δὲ τυχεὶ· οἱ διαρρήγησαι τῶν
tῶν ἱκθύων, οἶον ἡ καλομείνη βελόνη, διὰ τὸ μέγεθος
tῶν ψών· αὐτὴ γὰρ ἀντὶ τοῦ πολλὰ μεγάλα τὰ

35 κυηματὰ ἵσχε: τοῦ γὰρ πλῆθους ἡ φύσις ἀφελοῦσα

προσέβηκε πρὸς τὸ μέγεθος.

Ὅτι μὲν οὖν αὔξανεται τε καὶ δι’ ἑν τὴν αἰτίαν τὰ

tοιχαί τῶν ψών, εὑρήται.

755 b

1 φῶς κώνι. Platt.
grows by its own means and not in virtue of any attachment. The reason for this is on a par with the reason why yeast grows. Yeast, like these, is small in bulk to start with and gets larger: this growth is due to its more solid portion turning fluid, and the fluid turning into pneuma. This is the handiwork of the soul-heat in the case of animals, of the heat of the humour blent with it in the case of the yeast. Eggs thus grow of necessity on account of this cause (i.e., they contain a yeast-like residue), but also they 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. That is why the eggs are quite small when they are discharged and why they grow quickly: they are small because the uterus is not roomy enough to hold so large a number of eggs, and they grow quickly to prevent the destruction of their kind which would occur as a result of their spending a long time over the growing period of their formation. Even as it is, the majority of the fations that are laid externally get destroyed. That is why the fish tribe is prolific: Nature makes good the destruction by sheer weight of numbers. There are also some fishes, such as the one known as belone, which burst asunder owing to the size of the eggs, the fations of this fish being large instead of numerous; here Nature has taken away from their number and added to their size.

I have now described the growth of eggs of this sort and have stated the Cause of it.

*Syngnathus acus.* In this group (of which the well-known “sea-horse” is another member) the male incubates the eggs in a brood-pouch formed by the pelvic fins. Aristotle correctly states at *H.A. loc. cit.* that the fish is none the worse for its “bursting asunder.”
The argument seems to be this. Aristotle is arguing from the principle that the production of eggs, if a characteristic of any fishes, must be a characteristic of the whole tribe of fishes (cf. his enunciation of a similar principle below, 755 b 36: it would be fantastic, he says, if the distinction of sexes were found in some fishes and not throughout the whole tribe of them, just as it is found throughout the whole tribe of Vivipara. Cf. also 759 b 14 and 34). Nobody, however, disputes that the Selachia, which are fishes, are oviparous (internally), nor that they have the distinction of sexes. Hence, ex hypothesi, the whole tribe of fishes is oviparous (though of course the eggs are “imperfect” ones), and has the sexes distinct. Thus the argument will be against those who hold that fish produce not eggs but larvae (see 757 a 29 ff.), and do not have the sexes distinct. No 306
A proof that these fishes as well as the others produce eggs is that even the viviparous fishes, such as the Selachia, produce eggs internally at the first stage. Why is this a proof? Because it is plain that the whole of the tribe of fishes is oviparous. At the same time, no eggs of this sort reach perfection,—i.e., eggs of species where both males and females exist, and which are formed as the result of copulation unless the male sprinkles his genital fluid (milt) upon them; though there are some people who hold—incorrectly—that all fish are female apart from the Selachia. Their view is that the females differ from what are reputed to be males in the same way as those species of plants in which one tree will bear fruit and another will bear none (e.g., the olive and oleaster, the fig and caprifig). They say it is just the same with fish, except in the case of the Selachia, where they do not dispute the point. But as a matter of fact there is no difference as regards their seminal parts between males of the Selachian fishes and males which belong to the oviparous group, and semen can doubt there were some who maintained that the eggs of fishes, which Aristotle holds to be true, though "imperfect," eggs, were on a par with the "eggs" out of which caterpillars and the like developed; the latter, however, Aristotle holds to be "larvae" and not true eggs (see 738 b 9 ff.): and larvae, of course, are often found in connexion with creatures in which (according to Aristotle) the sexes are not distinct and are formed without copulation. Thus, the two points on which Aristotle insists, (1) that fishes have sexes and copulate, and (2) that they produce eggs, not larvae, are mutually corroborative.

The exception is the erythrinus; see 741 a 36, n.

See above, 715 b 25; also H. A. 557 b 31. There seems to be no similar phenomenon in the case of the olive, but it was a common practice to call some trees male and others female: see Theophr. Hist. plant. 1. 8. 2, and cf. Soph. Tr. 1196.
ARISTOTLE

755 b

"... ὥραν φαίνεται ἀμφότερον ἐκθελώμενον. ἔχουσι δὲ καὶ ύστερας αἱ θηλείαι. ἔδει δ' οὐ μόνον τοὺς ψωτοκοῦντας ἀλλὰ καὶ τοὺς ἄλλους ἔχεις μὲν, ἀλλὰ διαφερούσας τῶν ψωτοκοῦντων, [ὡςπερ αἱ ἡμέραι έν τῷ γένει τῶν λοφοῦρων], εἴπερ ἢν θῆλυ τὸ 20 γένος πᾶν, ἀλλ’ ἀτεκνοὶ τίνες αὐτῶν. νῦν δ’ οἱ μὲν ἔχουσι θορικὰ οἱ δ’ ύστερας, καὶ ἐν ἀπασίν ἐξῷ δυνῶν, ἐρυθρῶν καὶ χάννης, αὕτη ἐστὶν ή διαφορά: οἱ μὲν γὰρ θορικὰ ἔχουσιν, οἱ δ’ ύστερας. ή δ’ ἀπορία δι’ ἢν οὔτως ὑπολαμβάνουσιν, εὑρύθῳ τὸ συμβαίνον ἀκούσασιν. οὐθέν γὰρ τῶν ὁχευμένων πολλά φασί τίκτεων, λέγοντες ὀρθῶς: οὐσα 25 γὰρ ἐξ αὐτῶν γεννᾷ τέλεια ή ξῶα ή φά, οὐ πολυτοκεῖ οὔτως ὡςπερ οἱ ψωτοκοῦντες τῶν ἱκθύων ἀπλετον γὰρ τι τὸ το3 τοῦτων πλῆθος τῶν φῶν ἐστὶν. ἀλλὰ τοῦτο οὐχὶ συνεωράκεσαν, ὅτι οὐχ ὀμοιοτρόπως τοῖς τῶν ὀρνίθων ἔχει τὰ περὶ τα πά τῶν ἱκθύων. οἱ μὲν γὰρ ὀριθες καὶ τῶν τετραπόδων 30 ὀσα ψωτοκεῖ, καὶ εἰ τινα τῶν σελαχῳδῶν, τέλειους φῶν γεννῶσιν, καὶ οὐ λαμβάνει ἐξελθὼν αὔξησιν. οἱ δ’ ἱκθύες ἀτελῆ, καὶ λαμβάνει θύραζε τὰ φά τὴν αὔξησιν. ἐτὶ καὶ ἐπὶ τῶν μαλακίων τὸν αὐτὸν ἔχει τρόπον καὶ ἐπὶ τῶν μαλακοστράκων, ὁ καὶ

1 haec verba post τίνες αὐτῶν transtulit Platt; ego seclusi. fortasse plura corrupta.
2 οἱ μὲν . . . ύστερας secl. Α.-W.
3 τι τὸ Ζ: τι vulg.

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a i.e., those which are in fact males.
b See note on 777 b 5.
c Platt transposes these words to follow “of young” a few lines above; no doubt they were part of a marginal note on 308
clearly be seen oozing out from males of both groups at the proper season. Also, the females have a uterus; but if the whole tribe of fishes really were female, some of them being unproductive of young, then not only those fishes which lay eggs but all the others as well ought to have a uterus, though no doubt different in form from that of the ones which lay the eggs [like female mules in the class of bushy-tailed animals]. In fact, however, while some fishes have a uterus, others have seminal parts, and this distinction is found in all species except two, the *erythrinus* and the *channa*; some have seminal parts, others have an uterus. The puzzle which makes people put forward this theory is easily solved when we hear what the facts are. These people allege—and here they are quite correct—that none of the animals which copulate produces many young, for of all the animals which generate out of themselves either perfect animals or perfect eggs, none is so prolific as the oviparous fishes, the number of their eggs of course being something enormous. But this point they have overlooked: eggs of fishes do not behave in precisely the same way as those of birds. Birds, oviparous quadrupeds, and any oviparous Selachians there may be, produce a perfect egg, and once it has left the parent it grows no further; fish on the other hand produce imperfect eggs, which do grow after they have left the parent. Furthermore, the same occurs in the case of the Cephalopods and Crustacea; and these creatures can actually be seen the word *ἀτεκνοὶ*, but they are meaningless and irrelevant anywhere in the text.

For *erythrinus* see note, 741 a 36; the *channa* is another species of *Serranus*, probably *S. scriba*.

The fishing-frog; but see 754 a 26, n.
755 b

συνδυαζόμενα ὃρᾶται διὰ τὸ χρόνιον εἶναι τὸν
35 συνδυασμὸν αὐτῶν· καὶ τούτων φανερὸν ἐστὶ τὸ
μὲν ἄρρεν ὄν, τὸ δὲ ἔχον υστέραν. ἀτοπον δὲ καὶ
tὸ μὴ ἐν παντὶ (τῷ)¹ γένει ταύτην εἶναι τὴν δύ
ναμιν, ὦσπερ ἐν τοῖς ἔνωτοκοις τὸ μὲν ἄρρεν τὸ
de θῆλυ. αὐτίον δὲ τοῖς ἐκεῖνως λέγοντας τῆς
ἀγνοίας τὸ τὰς διάφορας μὴ δῆλας εἶναι παντο-
dαπᾶς οὕσας περὶ τε τὰς ὁχείας τῶν ζώων καὶ τὰς
5 γενέσεις, ἀλλ’ εὖ ὀλίγων² θεωροῦντας οἷςδαὶ δεῖν
ἐχειν ὁμοίως ἐπὶ πάντων.

Διὸ καὶ οἱ λέγοντες τὰς κυήσεις εἶναι ἐκ τοῦ
ἀνακάπτειν τὸ στέρμα τοὺς θήλεις τῶν ἰχθύων, οὐ
cατανενοηκότες ἔνα λέγονσαν οὕτως. ὑπὸ τὸν
αὐτόν γὰρ καὶρὸν οἱ τῷ ἄρρενες τῶν θορὸν καὶ αἱ
θήλειαι τὰ ὃ ἔχουσιν, καὶ ὅσῳ ἄν ἡ ἐγγυτέρω ἡ
10 θήλεια τοῦ τίκτειν, τότε πλείων καὶ ὕγρότερος ὁ
θορὸς ἐν τῷ ἄρρεν ἐγγίνεται. καὶ ὦσπερ ἡ αὐξήσις
κατὰ τὸν αὐτὸν χρόνον τοῦ θοροῦ ἐν τῷ ἄρρεν καὶ
tὸν ὄνοι ἐν τῇ θήλειᾳ, οὕτω καὶ ἡ ἀφεσις συμβαίνει·
οὔτε γὰρ αἱ θήλειαι ἀθρόα ἐκτίκτουσιν, ἀλλὰ κατὰ
μικρὸν, οὔθ’ οἱ ἄρρενες ἀθρόον ἀφίασι τὸν θορὸν.
15 καὶ ταύτα πάντα συμβαίνει κατὰ λόγον. ὦσπερ
γὰρ καὶ τὸ τῶν ὀφνέων γένος ἐν ἐνίοις ὀμέλει μὲν
การออกแบบ, ὃλγὰ δὲ καὶ ὀλγάκις, ἀλλ’ εὖ
ὀχείας τὰ πολλά, τοῦτ’ αὐτὸ συμβαίνει καὶ ἐπὶ τῶν
ἰχθύων, ἦπτον δὲ. ἄγονα δὲ καὶ ἀμφότερος γι-
20 νεται τὰ αὐτόματα ἐὰν μὴ ἐπιρράνῃ τὸ ἄρρεν, ἐν
ὠςος γένεσιν αὐτῶν καὶ τὸ ἄρρεν ἑστίν. τοῖς μὲν
οὖν ὀρνισὶ, διὰ τὸ τελεία ἐξεῖναι τὰ ὑά, ἐτὶ ἐντὸς

¹ τῷ supplavit Platt.
² sic PSYZ*: ὀλίγον vulg.
³ ὀχείας Peck: κυήσεως vulg.
copulating, for with them copulation goes on for quite a long time, and it is plain here that one is male and the other has a uterus. Also, it would be odd if this characteristic were present in a portion of the group and not in the whole of it, just as male and female are found in all the Vivipara. The reason for the ignorance of those who make the statement mentioned is that the differences in the copulation and generation of the various animals are manifold, but they are not obvious, and our friends base their study on a few instances and think the same holds good for all.

So too those who assert that female fishes conceive as a result of swallowing the male's semen have failed to notice certain points. Thus in fact milt is present in the male and eggs in the female at about the same time, and the closer the female is to laying the eggs the more abundant and the more fluid becomes the milt in the male. And just as the growth of the milt in the male and that of the egg in the female is simultaneous, so also the emission of them both is simultaneous: the females do not lay all their eggs at once, but a few at a time, and the males do not emit all their milt at once. All this is as we should expect. In the bird tribe, eggs are in some instances present without impregnation, though such eggs are not numerous and they occur but seldom, most eggs being the result of impregnation. Exactly the same occurs in fish, though to a smaller extent. These spontaneous eggs, both in birds and fish, are infertile unless (in those species where there are males as well) the male sprinkles them. With birds, owing to the fact that the eggs have reached

a *Dynamis, i.e., the existence of the two sexes. Cf. the beginning of ch. 5.*
οντων αναγκη τουτο συμβηναι τοις δ' ιχθυι δια το ατελη και εξω λαμβανειν την αυξησι πασιν, και εξ οχειας γενηται το φων, ομως τα εξω επιρανομενα σωζεται, και ενταθα αναλισκεται οθορος τοις άρρεσιν. διο και συγκαταβαινει ελαττουμενος αμα τοις ωσις τοις εν τοις θηλειν· αει γαρ τοις εκτυκτομενοις επιρραινουσι παρακολουθοντες. Ωστε άρρενες μεν και θηλεις ειτε και ωχευνται παντες, ει μη εν τυν γενει αδιοριστον εστι το θηλι 30 και το άρρεν, και άνευ της τοι άρρενος γονης ου γινεται των τοιουτων ουθεν.

Συμβαλλεται δε προς την άπαθην αυτοις και το ταχυν ειναι των συνδυασμων των τοιουτων ιχθυων, οστη πολλους λανθανειν και των όλιους ουθεις γαρ αυτων ουθεν τηρει τοιουτον του γνωναι χαριν· άλλως ομως αμμενος συνδυασμος εστιν. τον αυτων γαρ τροπων οι τε δελφινες ωχευνται παραπιπτοντες και οι ιχθυες οσοις <μη> εμποδιζει το ουραιον, άλλα των μεν δελφινων χρονιωτερα ή απολυσις εστι, των δε τοιουτων ιχθυων ταχεια. διοπερ ταυτην ουχ ορωντες, τας δ' ανακαπηεις του 5 θορου και των ων, και οι όλειεις περι της κυρηεως των ιχθυων τον ενηθη λεγουσι λογον και τεθυλη-

1 locus fortasse corruptus. pro και εξω λαμβανειν habent συμβαινειν PSY; pro και habent ei μη έντος Y, ει και μη έντος PS. fortasse scribendum diα το ατελη <εξειε} και εξω <εστι τελους> λαμβανειν <ωσπερ και εξω> συμβαινειν την αυξησι πασιν, και μη έντος <ωστε> και κτλ. cf. 757 a fin.
2 <μόνον> A.-W., <μόνα> Sus., Btf.; pro και εξ οχειας . . . σωζεται et cum mas eiererit sperma super ipsa recipiunt virtuteam suam et fiunt convenientia generationi (=νυσει γονυμα) Σ.
a perfected state when they are discharged, this must happen while they are as yet within the mother; but the eggs of fish, without exception, are imperfect when discharged and continue their growth afterwards; hence, even if the egg has come into being as the result of impregnation, still, the ones which persist safe and sound are those which get sprinkled after they have been discharged; that is where the milt of the males is used up, and that is why it comes down in smaller quantities at the same time that the production of eggs by the females diminishes, for the males always follow up the eggs and sprinkle them as they are laid.

Thus fish are male and female, and they copulate, all of them (unless there be some species where the sexes are not distinct), and no fish at all of any sort comes into being apart from the semen of the male.

Another point which helps to deceive these people is this. Fish of this sort take only a very short time over their copulation, with the result that many fishermen even never see it happening, for of course no fisherman ever watches this sort of thing for the sake of pure knowledge. All the same, the copulation has been observed. The fish copulate in the same way as dolphins do, by placing themselves alongside of each other [that is, those which are hampered by the tail]. Dolphins, however, take longer to relieve themselves, whereas fish of this sort do so quickly. The fishermen do not notice this, but they do notice the swallowing of the milt and eggs by the female, and so they join the chorus and repeat the same old stupid tale that we find told

\footnote{Erythrinus and channa.}
\footnote{See note, 718 a 2.}

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μένον, ὁνπερ καὶ Ἡρόδοτος ὁ μυθολόγος, ὡς κυῖσκομενῶν τῶν ἱχθύων ἐκ τοῦ ἀνακάπτειν τὸν θόρον, οὐ συνορώντες οὐτὶ τοῦτ' ἐστὶν ἀδύνατον. ὁ γάρ 'πορος ὁ διὰ τοῦ στώματος εἰσίων εἰς τὴν 10 κοιλίαν φέρει, ἀλλ' οὐκ εἰς τὰς ύπότερας· καὶ τὸ μὲν εἰς τὴν κοιλίαν ἔλθον ἀνάγκη τροφῆν γίνεσθαι (καταπέττεται γάρ), αἱ δ' ύπότεραι φαίνονται πλήρεις ὑῶν, ἀ πόθεν εἰςηθέν; 1

VI Ὅμοιος δὲ καὶ περὶ τὴν τῶν ὄρνηθων γένεσιν ἤχει. εἰσὶ γάρ τινες οὐ λέγουσι κατὰ τὸ στόμα 15 μέγιστοθατο τοὺς τε κόρακας καὶ τὴν ἵβιν, καὶ τῶν τετραπόδων τίκτευν κατὰ τὸ στόμα τῆν γαλῆν. ταύτα γάρ καὶ Ἰαναξαγόρας καὶ τῶν ἄλλων τινὲς φυσικῶν λέγουσι, λίαν ἀπλῶς καὶ ἀσκέπτως λέγοντες, περὶ μὲν οὖν τῶν ὄρνηθων ἐκ συλλογισμοῦ διαφευδόμενοι τῷ τὴν μὲν ὁχείαν ὀλγακίας ὀρᾶσθαι 20 τῇ τῶν κοράκων, τῇ τινὶ τοῖς ρύγχεσι πρὸς ἄλληλα κοινωνίαν πολλάκις, ἣν πάντα ποιεῖται τὰ κοράκωδη τῶν ὄρνων· δῆλον δὲ τοῦτο ἐπὶ τῶν τυθασευμένων κολούων. τὸ δ΄ αὐτὸ τοῦτο ποιεῖ καὶ τὸ τῶν περιστερῶν γένος· ἀλλὰ διὰ τὸ καὶ ὁχευόμενα φαίνεσθαι, διὰ τούτῳ ταύτης οὔ τετυχήκασι 25 τῆς φήμης. τὸ δὲ κορακώδες γένος οὐκ ἔστω ἀφροδίσιαστικῶν (ἐστι γὰρ τῶν ὀλυγογόνων), ἐπιώπται δ΄ ἦδη 2 καὶ τοῦτο ὀχευόμενον. τὸ δὲ δὴ μὴ συλλογίζεσθαι πῶς εἰς τὰς ύπότερας ἀφικνεῖται τὸ

1 sic interpunx. A.-W.; εἰςηθέν. vulg.; fortasse á πόθεν εἰςηθέν. scribendum.
2 ἐπιώπται δ΄ ἦδη Ζ: ἐπεὶ ὀπταὶ γ΄ ἦδη vulg. (γε δὴ SY).

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by Herodotus \(^a\) the fable-teller, to the effect that fish conceive by swallowing the milt. It never strikes them that this is impossible, but of course it is, because the passage whose entrance is through the mouth passes down into the stomach, not into the uterus, and whatever goes down into the stomach must of necessity be turned into nourishment, because it undergoes concoction. The uterus, however, as we can see is full of eggs; so we ask, how did they find their way there?

It is the same with the generation of birds. Thus there are those who say that ravens and ibises unite by the mouth, and that one of the quadrupeds, the weasel, brings forth its young by the mouth. This is, in fact, alleged by Anaxagoras and some of the other physiologers; but their verdict is based on insufficient evidence and inadequate consideration of the matter. \(^1\) So far as the birds are concerned, they have reasoned themselves into an erroneous conclusion, since the copulation of ravens is seldom witnessed, whereas they are frequently observed uniting with each other by their beaks, which is something that all birds of the raven family do, as is plain for everyone to see in the case of domesticated jackdaws. Precisely the same thing is done by birds of the pigeon family; but as their copulation is plainly observable as well, they have not succeeded in qualifying for the heroes’ part in this amazing story. Actually, birds of the raven group are not unduly sexual: it is one of the groups that produce but few young; still, like other birds, they have been observed in the act of copulation. It is odd, however, that our friends do not reason out how the

\(^a\) Hdt. II. 93.
σπέρμα διὰ τῆς κοιλίας πεπτούσης αἰεὶ τὸ ἐγγυνόμενον, καθάπερ τὴν τροφὴν, ἄτοπον. ὡστέρας δὲ ἔχουσι καὶ ταῦτα τὰ ὅρνεα, καὶ ὡς φαίνεται πρὸς τοὺς ὑποζώμασιν. καὶ ἡ γαλή, καθάπερ τάλλα τετράποδα, τὸν αὐτὸν τρόπον ἔχει ἐκείνους τὰς ὑστέρας. εὖ δὲν εἰς τὸ στόμα την βαδιεῖται τὸ ἐμβρυον; ἀλλὰ διὰ τὸ τίκτειν πάμπαν μικρὰ τὴν γαλήν, καθάπερ καὶ τάλλα τὰ σχεῖζόποδα, περὶ ὅν ὡς ὑστερον ἐροῦμεν, τῷ δὲ στόματι πολλάκις μεταφέρειν τοὺς νεοττοὺς, ταύτην πεποίηκε τὴν δόξαν.

Εὐθηνικῶς δὲ καὶ λίαν διεισευσμένοι καὶ οἱ περὶ τρόχου καὶ υάινης λέγοντες. φασὶ γὰρ τὴν μὲν υάιναν πολλοῖ, τὸν δὲ τρόχον Ἡρώδωρος ὁ Ἡρα-κλεώτης, δύο αἰδοῖα ἔχειν, ἀρρενος καὶ θήλεος, καὶ τὸν μὲν τρόχου αὐτὸν αὐτὸν ὄχευειν, τὴν δὲ υάιναν ὄχευειν καὶ ὄχευεσθαι παρ᾽ ἑτος. ὁπταί γὰρ ἡ υάινα ἐν ἔχουσα αἰδοῖον ἐν ἑνίοις γὰρ τόποις οὐ σπάνης τῆς θεωρίας. ἀλλὰ ἔχουσιν αἱ υάιαι ὑπὸ τὴν κέρκον ὀμοίαν γραμμήν τῷ τοῦ θήλεος αἰδοίῳ. ἔχουσι μὲν οὖν καὶ οἱ ἀρρενες καὶ αἱ θήλεαι τὸ τοιοῦτον σημεῖον, ἀλλὰ ἀλίσκονται οἱ ἀρρενες μᾶλ-λον. διὸ τοῖς ἐκ παρόδου θεωρούσι ταύτην ἐποίησε τὴν δόξαν.

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a In Bk. IV.

b This animal cannot be identified. It must be distinguished from the genus now called Trochus, which are shellfish. No species of mammal is normally hermaphrodite.

c See also H.A. 579 b 15 ff.

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semen manages to pass through the stomach and arrive in the uterus, in view of the fact that the stomach concocts everything that gets into it, as it does the nourishment. Besides, these birds have a uterus, just like other birds, and eggs can plainly be seen up towards the diaphragm. (2) The weasel, too, like other quadrupeds, has a uterus of exactly the same sort as theirs; and how is the embryo going to make its way from that uterus into the mouth? This notion is really due to the fact that the weasel produces very tiny young ones (as do the rest of the fissipede animals, of which we shall speak later), and that it often carries them about in its mouth.

(3) There is another silly and extremely wrong-headed story which is told about the *trochos* and the hyena, to the effect that they have two pudenda, male and female (there are many who assert this of the hyena; Herodorus of Heraclea asserts it of the *trochos*), and that whereas the *trochos* impregnates itself, the hyena mounts and is mounted in alternate years. In some localities, however, there is ample opportunity for inspection, and the hyena has been observed to possess one pudendum only; but hyenas have under the tail a line similar to the female pudendum. Both male and female ones have this mark, but as the males are captured more frequently, casual inspection has given rise to this erroneous idea.

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* a Heraclea Pontica, a colony of Megara, on the south shore of the Black Sea, about 100 miles east of the Bosphorus. Herodorus (fl. c. 400 B.C.) was the father of the sophist Bryson (both are mentioned at *H.A.* 563 a 7 and 615 a 9). He wrote a *History of Heracles*, which seems to have contained a great variety of matter.

* b *trochos*

* c *hyena*

* d Herodorus of Heraclea

* e See add. note, p. 565.
'Αλλὰ περὶ μὲν τούτων ἀλὶς τὰ εἰρημένα.

VII Περὶ δὲ τῆς τῶν ἱχθύων γενέσεως ἀπορῆσειν ἂν
15 τις διὰ τίνα ποτὲ αἰτίαν τῶν μὲν σελαχώδων οὐθ' αἰ θήλειαν τὰ κυήματα οὐθ' οἱ ἄρρενες ἀπορραίνοντες ὁρᾶνται τὸν θορόν, τῶν δὲ μῆ ζωοτόκων καὶ αἰ θήλειαν τὰ ὑά καὶ οἱ ἄρρενες τὸν θορόν. αἰτιον δ' ὅτι τὸ γένος οὐ πολύσπερμον ὅλως τὸ τῶν σελαχώδων· καὶ ἐτὶ αἰ γέ θήλεια πρὸς τῷ
20 διαζώματι τὰς ύστερας ἔχουσιν. τὰ γὰρ ἄρρενα τῶν ἄρρενων καὶ τὰ θήλεα τῶν θήλεων ὁμοίως διαφέρουσιν· ὁλογοχούστεροι γὰρ πρὸς τὴν γονῆν οἱ σελαχώδεις εἰσίν. τὸ δ' ἄρρεν γένος ἐν τοῖς ὕστοκοις, καθάπερ αἰ θήλεια τὰ ὑά διὰ πλήθος ἀποτίκτουσιν, οὕτως ἐκεῖνοι ἀπορραίνουσιν πλείω
25 γὰρ ἔχουσι θορόν ἢ ὄσον πρὸς τὴν ὀχείαν ἰκανόν· μᾶλλον γὰρ βούλεται ἡ φύσις δαπανᾶν τὸν θορόν πρὸς τὸ συναὐξεῖν τὰ ὑά, ὅταν ἀποτέκη ἡ θήλεια, ἢ πρὸς τὴν ἐξ ἀρχῆς σύστασιν. καθάπερ γὰρ ἐν τε τοῖς ἀνώ καὶ τοῖς ὑπογύοις ἐάρηται λόγοις, τὰ μὲν τῶν ὀρνύων ὑὰ τελεύτατον ἐντός, τὰ δὲ τῶν
30 ἱχθύων ἐκτός. τρόπον γὰρ τίνα ἔοικε τοῖς σκωληκοτοκούσιν· ἐτὶ γὰρ ἀτελέστερον προῖται τὸ κύημα τὰ σκωληκοτόκα τῶν ζώων. ἀμφοτέρως δὲ τὴν τελείωσιν καὶ τοῖς τῶν ὀρνύων θοῦ ὅς καὶ τοῖς τῶν ἱχθύων ποιεῖ τὸ ἄρρεν, ἀλλὰ τοῖς μὲν τῶν ὀρνύων ἐντός (τελεύτατον γὰρ ἐντός), τοῖς δὲ τῶν ἱχθύων
35 ἐκτός διὰ τὸ ἔξω προῖεσθαι ἀτελές, ἐπεὶ συμβαίνει γε ἐπ' ἀμφοτέρων ταῦτῶν.

1 ὅτι Y. 2 θήλεων E, Btf.: θηλεών vulg.

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I have now sa-""""n-eggs become fertile," and e-

With regard to VII, may be raised, what the Cause can possibly be why

VII may be raised, what the Cause can possibly be why

neither the females of Selachian fishes are seen

shedding their fetations nor the males their milt,

whereas the males and females are observed so doing

in the case of non-viviparous fishes. The reason is

that in general the class of the Selachians is not rich

in semen; and also in the females the uterus is up

towards the diaphragm." Of course males of one class
differ from males of another, and females similarly; and the fact is that the Selachians yield less semen

than most. With the oviparous fishes, the males

shed their milt, just as the females lay their eggs,

because there is such an abundance of both; the

males have more milt than the amount which suffices

for copulation, because Nature prefers to expend the

milt in helping to enlarge the eggs after the female

has laid them, rather than in constituting the eggs

at the outset. This remark is explained by what has

been said both in our earlier discussion and also not

long ago, viz., the eggs of birds are perfected inside

the parent, but the eggs of fish outside. In a way,

fish resemble the larva-producing animals, for the

latter deposit a fetation which is even more imperfect

still. The perfecting in both cases, birds’ eggs and

fishes’, is accomplished by the male. With birds this

down within the parent animal, because a bird’s egg is perfected inside; with fishes, outside, because

the egg is in an imperfect state when it is deposited

outside. The upshot however is the same in both cases.

And therefore the eggs are brought to perfection inside

the parent.
Ἀλλὰ περὶ μὲν τούτων ἄλις τὰ εἰπηνέμια γίνεται γόνων. 5 ἐκ τῶν ἴσημαινων ἴδειν ἐτέρου γένους τῶν ἄρρενων μεταβάλλει τὴν φύσιν εἰς τὸν υἱότερον ὁχεύοντα· καὶ τὰ οὐκεία δὲ, ἀναφερόμενον ὁμώς ὁντα ἄν 5 διαλέτη τὴν ὁχείαν, ὅταν ὁχεύη 5 πάλιν, ποιεῖ ταχεῖαν λαμβάνειν τὴν αὐξησιν· οὐ μέντοι κατὰ πάντα τὸν χρόνον, ἀλλὰ ἔανπερ πρότερον γένεται ἡ ὁχεία πρὶν μεταβαλεῖν εἰς τὴν τοῦ λευκοῦ ἀποκρισιν. τοὺς δὲ τῶν ἰχθυῶν οὐθέν ὁρισται τοιοῦτον, ἀλλὰ πρὸς τὸ σώζεσθαι ταχέως ἐπιρραίνουσιν

10 οἱ ἄρρενες. ἀυτιον δ’ ὃτι οὐ δίχροα ταῦτα· διόπερ οὐχ ὁρισται τοιοῦτος καὶρός τοῦτος οἶδα ἐπὶ τῶν ὁρισθων. τοῦτο δὲ συμβεβηκεν εὐλόγως· ὅταν γὰρ τὸ λευκὸν ἀφωρισμένον ἢ καὶ τὸ ὕπρον ἀπ’ ἀλλήλων, ἔχειν ἡδὴ τὴν ἀπὸ τοῦ ἄρρενος ἄρχην [eis] 10 ταύτην γὰρ συμβάλλεται τὸ ἄρρεν. τὰ μὲν οὖν 15 ὑπηνέμια λαμβάνειν τὴν γένεσιν μέχρι τοῦ ἐνδεχομένου αὐτοῦς. τελεωθησάν μὲν γὰρ εἰς ζῷον ἀδύνατον (δεῖ γὰρ αὐσθήσεως), τὴν δὲ τρεπτικὴν δύναμιν τῆς ψυχῆς ἔχει καὶ τὰ θήλεα καὶ τὰ ἄρρενα

1 hic addit Σ quando femina coierit existentibus illis ovis in matrice.
2 δὴ PSY. fort. ὁχευμένα δὲ scribendum, vel potius καὶ τὰ ὁχεία δὲ, ἃν ἀναφηκὴ ἢ τὰ φά διὰ τὸ διαλέπεσεν κτλ.
3 αναφηκὴ Z. αναφηκαὶ S et om. οὖνα.
4 διαλέτη Platt: διαλέτη vulg.
5 ὁχευὴ Platt: ὁχευὴ vulg.: δ’ ὁχευῃ PSY.
6 μεταβαλεῖν P: μεταβάλλειν vulg.
7 οὐσίαται Z.
8 επιρραίνουσιν Z: ἀπορραίνουσιν vulg.
9 lacunam hic statuit Platt.
10 eis om. S; seclusi: eis τοῦτο coni. A.-W. et per hunc modum erit conveniencia spermatis maris Σ. fortasse αὐσθήσαν scribendum, vel eis . . . ἄρρεν secludenda.

320
In birds, wind-eggs become fertile, and eggs previously impregnated by the treading of one sort of cock change their nature to that of the cock which treads the hen later; and also, where one and the same cock is concerned, if he has left off treading the hen and the eggs are not growing on that account, he makes them grow quickly when he resumes the treading. This however cannot happen at any and every period: the treading must take place before the change occurs when the white of the egg becomes separate. In the case of fishes' eggs there is no such point fixed, but the males sprinkle them without delay to keep them in sound condition. The reason is that fishes' eggs are not double-coloured: that is why in their case there is no such fixed time as there is for birds' eggs. This situation is what we should expect, for once the white and the yolk have been distinctly separated from each other, they already possess the principle that comes from the male, since the male contributes [towards] this. Thus wind-eggs attain to generation in so far as it is possible for them to do so. It is impossible for them to be perfected to the point of producing an animal, because sense-perception is required for that; the nutritive faculty of the Soul, however, is possessed by females as well as by males and by all

\[a\] Probably there should here be inserted "if the hen is trodden by the male while they are in the uterus."

\[b\] This is qualified below, 757 b 27 ff.

\[c\] The force of œkēia seems to be that the eggs are the cock's "own" in the sense that he and not some other cock originally impregnated them. But see critical note.

\[d\] And therefore cannot be altered by another cock.

\[e\] See 767 b 17 ff., and references there given in note.

\[f\] Which is supplied by the male.
καὶ πάντα τὰ ξώντα, καθάπερ εἴρηται πολλάκις:
διόπερ αὐτὸν ὁ ὄς μὲν φυτοῦ κύμμα τέλειόν
20 ἐστιν, ὡς δὲ ξώον ἀτελές. εἰ μὲν οὖν μὴ ἐνῆν ἀρρεν ἐν τῷ γένει αὐτῶν, ἐγίνεται ἀν ὁσπερ καὶ ἐπὶ τῶν ἱθύων, εἰπέρ ἐστι τι τοιοῦτον γένος οἰον ἀνευ ἀρρενος γεννάν· εἴρηται δὲ περὶ αὐτῶν καὶ πρό-
τερον, ὅτι οὐ πω ὤπται ἱκανὸς. γὰρ δ' ἐστιν ἐν πάσι τοῖς ὄρνυτι τὸ μὲν θῆλυ τὸ δ' ἀρρεν, ὦσθ' ἦ
25 μὲν φυτὸν, τετελέσκει (διόπερ οὐ μεταβάλλει πάλιν μετὰ τὴν ὁχείαν), ἡ δ' οὐ φυτὸν, οὔ τε 
τετελέσκειν, οὔδ' ἀποβαίνει εἷς αὐτοῦ ἐτερον οὐθὲν· οὔτε γὰρ ὡς φυτὸν ἄπλως οὔθ' ὡς ξώον ἐκ συνυπαγό-
γέγονεν. τὰ δ' εἷς ὁχείας μὲν γενόμενα ὡς, δια-
κεκριμένα δ' εἰς τὸ λευκὸν, γίνεται κατὰ τὸ πρῶτον
30 ὁχεύσαν· ἔχει γὰρ ὀμφοτέρας ἢδη τὰς ἀρχὰς.

VIII Τὸν αὐτὸν δὲ τρόπον καὶ τὰ μαλάκια ποιεῖται τὸν τόκον, οἷον σηπίαι καὶ τὰ τοιαῦτα, καὶ τὰ 
μαλακόστρακα, οἷον κάραβοι καὶ τὰ συγγενῆ τού-
τοις. τίκτει γὰρ εἷς ὁχείας καὶ ταῦτα, καὶ συνυπα-
35 μενὸν τὸ ἀρρεν τῷ θῆλει πολλάκις ὤπται. διόπερ 
οὔτ' ἰστορικῶς οὔτ' δὲ ταύτη φαίνονται λέγοντες οἱ 
φάσκοντες τοὺς ἱθῦς πάντας εἶναι θῆλεις καὶ

1 aūtò Platt : aŭtō vulg.
2 haec verba ad finem cap. transtulit Platt, recte, nisi 
omino omittenda.
3 quia non sunt animalia Σ.
4 φυτόν . . . ξώον Platt : φυτόν . . . ξώον vulg.

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a At 741 a 34 ff.
b Platt transposes these words to the end of the chapter.
c See 731 a 2, 3.
d Nutritive soul and sensitive soul, the latter being supplied by “the principle of the male.”
living things, as has been said repeatedly; hence the egg itself, regarded as the fætation of a plant, is perfect, but regarded as the fætation of an animal it is imperfect. If there were no such thing as a male in the class of birds, the egg would have been formed as it is in fishes, supposing there really is some species which generates without a male; though I mentioned earlier in this connexion that this has not yet been sufficiently observed. Actually, however, both sexes exist in all species of birds; so that, qua plant, the wind-egg has reached perfection (and that is why it does not change any more after impregnation),
b qua non-plant, on the other hand, it has not reached perfection, and nothing else results from it, since it has been formed neither as a plant simply and directly nor as an animal by means of copulation. As for eggs which are the result of copulation, however, but which have been distinguished into white and yolk, these are formed according to the male which impregnated them first, since by that time they possess both the required principles. The production of their young is accomplished in the same manner by the Cephalopods—sepias and the like—and by the Crustacea—caraboi and the creatures akin to them. They too lay eggs as a result of copulation; many instances have been observed of the male uniting with the female. So here we have another score on which we can convict of a lack of scientific accuracy those who allege that all fish are female and produce eggs without copula-

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At *P.A.* 683 b 25 Aristotle makes four main groups of Crustacea: (1) *caraboi*, (2) *astacoi*, (3) *carides*, (4) *carcinoi*, corresponding roughly to (1) lobsters, (2) crayfish, (3) prawns and shrimps, (4) crabs.
758 a
tíktein ouk e'ç òxeias: to gar tauto mên eç òxeias
óiesthai, èkeína de mê, thauomastôn: ei te tòut'
èeleithèi, sêmeíon ápferias. ginetai de ò sünduα-
5 smos tou'twn xroniôteros pántwn, óssper tòw
èntômwn, eilológwv: ãnaima gar èstì, diòper òuxhrà
tìn fúsw.
Taìs mên ouv sêpìas kai tais tènþoi dúo tâ
ώa faìnetai dià tò dìphèròsthai tìn ùstéran kai
faìnesthai dikróan: tò de tòw poluπòdovn èn òwôv,
áitovn ð' ò ì morphè stroggúli tìn ìdean óðsa kai
10 sfairоseidhìs: ò gar sçísias ádhlòs plhrrwheiòs
èstìw. dikróa de kai ò tòw karàbìwv èstìw ùstéra.
ápoteiktovnì de tò kûma àtêles kai tautà pánta
dià tìn áutìn áitìan. tà mên ouv karabwðh tâ
thèlêa pròs àutá poièítai tòv tòkon (diòper meûzous
èxei tâs plàkas tâ thèlêa àútôn ò tâ árrhena,
15 fylakðhìs xárìw tòw òwôv), tà ò ì malakìa èxw.
kai tòis mên thèles tòw malakiwv èpìrraínei ò
árrhì, katháper oî árrhèes içhòves tòis òwòs, kai
gîngnetai súnxèhes kai kolòdêses: tòis ò ì karabwðde-
siv oût' òppeta touîóttov oût' eilôgon: òpò tè gar
tì òthelëa tò kûma kai sklìrpóderrîwì èstì, kai
20 lamvßáeî aûçhëvì kai tauta kai tà tàw malakìwv
èxw, katháper kai tà tàw içhòwv.
Pùrospèfuke ð' ò ì ginvòmënh sêpìa tòis òwòs
kata tà ò pròðhìon: tìstìg thar ènðèxhetai ìwòn: èxèi
gar ìwòn èpi tauto tà tàpìsthòv ìwòs kai tà

a See also 717 a 5 ff.   b See 720 b 20.
GENERATION OF ANIMALS, III. viii.

tion. What an extraordinary thing, to hold that Cephalopods and Crustacea lay eggs as a result of copulation, but fish without copulation! Or alternatively, if they were not already aware that the other creatures copulate, then it just shows how ignorant they are. The copulation of all these creatures takes quite a long time, just as that of insects does, which is not surprising, because they are bloodless, and therefore cold in their nature.

In the sepias and calamaries the eggs appear to be two in number, because the uterus is divided and appears to be double. The octopuses appear to have a single egg; the reason is that the shape of the uterus is round and spherical in form, and when it is full the cleavage is not obvious. The caraboi also have a double uterus. All these animals as well deposit the fetaion in an imperfect condition, and for the same cause. Females of the caraboid group deposit their eggs on to themselves; that is why they have larger flaps than the males—in order to protect the eggs; the Cephalopods lay their eggs clear of themselves. The male Cephalopods sprinkle their milt over the females, just as male fishes do over the eggs, and it becomes a glutinous mass. Nothing of the kind has been observed to occur with the caraboids, nor should we expect it, because the fetaion is situated under the female and is hard-skinned, and both these eggs and those of the Cephalopods pursue their growth after they have left the parent, just as the eggs of fishes do.

The sepia while in process of formation is fastened to the egg by its front part, which is the only possible place, because its front and back parts face in the same direction (in this respect it is unique). For a
πρόσθιον. τὸ δὲ σχῆμα τῆς θέσεως ὄν ἔχει γυγνό-
25 μενα τρόπον, δεῖ θεωρεῖν ἐκ τῶν ἱστοριῶν.
Περὶ μὲν οὖν τῶν ἀλλῶν ζῷων τῆς γενέσεως
IX ἔρηται, καὶ πεζῶν καὶ πτηνῶν καὶ πλωτῶν· περὶ
dὲ τῶν ἐντόμων καὶ τῶν ὀστρακοδέρμων λεκτέων
κατὰ τὴν ύφηγημένην μέθοδον. εἶπομεν δὲ πρῶτον
περὶ τῶν ἐντόμων.
30 "Οτι μὲν οὖν τὰ μὲν ἐξ ὀχείας γίνεται τῶν τοι-
ούτων τὰ δ' αὐτόματα, πρότερον ἔλεξθη, πρὸς δὲ
tούτοις ὅτι σκωληκοτοκεῖ καὶ διὰ τῶν αἰτίαν
σκωληκοτοκεῖ. σχεδὸν γὰρ ἔοικε πάντα τρόπον
τινὰ σκωληκοτοκεῖν τὸν πρῶτον· τὸ γὰρ ἀτελέστα-
tον κύμα τοιοῦτον ἔστω, εν πάσι δὲ καὶ τοῖς ζῷο-
35 τοκοῦσι καὶ τοῖς ὕστοκοισι τέλειον ὕδω τὸ κύμα
τὸ πρῶτον ἀδιόριστον ὃν λαμβάνει τὴν αὐξησιν
τοιαύτη δ' ἔστω ἡ τοῦ σκώληκος φύσις. μετὰ δὲ
tούτο τὰ μὲν ὕστοκεῖ τὸ κύμα τέλειον, τὰ δ' ἀτελεῖς,
ἐξω δὲ γίγνεται τέλειον, καθάπερ ἐπὶ τῶν
ἰχθίων εὑρήτατο πολλάκις. τὰ δ' ἐν αὐτοῖς ἱσοτο-
κοῦντα τρόπον τινὰ μετὰ τὸ σύστημα τὸ ἐξ ἀρχῆς
φωειδῆς γίνεται· περιέχεται γὰρ τὸ ύγρὸν ὑμένι
λεπτῷ, καθάπερ ἄν εἰ τις—ἀφέλου τὸ τῶν ὕδων
5 ὀστρακον· διὸ καὶ καλοῦσι τὰς τότε γυγνομένας
tῶν κυμάτων φθοράς ἐκρύσεισ.
Τὰ δ' ἐντόμα καὶ γεννὰ τὰ γεννῶντα σκώληκας,
καὶ τὰ γυγνόμενα μὴ δι' ὀχείας ἀλλ' αὐτόματα ἐκ
τοιαύτης γίγνεται πρῶτον συστάσεως. δεῖ γὰρ

1 τὸ ΡΣ: om. vulg.

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GENERATION OF ANIMALS, III. viii.–ix.

figure showing the way in which it is situated during the process of formation, the Researches\(^a\) should be consulted.

We have now spoken about the generation of the animals that walk, fly and swim. Following the IX plan we have laid down, there remain the Insects and the Testacea to be discussed. We will deal with the Insects first.

I said earlier that some Insects are formed by means of copulation, others spontaneously; further, that they produce a larva, and I stated the cause of their so doing. In a way, it looks as though practically all animals produce a larva to begin with, for the fetation in its most imperfect state is something of this sort; and in all the Vivipara and all the Ovipara that produce a perfect egg, the fetation in its earliest stage is still undifferentiated and is growing, and this is just the sort of thing a larva is. At the next step, some of the Ovipara produce their fetation as a perfect egg, some as an imperfect one which reaches its perfection after it has left the parent, as I have often stated with regard to fish. In the case of the internally viviparous animals, the fetation, after it has been constituted at the outset, in a way becomes egglike: its fluid content becomes enclosed in a fine membrane—like an egg with its shell taken off—and that is why a fetation aborted at this stage is known as an "efflux."\(^b\)

Those Insects which generate, generate larvae; \((a)\) larvae, and those Insects also which are formed spontaneously and not by means of copulation are, to begin with, formed from an organism of this sort. This is:

\(^a\) See H.A. 550 a 10 ff.
\(^b\) Cf. H.A. 583 b 12.
καὶ τὰς κάμπτας εἶδός τι¹ τιθέναι σκώληκος, καὶ
tὰ τῶν ἄραχνῶν. καίτοι δόξειν ἂν ὕοις ἐοικέναι
dιὰ τὴν τοῦ σχήματος περιφέρειαν καὶ τούτων ἐνα
καὶ πολλὰ τῶν ἄλλων· ἄλλ' οὐ τῷ σχήματι λεκτέον
οὐδὲ τῇ μαλακότητι καὶ σκληρότητι (καὶ γὰρ
σκληρᾶ τὰ κυήματα γίγνεται ἐνίων) ἄλλα τῷ ὁλον
μεταβάλλειν καὶ µὴ ἐκ μορίου τινὸς γίνεσθαι τὸ
15 ζῷον. προελθόντα δὲ πάντα τὰ σκωληκώδη καὶ
tοῦ μεγέθους λαβόντα τέλος οἶον ὰν γίγνεται·
σκληρύνεται τε γὰρ περὶ αὐτὰ τὸ κέλυφος, καὶ
ἀκινητίζουσι κατὰ τοῦτον τὸν καίρον. δήλον δὲ
tούτῳ ἐν τοῖς σκώληξι τοῖς τῶν μελίττων καὶ
σφηκῶν καὶ ταῖς κάμπταις. τοῦτον δὲ αἰτιον ὅτι ἢ
20 φύσις ωσπερανεῖ πρὸ ὀφρας ωστοκεῖ διὰ τὴν
ἀτέλειαν τὴν αὐτῆς, ὥς ὅντος τοῦ σκώληκος ἐτὶ ἐν
αὐξήσει ψῳ µαλακοῦ. τὸν αὐτὸν δὲ τρόπον καὶ
ἐπὶ τῶν ἄλλων συμβαίνει πάντων τῶν µὴ² ἐξ ὧχείας
γιγνομένων ἐν ἐρίως ἢ τισιν ἄλλοις τοιούτοις, καὶ
tῶν ἐν τοῖς ὦδασιν. πάντα γὰρ µετὰ τὴν τοῦ
25 σκώληκος φύσιν ἀκινητίσαντα, καὶ τοῦ κέλυφους
περιέχρανθέντος, µετὰ ταῦτα τοῦτον ῥαγέντος
ἐξέρχεται καθάπερ ἐξ ὦῳ ζῷον ἐπιτελεσθέν ἐπὶ

¹ τὶ P: om. vulg. ² µὴ om. PSZ.

*This apparently means the eggs from which they are
correct, for we are bound to reckon caterpillars and the product of spiders as a form of larva. True, some of these, and many belonging to other Insects, would appear to resemble eggs on account of their circular shape; but our decision must not be determined by their shape nor yet by their softness or hardness (the fetations of some of these creatures are hard), but by the fact that the whole of the object undergoes change—the animal is formed out of the whole of it and not some part of it. All these larva-like objects, when they have advanced and reached their full size, become as it were an egg: the shell around them gets hard, and they remain motionless during this period. This is clearly to be seen with the larvae of bees and wasps, and with caterpillars. The reason for this is that their Nature, owing to its own imperfection, deposits the eggs as it were before their time, which suggests that the larva, while it is yet in growth, is a soft egg. A comparable thing occurs in the case of all other creatures which are formed independently of copulation in wool and other such material and in water. All of these first have the nature of a larva, then they remain motionless once the covering has solidified round them; after that the covering bursts and there emerges, as from an egg, an animal which, at this its third genesis, is at last produced. Aristotle however calls them larvae, and not eggs, at this stage, because according to him the stage which really corresponds to the egg-stage is not reached until later, when the creature becomes immobilized as a “pupa.”

The distinction which Aristotle makes here is an important one. See note on 732 a 32.

The stages are: larva, pupa, imago.
ἈΡΙΣΤΟΤΕΛΟΣ

758 b
tῆς τρίτης γενέσεως· ὃν τὰ [πλεῖστα] περιωτὰ τῶν πεζῶν <μείζων> ἔστιν.¹

Κατὰ λόγον δὲ συμβαίνει καὶ τὸ θαυμασθὲν ἃν δικαίως ὑπὸ πολλῶν, αἱ τε γὰρ κάμπις λαμβά-30 νοῦσαι τὸ πρῶτον τροφήν μετὰ ταῦτα οὐκέτι λαμβάνουσιν, ἀλλὰ ἀκινητίζουσιν αἱ καλοῦμεναι ὑπὸ τινῶν χρυσαλλίδες, καὶ τῶν σφηκῶν οἱ σκώ-ληκες καὶ τῶν μελιττῶν μετὰ ταῦτα αἱ καλοῦμεναι νῦσαι γίνονται, [καὶ τοιοῦτον οὐδὲν ἔχουσιν]² καὶ γὰρ ἢ τῶν φῶν φύσις ὅταν λάβῃ τέλος, ἀναυξης 35 ἐστι, τὸ δὲ πρῶτον αὐξάνεται καὶ λαμβάνει τροφήν, ἐως ὅτι διορισθῇ καὶ γένηται τέλειον φῶν. τῶν δὲ σκωλήκων οἱ μὲν ἔχουσιν ἐν εαυτοῖς τὸ τοιοῦτον ὅθεν πρεϕομένοις ἐπιγίγνεται [τοιοῦτον]³ περίτ-τωμα, οἷον οἱ τῶν μελιττῶν καὶ σφηκῶν. οἱ δὲ λαμβάνουσι θύραθεν, ὦσπερ αἰ τε κάμπις καὶ τῶν ἄλλων τινὲς σκωλήκων.

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Διότι μὲν οὖν τριγενῇ τε γίγνεται τὰ τουιάτα, καὶ δι’ ἣν αὐτίαν ἐκ κινουμένων ἀκινητίζει πάλιν, 5 εἰρήται· γίγνεται δὲ τὰ μὲν ἕξ όχείας αὐτῶν, καθάπερ οἱ τε ὀρνίθες καὶ τὰ ζωοτόκα καὶ τῶν ἱχθῶν οἱ πλείστοι, τὰ δὲ αὐτόματα, καθάπερ ἐνα τῶν φυομένων.

¹ correx'i (cf. 763 a 23). Σ vertit et volatilia ex eis sunt maiora quam ambulantia.
² ante haec verba lacunam plurimorum vv. statuit Platt (τροφήν pro τοιοῦτον coni. Α.-W., cf. 759 a 1); ego seclusi; fort. transferenda ad 759 a 1-2 et ita scribendum οἱ δὲ οὐδὲν τοιοῦτον ἔχουσιν (ἄλλα) λαμβάνουσιν κτλ. cf. infra 763 a 12 sqq.
³ 330
PERFECTED. OF THESE CREATURES, THE WINGED ONES ARE LARGER THAN THOSE THAT WALK.

ANOTHER OCCURRENCE, WHICH MAY WELL CAUSE SURPRISE TO MANY PEOPLE, IS REALLY QUITE REGULAR AND NORMAL. CATERPILLARS AT FIRST TAKE NOURISHMENT, BUT AFTERWARDS THEY CEASE DOING SO, THE CHRYSALIS (AS SOME CALL IT) BEING MOTIONLESS; SO TOO THE LARVAE OF WASPS AND BEES AFTERWARDS TURN INTO PUPAE AS THEY ARE CALLED [AND HAVE NOTHING OF THE SORT]. THIS IS NOT ABNORMAL, FOR AN EGG ALSO, WHEN IT HAS REACHED THE PERFECTION OF ITS NATURE, DOES NOT GROW, WHEREAS TO BEGIN WITH IT DOES GROW AND TAKES NOURISHMENT, UNTIL ITS DIFFERENTIATION IS EFFECTED AND IT HAS BECOME A PERFECT EGG. SOME LARVAE CONTAIN IN THEMSELVES MATERIAL FROM WHICH AS THEY FEED ON IT RESIDUE IS PRODUCED, \textit{e.g.}, THOSE OF BEES AND WASPS; OTHERS GET THE MATERIAL FROM WITHOUT, AS CATERPILLARS AND SOME OTHER LARVAE DO.

I HAVE NOW STATED WHY IT IS THAT IT TAKES A THREEFOLD GENERATION \textit{b} TO PRODUCE CREATURES OF THIS SORT, AND THE CAUSE WHICH, AFTER THEY HAVE BEGUN AS MOBILE CREATURES, MAKES THEM BECOME INMOBILE AGAIN. ALSO, SOME OF THEM ARE FORMED IN CONSEQUENCE OF COPULATION, JUST AS BIRDS, VIVIPARA AND THE MAJORITY OF FISHES ARE; OTHERS ARE FORMED SPONTANEOUSLY, AS CERTAIN PLANTS \textit{c} ARE.

\begin{itemize}
  \item \textit{a} \textit{Cf. H.A. 551 a 29 ff.} \textit{"the larvae of bees . . . and wasps, while they are young, take nourishment and are seen to have excrement";} \textit{cf. also ibid. a 25.}
  \item \textit{b} \textit{See above, 758 a 28 et praeced.}
  \item \textit{c} \textit{e.g.,} \textit{the mistletoe, 715 b 28.}
\end{itemize}

\begin{itemize}
  \item \textit{om. Z: τοιοῦτο ἡ τροφή S: habent in se id quo cibantur et eiciunt superfluitatem cibi Σ.}
  \item \textit{olov oï Peck (sicunt Σ): oï τε vulg.}
\end{itemize}
The facts about bees, so far as they are known, are these. There are three sorts of bees: (1) the Queen, which is a fully developed female; (2) the worker, which is a partially developed female; and (3) the drone, which is a male. Eggs are laid by the Queen, and it is generally agreed that the unfertilized eggs produce drones and the fertilized eggs Queens or workers. When a hive becomes over-populated, "swarming" takes place, and after the colony has settled down in its new home, the Queen takes the "marriage flight," followed by a number of males; copulation takes place in mid-air, and the Queen returns to the nest. At the end of the summer the drones are ejected by the workers. Queens
The generation of bees is a great puzzle. If it is a fact that certain fishes are generated without copulation, the same probably occurs among bees as well—or so it seems from appearances. The possible methods are these: Bees must either (a) fetch the offspring from elsewhere (some hold this view); in which case the offspring will either have sprung into being spontaneously or have been produced by some other animal; or (b) generate the young themselves; or (c) fetch some and generate some (this, too, is a view held by certain people, who maintain that the young of the drones only are fetched). If they generate the young themselves, this must be done either with or without copulation; if with copulation, then either (i) each kind generates its own kind, or (ii) one of the three kinds generates the others, or (iii) one kind unites with another kind. What I mean is, e.g., either (i) “bees” are formed from the union of “bees,” drones from the union of drones, kings from the union of kings; or (ii) all the rest are generated by one kind only: e.g., by the kings or leaders as they are called; or (iii) by the union of drones and “bees” (some people of course and workers are produced from similar eggs, though the queen-cells are larger; but the larva of a Queen is fed on “royal jelly” (a special food produced by the workers) throughout its development, whereas those of workers are fed on this for a short time (3 or 4 days) only, and for the remainder of the time on honey and digested pollen. It is thought that in rare cases the workers may produce Queens and other workers from unfertilized eggs. A worker’s development is completed in 3 weeks; a Queen’s in 16 days and a drone’s in 24 days.

The larvae.

The three “kinds” are: “kings” or “leaders” (i.e., queens); “bees” (i.e., workers); and drones.
759 a

μὲν ἄρρενας εἶναι τοὺς δὲ θήλεις, οἱ δὲ τὰς μὲν μελίττας ἄρρενας τοὺς δὲ θηφήνας θήλειας.

25 Ταῦτα δ’ ἐστὶ πάντα ἀδύνατα συλλογιζομένοι τὰ μὲν ἐκ τῶν συμβαινόντων ἵδα περὶ τὰς μελίττας, τὰ δὲ ἐκ τῶν κοινοτέρων τοὺς ἄλλους ζῴους. εἶτε γὰρ μὴ τίκτουσαι φέρουσιν ἀλλοθεν, ἐδει γύγνεσθαι μελίττας καὶ μὴ φερουσῶν τῶν μελιττῶν ἐν τοῖς τόποις ἔξ ὑν τὸ σπέρμα φέρουσιν. διὰ τί γὰρ

30 μετενεχθέντος μὲν ἔσται, ἐκεῖ δ’ οὐκ ἔσται; προσηκει γὰρ οὐδὲν ἦττον, εἰτε φυόμενον ἐν τοῖς ἀνθέσιν αὐτόματον εἰτε ἱζώμε τινὸς τίκτοντος. κἂν εἰ γε ζῷοι τινὸς ἐτέρου τὸ σπέρμα ἤν, ἐκεῖνο ἐδει γύγνεσθαι ἐξ αὐτοῦ, ἀλλὰ μὴ μελίττας. ἔτι δὲ τὸ μὲν μὲλι κομίζειν εὐλόγον (τροφὴ γὰρ), τὸ δὲ τὸν ἕνον ἀλλότριον οὖντα καὶ μὴ τροφῆν ἄτοπον. τινὸς γὰρ χάριν; πάντα γὰρ ὅσα πραγματεύεται περὶ τὰ τέκνα, περὶ τὸν φαιόμενον οἴκειον διαπονέται γόνων.

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Ἀλλὰ μὴν οὔδὲ τὰς μὲν μελίττας θηλείας εἶναι τοὺς δὲ κηφήνας ἄρρενας εὐλόγον. οὔδεν γὰρ τὸ πρὸς ἄλκην ὀπλὸν τῶν θηλείων ἀποδίδωσιν ἢ φύσις, εἰσὶ δ’ οἱ μὲν κηφήνες ἀκέντροι, αἱ δὲ 5 μελίτται πᾶσαι κέντρον ἔχουσιν. οὔδὲ τούναττον εὐλόγον, τὰς μὲν μελίττας ἄρρενας τοὺς δὲ κηφήνας θηλείας. οὔδεν γὰρ τῶν ἄρρενων εἰσὶ διαπονέισθαι περὶ τὰ τέκνα, νῦν δ’ αἱ μελίτται τοῦτο ποιοῦσιν. ὅλως δ’ ἐπειδὴ φαίνεται ὁ μὲν τῶν κηφήνων γόνος

1 oì δὲ PSYZ: οἶνον vulg.
2 ἐν τοῖς τόποις ἔξ ὑν Z: ἐκ τοῦ τόπου ἔξ οὗ vulg.
3 τροφή γάρ om. SY.
4 τίνος γάρ χάριν om. SZ.
5 θηλείας P: θηλείας SZ: θηλεία vulg.

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say that drones are male and "bees" female; others that "bees" are male and drones female).

We have only to bring before our minds the special and particular facts concerning bees, on the one side, and on the other the facts more generally applicable to other animals, to see that all of these theories are impossible. Suppose they do not generate offspring themselves but fetch them from elsewhere. In that case bees ought to be formed, even if the bees failed to fetch them away, in those places whence they fetch the seed (semen). For why should a bee be produced if the seed is fetched away, and not if it is left where it is? Surely it ought to be produced none the less, no matter whether it springs spontaneously to life in the blossoms or whether some animal generates it. Also, if the seed were that of some other animal, then that animal ought to be formed out of it, and not bees. Further, it is reasonable enough that bees should collect honey, for honey is their food; but it is absurd that they should collect offspring which (a) is produced by some animal other than themselves, and (b) is not food. After all, why should they? All creatures which concern themselves about young ones take that trouble over what appears to them to be their own proper offspring.

Nor is it reasonable to hold that "bees" are female and drones male; because Nature does not assign defensive weapons to any female creature; yet while drones are without a sting, all "bees" have one. Nor is the converse view reasonable, that "bees" are male and drones female, because no male creatures make a habit of taking trouble over their young, whereas in fact "bees" do. But generally, since it is apparent that the brood of the drones is produced
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ἐγγυνόμενος καὶ μηθενὸς ὁντὸς κηφῆνος, ὁ δὲ τῶν
10 μελιττῶν ὁυκ ἐγγυνόμενος ἀνευ τῶν βασιλέων (διὸ καὶ φασὶ τινες τὸν τῶν κηφῆνων φέρεσθαι μόνον),
δὴ λοι ὡς ὁυκ ἐξ ὀχείας γίνονται, οὔτ' ἐξ ἐκατέρου
τοῦ γένους αὐτοῦ αὐτῷ συνδυαζομένου, οὔτ' ἐκ
μελιττῶν καὶ κηφῆνων. τὸ τε τούτον φέρειν μόνον
dιὰ τα ἐιρημένα ἀδύνατον, καὶ οὐκ εὐλογον μὴ
15 περὶ πᾶν τὸ γένος αὐτῶν ὁμοίων τι συμβαίνειν
πάθος. ἀλλὰ μὴν οὐδ' αὐτάς τὰς μελίττας ἐν-
δέχεται τὰς μὲν ἀρρενας εἶναι τὰς δὲ θηλείας· ἐν
πάσι γὰρ διαφέρει τοῖς γένεσι τὸ θήλυ καὶ τὸ
ἀρρεν. κἂν ἐγέννων αὐταὶ αὐτάς· νῦν δ' οὐ φαί-
νεται γιγνόμενος ὁ γόνος αὐτῶν, ἐὰν μὴ ἐνώσων οἱ
20 ἡγεμόνες, ὡς φασίν. κοινὸν δὲ καὶ πρὸς τὴν ἐξ
ἀλλήλων γένεσιν καὶ πρὸς τὴν ἐκ τῶν κηφῆνων,
καὶ χωρὶς καὶ μετ' ἀλλήλων, τὸ μηδέποτε ὅφθαι
ὀχεύμενον μηθὲν αὐτῶν· εἰ δ' ἤν ἐν αὐτοῖς τὸ μὲν
θήλυ τὸ δ' ἄρρεν, πολλάκις ἄν τούτο συνέβαινεν.
λείπεται δ', εἰπέρ εξ ὀχείας γίγνεται, τοὺς βασιλείς
25 γενναν συνδυαζομένους. ἀλλ' οἱ κηφῆνες φαίνονται
γιγνόμενοι καὶ μὴ ἐνόντων ἡγεμόνων, ὡν οὔτε
φέρειν οἶδον τε τὸν γόνον τὰς μελίττας οὔτε γενναν
αὐτὰς ὀχευμένας. λείπεται δὴ, καθάπερ φαίνεται

1 οὐκ Z: οὔτ' vulg.

a Cf. above, 755 b 3, n.

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even when there is no drone present to start with, whereas young "bees" are produced only if the kings are present (and this is why some people say that the brood of the drones are the only ones they fetch from away), it is plain that they are not formed as a result of copulation, either (1) of "bee" with "bee" or drone with drone, or (2) of "bee" with drone. And anyway, not only is it impossible that drones are the only ones they fetch in, for the reasons stated, but also it is unreasonable to suppose that a similar thing does not happen in respect of the whole tribe of them." Again, it is impossible that some of the "bees themselves" should be male and some female, since in all kinds of animals the male and the female are different. And besides, if it were so, "bees" by themselves would generate "bees," but in actual fact we see that the brood of "bees" is not formed unless, as they say, "the kings are within." And here is a point which strikes at either theory (that they are produced (a) by the union of "bees" with one another, and (b) by their union with the drones, i.e., by one kind apart from the other, or by the two kinds together with one another): none of them has ever been seen in the act of copulation, whereas if there had been male and female among them this would often be occurring. The remaining possibility, assuming that they are generated by means of copulation at all, is that the kings unite and so generate them. But, as against this, the drones, as we see, are formed even if no "leaders" are "within"; and as it is impossible that the "bees" should either fetch in the brood of drones from away or generate them by copulation themselves, plainly the only possibility

b Proved already.
759 b συμβαίνον ἐπὶ τινῶν ἱχθῶν, τὰς μελίττας ἀνευ ὀχείας γεννᾶν τοὺς κηφήνας, τῷ μὲν γεννᾶν οὐσάς 30 θηλείας, ἔχουσας δὲ ἐν αὐταῖς, ὥσπερ τὰ φυτὰ, καὶ τὸ θηλυ καὶ τὸ ἄρρεν, διὸ καὶ τὸ πρὸς τὴν ἀλκήν ἔχουσιν ὄργανον· οὐ γὰρ δεῖ θηλυ καλεῖν ἐν ὦ ἄρρεν μή ἐστι κεχωρισμένον.

Εἰ δὲ ἐπὶ τῶν κηφήνων τούτω φαίνεται συμβαίνον καὶ γιγνόμενοι μή εἰς ὀχείας, ἦδη καὶ κατὰ τῶν 35 μελιττῶν καὶ τῶν βασιλεῶν τὸν αὐτὸν ἀναγκαῖον εἶναι λόγον καὶ μή γεννᾶσθαι εἰς ὀχείας. εἰ μὲν ὦν ἀνευ τῶν βασιλεῶν ἐφαίνετ' ἐγγυνόμενος ὁ γόνος τῶν μελιττῶν, καὶ τὰς μελίττας ἀναγκαῖον ἢν εἰς αὐτῶν ἀνευ ὀχείας γίγνεσθαι. νῦν δ' ἐπειδὴ τούτ' οὐ φασίν οἱ περὶ τὴν θεραπείαν τούτων τῶν ἱὼν ὄντες, λειπεται τοὺς βασιλείς καὶ αὐτοὺς γεννᾶν καὶ τὰς μελίττας.

5 "Οντος δὴ1 περιττοῦ τοῦ γένους καὶ ἱδίου τοῦ τῶν μελιττῶν, καὶ ἡ γένεσις αὐτῶν ἱδίως εἶναι φαίνεται. τὸ μὲν γὰρ γεννᾶν τὰς μελίττας ἀνευ ὀχείας εἰὴν ἄν καὶ ἐπὶ ἄλλων ἱὼν συμβαίνον, ἀλλὰ τὸ μή τὸ2 αὐτὸ γένος γεννᾶν ἱδίων· οἱ γὰρ ἐρυθρίνοι γεννώσων ἐρυθρίνους καὶ αἱ χάνναι χάννας. αὐτίον δ' ὅτι 10 καὶ αὐταὶ γεννῶνται αἱ μελίτται οὐχ ὥσπερ αἱ μνῖαι καὶ τὰ τοιαῦτα τῶν ἱὼν, ἀλλ' εἰς ἐτέρου

1 δὴ Rackham: δὲ vulg.

a e.g., erythrinus and channa (below, 760 a 9); see also 762 b 23, and H.A. 569 a 17, 570 a 2 (cestreus and eel).
b See above, 759 b 4. They are as much male as female; hence it is not irregular for them to possess a sting.

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remaining is something parallel to what we find occurs in certain fishes: the "bees" generate the drones without copulation, i.e., although so far as generating is concerned they are female, yet they contain in themselves the male as well as the female (factor), just as plants do; and this also is why they possess the organ for self-defence, for of course it is wrong to apply the term "female" to creatures where no separate male exists.

We find then that this is what occurs in the case of the drones: they are formed independently of copulation. And if this is so, then surely the same argument must apply to the "bees" and the kings; they too must be generated independently of copulation. Now if we were sure that the brood of the "bees" made their appearance without the kings being there, then it would follow of necessity that the "bees" as well as the drones are produced from "bees" without copulation. This however is denied by those whose business it is to look after these creatures. Hence the only possibility left is that the kings generate their own kind and the "bees" as well.

We see then that the manner in which bees are generated appears to be peculiar, in keeping with their extraordinary and peculiar character. Bees' generating without copulation might be paralleled by the behaviour of other animals, but their generating some different kind of creature is peculiar and unique, for even erythrinoi and channae generate creatures of the same kind as themselves. The reason is that the "bees themselves" are not generated in the same way as flies and other such creatures, but from a kind which though different is akin to
μὲν συγγενοῦς δὲ γένους· γίγνονται γὰρ ἐκ τῶν ἡγεμόνων. διό καὶ ἔχει ἀνάλογον πως ἡ γένεσις αὐτῶν. 1[οἱ μὲν γὰρ ἡγεμόνες μεγέθει μὲν ὦμοιοί εἰσι τοῖς κηφήσι, τῷ δὲ κέντρον ἔχειν ταῖς μελίτ-15 ταῖς· αἱ μὲν οὖν μέλιται κατὰ τοὺτ’ ἐσίκκασιν αὐτοῖς, οἱ δὲ κηφῆνες κατὰ τὸ μέγεθος.] ἀνάγκη γάρ τι παραλλαττεῖν, εἰ μὴ δεῖ αἰεὶ τὸ αὐτὸ γένος ἐξ ἐκάστου γίνεσθαι. τούτῳ δ’ ἀδύνατον: πᾶν γὰρ ἄν τὸ γένος ἡγεμόνες ἦσαν. αἱ μὲν οὖν μέλιται κατὰ τὴν δύναμιν αὐτοῖς ὦμοιώταται [καὶ τῷ2 20 τίκτειν], οἱ δὲ κηφῆνες κατὰ τὸ μέγεθος. [εἰ δ’ εἰχὸν καὶ κέντρον, ἡγεμόνες ἦν ἦσαν. νῦν δὲ τούτῳ λείπεται3 τῆς ἁπορίας4· οἱ γὰρ ἡγεμόνες ἀμφοτέροις ἐσίκκασιν ἐν τῷ αὐτῷ τοῖς γένεσι, τῷ μὲν κέντρον ἔχειν ταῖς μελίταις, τῷ δὲ μεγέθει τοῖς κηφήσι.]5 ἀναγκαῖον δὲ καὶ τοὺς ἡγεμόνας γίνεσθαι ἐκ τινός. 25 ἐπεὶ οὖν οὔτ’ ἐκ τῶν μελιττῶν οὔτ’ ἐκ τῶν κηφήνων, αὐτοῖς ἀναγκαῖον καὶ αὐτοὺς γεννᾶν. [γίγνονται δ’ ἐπὶ τέλει οἱ κύτταροι αὐτῶν καὶ οὐ πολλοὶ τοῦν ἀριθμὸν.]6 ὡστε συμβαίνει τοὺς μὲν

1 in seqq. plurima irepsisse videntur. αἱ μὲν οὖν . . . μέγεθος om. Σ.
2 τὸ Υ: τοῦ coni. Α.-W.; καὶ τῷ τίκτειν seclusi.
3 λέλυταί coni. Platt.
4 hic addit Υ καὶ ἤδη λέλυται τὰ προερημένα γὰρ ἡ λύσις τῆς ἁπορίας.
5 secl. Α.-W. 6 haec verba hie aliena.

a The full explanation of this statement comes at ll. 27 ff. below, but owing to a number of interpolations in the text the clarity of the passage has become obscured. The ἀναλογία is:

Kings can generate two kinds, their own and another (viz., kings and "bees");
them—they are, of course, generated from the “leaders.” Hence their manner of generation is in fact arranged in a sort of proportionate series; [thus, the leaders are similar to the drones in size, but similar to the “bees” in possessing a sting; therefore the “bees” are similar to them in this respect, but the drones are similar to them in size,] for of course the three kinds must of necessity fail to coincide in some respect, unless the same kind is always going to be bound to be generated from each, and this is impossible, because then the whole tribe of them would be “leaders.” Therefore the “bees” have been made similar to them in respect of characteristic properties, [i.e., in virtue of generating young,] while the drones have been made similar to them in respect of size [and if they had a sting as well, they would be “leaders.” As it is, this portion of the puzzle remains, since the leaders resemble both kinds at the same time, the bees in possessing a sting, the drones in size.] But the leaders too must be generated from something; and since they are generated neither from the bees nor from the drones, they must of necessity generate their own kind as well. [And their cells are the last to be formed, and are not many in number.] So it turns

“Bees” can generate one kind, i.e., a kind other than their own (viz., drones); Drones can generate no kind. This is the πέρας of the ἀναλογία (see 760 a 33).

Dynamis: referring to the special and distinctive characteristic, viz., ability to generate, as the gloss explains.

I have tentatively bracketed the passages which seem to have been interpolated. The main argument is about the power to generate, not about size or sting.

This sentence seems to have been misplaced; it is more relevant if moved to 760 b 27 below.
ARISTOTLE

760 a

ηγεμόνας γεννάν μὲν καὶ αὐτοὺς, γεννάν δὲ καὶ ἄλλο τι γένος (τοῦτο δ' ἐστὶ τὸ τῶν μελιττῶν), τὰς
30 δὲ μελίττας ἄλλο μὲν τι γεννᾶν, τοὺς κηφήνας, αὐτὰς δὲ μηκέτι γεννᾶν, ἄλλα τοῦτ' ἀφηρησθαί αὐτῶν. ἔπει δ' ἀεὶ τὸ κατὰ φύσιν ἔχει τάξιν, διὰ τοῦτο τῶν κηφήνων ἀναγκαίων καὶ τὸ ἄλλο τι γένος γεννᾶν ἀφηρησθαί. ὅπερ καὶ φαίνεται συμβαίνον: αὐτοὶ μὲν γὰρ γίγνονται, ἄλλο δ' οὐδὲν
35 γεννᾶσιν, ἄλλ' ἐν τῷ τρίτῳ ἀριθμῷ πέρας ἔσχεν ἡ γένεσις. καὶ οὕτω δὴ συνέστηκε τῇ φύσει καλῶς ὡς' αἰεὶ διαμένει οὐτα τὰ γένη καὶ μηδὲν ἐλλείπειν, μὴ πάντων γεννώντων. [εὐλογοῦν δὲ καὶ τοῦτο συμβαίνειν, ἐν μὲν ταῖς εὐεπομονίαις μέλι καὶ κηφῆνας γίνεσθαι πολλούς, ἐν δὲ ταῖς ἑπομομονίαις
5 διόλους γόνων πολύν. αἱ μὲν γὰρ ὑγρότητες περίττωμα ποιοῦσι πλεῖον ἐν τοῖς σώμασι τῶν ἡγεμόνων, αἱ δ' εὐεπομονίαι ἐν τοῖς τῶν μελιττῶν. ἔλαττω γὰρ οὖν τῷ μεγέθει δεῖται τῆς εὐεπομονίας μᾶλλον.2] εὖ δὲ καὶ τὸ τοὺς βασιλεῖς ὡσπερ πεποιημένους ἐπὶ τεκνωσιν ἐσῳ μένειν, ἀφειμένους τῶν ἀναγκαίων
10 ἔργων, καὶ μέγεθος δὲ ἔσχειν, ὡσπερ ἐπὶ τεκνοποιών συστάντος τοῦ σώματος αὐτῶν τοὺς τε κηφήνας ἄργους ἄτ' οὖν ἐξοντας ὀπλον πρὸς τὸ διαμάχεσθαι περὶ τῆς τροφῆς, καὶ διὰ τὴν βραδυτῆτα τῆς τοῦ σώματος. [αἱ δὲ μελίτται μέσοι3 τὸ μέγεθος εἰσὶν ἀμφοῖν (χρήσιμαι4 γὰρ οὕτω πρὸς τὴν

1 ἔλαττον γὰρ οὖν P: ἔλαττον γὰρ οὖ vulg. 2 aliena hic. 3 μείους coni. Btf.; τὸ μέγεθος del. Sus. 4 χρήσιμαι P: χρήσιμοι vulg.

a This passage also seems to be out of place.
out that the leaders generate their own kind, and another kind as well (viz., the "bees"); while the "bees" generate another kind (the drones), but not their own kind; this they have been deprived of doing. And since any business of Nature's always has an orderly arrangement, on that account necessity requires that the drones shall have been deprived even of generating some other kind. And this is what is found to be the case in actual fact: they are generated themselves, but generate no other creature; thus the progression of generation reaches its limit at the third term of the series. And this arrangement has been so well constituted by Nature that the three kinds continue ever in existence and none of them fails, though not all of them generate. [Another point about them, which is in accord with what we should expect, is this. In fine seasons, much honey and a large number of drones is produced, in rainy seasons a large number of offspring generally. The reason is that wet conditions produce more residue in the bodies of the leaders, whereas fine seasons do the same in those of the bees, for being smaller in size they have greater need of fine weather.] Besides, it is well that the kings, who have, as it were, been made specially for the purpose of procreation, should stay within, released from the drudgery that has got to be done by somebody; and that they should be large, since their body has been constituted as it were for procreation, and that the drones should be idle, as they have no weapon for engaging in combat to secure their food, and also on account of the slowness of their bodies. [The bees, however, are as regards size midway between the two, for thus they are serviceable for active work,
15 ἔργασίαν, καὶ ἐργάτιδες ὡς καὶ τέκνα τρέφουσαι καὶ πατέρας.  
1 omologoumenov δ’ ἐστὶ καὶ τὸ ἐπ-  
akołoutheív toûs basileûs tâ tûn génésoû ek tou-  
tôn eînai tûn tôn melittôn (ei gar mē̇thēn tòu̇tôν  
úpîrhexen, ouk eî̇xe lógon tâ sumbaînonta peri tûn  
ηγεμονîan autâw), kai tò tòus mên éȧn mē̇thēn ēr-  
20 γαζομένous ὡς γονεîs, tòus dè kηφή̇nas kolâξeiv ὡς  
tékna: kâllion gar tâ tékna kolâξeiv kai òn mē̇thēn  
éstîn ērâgon. tò dè tâs melîttas gennâtan pollâs  
aútoús ôntas ôlîgous tòus  
ηγεμônas paraπλîsion  
éouke sumbaîwein tûn génése tûn leôntôn, òi  
tò prîtôton pênte γεννή̇santès ústeron élâttw gén-  
25 nûso kai têlos ēn, eî̇t’ ouûdên. òi δ’  
ηγεμônes tò  
mên prîtôton plîthos, ûsteron δ’ ôlîgous áutoûs,  
kâkeînou2 môên élâttw tôn gônon, áutoûs δ’  
êpëi tòu plîthous ἀφεîle, tô3 méγëthos áutoîs4  
apéðwkeven  
̄h fûsis.5  

1 Ek mên oun tòu lógon tâ peri tûn génésoû tûn  
30 méliptaûn tòu̇tôn êxein faînetai tòn tròpôn, kai  
êk tûn sumbaînein dokouûntôn peri autâs: ou mîn  
eîlîppai gê tûn sumbaînonta ikanôs,  
âll’ êan pote  

ηθθῆ, tôte tûn aiôthêseî ùstlûn tûn lógon pîstêu-  

1 moment corrupta esse A.-W.: pro prós tûn . . .  
patéraς creationi pullorum Σ (=pròs tûn téknuwewn). unde  
et credo leg. esse v. 17 (tâs melîttas) toûs basileûs . . . [tûn  
tûn melîttôn].  
2 kâkeînou PS.  
3 ἀφεîle tô] ἀφεîleto ΥZ.  
4 δ’ áutoîs Y.  
5 áutoûs . . . fûsis] quoniam diminuuntur superfluitates  
que sunt in corpore Σ.
and they are workers inasmuch as they support and feed their children and fathers alike. Other facts which fit in well are these: (a) the bees attend upon the kings—because the bees are generated from the kings; since, if nothing of this kind were the case, the facts about their leadership would be lacking in reason; (b) they allow the leaders to do no work, as being their parents, and they punish the drones, as being their children, because it is a finer thing to punish children and those who have no function to perform. The fact that the leaders, though few themselves in number, generate a large number of bees looks like a parallel phenomenon to the generation of lions. Lions to begin with generate five, then fewer, finally one, then none at all. The "leaders" generate a multitude to begin with, and later on a few—these are of their own kind, and though the brood of these is smaller in number, Nature, because she has taken away from their numbers makes up for it by giving them more in the way of size.

This, then, appears to be the state of affairs with regard to the generation of bees, so far as theory can take us, supplemented by what are thought to be the facts about their behaviour. But 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

a Part of this sentence is inconsistent with what has already been said about the comparative sizes of the three kinds, and part anticipates what is to be said in the next sentence.
b I suppose attention should be called to this statement.
c See 750 a 31 ff.
d The statement at 760 a 26 above seems relevant here.
τέον, καὶ τοῖς λόγοις, ἔαν ὀμολογούμενα δεικνύσαι τοῖς φαινομένοις.

[Πρὸς δὲ τὸ μὴ ἔξ ὀχείας γίνεσθαι σημεῖον καὶ
tὸ τὸν γόνον φαίνεσθαι μικρὸν ἐν τοῖς τοῦ κηρίου
35 κυτταρίων· ὥσα δ' ἔξ ὀχείας τῶν ἐντόμων γεννᾶται,
sυνδυάζεται μὲν πολὺν χρόνον, τίκτει δὲ ταχέως
καὶ μέγεθος ἔχον σκωληκοειδές.]¹

Περὶ δὲ τὴν γένεσιν τὴν τῶν συγγενῶν ζώων
αὐταῖς, οἴον ἄνθρωπον τε καὶ σφήκα, τρόπον των
ἔχει παραπληθώς πάσιν, ἀφήρηται δὲ τὸ περιττὸν
5 εὐλόγως· οὐ γὰρ ἔχουσιν οὐθὲν θείον, ὡσπερ τὸ
γένος τὸ τῶν μελίττων. γεννῶσι μὲν γὰρ αἱ
μήτραι καλοῦμεναι, καὶ τὰ πρῶτα συμπλάττουσι
τῶν κηρίων, ὀχεύομεναι δὲ γεννῶσιν ὡτ' ἀλλήλων
ἂπταν γὰρ πολλάκις ὁ συνδυασμὸς αὐτῶν. πόσας
δ' ἔχουσι διαφορὰς ἢ πρὸς ἀλληλα τῶν τουούτων
10 γενών ἐκαστον ἢ πρὸς τὰς μελίττας, ἐκ τῶν περὶ
tὰς ἱστορίας ἀναγεγραμμένων δεὶ θεωρεῖν.

Καὶ περὶ μὲν τῶν ἐντόμων τῆς γενέσεως εὑρηται
πάντων, περὶ δὲ τῶν ὀστρακοδέρμων λεκτέων.

XI Ἐχει δὲ καὶ τούτων τὰ περὶ τὴν γένεσιν τῇ μὲν
15 ὀμοίως τῇ δ' οὔχ ὀμοίως τοῖς ἄλλοις. καὶ τοῦτ'
εὐλόγως συμβαίνει: πρὸς μὲν γὰρ τὰ ζώα φυτοῖς
ἐσώκατα, πρὸς δὲ τὰ φυτὰ ζώως, ὡστε τρόπον μὲν
τινα ἀπὸ σπέρματος φαίνεσθαι γνώμενα, τρόπον δ' ἄλλον
οὐκ ἀπὸ σπέρματος, καὶ τῇ μὲν ἀυτόματα

¹ haec non proprio loco sita.

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ᵃ The most important principle announced in this paragraph deserves very special attention.
ᵇ This is another misplaced paragraph.
to theories,—and to theories too provided that the results which they show agree with what is observed.\(^a\)

[Another piece of evidence which goes to show that bees are generated without copulation is that the brood appears to be quite small in the cells of the comb, whereas those insects which are generated by means of copulation (\(a\)) spend a long time in intercourse. and (\(b\)) quickly bring forth their offspring, which is of the nature of a larva and of considerable size.] \(^b\)

With regard to the generation of the animals that are akin to bees, such as hornets and wasps,\(^c\) the situation is in a way similar in all of them, but the extraordinary features are lacking, and this is what we should expect, because they contain no divine ingredient as the tribe of bees does. Although the "mother-wasps" as they are called do indeed generate, and mould the first of the cells, it is by copulation with one another that they generate, as their copulation has often been observed. To find out the various differences between each of these kinds of creatures, and between them and bees, the records given in the Researches \(^d\) should be studied.

We have now described the generation of all the Insects, and we have next to describe the Testacea.

The circumstances of the generation of these XI animals also is to some extent similar, to some extent dissimilar, to those of the others. And this is what we should expect, for compared with animals, they resemble plants, compared with plants, they resemble animals, so that in a way it seems that they are generated from semen, but in another way not;

\(^a\) See H.A. 627 b 23 ff., 628 b 32 ff.
\(^b\) At H.A., locc. cit.
\(^c\) See H.A. 627 b 23 ff., 628 b 32 ff.
\(^d\) At H.A., locc. cit.
The scheme which Aristotle has in mind is:

**Place:** Earth  Water  Air

**Creature:** Plants  Testacea  Land-animals.

(From the passage 761 b 16-23 (see n., p. 352) we may add a fourth pair, Fire, and Moon-animals; but it is not essential to Aristotle’s main argument, and Aristotle himself does not seem too sure of the existence of such creatures.) Aristotle holds that water supports life better than earth (I. 27); and also that the more “perfect” animals are those which breathe, *i.e.*, which live in the air (see 732 b 28 ff.); hence the three
and in one sense that they are spontaneously generated, in another that they are generated from themselves, or some by the one method, some by the other. In virtue of the Testacea being in their nature the correlative of plants, no part, or only a small part, of this tribe comes into being in the earth (examples are snails, and any such species there may be besides, but there are not many), whereas many species, of all kinds of shapes, live in the sea and similar watery places. The plant tribe, on the other hand, makes very little show—practically none at all, in fact—in the sea and such places, but all members of this tribe grow in the earth. The reason is that in respect of their nature the two tribes stand in a correlative position: the nature of Testacea is removed from that of plants by an interval corresponding to that by which water and fluid matter are better able to support life than earth and solid matter, since Testacea aim at being so related to the water as plants are related to the earth: it is as though plants were a sort of land-shellfish, and shellfish a sort of water-plant.

And it is for some such cause as this that the things which grow in the water are more various in shape than those which grow in the earth. It is because a fluid substance is in its nature more plastic than earth, and not much less substantial; and this is a characteristic possessed to a marked degree by the creatures in the sea, since fresh water, though sweet stages are in order of increasing “perfection.” We thus get the ἀναλογία (l. 27):

Testacea : Water : : Plants : Earth, or

*b Or, “proportionate relationship.”*
τρόφιμον, ἢττον δὲ σωματῶδες καὶ ψυχρόν ἔστιν. διότι ὅσα ἄναμμα καὶ μὴ θερμᾶ τὴν φύσιν, οὐ γίνεται ἐν ταῖς λίμναις οὔδὲ τῶν ἀλμυρῶν ἐν τοῖς 5 ποτιμωτέροις ἀλλ' ἢττον, οἶνον τὰ ὀστρακόδερμα καὶ τὰ μαλάκια καὶ τὰ μαλακόστρακα (πάντα γὰρ ἄναμμα καὶ ψυχρὰ ταῦτα τὴν φύσιν ἐστίν), ἐν δὲ ταῖς λιμνοθαλάτταις καὶ πρὸς ταῖς ἐκβολαῖς τῶν ποταμῶν γίνονται: ζητοῦσι γὰρ ἄμα τὴν τῷ ἀλέαν καὶ τὴν τροφήν, ἢ δὲ θαλαττα ὑγρά τε καὶ σω- 10 ματώδης πολλῷ μάλλῳ τοῦ ποτίμου καὶ θερμῆ τὴν φύσιν ἐστὶ, καὶ κεκοιμώνηκε πάντων τῶν μορίων, ὑγρῶ καὶ πνεύματος καὶ γῆς, ὅστε καὶ πάντων μετέχειν τῶν καθ' ἐκαστὸν γινομένων [ἐν 15 τοῖς τόποις ζῷων].1 τὰ μὲν γὰρ φυτὰ θείη τις ἂν γῆς, ὧδας δὲ τὰ ἐνυδρα, τὰ δὲ πεζὰ ἀέρος· τὸ δὲ μάλλον καὶ ἢττον καὶ ἐγγύτερον καὶ πορρώτερον πολλῆν ποιεῖ καὶ θαμμαστὴν διαφοράν.2 τὸ δὲ τέταρτον γένος οὐκ ἐπὶ τούτων τῶν τόπων δεῖ 1 seclusit Platt, ὅστε καὶ . . . ζῷων om. Σ. 2 haec sensu carere monet Platt, post πορρώτερον addit Ζ δεῖ τιθέναι, et pro ποιεῖ PZ habent ποιεῖ.
(palatable) and nutritious, is less substantial and is cold. Hence, those animals which are bloodless and not hot by nature are not produced in lakes nor in the fresher of brackish waters, except to a somewhat small extent—such as the Testacea, Cephalopods and Crustacea, all of which are bloodless and cold by nature—whereas in lagoons and near the mouths of rivers they are produced. The reason is that they seek both warmth and food together; and sea-water is fluid and much more substantial than fresh water and it is hot by nature, and it contains a quota of all the parts—of fluid, of pneuma, and of earth—so that it also contains a quota of all the creatures which grow in each of them, because we may say that plants belong to the earth, aquatic creatures to the water, and land-animals to the air, but the more and less and nearer and further make a surprisingly great difference. As for the fourth tribe, we must not look for a composition closely approximating to that of sea-water, which suggests that all vertebrates originated in the sea: and this receives support from comparative anatomical and embryological studies. Anaximander had asserted that human beings originated in fishes; see Plut. Symp. viii. 8. 4, p. 730 ε ἐν ἱζθύσιν ἐγγενέσθαι το πρῶτον ἄνθρωπος . . . ὡσπέρ οἱ γαλεοί [παλαιοί mss.] (see note, 754 b 32).

The rest of the paragraph from this point is obscure, and other passages do not help much in its elucidation. For Aristotle's theory of the structure of the universe, see App. A §§ 2 ff.

As Platt says, the sea "shares" in all three, earth, water, and air: it is fluid; it is σωματικὸν, and so contains earthy matter; and it has pneuma in it, being warm—for pneuma is "hot air" (736 a 1), and also, as Aristotle says at 762 a 19 ff., the things which are produced spontaneously in water are produced mainly in virtue of the pneuma in it, which contains Soul.

It is difficult to attach any meaning to this statement.
According to Aristotle, the "heavens" and the heavenly bodies were composed of the "fifth element," aither, whose natural movement is circular (see 736 b 35 ff. and n., and App. A § 2). As fire is the outermost of the sublunary elements and is therefore in contact with the "heaven" which is nearest to the earth, and as this "heaven" carries the moon, it follows that the moon can be said to "have a share in the fourth degree of remove," viz., fire. Aither must be clearly distinguished from fire; and, according to G. A. 737 a 1 (cf. Meteor. 382 a 7), fire generates no animal, whereas aither, the "element of the stars," is a form of θερμόν which can produce living creatures (ποιεί γόνυμα τά σπέρματα; see 736 b 30-35). But at H. A. 552 b 10 Aristotle speaks of a creature which is engendered in the fire in places where ore is smelted; and also mentions
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it in these regions, although there wants to be a kind corresponding to the position of fire in the series, since fire is reckoned as the fourth of the corporeal substances. But always, as we see, the shape and appearance which fire has is not its own; on the contrary, fire is always in some other one of the substances, for the object which is on fire appears either as air or smoke or earth. No; this fourth tribe must be looked for on the moon, since the moon, as it appears, has a share in the fourth degree of remove. However, these matters should form the subject of another treatise.

With regard to the Testacea, then: some of them take shape spontaneously, others by means of the emission of some special substance from themselves, though these too are often formed from a spontaneous composition. We must here apprehend the ways in which plants are generated. Some plants are formed from seed, some from slips planted out, others by sideshoots (e.g., the onion tribe). Now the last-named is the method by which mussels are formed; small ones are always growing up by the salamander, which cannot be destroyed by fire; the History of Animals passage is, however, excised by A.-W. There is a long discussion in Jaeger, Aristotle, 144-148, in which the doctrine of fire-animals is involved. Jaeger tries to prove that the doctrine that there were animals that were engendered in fire must have come in one of Aristotle’s dialogues (On Philosophy), and by a curious blunder states that it does not come in History of Animals (loc. cit., to which he actually refers); but in fact Aristotle’s words are γίνεται θηξία ἐν τῷ πυρί. Jaeger makes no reference at all to the present passage.

Cf. P.A. II. 649 a 22 ff., G. § C. II. 331 b 25, Meteor. I, chh. 3, 4, etc.

Lit., the nature, i.e., the physical structure, of the Testacea. See Introd. §§ 26, 27.
The “honeycombs” are really the eggs of these Gastropods, and Aristotle rightly recognizes their nature, as against later scientists who regarded them as distinct species of animals.

As against none, in the case of spontaneous generation.
side of the original one. The whelks and purpuras and those which, as the phrase goes, are "honeycombers" emit quantities of slimy fluid emanating as if were from some seminal substance. (We must not, however, consider any of these substances as being semen proper; instead, we should regard them as sharing in the resemblance to plants in the way already mentioned. And that is why a large number of such creatures is produced when once one has been produced, since, as all these creatures are in fact produced spontaneously as well, pro rata more of them arise if there are actually some present to start with.) After all, it is reasonable to suppose that there is a surplus portion of residue close by each of the original stock, from which each of the sideshoots springs up. And since the residue is a substance possessing one and the same character as the nourishment of which it is the residue, it is probable that the stuff produced by the "honeycombers" is similar to the substance out of which they were originally constituted; hence it is reasonable to suppose that it too gives rise to young ones.

All which neither produce sideshoots nor make "honeycombs" reproduce by spontaneous generation; and all which arise in this manner whether on land or in the water come to be formed, as can be seen, to the accompaniment of putrefaction and admixture of rainwater: as the sweet ingredients are separated off into the principle which is taking form, that which remains over assumes a putrefying aspect. Nothing, however, is formed by a process of putrefaction, but by a process of concoction: the putrefaction

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*e i.e., as well as residues such as semen.

*d i.e., putrefies.
15 καὶ τὸ σηπτὸν περίττωμα τοῦ πεφθέντος ἐστὶν· οὐθὲν γὰρ ἐκ παντὸς γίνεται, καθάπερ οὖν ἐν τοῖς ὑπὸ τῆς τέχνης δημιουργουμένοις· οὐθὲν γὰρ ἀν ἐδει ποιεῖν· νῦν δὲ τὸ μὲν ἡ τέχνη τῶν ἀχρῆστων ἀφαιρεῖ, τὸ δὲ ἡ φύσις.

Γίνεται δ' ἐν γῇ καὶ ἐν υγρῷ τὰ ζώα καὶ τὰ
20 ψυτᾶ διὰ τὸ ἐν γῇ μὲν υδωρ ὑπάρχειν, ἐν δὲ ύδατι πνεῦμα, ἐν δὲ τούτῳ παντὶ θερμότητα ψυχικὴν, ὡστε τρόπον τινα πάντα ψυχῆς εἶναι πλήρη· διὸ συνύσταται ταχέως, ὅποταν ἐμπεριληφθῇ. ἐμπεριλαμβάνεται δὲ καὶ γίνεται θερμαινομένων τῶν σωματικῶν υγρῶν οἶον ἀφρώδης πομφόλυξ. αἱ 25 μὲν οὖν διαφορὰ τοῦ τιμιώτερον εἶναι τὸ γένος καὶ ἀτιμότερον τὸ συνιστάμενον ἐν τῇ περιλήψει τῆς ἀρχῆς τῆς ψυχικῆς εἰσιν.1 τούτου2 δὲ καὶ οἱ τόποι αὐτοὶ καὶ τὸ σῶμα τὸ περιλαμβανόμενον. ἐν δὲ τῇ θαλάττῃ πολὺ τὸ γεώδες ἐνεστών· διὸ περὶ ἐκ τῆς τοιαύτης συνύστασεως ἡ τῶν ὀστρακοδέρμων 30 γίνεται φύσις, κύκλω μὲν τοῦ γεώδους σκληρυνομένου καὶ πηγυνυμένου τὴν αὐτὴν πῆξιν τοῖς ὀστοῖς καὶ τοῖς κέρασι (πυρὶ γὰρ ἄτικτα ταῦτ' ἐστὶν), εντὸσ ἐκ περιλαμβανόμενου τοῦ τῆς ζωῆς ἔχοντος σῶματος.

Μόνον δὲ τῶν τουούτων συνδυαζόμενον ἑώραται τὸ τῶν κοχλιῶν γένος. εἰ δ' ἐκ τοῦ συνδυασμοῦ

1 εἰσιν Peck: ἐστὶν vulg. 2 τούτων P.

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a This of course is not intended to cover the development of a larva once it has been constituted.

and the putrefied matter are a residue of that which has been concocted, for no creature's formation uses up the *whole* of the material,\(^a\) any more than in the case of objects fashioned by the agency of art, otherwise there would be no need to make anything at all, whereas what happens in actual fact is that the useless material is removed in the one case by art and in the other by Nature.

Animals and plants are formed in the earth and in the water because in earth water is present, and in water *pneuma* is present, and in all *pneuma* soul-heat is present,\(^b\) so that in a way all things are full of Soul; and that is why they quickly take shape once it has been enclosed. Now it gets enclosed as the liquids containing corporeal matter\(^c\) become heated, and there is formed as it were a frothy bubble. The object which thus takes shape may be more valuable in kind or less valuable; and the differences herein depend upon the envelope which encloses the soul-principle; and the causes which determine this are the situations where the process takes place and the physical substance which is enclosed. Now in the sea earthy substance is plentiful, and that is why the Testacea\(^d\) are formed and constructed out of a composition which is earthy in character: the earthy substance hardens all round and congeals in the same way that bones and horns do (since these cannot be melted by fire), while within it the physical substance contains the life becomes enclosed.

Of such creatures the only tribe which has been observed to copulate is that of the snails; but whether

\(^a\) Sea-water is such a liquid; see above, 761 b 9 and immediately below, l. 27. Also App. B §§ 13-17.

\(^b\) Lit., the nature of the Testacea; cf. above, 761 b 24.
35 ἡ γένεσις αὐτῶν ἐστὶν ἡ μή, οὕτω συνώπται ἰκανῶς.

Ζητήσεις δ' ἂν τις βουλόμενος ὀρθῶς ζητεῖν, τί τὸ κατὰ τὴν ὑλικὴν ἀρχὴν συνιστάμενόν ἐστὶν ἐν τοῖς τοιούτοις. ἐν μὲν γὰρ τοῖς θήλεσι περίττωμα τι τοῦ ζῷου τοῦτ' ἐστὶν, ὥς ἡ παρὰ τοῦ ἄρρενος ἀρχῇ κινοῦσα, δυνάμει τοιούτον ὅν οἶνον ἀφ' οὕπερ ἦλθεν, ἀποτελεῖ τὸ ζῷον. ἐνταῦθα δὲ τί δεῖ λέγειν 5 τὸ τοιούτον, καὶ πόθεν καὶ τίς ἡ κινοῦσα ἀρχῇ ἡ κατὰ τὸ ἄρρεν; δεῖ δὴ λαβεῖν ὅτι καὶ ἐν τοῖς ζῴωις τοῖς γεννώσιν ἐκ τῆς εἰσιούσης τροφῆς ἐν τῷ ζῷῳ θερμότης ἀποκρίνουσα καὶ συμπέττουσα ποιεῖ τὸ περίττωμα, τὴν ἀρχῇ τοῦ κυήματος. ὀμοίως δὲ καὶ ἐν φυτοῖς, πλὴν ἐν μὲν τούτοις καὶ 10 ἐν τοῖς τῶν ζῴων οὐθέν προσδεῖται τῆς τοῦ ἄρρενος ἀρχῆς (ἔχει γὰρ ἐν αὐτοῖς μεμιγμένην), τὸ δὲ τῶν πλείστων ζῷων περίττωμα προσδεῖται. τροφῆ δ' ἐστὶ τοῖς μὲν ὑδώρ καὶ γῆ, τοῖς δὲ τὰ ἐκ τούτων, ἀφ' ὅπερ ἢ ἐν τοῖς ζῴωις θερμότης ἐκ τῆς τροφῆς ἀπεργάζεται, τοῦθ' ἢ τῆς ὄρας ἐν τῷ περιέχοντι 15 θερμότης ἐκ θαλάττης καὶ γῆς συγκρίνει πέττουσα καὶ συνίστησιν. τὸ δ' ἐναπολαμβανόμενον ἡ ἀποκρίνομενον ἐν τῷ πνεύματι τῆς ψυχικῆς ἀρχῆς κύρια ποιεῖ καὶ κάνον περιήκειν. ὡς μὲν οὖν τῶν

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See note, 767 b 17.
or not their generation is the result of such copulation has not so far been adequately observed.

Anyone who wishes to follow the right line of inquiry might well inquire what it is which, as it takes shape, corresponds in the case of these creatures to the "material principle." In females of course this is a residue produced by the animal, a residue which potentially is such as the parent is from which it came, and which is perfected into an animal by the principle from the male imparting movement to it. In the present case, however, what are we to describe as holding this sort of position? and whence comes the principle that imparts movement, corresponding to the male, and what is it? Now we must apprehend that, even in the case of those animals which generate, it is the incoming nourishment that is the material out of which the heat residing in the animal produces the residue—the "principle" of the fetaition—by setting it apart and concocting it. Similarly with plants, except that with them and certain of the animals there is no need of the principle of the male over and above that, because they contain in themselves this principle mixed (with the female); in most animals, however, the residue does need this principle. Of the one set, the nourishment is water and earth; of the other, it is the things that are formed out of these; so that in their case the seasonal heat present in their environment causes to accumulate and to take shape by means of concoction out of sea-water and earth that which in the case of animals the heat present in them produces out of the nourishment. And that portion of the soul-principle which gets enclosed or separated off within the pneuma makes a fetaition and implants movement in it. Now
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ΣΦΥΤΩΝ ΤΩΝ ἈΠΟ ΤΑΒΟΡΜΑΤΟΥ ΓΙΝΟΜΕΝΩΝ ΣΥΣΤΑΣΙΣ ΟΜΟΕΙΔΗΣ ΕΣΤΙΝ. ΕΚ ΤΙΝΟΣ ΓΑΡ ΜΟΡΙΟΝ ΓΙΝΕΤΑΙ, ΚΑΙ
20 ΤΟ ΜΕΝ ἈΡΧΗ ΤΟ ΔΕ ΤΡΟΦΗ ΓΙΝΕΤΑΙ ὩΙ ΠΡΩΤΗ ΤΟΙΣ ἘΚΦΥΟΜΕΝΟΙΣ. 1 ΤΑ ΔΕ ΤΩΝ ΖΩΩΝ ΣΚΩΛΗΚΟΤΟΚΕΙΤΑΙ ΚΑΙ ΤΩΝ ἈΝΑΙΜΩΝ ὍΣΑ ΜΗ ἈΠΟ ΖΩΩΝ ΓΙΝΕΤΑΙ ΚΑΙ ΤΩΝ ἝΝΑΙΜΩΝ, ΟΙΝΟΝ ΓΕΝΟΣ ΤΙ ΚΕΣΤΡΕΩΝ ΚΑΙ ΆΛΛΩΝ ΠΟΤΑΜΩΝ ΙΧΘΥΩΝ, ΕΤΙ ΔΕ ΤΟ ΤΩΝ ΕΓΧΕΛΕΩΝ ΓΕΝΟΣ.
25 ἈΠΑΝΤΑ ΓΑΡ ΤΑῦΤΑ, ΚΑΙΠΕΡ ὍΛΙΓΑΙΜΟΝ ἘΧΟΝΤΑ ΤΗΝ ΦΥΣΙΝ, ὍΜΩΣ ΕΝΑΙΜΑ ΕΣΤΙ, ΚΑΙ ΚΑΡΔΙΑΝ ἘΧΟΝΤΟΙ ΤΗΝ ἈΡΧΗΝ ΤΗΝ ΤΩΝ ΜΟΡΙΩΝ ΑΙΜΑΤΙΚΗΝ. ΤΑ ΔΕ ΚΑΛΟΥΜΕΝΑ ΓΗΣ ΕΝΤΕΡΑ ΣΚΩΛΗΚΟΣ ἘΧΕΙ ΦΥΣΙΝ, ἘΝ ΟΙΣ ΕΞΙΝ ΓΙΝΕΤΑΙ ΤΟ ΣΩΜΑ ΤΟ ΤΩΝ ΕΓΧΕΛΕΩΝ. ΔΙΟ ΚΑΙ ΠΕΡΙ ΤΗΣ ΤΩΝ ἈΝΘΡΩΠΩΝ ΚΑΙ ΤΕΤΡΑΠΟΔΩΝ ΓΕΝΕΣΕΩΣ ΥΠΟΛΑΒΟΙ ΤΙΣ ἍΝ, ΕΙΣΕΡΕΙ ΕΓΙΓΝΟΝΤΟ ΠΟΤΕ ΓΗΓΕΝΕΙΣ,
30 ΩΣΠΕΡ ΦΑΘΙ ΤΙΝΕΣ, ΔΥΟ ΤΡΟΠΩΝ ΤΟΥΤΩΝ2 ΓΙΝΕΣΘΑΙ ΤΟΝ ΕΤΕΡΟΝ. Ἡ ΓΑΡ ὍΣ ΣΚΩΛΗΚΟΣ ΣΥΝΙΣΤΑΜΕΝΟΥ ΤΟ ΠΡΩΤΟΝ Ἡ ἘΞ ΖΩΩΝ, ΑΝΑΓΚΑΙΟΝ ΓΑΡ Ἡ ΕΝ ΑΥΤΟΙΣ ἘΧΕΙΝ ΤΗΝ ΤΡΟΦΗΝ ΕΙΣ ΤΗΝ ΑΥΞΗΣΩΝ (ΤΟ ΔΕ ΤΟΙΟΥΤΟΝ ΚΥΜΑ ΣΚΩΛΗΧΕΣ ΕΣΤΙΝ) Η ΛΑΜΒΑΝΕΙΝ ἈΛΛΟΒΕΝ, ΤΟΤΟ

1 hic lacunam statuit Platt.
2 τούτων ΡΖ, istorum Σ: om. vulg.

a Cf. 715 b 27 "they are formed when ... certain parts in plants become putrescent ... as for instance the mistletoe."
b See above, 741 b 1.

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as for plants, the manner in which those plants take shape which are generated spontaneously is uniform: they are formed from a part of something, and some of it forms into the "principle," some into the first nourishment of the germinating plants. As for the animals, however, some of them are brought forth as larvae, both the bloodless ones that are not formed from living animals, and some blooded ones (examples are a kind of cestreus and other river fishes, also the eel tribe): all of these, although by nature they have but little blood, nevertheless are blooded animals and have a heart, which is the "principle" of the parts and bloodlike in constitution. The "earth's-guts" as they are called have the nature of a larva; the body of the eels forms within them. Hence, too, with regard to the generation of human beings and quadrupeds, if once upon a time they were "earthborn" as some allege, one might assume them to be formed in one of these two ways—either it would be by a larva taking shape to begin with, or else they were formed out of eggs, since of necessity they must either contain the nourishment for their growth within themselves (and a fetation of this sort is a larva) or they must get it from elsewhere, and that means either from

The "earth's-guts" are apparently the round-worm Gordius. Cf. H.A. 570 a 15 ff., where they are said to be "formed spontaneously in mud and humid ground . . . for it is by the water's edge that the heat of the sun is strong and causes putrefaction." See note on eels, p. 565.

This was an old and traditional belief; cf. Plato, Politicus 269 b; in Hdt. VIII. 55 there is a reference to "Erechtheus, who is said to have been γργενής": cf. also Empedocles, Diels, Vorsokr. 31 B 62 "First whole-natured forms sprang up from the earth, having a portion both of water and fire"; and ibid. B 57; 96; 98. And above, G.A. 722 b 20 ff.
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δ' ἡ ἐκ τῆς γεννώσης ἡ ἐκ μορίου τοῦ κυήματος.

35 ὥστε εἰ θάτερον ἀδύνατον, ἐπιπρεπέν ἐκ τῆς γῆς ὀστερ ἐν τοῖς ζῴοις ἐκ τῆς μητρὸς, ἀναγκαίον ἐκ μορίου λαμβάνειν τοῦ κυήματος. τὴν δὲ τοιαύτην ἔξ ὑοὺ λέγομεν εἶναι γένεσιν. ὅτι μὲν οὖν, εἰπερ ἦν τις ἀρχὴ τῆς γενέσεως πάσι τοῖς ζῴοις, εὐλογον τοῖς δυοῖν τούτοις εἶναι τὴν έτέραν, φανερον ἔττον

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5 δ' ἔχει λόγον ἐκ τῶν ψων. οὐθενὸς γὰρ τοιαύτην ὀρῶμεν ζῷον γένεσιν, ἀλλὰ τὴν έτέραν, καὶ τῶν ἐναίμων τῶν ῥηθέντων καὶ τῶν ἀναίμων. τοιαύτα δ' ἐστὶ τῶν τ' ἐντόμων ἐνα καὶ τὰ ὀστρακόδερμα περὶ ὅν ὁ λόγους. οὐ γὰρ ἐκ μορίου γίνονται τυόν, ὀστερ τὰ φωτοκοῦμενα, ποιοῦνται δὲ καὶ τὴν

10 αὐξησιν ὁμοίως τοῖς σκώληξιν. ἐπὶ τὰ ἁνω γὰρ καὶ τὴν ἀρχὴν αὐξάνονται οἱ σκώληξες. ἐν τῷ κάτω γὰρ ἡ τροφὴ τοῖς ἁνω. καὶ τούτῳ γε ὁμοίως ἔχει τοῖς ἐκ τῶν ψων, πλὴν ἐκεῖνα μὲν καταναλίσκει πᾶν, ἐν δὲ τοῖς σκώληκτοκυκομένουσιν, ὅταν αὐξηθῇ ἐκ τῆς ἐν τῷ κάτω μορίῳ συστάσεως τὸ

15 ἁνω μορίῳν, οὐτως ἐκ τοῦ υπολοίπου διαρθροῦται τὸ κάτωθεν. αἴτιον δ' ὅτι καὶ ὀστερον ἡ τροφὴ ἐν τῷ μορίῳ τῷ ὑπὸ τὸ ὑπόζωμα γίνεται πᾶσιν. ὅτι δὲ τούτων τοῦ τρόπου ποιεῖται τὰ σκωληκώδη τὴν

1 ἄλλως post τοῖς vulg.: om. PZ.

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*a* i.e., in the uterus.

*b* i.e., the egg. Thus the three possibilities are—production as larvae; viviparously; oviparously. It should not be supposed that Aristotle seriously envisages the possibility of this sort of “evolution”; but in view of the popular nature of the belief he thinks fit to show by which of the three modes of generation these “earthborn” men would have been produced, if they had been produced.

*c* Spontaneous generation from eggs.

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the female parent \(a\) or from part of the fetation \(b\); so that if the former way is impossible (\(i.e.,\) if it cannot flow to them out of the earth as it flows to animals from the mother), of necessity they must get it from part of the fetation, and generation of this sort we call generation from an egg. Thus much, therefore, is plain: if there were a "principle" of their generation in the case of all animals, we should reasonably expect it to be one or other of these two, larva or egg. It is, however, less reasonable to hold that their generation would take place out of eggs, because in the case of no animal do we observe this sort of generation \(c\) to occur, whereas we do see the other, in the case both of the blooded animals I mentioned \(d\) and the bloodless ones. Under this latter heading come certain of the Insects, and also the Testacea with which our discussion is concerned: they are not formed out of a part of something as are the creatures produced from eggs, and further, they effect their growth in a similar way to larvae, for larvae grow towards the upper part, towards the "principle," the nourishment for the upper parts being in the lower part. In this respect they resemble the creatures that are produced from eggs, except that the latter use up the whole of the egg, whereas, in the case of those produced from larvae, when the upper part has grown by drawing on the substance in the lower part, then the lower part becomes articulated out of what remains. The reason for this is that (not only in the early stages but) afterwards as well \(e\) the nourishment is produced in the part below the diaphragm in all animals. That the larva-like creatures effect their growth in

\[ a \ Cestreaus \text{ and eels.} \quad e \text{ When they are fully grown.} \]
αὔξησιν, δὴ λοι ἐπὶ τῶν μελιστῶν καὶ τῶν τοιούτων· κατ’ ἄρχας γὰρ τὸ μὲν κάτω μόριον μέγα
20 ἔχουσι, τὸ δ’ ἄνω ἐλαττον. καὶ ἐπὶ τῶν ὀστρακο-

dέρμων δὲ τὸν αὐτὸν τρόπον ἔχει τὰ περὶ τὴν
αὔξησιν. φανερὸν δὲ καὶ τοῦτ’ ἐπὶ τῶν στρομβω-
dῶν <ἐν>¹ ταῖς ἑλίκαις· ἣ ἀρὰ αὐξανομένων

γίνονται μεῖζοι² ἐπὶ τὸ πρόσθιον καὶ τὴν καλο-
mένην κεφαλὴν.

"Ον μὲν οὖν τρόπον ἔχει ἡ γένεσις καὶ τούτων καὶ
25 τῶν ἀλλων τῶν αὐτομάτων, εἰρηται σχεδὸν.

"Οτι δὲ συνιστασθαι αὐτόματα πάντα τὰ ὀστρα-
kόδερμα, φανερὸν ἐκ τῶν τοιούτων, ὅτι πρὸς τε
τοῖς πλοίοις γίνεται σημομένης τῆς ἀφρώδους

ιλώς, καὶ πολλαχοῦ, οὔ̇ πρότερον οὐθέν ὑπήρχε
τοιοῦτον, ὡστὲρον δὴ ἐνδειαν ὑγρὸ τοῦ τόπου
30 βορβορωθέντος ἐγένετο τὰ καλομένα λημνόστρεα

τῶν ὀστρακηρῶν, οὗν περὶ 'Ῥόδου παραβαλόντος
ναυτικοῦ στόλου καὶ ἐκβληθέντων κεραμίων εἰς

τὴν θάλατταν, χρόνου γενομένου καὶ βορβόρου περὶ

αὐτὰ συναλισθέντως, ὀστρεα εὐρίσκοντ' ἐν αὐτοῖς.

ὅτι δ’ οὐ̇δ’ ἀφίησι τὰ τοιαύτα οὐθὲν ἀφ’ αὐτῶν

gεννητικόν, τεκμήριον· ἐπεὶ γὰρ Χιοὶ τινὲς ἐκ

Πύρρας τῆς ἐν Δέσβῳ τῶν ὀστρέων διεκόμισαν

1 <ἐν> Λ.-W.: καὶ ταῖς S: ἐπὶ ταῖς PZ: ταῖς vulg.

2 μεῖζοις Platt: πλείουσ vulg., om. Y.

¹ This does not entirely square with what has been said,
2 although Aristotle seems to think that even those which are
germinated otherwise are also spontaneously generated; see
3 761 b 25 ff.
4 b Cf. 736 a 13 ff.
5 i.e., when there is only mud and no water in the lagoon;
6 cf. H.A. VI, ch. 15.
this manner is plain in the case of bees and insects of that sort, as their lower part is large to start with and the upper part smaller. The arrangements for growth in the Testacea are on the same lines. This is shown in the convolutions of the spiral-shelled creatures, which as they grow always become larger towards the front and the "head" as it is called.

This practically completes our description of the manner of generation of these animals and of the others that are generated spontaneously.

The fact that all a the Testacea take shape spontaneously is shown by considerations like the following: They form on the side of boats when the frothy slime b putrefies; and also, in many places where nothing of the kind had been present previously, after a time when the place has become muddy owing to lack of water, c lagoon-oysters, d as they are called, a kind of testaceous animal, have been formed; for example, on an occasion when a naval squadron cast anchor off Rhodes, some earthenware pots were thrown out into the sea, and as time went on and mud had collected round them, oysters were continually found inside them. Here is a piece of evidence to show that animals of this kind emit no generative substance: people from Chios transported some live oysters across from Pyrrha in Lesbos,

a Cf. H.A. 547 b 11. Apparently barnacles, which are, however, Crustacea, not Testacea.

b The lagoon at Pyrrha seems, as D'Arcy Thompson (prefatory note to translation of H.A.) suggests, to have been one of the chief places where Aristotle carried on his researches. The strait leading to it is mentioned again at P.A. 680 b 1 (a passage where also the "eggs" of sea-urchins and oysters are discussed), and several times in H.A. Cf. 761 b 4.
The characteristic of a euripos is the force and violence of the currents sweeping through it; hence there is no opportunity for mud to collect and so for any Testacea to arise. Platt's conjecture ομόρρους is also supported by the use of the
and deposited them in some sea-straits where the currents met. As time passed the oysters did not increase at all in number, but they grew greatly in size. As for their "eggs," as they are called, these contribute nothing to generation; they are just a sign of good nourishment, like fat in blooded animals, and that too is why they are tasty to eat at these seasons. A proof of this is that these creatures—e.g., pinnae, whelks and purpurae—have such "eggs" as these always, only sometimes they are larger, sometimes smaller. Others—e.g., pectens, mussels and the lagoon-oysters as they are called—do not have them always, but only in the spring; as the season advances they wane, and finally disappear altogether; the reason being that the spring-season is favourable to their physical condition. In others—e.g., the seasquirts—nothing of the kind is to be detected. For an account dealing with these individually, and the places where they grow, the student should consult the *Researches*.

verb ἔδω elsewhere in connexion with εὑρίσκω, e.g. E.N. 1167 b 7 μενε τὰ βουλεύματα καὶ οὐ μεταρρέει ὁπερ εὑρίσκω: cf. Prob. 940 b 16 οἱ εὑρίσκοι ἔδουσαν, and De somno et vig. 456 b 21. Gaza's translation luto similia seems to imply the reading βαρβαρώδεις, which is entirely against the sense.

See note on 763 b 1.
TABLE OF BIRDS

(This table has been constructed solely as an aid to the reading of Aristotle's discussions of birds. It has no value as a scientific classification.)

<table>
<thead>
<tr>
<th>A</th>
<th>C</th>
<th>D</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-fliers</td>
<td>Fliers</td>
<td>Fliers (P.A.)</td>
<td>Fliers (Crook-taloned)</td>
</tr>
<tr>
<td>Heavy, bulky bodies</td>
<td>Bulky bodies</td>
<td>Small</td>
<td>Small (apart from wings)</td>
</tr>
<tr>
<td></td>
<td>Residue to wings</td>
<td>Much residue</td>
<td>Residue to wings and feathers</td>
</tr>
<tr>
<td>Prolific, many eggs</td>
<td>Prolific; lay few, but often</td>
<td>Prolific</td>
<td>Not prolific</td>
</tr>
<tr>
<td><em>E.g.</em>, fowls, partridges, Pigeons, ringdoves, ostrich, turtledoves</td>
<td>Adrianic fowls and small birds named at 774 b 25 ff.: crow, rook, jay, sparrow, swallow</td>
<td>Migrants (P.A.)</td>
<td></td>
</tr>
</tbody>
</table>

At 749 b 1-25 Aristotle seems to make a threefold classification of birds, but he immediately goes on to speak of a class of “small” birds (also mentioned at 774 b 25 ff.) which does not appear to be allowed for in the threefold classification, though it has some characteristics in common with class C and some with class B (those in B, as appears also from P.A. 694 a 5 ff., have small bodies, apart from their wings). These “small” birds must therefore be inserted as a fourth class, D, between C and B.
The dotted lines represent mesoblast. The diagram shows the state of development after about ten days. The embryo itself is in the central part of the diagram. Immediately above the gut is the notochord (shown in black), and immediately above that is the nerve-cord, of which the right end is the brain. The two "umbilical cords" mentioned by Aristotle (III. 753 b 20 ff.) are shown: (a) the yolk-sac stalk, (b) the stalk of the allantois.

To begin with, the embryo is a sort of thin plate on top of the yolk; and as time goes on, both the amniotic cavity (which encloses the embryo) and the allantois (which acts as a respiratory organ and as a receptacle for excreta) progressively encircle the yolk, which finally becomes enclosed in the embryo (as Aristotle says). The chorion and allantois coalesce after a period, and the resulting chorio-allantois then corresponds to the fetal placenta of mammals. The chorion is really the outer layer of the amnion. The extra-embryonic coelom, which is lined with mesoblast, is an extension of the coelom proper (the main body-cavity), which is also lined with mesoblast.
The first microscopically visible signs of sex-differentiation occur about the fifth day in the chick. Aristotle was quite justified in his belief that sex-differentiation occurs early. We know to-day that sex is determined genetically from the moment of fertilization, since some animals have two kinds of sperm and others have two kinds of egg.
BOOK IV

The formation of animals, both in general and as concerns all of them separately, has now been dealt with. Since, however, in the most perfect of them the male and the female are separate, and we hold that these characteristics are "principles" of all animals and all plants alike (the only difference being that in some these "principles" are inseparable while in others they are separate), we must deal with the formation of these first of all, for male and female become distinct while animals are still imperfect in kind. It is however not agreed whether one is male and another female even before the difference is plain to our senses, the difference being acquired by them either within the mother or earlier. Thus, some people, such as Anaxagoras and certain other physiologers, say that this opposition exists right back in the semen, alleging that the semen comes Aristotle's view will be found in the passage below, 766 a 30-31. The heart is the first thing to be formed in the embryo, because it is the seat of τὸ ὑπερτικόν, the nutritive part of the Soul; and τὸ ὑπερτικόν is also τὸ γεννητικόν (see 735 a 17 ff., 744 b 36, n.). Sex can be ultimately traced back to the heart, which, as also containing the principle of vital heat, is the source of concoction, upon which ability to produce semen, etc., depends.

e See pp. xvi ff.
f This is an example of the view that the difference is acquired "earlier" than in the mother.

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σπέρμα, τὸ δὲ θῆλυ παρέχειν τὸν τόπον, καὶ εἶναι τὸ μὲν ἄρρεν ἐκ τῶν δεξιῶν τὸ δὲ θῆλυ ἑκ τῶν ἀριστερῶν [καὶ τῆς υστέρας τὰ μὲν ἄρρενα ἐν τοῖς δεξιοῖς εἶναι τὰ δὲ θήλεα ἐν τοῖς ἀριστεροῖς]. 1 οἱ δ’ ἐν τῇ μήτρᾳ, καθάπερ Ἕμπεδοκλῆς· τὰ μὲν γὰρ εἰς θερμὴν ἐλθόντα τὴν υστέραν ἄρρενα γίνεσθαι φησι τὰ δ’ εἰς ψυχράν θήλεα, τῆς δὲ θερμότητος 5 καὶ τῆς ψυχρότητος τὴν τῶν καταμηνίων αὐτίαν εἶναι ρύσων, ἡ ψυχρότεραν οὔσαν ἡ θερμότεραν, καὶ ἡ παλαιότεραν ἡ πρόσφατωτέραν. Δημόκριτος δὲ ὁ Ἀβδηρίτης ἐν μὲν τῇ μητρὶ γίνεσθαι φησι τὴν διαφορὰν τοῦ θήλεος καὶ τοῦ ἄρρενος, οὐ μέντοι διὰ θερμότητά γε καὶ ψυχρότητα τὸ μὲν γίγνεσθαι 10 θῆλυ τὸ δ’ ἄρρεν, ἀλλ’ ὑποτέρου ἄν κρατήσῃ τὸ σπέρμα τὸ ἀπὸ τοῦ μορίου ἐλθόν ἕι διαφέρουσιν ἄλληλων τὸ θῆλυ καὶ τὸ ἄρρεν. τοῦτο γὰρ ὡς ἀληθῶς Ἕμπεδοκλῆς ῥαθυμότερον ὑπείληφεν, οἰόμενος ψυχρότητι καὶ θερμότητι διαφέρειν μόνον ἄλληλων, ὁρῶν δὲ τὰ μόρια μεγάλην ἔχοντα 15 διαφορὰν τὴν τε τῶν αἰδοῖων καὶ τὴν τῆς υστέρας. εἰ γὰρ πεπλασμένων τῶν ζώων, τοῦ μὲν τὰ μόρια

1 seclusi, nam argumento aliena; cf. 765 a 22.

a This is a view put forward also in the Eumenides of Aeschylus (658 ff.) by Apollo, who cites the apposite example of Athena standing by his side:

οὐκ ἔστι μήτηρ τοῦ κεκλημένου τέκνου τοκεύς, τροφὸς δὲ κύματος νεοσπόρου.

τίκτει δ’ ὁ θρόσκων, etc.

(τοῦ in the first line is Headlam’s emendation for ἥ.) In his commentary, ii. 293-294, G. Thomson gives references to a similar belief among the Egyptians and primitive peoples in Australia and South America; the reference which he gives 372
into being from the male, while the female provides the space for it, and that the male comes from the right side and the female from the left [and, as regards the uterus, that the males are in the right side and the female in the left]. Others, like Empedocles, hold that the opposition begins in the womb; according to him, the semen which enter a hot womb become males, those which enter a cold one, females; and that the cause of this heat and cold is the menstrual flow, according as it is hotter or colder, older or more recent. Democritus of Abdera holds that the difference of male and female is produced in the womb, certainly, but denies that it is on account of heat and cold that one becomes male and another female; this is determined, he asserts, according to which of the two parents' semen prevails, the semen, that is to say, which has come from the part wherein male and female differ from one another. After all, Empedocles was really rather slipshod in his assumption, in supposing that the two differ from each other merely in virtue of heat and cold, when he could see that the whole of the parts concerned—the male pudenda and the uterus—exhibit a great difference; for supposing that once the animals have been fashioned, and one has got all the parts of the

for the Pythagoreans is, however, to a different doctrine from this. See also G. Thomson, *Aeschylus and Athens* (1941), and for other references to such views and their social consequences, J. Needham, *History of Embryology*, 25 ff.

b *i.e.*, the right testis.

c These words must be an interpolation, as they are inconsistent with the view just described. Cf. 765 a 22.

d See quotation, 723 a 24.

e These terms, as Platt suggests, may echo Empedocles' own words. The hotter will of course be the more recent.

764 a

\[\text{ε}χοντος \text{τ}α \text{τ}ου \text{θ}ήλεος \text{πάντα}, \text{τ}ου \text{δ}ε \text{τ}α \text{τ}ου \text{ἀρ}ρενος, \text{καθάπερ \ ε}ις \text{κάμινον \ ε}ις \text{τ}ην \ \text{φ}οσ\text{έ}ραν \ \text{τ}εθει\text{η}, \text{τ}ο \\text{μ}ὲν \ \text{ἐ}χων \ \text{φ}οσ\text{έ}ραν \ \text{ε}ις \ \text{θ}ερμήν, \\text{τ}ο \ \text{δ}ε \ \text{μ}ὴ \ \text{ἐ}χον \ \text{ε}ις \ \text{ψυχράν}, \ \text{ἐ}σται \ \text{θ}ῆλυ \ \text{τ}ο \ \text{ο}ὐκ \ \text{ἐ}χων \ \text{φ}οσ\text{έ}ραν \ \text{kα}i \ \text{ἀ}ρρεν \text{20 τ}ο \ \text{ἐ}χον. \ \text{τ}ούτο \ \text{δ}ε \ \text{ἀ}δ\text{ύ}νατον. \ \text{ὡ}στε \ \text{τ}αύτη \ \text{γε} \ \text{βελτιον \ ἀν \ λέγοι \ Δημόκριτος}. \ \text{ζητεῖ \ γάρ \ ταύτης \ \text{τ}ης \ \text{γενέσεως \ \text{τ}ην \ \text{διαφοράν}}^1 \ \text{kai \ \text{πειράται \ λέγειν}. \ \text{ε}ι \ \text{δ}ε \ \text{καλῶς} \ \text{ἡ} \ \text{μ}ὴ \ \text{καλῶς}, \ \text{ἐ}τερος \ \text{λόγος}. \ \text{ἀλλὰ} \ \text{μὴν} \ \text{kαν} \ \text{εἰ ^2 τ}ων \ \text{μορίων \ \text{τ}ης \ \text{διαφοράς} \ \text{αὐτίνον} \ \text{ἡ} \ \text{θερμότης} \ \text{kai} \ \text{25 ἡ} \ \text{ψυχρότης}, \ \text{τούτο \ λεκτέον} \ \text{ἡν} \ \text{τοῖς} \ \text{ἐκείνως} \ \text{λέγουσ}-\text{σων}. \ \text{τούτο \ γάρ} \ \text{ἐστιν} \ \text{ὡς} \ \text{εἰπεῖν} \ \text{το} \ \text{λέγειν} \ \text{περὶ} \ \text{γενέσεως} \ \text{ἀρρενος} \ \text{και} \ \text{θήλεος}. \ \text{τούτοις}^3 \ \text{γάρ} \ \text{διαφέρει} \ \text{φανερῶς}. \ \text{ο}ὐ \ \text{μικρον} \ \text{δε}^4 \ \text{ἐργον} \ \text{τ}ο \ \text{απ’} \ \text{ἐκείνης} \ \text{της} \ \text{ἀρχῆς} \ \text{περὶ} \ \text{της} \ \text{γενέσεως} \ \text{τούτων} \ \text{των} \ \text{μορίων} \ \text{της} \ \text{αὐτίαν} \ \text{συναγαγεῖν}, \ \text{ὡς} \ \text{ἀναγκαῖον}^5 \ \text{ἀκολουθεῖν} \ \text{ψυχο-} \ \text{μένως} \ \text{μὲν} \ \text{τ}ω \ \text{ξ}ώφι \ \text{γίνεσθαι} \ \text{τούτω} \ \text{το} \ \text{μόριον} \ \text{ἡν} \ \text{30 καλοῦσιν} \ \text{φ}οσ\text{έ}ραν, \ \text{θερμαινομένως} \ \text{δὲ} \ \text{μὴ} \ \text{γίνεσθαι}. \ \text{τ}ων \ \text{αὐτόν} \ \text{δὲ} \ \text{τρόπον} \ \text{και} \ \text{περὶ} \ \text{των} \ \text{εἰς} \ \text{την} \ \text{ὅ}μιλιαν \ \text{συντελοῦντων} \ \text{μορίων} \ \text{και} \ \text{γάρ} \ \text{ταύτα} \ \text{διαφέρει}, \ \text{καθάπερ} \ \text{ἐφηται} \ \text{πρότερον}.

"Ἐτι \ \text{δὲ} \ \text{γίνεται} \ \text{δ}ίδυμα \ \text{θῆλυ} \ \text{kai} \ \text{ἀρρεν} \ \text{άμα} \ \text{ἐν} \ \text{τ}ῷ \ \text{αὐτῷ} \ \text{μορίῳ} \ \text{πολλάκις} \ \text{της} \ \text{φοσ\έρας}, \ \text{kai} \ \text{τοῦθ’}
\]

1 \ \text{διαφοράς} \ \text{την} \ \text{γένεσιν} \ \text{coni. Platt.}
2 \ \text{εἰ PSYZ : ή vulg.}
3 \ \text{τούτοις} \ \text{Peck : τούτο vulg.}
4 \ \text{δὲ Platt : τε vulg.}
5 \ \text{〈δὲ〉 coni. Platt.}

\[\text{a Viz., primarily testes and uterus, not the parts employed in intercourse;} \ \text{these are mentioned separately, ll. 30-32 below. See also 716 a 25-3 b 3.}
\]

\[\text{b Empedocles’. Aristotle seems to assume all through} \ \text{this discussion that according to Empedocles the fundamental difference between male and female was one of heat 374.}\]
male and the other all the parts of the female, they were to be put into the uterus as though it were into an oven, the one which has a uterus into a hot oven, and the one which has no uterus into a cold one, then it follows that the one that has no uterus will turn out a female and the one that has a uterus a male. And this is impossible. So that we may allow that in this respect Democritus's statement is the better of the two, because he is trying to find out what is the difference inherent in this process of formation of male and female, and endeavouring to state it, though whether he is right or not is another matter. Yet indeed, if heat and cold were the cause of the difference of the actual parts, then those who hold the other view ought to have stated this, because, one might say, this is tantamount to making a statement about the process of formation of male and female, since it is in these parts that the evident difference between the two lies. And also, if you start from this principle, you have your work cut out to prove the cause of the process of formation of these parts, and to show that it necessarily follows that when the animal is cooled the part called the uterus is formed in it, but that when it is heated it is not formed. The same may be said about the parts which serve for intercourse, since these too differ, as has already been stated.

Further, male and female twins are often formed together in the same part of the uterus. This has and cold (see above, l. 13), and that this had little or nothing to do with the difference of the sexual organs. But it seems impossible that Empedocles could have meant anything else than that heat and cold were the cause of the difference of the sexes, including that of the distinctive organs.

* i.e., of heat and cold.
35 ἰκανῶς τεθεωρήκαμεν ἐκ τῶν ἀνατομῶν ἐν πᾶσιν τοῖς ζωότοκοσι, καὶ ἐν τοῖς πεζοῖς καὶ ἐν τοῖς ἵθοσιν. περὶ δὲν εἰ μὲν μὴ συνεωράκει, εὐλόγως ἡμάρτανε ταύτην τήν αἰτίαν εἰπόν, εἰ δὲ ἑωρακός, ἀτοπον τὸ ἐτί νομίζειν αἰτίαν εἶναι τήν τῆς υστέρας θερμότητα ἡ ψυχρότητα· ἀμφοὶ γὰρ ἄν ἐγίνετο ἡ θῆλεα ἡ ἄρρενα, νῦν δὲ τοῦτ' οὐχ ὀρῶμεν συμβαίνων.

Λέγοντι τε τὰ μόρια διεσπάσθαι τοῦ γινομένου
5 (τὰ μὲν γὰρ ἐν τῷ ἄρρενὶ φησιν εἶναι τὰ δὲ ἐν τῷ θῆλει, διὸ καὶ τῆς ἀλλήλων ὀμιλίας ἐπιθυμεῖν) ἀναγκαίον καὶ τῶν τοιούτων διηρήσθαι τὸ μέγεθος καὶ γίνεσθαι σύνοδον, ἀλλ' οὐ διὰ ψυξίν ἡ θερμασίαν. ἀλλὰ περὶ μὲν τῆς τοιαύτης αἰτίας [τοῦ σπέρματος]¹ τάχ' ἂν εἴη πολλὰ λέγειν· ὅλως γὰρ ἔοικεν ὁ τρόπος 10 τῆς αἰτίας πλασματώδης εἶναι. εἰ δ' ἔστι περὶ σπέρματος οὕτως ἔχων ὥσπερ τυγχάνομεν εἰρήκοτες, καὶ μὴτ' ἀπὸ παντὸς ἀπέρχεται μὴθ' ὅλως τὸ ἀπὸ τοῦ ἄρρενου παρέχει τοῖς γινομένοις ὑλὴν μηδεμίαν, καὶ πρὸς τοῦτον καὶ πρὸς Δημόκριτον, 15 καὶ εἰ τίς ἄλλος οὕτω τυγχάνει λέγων, ὁμοίως ἀπαντητέον. οὕτε γὰρ διεσπασμένον ἐνδέχεται τὸ

¹ secl. Platt, qui post θερμασίαν supra transfert.

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a See quotation, 722 b 12, 764 b 17 and context.

b For μέγεθος = σῶμα, cf. G. & C. 321 b 16; and 765 a 13
been amply observed by us from dissections in all the Vivipara, both in the land-animals and in the fishes. Now if Empedocles had not detected this, it is understandable that he should have made the mistake of assigning the cause he did; if on the other hand he had detected it, it is extraordinary that he should still continue to think that the cause is the heat and cold of the uterus, since according to his theory the twins should both turn out male, or both female; whereas in actual fact we do not observe this to occur.

Also, he says that the parts of the creature which gets formed are "torn asunder"; some, he says, are in the male and some in the female, and that also explains why they desire intercourse with each other. If so, necessity requires that the physical substance of these parts as well as of the others is "torn asunder" and that a junction takes place, not that the difference is due to cooling or heating. However, discussion of a cause of this sort might well prove lengthy, as the whole cast of this cause seems to be a product of the imagination. If on the other hand the truth about semen is as we have actually stated—i.e., that it is not drawn from the whole body and that the secretion from the male provides no material at all for the creatures which get formed—then we must take up our stand against Empedocles and against Democritus and against anyone else who maintains this position, because (a) it is impossible below. μέγεθος thus means something which has size, i.e., a physical body or substance. Empedocles, says Aristotle, is inconsistent in saying (a) that the physical substance of the parts is present as such in the parents to begin with, and (b) that the formation of the sexual parts is due to the action of heat and cold.

Viz., testes and uterus.
śwma toū σπέρματος εἶναι, το μὲν ἐν τῷ θῆλει τὸ δ' ἐν τῷ ἄρρενι, καθάπερ Ἐμπεδοκλῆς φησιν εἰπὼν ἀλλὰ διέσπασται μελέων φύσις, ἢ μὲν ἐν ἀνδρός . . . ,

οὐτ' εἴς ἐκατέρου πάν ἀποκρινόμενον, τῷ κρατῆσαι 20 τὶ μέρος ἄλλου μέρους γίνεσθαι το μὲν θῆλυ τὸ δ' ἄρρεν. ὅλως δὲ τὸ γε τὴν τοῦ μέρους ὑπεροχὴν κρατήσασαν ποιεῖν θῆλυ βέλτιον, μὲν ἢ μηθὲν φροντίσαντα τὸ θερμὸν αὐτιᾶσθαι μόνον, τὸ μέντοι συμβαίνειν ἁμα καὶ τὴν τοῦ αἴδοιου μορφῆν ἔτεραν δεῖται λόγου πρὸς τὸ συνακολουθεῖν αεὶ ταῦτ' 25 ἀλλήλοις. εἰ γὰρ ὤτι σύνεγγυς, καὶ τῶν λοιπῶν ἐκαστὸν ἐδει μορίων ἀκολουθεῖν· ἐτέρῳ γὰρ ἐτερον ἐγγὺς τῶν νυκώντων, ὡστε ἁμα θῆλυ τ' ἂν ἢν καὶ τῇ μητρὶ ἑοικός, ἢ ἄρρεν καὶ τῷ πατρὶ. ἐτι ἄτοπον καὶ τὸ μόνον ταῦτ' οἴεσθαι δεῖν γίγνεσθαι τὰ μόρια, καὶ μὴ τὸ σύνολον μεταβεβληκέναι σῶμα, 1

1 τοῦ σπέρματος velit secludere Platt.

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a See above, note on μέγεθος, 1. 7.

b Perhaps "of the semen" should be deleted.

c Cf. 722 b 12.

d This is Democritus's view. Empedocles had said that each parent supplied only half the tale of the parts; Democritus said that each parent supplied a full tale of parts. See also note on pangenesis, 721 b 9.

e i.e., one sexual part over the other; see 764 a 10, 11.

f i.e., the conformation of the part employed in intercourse as well as the conformation of the uterus: in all cases they both exhibit a difference from the corresponding parts in males, the penis and the testes respectively.

g e.g., why no individual is found having uterus and penis.

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that the physical substance \(^a\) of the semen \(^b\) exists "torn asunder," one part in the male and the other in the female, as Empedocles alleges—

But torn asunder waits
The substance of the limbs; part is in man's . . . \(^c\)

and (b) it is impossible that a complete tale \(^d\) of parts is secreted off from each of the parents and that a male or female embryo is formed according as one part prevails over another part.\(^e\) Considering the matter generally: To hold that the superiority of one part prevails and that this is what makes the embryo female is certainly better than saying that heat alone is the cause without having stopped to think about it; but the fact that at the same time the conformation of the pudendum as well \(^f\) is different requires an explanation to show why these parts are always of a piece with each other.\(^g\) If the answer is "Because they are in close proximity," then every one of the remaining parts ought to be all of a piece as well,\(^h\) since while the parts are gaining the mastery \(^i\) any one of them is close to any other, so that on that showing all the characteristics should go together, \(i.e.,\) the offspring, if female, should also take after its mother, and if male after its father.\(^j\) Besides, it is fantastic to imagine that these parts alone can be formed, without the whole body also having under-

\(^a\) i.e., as well as the sexual parts; \(e.g.,\) if the offspring has sexual parts resembling those of its father—\(i.e.,\) male ones—then it ought to resemble its father in all its other parts too.

\(^b\) This refers to the "prevailing" mentioned above, l. 21, etc.

\(^c\) i.e., the offspring should take after the parent whose sex has determined its own, and take after it not only in respect of sexual parts but in all other respects as well. But of course this is not borne out by the facts.
30 καὶ μάλιστα καὶ πρῶτον τὰς φλέβας, περὶ ἂς ὡς περὶ ὑπογραφὴν τὸ σῶμα περικεῖται τὸ τῶν σαρκῶν. ὡς οὐ διὰ τὴν υστέραν εὑλογον γενέσθαι ποιάς τινας, ἀλλὰ μᾶλλον δι’ ἐκείνας τῆς υστέραν. ὑποδοχή γὰρ αἰματός τινος ἐκάτερον, προτέρα δ’ ἤ τῶν φλέβων. τὴν δὲ κινοῦσαν ἀρχὴν ἀναγκαῖον

35 αἰεὶ προτέραν εἶναι καὶ τῆς γενέσεως αὐτίαν τὸ ποιὰν εἶναι τινα. συμβαίνει μὲν οὖν ἡ διαφορὰ τῶν μερῶν τούτων πρὸς ἀλλήλα τοῖς θῆλεσι καὶ τοῖς ἁρρεσιν, ἀλλ’ οὐκ ἀρχὴν οὐητέον οὐδ’ αὐτίαν εἶναι ταύτην, ἀλλ’ ἐτέραν, κἂν εἰ μηθὲν ἀποκρίνεται σπέρμα μήτε ἀπὸ τοῦ θῆλεος μήτ’ ἀπὸ τοῦ ἁρρενος, ἀλλ’ ὅπως δὴ ποτε συνίσταται [τὸ σπέρμα]’ τὸ γιγνόμενον.

Ὁ δ’ αὐτὸς λόγος καὶ πρὸς τοὺς λέγοντας τὸ 5 μὲν ἁρρεν ἀπὸ τῶν δεξιῶν εἶναι τὸ δὲ θῆλυ ἀπὸ τῶν ἁριστερῶν ὅσπερ καὶ πρὸς Ἐμπεδοκλέα καὶ πρὸς Δημόκριτον. ἐπεὶ γὰρ μηδεμίαν ὕλην συμβάλλεται τὸ ἁρρεν, οὐθὲν ἄν λέγοιεσ ἦς λέγοντες οὕτως· εἰτε καὶ συμβάλλεται, καθάπερ φασίν, ὅμοιως ἀναγκαῖον ἀπαντῶν καὶ πρὸς τῶν Ἐμπεδοκλέους λόγον, 10 ὃς διορίζει τὸ θῆλυ πρὸς τὸ ἁρρεν θερμότητι καὶ ψυχρότητι τῆς υστέρας. οἱ δὲ τὸ αὐτὸ τοῦτο2 ποιοῦσιν, τοῖς δεξιοῖς καὶ τοῖς ἁριστεροῖς ὀρίζοντες, ὀρώντες

1 secl. Platt: τὸ κύμα coni. A.-W.
2 τοῦτο PSYZ*, om. Bekker per errorem.

a See 716 b 2 ff. and 766 a 24 ff.  b Cf. 743 a 2, n.

This is the statement of the general rule of which the foregoing is an example; Aristotle makes a similar criticism (of Ἐμπεδόκλης) for putting the cart before the horse at P. L. 640 a 20 ff., e.g., ἀγνωσὶν . . . ὅτι τὸ ποιήσαν πρὸτερον ὑπῆρχεν: the whole context is apposite.

d συμβαίνει: it happens κατὰ συμβεβηκός, not καθ’ αὐτό: it 380
gone a change, and first and foremost the blood-vessels, on to which the fleshy structure of the body has been applied all round, as on to a framework. And it is reasonable to suppose not that the blood-vessels have been formed to be of a particular character on account of the uterus, but rather that the uterus has been so formed on account of them, since although each is a receptacle of blood in some form, the blood-vessels are prior to the uterus; and the motive principle must of necessity be prior always and be the cause of the process of formation in virtue of possessing a particular character. So then, this difference of the sexual parts as between males and females is a contingent phenomenon: we must not look upon it as being a "principle" or a cause: this function is fulfilled by something else, even though no semen at all is discharged either by the female or by the male and whatever the manner may really be by which the forming creature takes shape.

The same argument which we used against Empedocles and Democritus holds good against those who allege that the male comes from the right side and the female from the left: thus if the male contributes no material at all, then those who take this view are of course talking nonsense; if on the other hand it does contribute something, as they assert, we have to counter them in the same way that we countered Empedocles' argument which draws the line as between male and female by reference to the heat and coldness of the uterus. They make the same mistake as he does, in drawing the line by

is an "accidental," not an "essential," characteristic. For the sentiment, see 766 b 2 ff.

*e.g., Anaxagoras; see 763 b 33.
765 a

diaφέρονται τὸ θῆλυ καὶ τὸ ἄρρεν καὶ μορίως ὀλοις, ὡν διὰ τιν’ αὐτίαν ὑπάρξει τοῖς ἐκ τῶν ἀριστερῶν, τοῖς δ’ ἐκ τῶν δεξιῶν οὐχ ὑπάρξει τὸ σῶμα τὸ 15 τῆς ὑστέρας; ἃν γὰρ ἔλθῃ μὲν μὴ σχῆ δὲ τούτῳ τὸ μόριον, ἔσται θῆλυ οὐκ ἔχων ὑστέραν καὶ ἄρρεν ἔχων, ἃν τύχῃ. [ἐτὶ δ’ ὁπερ εἰρηται καὶ πρότερον, ὦπται καὶ θῆλυ ἐν τῷ δεξιῷ μέρει τῆς ὑστέρας καὶ ἄρρεν ἐν τῷ ἀριστερῷ καὶ ἀμφώ ἐν τῷ αὐτῷ μέρει, 20 καὶ τοῦτ’ οὐχ ὅτι ἀπαξ ἀλλὰ πλεονάκις, ἡ τὸ ἄρρεν μὲν ἐν τοῖς δεξιοῖς, τὸ θῆλυ δ’ ἐν τοῖς ἀριστεροῖς· οὐχ ἠπτον δὲ ἀμφότερα γίνεται ἐν τοῖς δεξιοῖς].¹ παραπλησίως δὲ τινὶς πεπεισμένοι τοῦτοις εἰσὶ καὶ λέγουσιν ὡς τὸν δεξιὸν ὀρχιν ἀποδομαίνεις ἡ τὸν ἀριστερὸν συμβαίνει τοῖς ὀχέουσιν ἀρρενοτοκεῖν 25 ἡ θηλυτοκεῖν. οὕτω γὰρ καὶ Δεσφάνης ἔλεγεν. ἐπὶ τε τῶν ἐκτεμνομένων τῶν ἐτερῶν ὦρχιν τὸ αὐτὸ τοῦτο συμβαίνει τινὲς φασιν, οὐκ ἀληθῆ λέγοντες, ἀλλὰ μαντευόμενοι τὸ συμβαθησόμενον ἐκ τῶν εἰκό- των, καὶ προλαμβάνοντες ὡς οὕτως ἔχων πρὶν γινόμενον οὕτως ἱδεῖν, ἐτὶ δ’ ἀγνοοῦντες ὡς οὐθέν 30 συμβάλλεται πρὸς τὴν γένεσιν τῆς ἄρρενογονίας καὶ θηλυγονίας τὰ μόρια ταῦτα τοῖς ξώοις. τοῦτον δὲ σημεῖον ὅτι πολλὰ τῶν ξώων αὐτὰ τε θῆλεα καὶ ἄρρενα ἐστί, καὶ γεννᾷ τὰ μὲν θῆλεα τὰ δ’ ἄρρενα,

¹ ἡ τὸ ἄρρεν . . . γίνεται ἐν τοῖς δεξιοῖς secl. Platt; om. Σ; credo equidem etiam ἐτὶ δ’ ὁπερ huc usque secl., nam argumento aliena; cf. 764 a 1.

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*a* Lit., “body of the uterus,” drawing special attention to the fact of its physical existence: cf. μέγεθος above, 764 b 7. 

*b* This sentence, which has nothing to do with the argument, must be deleted. 

*c* Leophanes is quoted by Theophrastus, *De caus. plant.* II. 382
reference to right and left, although they can see for themselves that male and female differ in fact by the entirety of the parts concerned. By what cause, then, will the uterus\(^a\) be present in those which come from the left side but not in those which come from the right? Supposing one comes (from the left) without having got this part, there will be a female without a uterus—or if it so chance, a male with one! [Again, as has in fact been said before, a female embryo has actually been observed in the right part of the uterus, and a male one in the left part, and both male and female in the self-same part, and that not once but several times over; or the male one on the right side, and the female on the left, and no less both are formed on the right side].\(^b\) There are some who are firmly convinced of a similar view to this, and maintain that males who copulate with the right or left testicle tied up produce male or female offspring respectively; this used in fact to be maintained by Leophanes.\(^c\) Some allege that the same occurs in the case of those who have one testis excised. This statement is untrue, and is a mere piece of guesswork on their part. They start from probabilities and guess what will occur; they pre-judge that it is so before they see it happen. Added to which they do not know that these parts of animals contribute nothing at all to generation so far as producing male and female offspring is concerned; and a proof that this is so is that many animals, although they are themselves male and female and generate male and female offspring,

4. 11; and the fact that in Aëtius' *Placita* V. 7. 5 (*Doxogr.* 420 a 7) he comes between Anaxagoras and Leucippus may give a rough indication of his date.
765 a  ὀρχεις οὐκ ἔχοντα, καθάπερ τὰ μὴ ἔχοντα πόδας, οἶνον τὸ τε τῶν ἱχθύων γένος καὶ τὸ τῶν ὀφεων.

765 b  Τὸ μὲν οὖν θερμότητα καὶ ψυχρότητα αἱτίαν οἴεσθαι τοῦ ἀρρενος καὶ τοῦ θῆλεος, καὶ τὴν ἀπόκρισιν ἀπὸ τῶν δεξιῶν γίνεσθαι ἢ τῶν ἀριστερῶν, ἔχει τυνὰ λόγον. θερμότερα γὰρ τὰ δεξιὰ τοῦ σώματος τῶν ἀριστερῶν, καὶ τὸ σπέρμα τὸ πεπεμμένον θερμότερον, τοιοῦτον δὲ τὸ συνεστὸς, γονιμώτερον δὲ τὸ συνεστὸς μᾶλλον. ἀλλὰ λίαν 5 τὸ λέγειν οὖτω πόρρωθεν ἐστιν ἀπτεσθαι τῆς αἵτιας, δεὶ δ’ ὅτι μάλιστα προσάγειν ἐκ τῶν ἐνδεχόμενων ἐγγὺς τῶν πρῶτων αἵτιων.

Περὶ μὲν οὖν ὁλον τε τοῦ σώματος καὶ τῶν μορίων, τί τε ἐκαστὸν ἐστι καὶ διὰ τίν’ αἵτιαν, εἰρήται πρότερον ἐν ἔτεροις. ἀλλ’ ἔπει τὸ ἀρρεν καὶ 10 τὸ θῆλυ διώρισται δυνάμει τωλὶ καὶ ἄδυναμίᾳ (τὸ μὲν γὰρ δυνάμενον πέττειν καὶ συνιστάναι τε καὶ ἐκκρίνειν σπέρμα ἔχον τὴν ἀρχὴν τοῦ εἴδους ἄρρεν. λέγω δ’ ἀρχὴν οὐ τὴν τοιαύτην εἷς ἢς ὀσπερ ὑλῆσ γίνεται τοιοῦτον οἶνον τὸ γεννών, ἄλλα τὴν κυνοῦσαν πρῶτην, ἐὰν τ’ ἐν αὐτῷ ἕαν τ’ ἐν ἄλλῳ τούτῳ 15 δύνηται ποιεῖν· τὸ δὲ δεχόμενον μὲν ἄδυνατον δὲ

* a See 716 b 14 f.
* b Thus the semen which comes from the right side will be hotter.
* c Cf. above, 747 a 5 ff.
* d And therefore, of course, capable of producing males.
* e Compare the method described in Physics, 184 a 10 ff.
* f In the Parts of Animals and in the first book of the Generation of Animals.
* g Dynamis: see Introd. § 30.
possess no testes—as is the case with the animals that have no feet, e.g., the tribes of fishes and serpents.\(^a\)

Now the opinion that the cause of male and female is heat and cold, and that the difference depends upon whether the secretion comes from the right side or from the left, has a modicum of reason in it, because the right side of the body is hotter than the left \(^b\); hotter semen is semen which has been concocted; the fact that it has been concocted means that it has been set and compacted,\(^c\) and the more compacted semen is, the more fertile it is.\(^d\) All the same, to state the matter in this way is attempting to lay hold of the cause from too great a distance, and we ought to come as closely to grips as we possibly can with the primary causes.\(^e\)

We have dealt already elsewhere \(^f\) with the body as a whole and with its several parts, and have stated what each one is, and on account of what cause it is so. But that is not all, for (1) the male and the female are distinguished by a certain ability \(^g\) and inability.\(^h\) Male is that which is able to concoct, to cause to take shape, and to discharge, semen \(^i\) possessing the "principle" of the "form"; and by "principle" I do not mean that sort of principle out of which, as out of matter, an offspring is formed belonging to the same kind as its parent, but I mean the first motive principle, whether it is able to act thus \(^j\) in itself or in something else. Female is that which receives the semen, but is unable to cause

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\(^a\) Thus much has already been stated at 716 a 18 ff., but Aristotle now develops it more fully.

\(^b\) With this passage cf. the discussion at 724 a 29 ff.

\(^c\) i.e., act as the cause of movement.
συνιστάναι καὶ ἐκκρίνειν θῆλυ), ἐτὶ εἰ' πᾶσα πέψις ἐργάζεται θερμῶς, ἀνάγκη [καὶ]² τῶν ζώων τὰ ἄρρενα τῶν θηλέων θερμότερα εἶναι· διὰ γὰρ ψυχρότητα καὶ ἄδυναμιαν πολυναιμεῖ κατὰ τόπους τινὰς τὸ θῆλυ μᾶλλον. καὶ ἔστιν αὐτὸ τούναντίον σημείον ὑπεροπτήν τινὲς τὸ θῆλυ θερμότερον εἶναι τοὺς ἄρρενους, διὰ τὴν τῶν καταμηνίων πρόεσιν· τὸ μὲν γὰρ αἴμα θερμὸν, τὸ δὲ πλεῖον ἔχον μᾶλλον. ὑπολαμβάνουσι δὲ τούτο γίνεσθαι τὸ πάθος δι' ὑπερβολὴν αἴματος καὶ θερμότητος, ὦσπερ ἐνδεχόμενον αἷμα εἶναι πάν ὀμοίως, ἀνπερ μόνον ὤγρον ἢ καὶ τὴν χρόνα αἰματῶδες, καὶ οὐκ ἐλαττον γινόμενον καὶ καθαρώτερον τοῖς ἐντροφοῦσιν. οἱ δ' ὦσπερ τὸ κατὰ τὴν κοιλίαν περίττωμα, τὸ πλεῖον τοῦ ἐλάττονος οὖνται σημείον εἶναι θερμῆς φύσεως μᾶλλον. καίτοι τούναντίον ἐστίν· ὦσπερ γὰρ καὶ ἐκ τῆς πρώτης τροφῆς ἐκ πολλῆς ὀλίγον ἀποκρίνεται τὸ χρήσιμον ἐν ταῖς περὶ τοὺς καρποὺς ἐργασίας, καὶ τέλος οὕθεν μέρος τὸ ἐσχάτων πρὸς τὸ πρῶτων πλήθος ἐστὶν, οὕτω πάλιν καὶ ἐν τῷ σώματι διαδεχόμενα τὰ μέρη ταῖς ἐργασίαις, τὸ τελευταῖον πάμπαν μικρὸν ἐξ ἀπάσης γίνεται ³ τῆς τροφῆς. τοῦτο δὲ ἐν μὲν τισὶν ἀιμά ἐστιν, ἐν δὲ 35 τισι τὸ ἀνάλογον.

'Επεὶ δὲ τὸ μὲν δύναται τὸ δ' ἄδυνατεὶ ἐκκρί-

¹ ἐπεὶ δὲ coni. Platt; fort. ἐτὶ ἐπεὶ scribendum.
² secl. Platt.
³ ἐκκρίνει Btf.

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ᵃ Cf. 725 a 17 f.
semen to take shape or to discharge it. And (2) all concoction works by means of heat. Assuming the truth of these two statements, it follows of necessity that (3) male animals are hotter than female ones, since it is on account of coldness and inability that the female is more abundant in blood in certain regions of the body. And this abundance of blood is a piece of evidence which goes to prove the opposite of the view held by some people, who suppose that the female must be hotter than the male, on account of the discharge of menstrual fluid: blood, they argue, is hot, so that which has more blood in it is hotter. They suppose, however, that this condition occurs owing to excess of blood and heat, as though it were possible for anything and everything to be equally blood if only it is fluid and bloodlike in colour, without allowing for the possibility of its becoming less in quantity and purer in animals that are well-nourished. They apply the same standard here as they do to the residue in the intestine: if there is more of it they imagine that is a sign of a hotter nature. Yet in fact the opposite is the truth. Take a parallel case, that of fruit. Here the nourishment in its first stage is large in quantity, but the useful product resulting from it through the various stages of its treatment is small, and in the end the final result is nothing in proportion compared with the original bulk. So too in the body, the various parts receive the nourishment in turn at the different stages of its treatment, and the final product resulting from all that amount of nourishment is quite small. In some, this is blood; in others, its counterpart.

Now as the one sex is able and the other is unable to take shape or to discharge it.


3 ὀργανον PSYZ*; ὀργάνα E*, vulg.

4 οὔτ' P: οὔθ' ἢ vulg.

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1 i.e., here “able” means “can do it better,” “unable” means “can do it less well.”

b Cf. 716 a 23 ff.

c Cf. 716 a 32, and H.A. 493 b 9 “the part between the thigh and the buttock is the perineos.”

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to secrete the residue in a pure condition; and as there is an instrument for every ability or faculty, for the one which yields its product in a more finished condition and for the one which yields the same product in a less finished condition; and as male and female stand opposed in this way ("able" and "unable" being used in more senses than one); therefore of necessity there must be an instrument both for the male and for the female; hence the male has the perineos and the female has the uterus. Nature gives each one its instrument simultaneously with its ability, since it is better done thus. Hence each of these regions of the body gets formed simultaneously with the corresponding secretions and abilities, just as the ability to see does not get perfected without eyes, nor the eye without the ability to see, and just as the gut and the bladder are perfected simultaneously with the ability to form the residues. Now as the stuff out of which the parts are formed is the same as that from which they derive their growth, namely the nourishment, we should expect each of the parts to be formed out of that sort of material and that sort of residue which it is fitted to receive. Secondly, and on the contrary, it is, as we hold, formed in a way out of its opposite. Thirdly, in addition, it must be laid down that, assuming the extinction of a thing means its passing into its opposite condition, then also that which does not get mastered by the agent which is fashioning it must of necessity change over into its opposite condition. With these

a For this distinction between the grades of nourishment, see 744 b 32 ff.

b This is explained at length at 768 a 1 ff. The whole of the present passage should be read in conjunction with the later and fuller discussion. See also 766 b 15 ff.
ménwv istorw autn ̓h ̓h μᾶλλον εἰ ἐκείνη φανεροῦ δι’ ἐκ τοῦ μεν θῆλυ τὸ δ’ ἀρρεν. ὅταν γὰρ
μῆ κρατῇ ἢ ἀρχῇ μηδὲ δύνηται πέσαι δι’ ἐνδειαν
θερμότητος μὴ ἀγάγη εἰς τὸ ἵδιον εἴδος τὸ αὐτοῦ, 1
ολλὰ ταύτη ἡττήθη, ἀνάγκη εἰς τούνατίον μετα-
βάλλειν. ἐναντίον δὲ τῷ ἀρρεν τὸ θῆλυ, καὶ ταύτῃ
ὁ τὸ μὲν ἀρρεν τὸ δὲ θῆλυ. ἐπεὶ δ’ ἔχει διαφοράν
ἐν τῇ δυνάμει, ἔχει καὶ τὸ ὀργανόν διαφέρον ὡστ’
eἰς τούτων μεταβάλλει. ἐνὸς δὲ μορίῳ ἐπικαίρου
μεταβάλλοντος ὅλῃ τὸ σύστασι τοῦ ἱμῶν πολὺ τῷ
eἰδέι διαφέρει. ὅραν δὲ ἔξεστι ἐπὶ τῶν εὐνοῦχων,
οἱ ἔνὸς μορίου πηρωθέντος τοσοῦτον ἐξαλλάττουσι
tῆς ἀρχαίας μορφῆς καὶ μικρὸν ἐλλείπουσι 2 τοῦ
θήλεος τὴν ἱδέαν. τούτου δ’ αὐτοῦ ὅτι ἐνα τῶν
μορίων ἀρχαὶ εἴσον ἀρχῆς δὲ κυνηθείσης πολλὰ
ἀνάγκη μεθίστασθαι τῶν ἀκολούθων ὑπ’

Εἰ ὀὖν τὸ μὲν ἀρρεν ἀρχῇ τις καὶ αὐτοῦ, ἐστὶ
δ’ ἀρρεν ἢ δύναται τι, θῆλυ δὲ ἢ ἄδυνατει, τῆς
dυνάμεως ὁρὸς καὶ τῆς ἄδυναμίας τὸ πεπτικὸν εἶναι

1 αὐτοῦ Peck (cf. 766 b 16, 767 b 17) : αὐτοῦ vulg.
2 ἐλλείπουσι P : λείπουσι vulg.

a The “movement” derived from the male, the male
“principle.” See 767 b 17 ff.
b i.e., male.
c Cf. the terminology of this and the two following chapters
with Hippocrates, π. διαίτης I. 25 ff. The following examples
may be given: I. 28 (vi. 502 Littré) ἢν ἐπικρατῆσῃ τὸ ἄρρεν;
ibid. τὸ θῆλυ μειώται καὶ διακρίνεται εἰς ἄλλην μοῖραν; I. 27
(vi. 500 L.) διαλύεται εἰς τὴν μείω τάξιν.
d See, e.g., 716 a 27 ff., 766 b 2 ff.
e i.e., the condition of possessing the female generative
organs.
f Cf. above, 716 b 2 ff., and 764 b 28 ff.
g Aristotle seems to have between asserting and denying
as our premisses it may perhaps be clearer why and by what cause one offspring becomes male and another female. It is this. When the "principle" a is failing to gain the mastery and is unable to effect concoction owing to deficiency of heat, and does not succeed in reducing the material into its own proper form, b but instead is worsted in the attempt, then of necessity the material must change over into its opposite condition. c Now the opposite of the male is the female, and it is opposite in respect of that whereby one is male and the other female. d And since it differs in the ability it possesses, so also it differs in the instrument which it possesses. Hence this is the condition e into which the material changes over. And when one vital part changes, f the whole make-up of the animal differs greatly in appearance and form. This may be observed in the case of eunuchs; the mutilation of just one part of them results in such a great alteration of their old semblance, and in close approximation to the appearance of the female. The reason for this is that some of the body's parts g are "principles," and once a principle has been "moved" (i.e., changed), many of the parts which cohere h with it must of necessity change as well.

Let us assume then (1) that "the male" is a principle and is causal in its nature; (2) that a male is male in virtue of a particular ability, and a female female in virtue of a particular inability; (3) that the line of determination between the ability and the inability is whether a thing effects or does not effect

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The ultimate source of sex is the heart.

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"Are of a piece with it": cf. 764 b 24, 25.
The bloodless animals.

Cf. note on 763 b 25. This extremely important paragraph gives Aristotle's view on the seat of the distinction of sex, and its main conclusions must be borne in mind throughout his discussion of this subject. It also serves to elucidate the apparent contradictions in his statements elsewhere (e.g., 716 a 28, 764 b 36, 766 a 28) as to whether or not the sexual parts are to be considered "principles."
concoction of the ultimate nourishment (in blooded animals this is known as blood, in the bloodless ones it is the counterpart of blood); (4) that the reason for this lies in the "principle," i.e., in the part of the body which possesses the principle of the natural heat. From this it follows of necessity that, in the blooded animals, a heart must take shape and that the creature formed is to be either male or female, and, in the other kinds which have male and female sexes, the counterpart of the heart. As far, then, as the principle and the cause of male and female is concerned, this is what it is and where it is situated; a creature, however, really is male or female only from the time when it has got the parts by which female differs from male, because it is not in virtue of some casual part that it is male or female, any more than it is in virtue of some casual part that it can see or hear.

To resume then: We repeat that semen has been posited to be the ultimate residue of the nourishment. (By "ultimate" I mean that which gets carried to each part of the body—and that too is why the offspring begotten takes after the parent which has begotten it, since it comes to exactly the same thing whether we speak of being drawn from every one of the parts or passing into every one of the parts, though the latter is more correct.) The semen of the male, however, exhibits a difference,

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*e The following paragraph is a short recapitulation, with additions, of the main points of the preceding argument, 765 b 8—766 b 7. (For the use of υπόκειται with participle, cf. 778 b 17 τοιόνδε ζῷον υπόκειται δι.)

*d See Bk. I. 721 b 13 ff., and especially the conclusion of that discussion, 725 a 21 ff.
The passage following has been corrupted. It should probably read: “a principle of such a kind as to set in movement and to concoct thoroughly the ultimate nourishment, and to cause it to pass into the uterus of the female; whereas the formation of the embryo takes place in the female.” Cf. the parallel passage above, 765 b 10.

There is no subject to this verb in the Greek; at 766 a 18 it is “the principle”; at 767 b 17 it is “the movement derived from the male”—where also Aristotle explains that
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inasmuch as the male possesses in itself a principle of such a kind as to set up movement [in the animal as well] and thoroughly to concoct the ultimate nourishment, whereas the female's semen contains material only. If (the male semen) gains the mastery, it brings (the material) over to itself; but if it gets mastered, it changes over either into its opposite or else into extinction. And the opposite of the male is the female, which is female in virtue of its inability to effect concoction, and of the coldness of its bloodlike nourishment. And Nature assigns to each of the residues the part which is fitted to receive it. Now the semen is a residue, and in the hotter of the blooded animals, i.e., the males, this is manageable in size and amount, and therefore in males the parts which receive this residual product are passages; in females, however, on account of their failure to effect concoction, this residue is a considerable volume of bloodlike substance, because it has not been matured; hence there must of necessity be here too some part fitted to receive it, different from that in the male, and of a fair size. That is why the uterus has these characteristics; and that is the part wherein the female differs from the male.

We have now stated the cause why some creatures are formed as males, others as females.

And our statements are borne out by the facts. II Thus: Young parents, and those which are older too, tend to produce female offspring rather than parents by the facts.

it is all one whether we say "the semen," or "the movement which causes the growth of each of the parts," or "the movement which originally sets and constitutes the feta-

Cf. 771 b 19 ff.

Because it is more compact; see above, 765 b 3.

c Cf. 738 b 35 ff.
30 καὶ τὰ πρεσβύτερα: τοῖς μὲν γὰρ οὕτω τέλειον τὸ θερμόν, τοῖς δὲ ἀπολείπει. καὶ τὰ μὲν ύγρότερα τῶν σωμάτων καὶ γυναικικότερα θηλυγόνα μᾶλλον, καὶ τὰ σπέρματα τὰ υγρὰ τῶν συνεστηκότων, πάντα γὰρ ταῦτα γίνεται δι᾽ ἐνδεικνθὲς θερμότητος φυσικῆς.

35 Καὶ τὸ βορεῖος ἀρρενοτοκεῖν μᾶλλον ἢ νοτίοις (διὰ ταύτῳ συμβαίνει· ύγρότερα γὰρ τὰ σώματα νοτίοις), ὥστε καὶ περιττωματικότερα. τὸ δὲ πλεῖον περίττωμα δυσπεπτότερον διὸ τοῖς μὲν ἀρρεσιν ύγρότερον τὸ σπέρμα, ταῖς δὲ γυναιξίν ἢ τῶν καταμηνίων ἐκκροισι.

Καὶ τὸ γίνεσθαι δὲ τὰ καταμήνια κατὰ φύσιν ψυχρότερος γὰρ οἱ χρόνοι οὕτος τοῦ 5 μηνὸς καὶ ύγρότερος διὰ τὴν θεῖαν καὶ τὴν ἀπόλευψιν τῆς σελήνης: οὐ μὲν γὰρ ἡλιος ἐν ὅλῳ τῷ ἐνιαυτῷ ποιεῖ χειμῶνα καὶ θέρος, ἢ δὲ σελήνη ἐν τῷ μηνί. [τούτῳ δ’ οὐ διὰ τὰς τροπὰς, ἀλλὰ τὸ μὲν αὐξανομένου συμβαίνει τοῦ φωτός, τὸ δὲ ψυχρότερος.]’

10 καὶ ἀρρενογονών οὐ μόνον ἐὰν συμβαίνη τὴν ὀχείαν γίνεσθαι βορείοις ἢ νοτίοις, ἀλλὰ καὶ ὀχυρόμενα

1 τὰ πρεσβύτερα P: γηράσκοντα μᾶλλον vulg.
2 supplevi; quia corpora sunt humida quando ventus movetur meridionalis Σ.
3 κατά P: τὰ κατὰ vulg.
4 seclusi; om. Σ: συμβαίνει om. SY, μηνὸς pro φωτός S.

a Cf. H.A. 573 b 34.
b Cf. the effects of the south wind described in Hippocrates, π. ἤρης νυσσον 13, π. ἀέρων ὑδάτων τόπων 3.
c See 777 b 24 ff.
d This explanation sounds like a gloss. Its meaning is
which are in their prime; the reason being that in the young their heat is not yet perfected, in the older, it is failing. Also, parents which are more fluid of body and feminine tend to produce females; this is true also of fluid semen as opposed to that which has "set"; all these things are due to a deficiency of natural heat.

Also, the fact that when the wind is in the north male offspring tend to be engendered rather than when it is in the south (is due to the same cause: animals' bodies are more fluid when the wind is in the south) so that they are more abundant in residue as well. And the more residue there is, the more difficulty they have in concocting it; hence the semen of the males and the menstrual discharge of the women is more fluid.

Also, the fact that the menstrual discharge in the natural course tends to take place when the moon is waning is due to the same cause. That time of month is colder and more fluid on account of the waning and failure of the moon (since the moon makes a summer and winter in the course of a month just as the sun does in the course of the whole year. [This is not due to its turning at the tropics; no, the one occurs when the moon's light is increasing, the other when it is waning]. Also, shepherds say that it makes a difference so far as the generation of males and females is concerned not only whether copulation occurs when the wind is in the north or in the south, but also whether that whereas summer and winter result from the "turnings" of the sun, viz., the solstices, the "summer" and "winter" of the moon are not due to the moon's "turnings," but to its waxings and wanings, which are completely independent of its "turnings."

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βλέπῃ πρὸς νότον ἡ βορεάν· οὕτω μικρὰν ἐνίοτε ῥοπὴν αἰτίαν γίνεσθαι τῆς ψυχρότητος καὶ θερμότητος, ταύτα δὲ τῆς γενέσεως.

Διέστηκε μὲν οὖν ὅλως πρὸς ἄλληλα τὸ τε θῆλυ 15 καὶ τὸ ἄρρεν πρὸς τὴν ἀρρενογονίαν καὶ θηλυγονίαν διὰ τὰς εἰρημένας αἰτίας, οὐ μὴν ἄλλα καὶ δεῖ συμμετρίας πρὸς ἄλληλα· πάντα γὰρ τὰ γινόμενα κατὰ τέχνην ἡ φύσιν λόγος τινὶ ἑστὶν. τὸ δὲ θερμὸν λίαν μὲν κρατοῦν ἤτραίνει τὰ υγρὰ, πολὺ δὲ ἐλεύθερον οὐ συνιστήσιν, ἄλλα δεὶ πρὸς τὸ δημιουργοῦν 20 μενον ἔχειν τοῦτον τὸν τοῦ μέσου λόγον· εἰ δὲ μὴ, καθάπερ ἐν τοῖς ἐφομένοις προσκαίρει μὲν τὸ πλεῖον πῦρ, οὐχ ἔσει δὲ τὸ ἐλαττων, ἄμφοτέρως δὲ συμβαινει μὴ τελειοῦσθαι τὸ γινόμενον, οὕτω καὶ ἐν τῇ τοῦ ἀρρενος μίξει καὶ τοῦ θηλεος δεὶ τῆς συμμετρίας. καὶ διὰ τοῦτο πολλοῖς καὶ πολλαῖς 25 συμβαίνει μετ᾽ ἄλληλων μὲν μὴ γεννῶν, διαζευγθεῖτο δὲ γεννῶν, καὶ ὅτε μὲν νέοις ὅτε δὲ πρεσβυτέροις οὕσι ταύτας γίνεσθαι τὰς ὑπεναντιώσεις, ὅμοιως περὶ τε γένεσιν καὶ ἁγονίαν καὶ ἀρρενογονίαν καὶ θηλυγονίαν. διαφέρει δὲ καὶ χώρα χώρας εἰς ταύτα καὶ ὦδωρ ὦδατος διὰ τὰς αὐτὰς αἰτίας· 30 ποιὰ γὰρ τις ἡ τροφὴ γίνεται μάλιστα καὶ τοῦ σώματος ἡ διάθεσις διὰ τε τῆν κράσιν τοῦ περι-

1 τοῦτον τὸν ΡΖ1* : τοῦτον om. vulg.

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a Cf. H.A. 574 a 2.
b Cf. 723 a 30, 772 a 17, 777 b 25, and Introd. §§ 39 f.
c With the following passage, cf. Hippocrates, π. ἁέρων ὦδατων τόπων, chh. 1-8 (ii. 12 ff. Littre), id. π. διαίτης Π. 37-39. 398
the animals face north or south while they are copulating: such a small thing thrown in on one side or the other (so they say) acts as the cause of heat and cold, and these in turn act as the cause of generation.

Male and female, then, differ generally with regard to each other in respect of the generation of male and female offspring on account of the causes which have been stated. At the same time, they must stand in a right proportional relationship to one another, since everything that is formed either by art or by nature exists in virtue of some due proportion. Now if "the hot" is too powerful it dries up fluid things; if it is very deficient it fails to make them "set"; what it must have in relation to the object which is being fashioned, is the mean proportional, and unless it has that, the case will be the same as what happens when you are cooking: if there is too much fire it burns up your meat, if there is too little it will not cook it—either way what you are trying to produce fails to reach completion. The same applies to the mixture of the male and the female: they require the right proportional relationship, and that is the reason why it happens that many couples fail to effect generation with one another, but if they change partners they succeed; and also that these oppositions occur sometimes in young people, sometimes among those who are older, both with regard to failure and success in generation and also with regard to the generation of male and female offspring.

Also, one country differs from another in these respects, and one water from another, on account of the same causes, for the quality of the nourishment especially and of the bodily condition of a person...
estwto aéros kai tw:n eiswóntwv, máliosta de dia

tin toû ùdatos tróphi=n: tou=to gar pléiston

eisféronta, kai ev pásin èsti tróphi tou=to, kai

ev tois ègropis. diò kai ta àtéra'ma ùdata kai

35 fvxra ta mèn àteknián pòiei ta de òthluto'kían.

III Aì d' autai ait'iai kai tou= tou mèn èoiikóta gíne-

satai tois teknw'sasi ta de mì èoiikóta, kai ta mèn

patri ta de mìtrí, katà te ólon to sówma kai

katà mòriion èka'ston, kai málloyn autòis ì tois

progonois, kai tou'tois ì tois tuchosoi, kai ta mèn

árr'ena málloyn tw' patri ta de òthlèa tì mìtrí, tà

5 d' oudenv tw'n su'ghenw'n, òmws d' anbhròpòw òe twv,
tà d' oud' anbhròpòw tìn ì'deavì ìll' òdhì tératì.

kai gar ò mì èoiikèw tois gonoë'san òdhì trò'pov

tinà téras èstìn: parékbe'htke gar ì thûsias èn

tou'tois èk tou' genous trò'pov tinà.

érchè de prò'th

to òthlûu gíne'shainè 2 kai mì àr'ren. ìll' autì mèn

ànagkaià tì thûsia, deì gar sózë'shain tà genos tw'n

10 kekhvirsumè'nov kata to òthlûu kai to àr'ren. èn-
dechomè'nov de mì kràtein pòte to àr'renì ì dià

nèóstha ì gîr'pas ì diì ìllhn tina ait'ian toiaù'thn,

1 tìn ì'deav] tinì SY. 2 gíne'shainè P: gíne'shainì vulg.
3 to àr'ren Rackham: toù àr'renos vulg.

a See Introd. §§ 39 f., and Hippocrates, ò. dià'ths I. passim.
For another reference to kràsis in connexion with the "sur-
rrounding air," see 777 b 7.

b Cf. Hippocrates, ò. àéron ùdatwv tòpov, ch. 4 (ii. 22, 2 ff.
Littre).

c Cf. 775 a 15: the female is a "deformity," though one
depends upon the blend of the surrounding air and of the foods which the body takes up, and especially upon the nourishment supplied by the water, since this is what we take most of, water being present as nourishment in everything, even in solid substances as well. Hence hard, cold water in some cases causes barrenness, in others the birth of females.

The following things are due to these same causes. III

Some offspring take after their parents and some do not; some after their father, some after their mother, as well in respect of the body as a whole as in respect of each of the parts, and they take after their parents more than after their earlier ancestors, and after their ancestors more than after any casual persons. Males take after their father more than their mother, females after their mother. Some take after none of their kindred, although they take after some human being at any rate; others do not take after a human being at all in their appearance, but have gone so far that they resemble a monstrosity, and, for the matter of that, anyone who does not take after his parents is really in a way a monstrosity, since in these cases Nature has in a way strayed from the generic type. The first beginning of this deviation is when a female is formed instead of a male, though (a) this indeed is a necessity required by Nature, since the race of creatures which are separated into male and female has got to be kept in being; and (b) since it is possible for the male sometimes not to gain the mastery either on account of youth or age or some other such cause, female produced in the normal course of nature (ἀναπηρίαν φυσικάν). See Introd. § 13.

This is an instance of a necessity required by the Final Cause; see 731 b 25—732 a 3.
ανάγκη γίνεσθαι θηλυτοκίαν ἐν τοῖς ζύφοις. τὸ δὲ
tέρας οὐκ ἀναγκαίον πρὸς τὴν ἐνεκά του καὶ τὴν
tοῦ τέλους αἰτίαν, ἀλλὰ κατὰ συμβεβηκός ἀναγ-
15 καίον, ἐπεὶ τὴν γ’ ἀρχήν ἐντεῦθεν δεὶ λαμβάνειν.
eὐπέπτου μὲν γὰρ οὔσης τῆς περιπτώσεως ἐν τοῖς
cαταμηνίωι τῆς σπερματικῆς, καθ’ αὐτὴν ποιήσει
tὴν μορφήν ἢ τοῦ ἀρρενος κίνησις. (τὸ γὰρ γονὴν
λέγειν ἡ κίνησιν τὴν αὔξουσαν ἐκαστον τῶν μορίων
20 οὐθέν διαφέρει, οὐδὲ τὴν αὔξουσαν ἢ τὴν συνιστάσαν
ἐξ ἀρχῆς. οὸ γὰρ αὐτὸς λόγος τῆς κινήσεως.) ὥστε
κρατοῦσα¹ μὲν ἀρρενε τε ποιήσει καὶ οὐ θῆλυ, καὶ
ἐοικὸς τῷ γεννῶντι ἀλλ’ οὐ τῇ μητρί. μὴ κρατῆσασα²
dὲ, καθ’ ὁποιαν ἢν μὴ κρατήσῃ δύναμιν, τὴν ἔλ-
λειψιν ποιεῖ κατ’ αὐτήν. λέγω δὲ ἐκάστην δύναμιν
tόνδε τὸν τρόπον: τὸ γεννῶν ἐστὶν οὐ μόνον ἀρρεν
25 ἀλλὰ καὶ τοῖον ἀρρεν, οἰδον Κορίσκος ἢ Σωκράτης,
καὶ οὐ μόνον Κορίσκος ἐστὶν ἀλλὰ καὶ ἀνθρωπος.
καὶ τοῦτον δὴ τὸν τρόπον τὰ μὲν ἐγγύτερον τὰ δὲ
πορρώτερον ὑπάρχει τῷ γεννῶντι, καθὸ γεννητικῶν,
ἀλλ’ οὐ κατὰ συμβεβηκός, οἰδον εἰ γραμματικὸς ὁ
30 γεννῶν ἢ γείτων τινός. ἀεὶ δ’ ἱσχύει πρὸς τὴν
gένεσιν μᾶλλον τὸ ἱδιόν καὶ τὸ καθ’ ἐκαστὸν. οὸ
γὰρ Κορίσκος καὶ ἀνθρωπὸς ἐστὶ καὶ ζώον· ἀλλ’

1 κρατοῦσα Peck: κρατοῦσα vulg.
2 κρατήσασα Peck: κρατήσαν vulg.

ᵃ This is an instance of a necessity enforced by the nature
of the Matter; see below, 768 a 2–b 33. For these two
modes of necessity (here distinguished as ἐνεκά του and κατὰ
συμβεβηκός), cf. P. A. 642 a 33, and Introd. §§ 6 ff.
b Cf. 766 a 18, 766 b 15, 771 b 22, 772 b 32.
offspring must of necessity be produced by animals.\textsuperscript{a}
As for monstrosities, they are not necessary so far as the purposive or final cause is concerned, yet \textit{per accidens} they are necessary, since we must take it that their origin at any rate is located here. Thus:
If the seminal residue in the menstrual fluid is well-concocted, the movement derived from the male will make the shape after its own pattern.\textsuperscript{b} (It comes to the same thing whether we say "the semen" or "the movement which makes each of the parts grow"; or whether we say "makes them grow" or "constitutes and 'sets' them from the beginning"—because the \textit{logos} of the movement is the same either way.) So that if this movement gains the mastery it will make a male and not a female, and a male which takes after its father, not after its mother; if however it fails to gain the mastery, whatever be the "faculty" in respect of which it has not gained the mastery, in that "faculty" it makes the offspring deficient. "Faculty," as applied to each instance, I use in the following sense. The generative parent is not merely male, but in addition a male with certain characteristics, \textit{e.g.,} Coriscus or Socrates; and it is not merely Coriscus, but in addition a human being. And it is of course in this sense that, of the characteristics belonging to the generating parent, some are more closely, some more remotely his, \textit{qua} procreator (not \textit{qua} anything else he may be \textit{per accidens}, \textit{e.g.,} supposing he were a good scholar or somebody's next-door neighbour); and where generation is concerned, it is always the peculiar and individual characteristic that exerts the stronger influence. Thus: Coriscus is both a human being and an animal; but the
ARISTOTLE

767 b

εγγύτερον τού ἰδίου τῷ ἀνθρωπος ἢ τῷ ζῷον. γεννᾶ δὲ καὶ τὸ καθ’ ἐκαστὸν καὶ τὸ γένος, ἀλλὰ μᾶλλον τὸ καθ’ ἐκαστὸν τοῦτο γὰρ ἡ οὐσία· καὶ τῷ 35 γνώμενον γίνεται μὲν καὶ ποιόν τι, ἀμα δὲ τόδε τι, καὶ τοῦθ’ ἡ οὐσία. διόπερ ἀπὸ τῶν δυνάμεων ὑπάρχουσιν αἱ κινήσεις ἐν τοῖς σπέρμασι πάντων τῶν τοιούτων, δυνάμει δὲ καὶ τῶν προγόνων, μᾶλλον δὲ τοῦ εγγύτερον ἄει τῶν καθ’ ἐκαστὸν τινος· λέγω δὲ καθ’ ἐκαστὸν τὸν Κορίσκου καὶ τὸν Σωκράτην. ἐπεὶ δ’ ἐξίσταται πάν ‹οὐκ εἰς τὸ τυχόν ἀλλ’ εἰς τὸ ἀντικείμενον, καὶ τὸ ἐν τῇ γενέσει μὴ κρατούμενον ἀναγκαῖον ἐξίστασθαι καὶ γίνεσθαι 5 τὸ ἀντικείμενον καθ’ ἣν δύναμιν οὐκ ἐκράτησε τὸ γεννῶν καὶ κυνόν. ἕαν μὲν οὖν ἦν ἄρρεν, θῆλυ γίνεται, ἕαν δὲ ἦ Κορίσκος ἢ Σωκράτης, οὐ τῷ πατρὶ ἐμίκος ἀλλὰ τῇ μητρὶ γίνεται· ἀντικείται γὰρ ὁσπερ τῷ ὅλως 4 πατρὶ μήτηρ, καὶ τῷ καθ’ ἐκαστὸν γεννῶντι ἡ καθ’ ἐκαστὸν γεννώσα. ὁμοίως δὲ καὶ 10 κατὰ τὰς ἐχομένας δυνάμεις· ἄει γὰρ εἰς τὸν ἐχόμενον μεταβαίνει μᾶλλον τῶν προγόνων, καὶ ἐπὶ

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a Cf. 731 b 34, and below 768 a 1; and see the definition of οὐσία given in Cat. 2 a 11, and the examples cited, ὅ τις ἄνθρωπος, ὅ τις ἵππος. There are of course other usages and meanings of οὐσία. Cf. Introd. § 16, App. A § 18.

b Viz., individual, human being, animal, etc.

c Loses and alters its character; degenerates. The force of εξίστασθαι can be seen from the phrase εξίστησα καὶ φθέρει τὴν φύσιν (Eth. Nic. 1119 a 23); cf. G. & G. 323 b 28, Phys. 261 a 20 (τῆς φύσεως, τῆς οὐσίας, εξίστασθαι), and 725 a 28 above.

d Cf. above, 766 a 15.

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former characteristic stands closer to what is peculiar to him than the latter does. Now both the individual and the genus to which it belongs are at work in the act of generation; but of the two the individual takes the leading part, because this is the really existent thing \(^a\); the offspring also which is formed, though of course it is formed so as to possess the generic characteristics, at the same time comes to be a particular individual—and this, again, is the really existent thing. Therefore, it is from the "faculties" of all such things as these \(^a\) that the movements which are present in the semens are derived, potentially even from (the faculties) of earlier ancestors, but more specially of that which on each occasion stands closer to some individual; and by individual I mean Coriscus, or Socrates. Now everything, when it departs from type,\(^6\) passes not into any casual thing but into its own opposite; thus, applying this to the process of generation, the (substance) which does not get mastered must of necessity depart from type and become the opposite\(^d\) in respect of that "faculty" wherein the generative and motive agent has failed to gain the mastery. Hence, if this is the "faculty" in virtue of which the agent is male, then the offspring formed is female; if it is that in virtue of which the agent is Coriscus or Socrates, then the offspring formed does not take after its father but after its mother, since, just as "mother" is the opposite of "father" as a general term, so also the individual mother is the opposite of the individual father. The same applies to the "faculties" that stand next in order, since the offspring always tends to shift over to that one of its ancestors which stands next, both on the father's side
πατέρων καὶ ἐπὶ μητέρων. ἔνεισι δ' αἱ μὲν ἐν-
ergeia tōn kynhseon, αἱ δὲ δυνάμει, ἐνεργείᾳ μὲν αἱ
tōν γεννώντος καὶ τῶν καθόλου, οὖν ἀνθρώπου καὶ
ζωῆς, δυνάμει δὲ αἱ τῶν θηλεως καὶ τῶν προγόνων.

15 
metabálleis μὲν οὖν ἔξιστάμενον πρὸς τὰ ἀντικεῖ-
mena, λύονται δὲ αἱ κυνήσεις αἱ δημιουργοῦσαί εἰς
tὰς ἐγγύς, οὖν ἥ τὸν γεννώντος ἀν λυθῇ κυνήσις,
ἐλαχιστῇ διαφορᾷ μεταβάινει εἰς τὴν τοῦ πατρός,
δευτέρον δ' εἰς τὴν τοῦ πάππου· καὶ τοῦτον δὴ τὸν
τρόπον [καὶ ἔπι τῶν ἄρρενων καὶ ἔπι τῶν θηλεῶν]\(^2\)

20 ἡ τῆς γεννώσης εἰς τὴν τῆς μητρός, ἐὰν δὲ μὴ
eἰς ταύτην, εἰς τὴν τῆς τῆθης: ὁμοίως δὲ καὶ
ἐπὶ τῶν ἀνώθεν.

Mάλιστα μὲν οὖν πέφυκεν ἡ ἀρρεν καὶ ἡ πατηρ
ἀμα κρατεῖν καὶ κρατείσθαι: μικρὰ γὰρ ἡ διαφορά,
ὡστ' οὖν ἐργον ἀμα συμβῆναι ἀμφότερα: ὁ γὰρ
Σωκράτης ἀνήρ τούσδε τις.\(^3\) διὸ ὃς ἐπὶ τὸ πολὺ

25 τὰ μὲν ἄρρενα τῷ πατρὶ ἔοικεν, τὰ δὲ θηλεας τῇ
μητρὶ, ἀμα γὰρ εἰς ἀμφω ἐκστασις ἐγένετο, ἀντὶ-

\(^1\) ἐπὶ P : om. vulg.

\(^2\) secl. A.-W.

\(^3\) ὁ γὰρ . . . τις secl. A.-W.: ἀνήρ om. S.

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a Aristotle now introduces the distinction between ἔξιστά-
σθαι καὶ μεταβάλλειν ("departing from type and changing
over") and λύσθαι ("relapsing"): as will be seen, the
result of the former process is that the embryo acquires a
characteristic opposite to that of the original movement (this
process has been clearly described already); the result of
the latter process (not so far described) is that the embryo
acquires a characteristic which belonged to one of its ancestors.
(The explanation of these two processes is given below at
768 b 15 ff.)

b The semen, the movement derived from the male parent.
Cf. 766 a 17.

c See 768 a 2 above.
and the mother's. Some of the movements (those of the male parent and those of general kinds, e.g., of human being and animal) are present in (the semen) in actuality, others (those of the female and those of ancestors) are present potentially. a Now when (a) it b departs from type, c it changes over into its opposites; but when (b) the movements which are fashioning the embryo relapse, they relapse into those which stand quite near them; for example, if the movement of the male parent relapses, it shifts over to that of his father—a very small difference—and in the second instance to that of his grandfather. And in this way too [not only on the male side but also on the female] the movement of the female parent shifts over to that of her mother, and if not to that, then to that of her grandmother; and so on with the more remote ancestors.

(1) Usually the natural course of events is that when (the movement of the male parent) d gains the mastery—and when it is mastered—it will do so both qua male and qua individual father, e since the difference between the two (faculties) is a small one, and so there is no difficulty in their both coinciding (for Socrates is a man who, while (a) he has the characteristics of a class, f (b) is also an individual). Hence for the most part males take after their father—and females after their mother, since a departure from type takes place in both directions g

a See above, 766 b 15.

b Care must be taken to distinguish the use of "father" applied (a) to the male parent qua a particular individual, and (b) to the father of the male parent.

c i.e., is "male." For τοιόσδε, τοιόσδι, cf. Met. 1077 b 20 ff.

d i.e., from "male" into "female," and from "father" into "mother."
κειται δὲ τῷ μὲν ἀρρενὶ τὸ θῆλυ τῷ δὲ πατρὶ ἢ μήτηρ, ἡ δὲ ἐκστασις εἰς τάντικείμενα. ἐὰν δὲ ἡ μὲν ἀπὸ τοῦ ἀρρενος κρατήσῃ κόινος, ἡ δὲ ἀπὸ τοῦ Σωκράτους μὴ κρατήσῃ, ἡ αὕτη μὲν ἐκεῖνη δὲ 30 μῆ, τότε συμβαίνει γίνεσθαι ἀρρενά τε μητρὶ ἐοικότα καὶ θήλεα πατρί. ἐὰν δὲ λυθῶσιν αἱ κινήσεις, καὶ ἡ μὲν ἀρρεν μείνῃ, ἡ δὲ τοῦ Σωκράτους λυθῇ εἰς τὴν τοῦ πατρός, ἔσται ἀρρεν τῷ πάσπῳ ἐοικός ἢ τῶν ἄλλων τυι τῶν ἀνωθὲν προγόνων [κατὰ τούτον τὸν λόγον].[1] κρατηθέντος[2] δὲ ἡ ἀρρεν.[3] 35 θῆλυ ἐσται, καὶ ἐοικὸς μάλιστα μὲν τῇ μητρὶ, ἐὰν δὲ καὶ αὕτη λυθῇ κόινος, μητρὶ μητρός ἢ ἄλλη τυι τῶν ἀνωθὲν ἐσται ἡ ὁμοιότης κατὰ τὸν αὐτὸν λόγον. ὁ δὲ αὐτὸς τρόπος καὶ ἐπὶ τῶν μορίων· καὶ γὰρ τῶν μορίων τὰ μὲν τῷ πατρὶ ζοικε πολλάκις, τὰ δὲ τῇ μητρὶ, τὰ δὲ τῶν προγόνων τυιν· ἐνεισὶ γὰρ καὶ τῶν μορίων αἱ μὲν ἐνεργεία κινήσεις 5 αἱ δὲ δυνάμει, καθάπερ εἰρηται πολλάκις. καθόλου δὲ δεὶ λαβεῖν ὑποβέσεις, μίαν μὲν τὴν εἰρημένην, ὅτι ἐνεισὶ τῶν κινήσεων αἱ μὲν δυνάμει αἱ δὲ ἐνεργείαι, ἀλλὰς δὲ δῦο, ὅτι κρατοῦμεν μὲν ἐξ- ἔσται εἰς τὸ ἀντικείμενον, λυόμενον δὲ εἰς τὴν ἐχομένην κίνησιν, καὶ ἦττον μὲν λυόμενον εἰς τὴν

1 om. PS : seclusi. 2 κρατηθέντα Y.
3 post ἀρρεν addunt codd. ἡ (ἡ om. P) θῆλυ, τῶν προγόνων τυῖ ἐοικὸς PSYZ; amplius κρατηθείσης δὲ καὶ (καὶ om. Z) τῆς τοῦ προγόνου κινήσεως PSYZ.

— See 768 a 3.
5 i.e., the movement derived from that particular individual male.
6 Cf. 772 b 36.
simultaneously, and the opposite of “male” is “female” and the opposite of “father” is “mother,” departure from type always being into opposites. But (2) if the movement that comes from “the male” gains the mastery and the movement that comes from Socrates does not, or the other way round, then the result is that male offspring taking after their mother are formed and female ones taking after their father. Supposing (3) the movements relapse: if (i) the male “faculty” stands fast but the movement from Socrates relapses into that of his father, then the offspring will be male and take after its grandfather or some other more remote ancestor [according to this principle]; if (ii) the male-faculty gets mastered, the offspring will be female, and usually will take after the mother; but supposing this movement also relapses, it will take after the mother’s mother or some other more remote ancestor on the same principle. Precisely the same scheme holds good with the various parts of the body; very often, of course, some parts take after the father and some after the mother, and others after some of the ancestors, since the movements belonging to the parts as well are present in (the seminal substance), some of them in actuality, some potentially, as has often been stated. We must lay down as general principles that which we stated just now, for one (viz., that some of the movements are present in (the seminal substance) potentially, others in actuality), and also two others: (a) that which gets mastered departs from type and passes into its opposite; (b) that, however, which relapses passes into the movement next to it in order: if it relapses a little, into the movement
10 ἐγγὺς, μᾶλλον δὲ εἰς τὴν πορρώτερον. τέλος δ’ οὗτος συγχέονται ὡστε μηθενὶ ἐοικέναι τῶν οἰκείων καὶ συγγενῶν, ἀλλὰ λείπεσθαι τὸ κοινὸν μόνον καὶ εἶναι ἀνθρωπον. τούτοι δ’ αὖτιν οἵ τι πᾶσιν ἀκολουθεῖ τούτο τοῖς καθ’ ἕκαστον· καθόλου γὰρ ὁ ἀνθρωπός, ὁ δὲ Σωκράτης πατήρ, καὶ ἡ 15 μῆτηρ ἢτις ποτ’ ἢν, τῶν καθ’ ἕκαστον.

Αὖτιν δὲ τοῦ μὲν λύεσθαι τὰς κινήσεις ὅτι τὸ ποιοῦν καὶ πάσχει ὑπὸ τοῦ πάσχοντος (οἷον τὸ τέμνον ἀμβλύνεται ὑπὸ τοῦ τεμνομένου καὶ τὸ θερμαῖνον ψύχεται ὑπὸ τοῦ θερμαίνομενον, καὶ ὅλως τὸ κινοῦν ἔξω τοῦ πρῶτου ἀντικινεῖται τοῖς 20 κίνησιν, οἷον τὸ ὕθος ἀντωθεῖται πως καὶ ἀντιθέλεται τὸ θλῖβον· ἐνίοτε δὲ καὶ ὅλως ἔπαθε μᾶλλον ἡ ἐποίησεν, καὶ ἐψύχθη μὲν τὸ θερμαῖνον, ἑθερμάνθη δὲ τὸ ψύχον, ἵνα μὲν οὗθεν ποιήσαν, ὅτε δὲ ἤττον ἡ παθὸν· εὑρηταὶ δὲ περὶ αὐτῶν ἐν 25 τοῖς περὶ τοῦ ποιεῖν καὶ πάσχειν διωρισμένους, ἐν τοῖς ποιεῖν τοῦ ποιεῖν καὶ πάσχειν). ἐξίσοται δὲ τὸ πάσχον καὶ οὐ κρατεῖται ἡ δὲ ἐλλειψιν δυνάμεως τοῦ πέπτοντος καὶ κινούντος, ἡ δὲ τῆς πλῆθος καὶ ψυχρότητα τοῦ πεπτομένου καὶ διορίζομένου· τῇ μὲν γὰρ κρατοῦν τῇ δὲ οὐ κρα-

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a The species is “consequent” to every individual; cf. Topics 128 b 4 ὡς γένοις ὑπὸ τοῦ δεῖ ἀκολουθοῦντος.

b See G. & C. 324 a 31 ff.

c Not extant. But see G. & C. 324 a 33 ff.

d Cf. 766 b 15.
which is close by, if more, into that which is further removed. In the end, they become so confused that the product does not take after any of its family or kindred, and all that remains is what is common to the race—i.e., it is just a human being. The reason for which is that all particular individuals are accompanied by this characteristic: since "human being" is general, whereas Socrates who is the father, and the mother whoever she may be, are to be classed as particular individuals.

(1) The reason why the movements relapse is that the agent in its turn gets acted upon by that upon 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, and, generally, any motive agent, except the "prime mover," gets moved somehow itself in return, e.g., that which pushes gets pushed somehow in return, and that which squeezes gets squeezed in return; sometimes the extent to which it gets acted upon is greater than that to which it is acting—a thing which heats may get cooled, or one which cools may get heated, sometimes (a) without having acted at all, sometimes (b) having acted less than it has been acted upon. These matters have been discussed in the treatise on Acting and being acted upon, where it is stated in what sorts of things acting and being acted upon occur. (2) The reason, however, why that which is acted upon departs from type and does not get mastered is either (a) deficient potency in the concocting and motive agent, or (b) the bulk and coldness of that which is being concocted and articulated; since (the motive agent), gaining the mastery at one place but not at another, causes the embryo that is

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The mechanics of λύσθαι and μεταβαλλεῖν.
τούν ποιεῖ πολύμορφον τὸ συνιστάμενον, ὁπον ἐπὶ
30 τῶν ἀθλητῶν συμβαίνει διὰ τὴν πολυβαγίαν· διὰ
πλήθος γάρ τροφῆς οὐ δυναμείς τῆς φύσεως κρα-
τειν, ὡστ' ἀνάλογον αὐξεῖν καὶ διανέμειν ὁμοίως
τὴν τροφήν, ἀλλοία γίνεται τὰ μέρη, καὶ σχέδον
ἐνίοθεν οὕτως ὡστε μηθεν ἐοικέναι τῷ πρότερον.
παραπλῆσιον δὲ τούτῳ καὶ τὸ νόσημα τὸ καλοῦ-
35 μενον σατυριᾶν· [καὶ γάρ ἐν τούτῳ διὰ ρεύματος ἡ
πνεύματος ἀπέπτυξεν πλήθος εἰς μόρια τοῦ προσ-
ώπου παρεμπεσόντος τοῦ ζῶου, καὶ σατύρου
φαίνεται τὸ πρόσωπον.]

769 a

Διὰ τίνα μὲν οὖν αἰτίαν θῆλεα καὶ ἀρρενα γίνεται,
καὶ τὰ μὲν ἐοικότα τοῖς γονεύοι, θῆλεα τε θῆλεσι
καὶ ἀρρενα άρρεσι, τὰ δ' ἀνάπαλιν, θῆλεα τε τῷ
πατρί καὶ ἀρρενα τῇ μητρί, καὶ ὡλις τὰ μὲν τοῖς
5 προγόνοις ἐοικότα τὰ δ' ὀυθεν, καὶ ταύτα καὶ καθ'
ὀλον τὸ σῶμα καὶ τῶν μορίων ἐκαστον, διώρισται
περὶ πάντων.

Εἰρήκασι δὲ τίνες τῶν φυσιολόγων καὶ ἐτερα
περὶ τούτων, διὰ τίν' αἰτίαν ὁμοία καὶ ἀνόμοια
γίνεται τοῖς γονεύοιν. Δύο δὴ τρόπους λέγουσι
τῆς αἰτίας. ἐνιοῖ μὲν γάρ φασιν, ἀφ' ὀποτέρου

1 διανέμειν S, Aldus, Platt: diaménein vulg.
2 ὁμοίως E: ὁμολαυ vulg.
3 τροφήν E, Aldus: μορφήν vulg. 4 εἰς τὰ Aldus.
5 τοῦ ζῶου] ἄλλου ζῶου Ob*m, A.-W. in textu: ζῶου τοῦ
coni. A.-W.; τοῦ fort. Z1, ἄλλου corr. fort. ipse Z1, ἄλλου
6 corrupta et fort. secludenda: pro καὶ γάρ . . . πρόσωπον
quoniam accidit ex [con]descensu ad membrum maris cum
vento generato ex cibo indigesto Σ.
7 ἐοικότα P: έουκε vulg.
8 ἐτερα Platt, quod causa: . . . sunt aliae Σ: ἐτερόν τι P:
ἐτεροι vulg.

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GENERATION OF ANIMALS, IV. III.

taking shape to turn out diversiform. This is just what happens to athletes through eating an excessive amount; in their case, owing to the great bulk of nourishment there is, Nature cannot gain the mastery over it so as to bring about well-proportioned growth and distribute the nourishment evenly throughout; the result is that the parts turn out ill-assorted, and sometimes even bear hardly any resemblance at all to what they were like before. Similar to this is the disease which is known as satyriasis; [in this too, a large bulk of unconcocted flux or pneumata finds its way into parts of the face of the animal, and in consequence the face actually appears like that of a satyr.]

We have now expounded the cause of all the following: why male and female offspring are formed; why some take after their parents, female after female and male after male, and others the other way round, females taking after their father and males after their mother; and generally why some take after their ancestors and some after none of them, in respect both of the body as a whole and of each of its parts.

Certain of the physiologers, however, have treated of these matters on different lines, explaining otherwise the cause why offspring are formed similar and dissimilar to their parents. The cause is presented by them in two ways. (1) Some say that the offspring which is formed takes more closely after that

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This sentence is probably a marginal note which has crept into the text; in any case it is corrupt, and “unconcocted pneumata” is meaningless. Scot has no mention of animal or face; see critical note. The disease seems to be elephantiasis.—With b 30-37 however cf. Pol. 1302 b 35 ff.
10 ἂν ἔλθῃ σπέρμα πλέον, τοῦτῳ γίγνεσθαι μᾶλλον ἑοικός, ὁμοίως παντὶ τε πᾶν καὶ μέρει μέρος, ὡς ἀπιόντος ἀφ’ ἐκάστου τῶν μορίων σπέρματος· ἂν δ’ ἵσον ἔλθῃ ἀφ’ ἐκατέρου, τοῦτο δ’ οὔδετέρῳ γίγνεσθαι ὁμοίως. εἰ δὲ τούτ’ ἐστὶ ψεῦδος καὶ μὴ ἀπὸ παντὸς ἀπέρχεται, δῆλον ὡς οὔδε τῆς ὁμοίω-
15 τητος καὶ ἀνομοιότητος αἰτίου ἂν εἰῇ τὸ λεχθέν. ἐτὶ δὲ πῶς ἁμα θῆλυ μὲν πατρὶ ἑοικὸς ἄρρεν δὲ μητρὶ ἑοικός, οὐκ εὐπόρως δύνανται διορίζειν· οἱ μὲν γὰρ ὁσπερ Ἐμπεδοκλῆς λέγοντες ἦ Δημό-
κριτος περὶ τοῦ θῆλεος καὶ ἄρρενος τῆς αἰτίαν ἄλλον τρόπον ἀδύνατα λέγουσιν· οἱ δὲ τῷ πλείον
20 ἢ ἐλαττον ἀπειναὶ ἀπὸ τοῦ ἄρρενος ἢ θῆλεος, καὶ διὰ τοῦτο γίγνεσθαι τὸ μὲν θῆλυ τὸ δ’ ἄρρεν, οὐκ ἂν ἔχοιεν ἀποδείξας τίνα τρόπον τὸ τε θῆλυ τῷ πατρὶ ἑοικὸς ἐσταὶ καὶ τὸ ἄρρεν τῇ μητρί· ἁμα γὰρ ἐλθεὶν πλέον ἂπ’ ἀμφοτέρων ἀδύνατον. ἐτι
δὴ διὰ τίν’ αἰτίαν ἑοικὸς γίνεται τοῖς προγόνοις ὡς
25 ἐπὶ τὸ πολὺ καὶ τοῖς ἀποθεῖ· οὐ γὰρ ἀπ’ ἐκείνων γ’ ἀπελήλυθεν οὐθὲν τοῦ σπέρματος. ἀλλὰ μᾶλλον οἱ τὸν λειπόμενον τρόπον λέγοντες περὶ τῆς ὁμοιό-
τητος καὶ τῶλλα βέλτιον καὶ τοῦτο λέγουσιν. εἰς
gάρ τινες οἱ φασὶ τὴν γονὴν μίαν ὀδον ὀδον
pανσπερμίαν εἶναι τινα πολλῶν· ὁσπερ οὖν οὖν
1 ὡς ἐπὶ τὸ πολὺ fort. secludendum.
2 οὖν] ἂν S.

a See 764 a—765 a.
b e.g., Alcmeon; see Diels 24 A 14.
parent from which the larger portion of the semen comes, and that the whole of the offspring takes after the whole of the parent, and part after part (this assumes that semen is drawn from each of the parts); if the same amount comes from each of the two, then, they say, the offspring formed resembles neither. But if this is untrue (as it is), i.e., if the semen is not drawn from the whole of the body, then, clearly, the reason they give for the similarity and dissimilarity of the offspring cannot be true either. Further, they cannot explain with any ease how it is that at the same time a female offspring takes after the father and a male offspring after the mother; for those who state the cause of male and female as Empedocles or Democritus state it, make statements which on another score are impossible; while those who maintain that it all depends upon whether more or less semen comes from either the male or the female, and that this is why one offspring is formed as a male, and another as a female, these people, I am sure, are not in a position to show how the female is going to take after the father and the male after the mother, since it is impossible for more semen to come from both parents at one and the same time. And further, for what cause is it that the offspring for the most part takes after its ancestors, even distant ones? Surely no portion at all of the semen has come from them, anyway. (2) One more type of explanation of the resemblance remains to be mentioned, and those who adopt it make a better show all round, including this particular question. There are some who hold that the semen, though a unity, is as it were a "seed-aggregate" consisting of a large number of ingredients; it is as though someone were to mix and
30 Κερασεις πολλούς χυμούς εἰς ἐν υγρόν, καπειτ' ἐντεύθεν λαμβάνων, [καὶ]¹ δύνατ' ἂν λαμβάνειν μη ἵσον αἰ ἄφ' ἐκάστον, ἀλλ' ὅτε μὲν τοῦ τοιούτου πλέον ὅτε ὅτε τοῦ τοιούτου, ὅτε δὲ τοῦ μὲν λαβεῖν τοῦ δὲ μηθὲν λαβεῖν—τοῦτο συμβαίνειν² καὶ ἐπὶ τῆς γονῆς πολυμυγώς οὔσης· ἄφ' οὖ γὰρ ἃν τῶν
35 γεννύοντων πλείστων ἐγγένηται, τούτω γίνεσθαι τὴν μορφήν ἑοικός. οὕτος δὲ δ' λόγος οὐ σαφῆς μὲν καὶ πλασματίας ἐστὶ πολλαχῆς, βούλεται δὲ καὶ βέλτιον λέγειν μη ἐνεργεία ὑπάρχειν, ἀλλὰ κατὰ δυνάμιν, ἣν λέγει πανσεμερμίαν· ἐκείνως μὲν γὰρ ἀδύνατον, οὕτως δὲ δυνατόν.

Οὐ ρέδιον δὲ οὐδὲ τρόπον ἐνα τῆς αἰτίας ἀπο- διδόντας τὰς αἰτίας εἰπεῖν περὶ πάντων, τοῦ τε
5 γίνεσθαι θῆλι καὶ ἄρρεν, καὶ διὰ τὸ τὸ μὲν θῆλι τῷ πατρὶ πολλάκις ὁμοιόν τὸ δ' ἄρρεν τῇ μητρί, καὶ πάλιν τῆς πρὸς τοὺς προγόνους ὁμοίότητος, ἐτι δὲ διὰ τίν' αἰτίαν ὅτε μὲν ἄνθρωπος μὲν τούτων δ' οὕθειν προσόμοιος, ὅτε δὲ προϊόν οὕτως τέλος οὐδὲ ἄνθρωπος ἀλλὰ ζῷον τι μόνον φαίνεται τὸ
10 γεγομένου, ἢ δ' καὶ λέγεται τέρατα.

Καὶ γὰρ ἔχομεν τῶν εἰρημένων ἐστὶν εἰπεῖν περὶ τῶν τοιούτων τὰς αἰτίας. τέλος γὰρ τῶν μὲν κινήσεων λυμένων, τῆς δ' ὕλης οὐ κρατουμένης, μένει τὸ καθόλου μάλιστα· τοῦτο δ' ἐστὶ τὸ ζῷον.

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¹ secl. Α.-W.  
² συμβαίνει PSYZ.

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Because it can be restated in Aristotelian terminology, as he goes on to show.

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blend together a large number of juices into one fluid, and then take off some of this mixture; in doing so he could take off not always an equal amount of each juice, but sometimes more of this one, sometimes more of that, and sometimes he might take some of one and nothing at all of another: So, they say, it is with the semen, which is a mixture of a large number of ingredients; and in appearance the offspring takes after that parent from whom the largest amount is derived. This theory is obscure, and at many points a sheer fabrication. At the same time, it aims at a more satisfactory statement, viz., that this "seed-aggregate" is something that exists not in actuality, but only potentially, since it cannot exist in actuality, whereas it can exist potentially.

Still it is not easy, by stating a single mode of cause, to explain the causes of everything,—(1) why male and female are formed, (2) why female offspring often resembles the father and male offspring the mother, and again (3) the resemblance borne to ancestors, and further (4) what is the cause why sometimes the offspring is a human being yet bears no resemblance to any ancestor, sometimes it has reached such a point that in the end it no longer has the appearance of a human being at all, but that of an animal only—it belongs to the class of monstrosities, as they are called.

And indeed this is what comes next to be treated after what we have already dealt with—the causes of monstrosities, for in the end, when the movements (that came from the male) relapse and the material (that came from the female) does not get mastered, what remains is that which is most "general," and this is the (merely) "animal." People say that the
τὸ δὲ γιγνομένου κριοῦ κεφαλῆν φασιν ἡ βοῶς ἔχειν, 15 καὶ ἐν τοῖς ἄλλοις ὀμοίως ἑτέρου ζῷου, μόσχον παιδὸς κεφαλῆν ἡ προβατον βοῶς. ταύτα δὲ πάντα συμβαίνει μὲν διὰ τὰς προειρημένας αἰτίας, ἐστι δὲ οὐθὲν ὃν λέγουσιν, ἀλλ’ ἐοικότα μόνον ὅπερ γίγνεται καὶ μὴ πεπηρωμένων. διὸ πολλάκις οἱ σκώπτοντες έλκάζουσι τῶν μὴ καλῶν ἐνίοντος τοὺς μὲν αἰγὶ φυσώντι πῦρ, τοὺς δ’ οἳ κυρίττοντι. φυσιογνώμων δὲ τις ἀνήγε πάσας1 εἰς δύο ἡ τριῶν ζώων2 οψεις, καὶ συνεπεθῇ πολλάκις λέγων. ὅτι δ’ ἐστὶν ἀδύνατον γίγνεσθαι τέρας τοιοῦτον, ἑτερον ἐν ἑτέρῳ ζῷον, δηλούσω οἱ χρόνοι τῆς κυησεως πολὺ διαφέροντες ἀνθρώπου καὶ προβάτου καὶ 25 κυνὸς καί βοῶς· ἀδύνατον δ’ ἐκαστὸν γενέσθαι μὴ κατὰ τοὺς οἰκείους χρόνους.

Τὰ μὲν οὖν τοῦτον τὸν τρόπον λέγεται τῶν τεράτων, τὰ δὲ τῶν πολυμερῆ τῆν μορφὴν ἔχειν, πολύποδα καὶ πολυκέφαλα γιγνόμενα.

Πάρεγγυς δ’ οἱ λόγοι τῆς αἰτίας καὶ παραπλήσιοι τρόπον τινὲς εἰσιν οἱ τε περὶ τῶν τεράτων καὶ οἱ 30 περὶ τῶν ἀναπήρων ζώων· καὶ γὰρ τὸ τέρας ἀναπηρία τις ἐστίν.

IV Δημόκριτος μὲν οὖν ἐφῆσε γίγνεσθαι τὰ τέρατα διὰ τὸ δύο γονάς πίπτειν,3 τὴν μὲν πρότερον ὀρμη- σασαν4 τὴν δ’ ύστερον, ᾃ καὶ5 ταύτην ἐξελθοῦσαν6

1 πάντας P.
2 η τριῶν ζώων P: ζώων η τριῶν vulg.
3 (συμ)πίπτειν Diels. 4 et non egredientem add. Gul.
5 ύφ' ἡς καὶ P (a quo et hanc egredientem Gul., teste Bussemaker).
6 ἐπελθοὺσαν Diels.
offspring which is formed has the head of a ram or an ox; and similarly with other creatures, that one has the head of another, e.g., a calf has a child’s head or a sheep an ox’s head. The occurrence of all these things is due to the causes I have named; at the same time, in no case are they what they are alleged to be, but resemblances only, and this of course comes about even when there is no deformation involved. Thus, humorists often compare those whose strong point is not good looks in some cases with a fire-spouting-goat, in others with a butting ram; and there was a physiognomist who in his lectures used to show how all people’s faces could be reduced to those of two or three animals, and very often he carried conviction with his audience. It is however impossible for a monstrosity of this type to be formed (i.e., one animal within another), as is shown by the gestation-periods of man, sheep, dog, and ox, which are widely different, and none of these animals can possibly be formed except in its own proper period.

This, then, is one sort of “monstrosity” we hear spoken of. There are others which qualify for the name in virtue of having additional parts to their body, being formed with extra feet or extra heads.

The account of the cause of monstrosities is very close and in a way similar to that of the cause of deformed animals, since a monstrosity is really a sort of deformity.

Now Democritus explained the formation of monstrosities thus. Two semens fall into the uterus, one of them having started forth earlier and the other later, and the second when it has gone out goes

a See Diels, Vorsokr. 68 A 146.
ARISTOTLE

769 b

εἴθειν εἰς τὴν ύστεραν ὡστε συμφύεσθαι καὶ ἐπαλ- λάττειν τὰ μόρια. [ταῖς δ' ὅρνισιν ἐπεὶ συμβαίνει 35 ταχεῖαν γίνεσθαι τὴν ὁχεῖαν ἀεί, τὰ τ' ὡς καὶ τὴν χρόνον αὐτῶν ἐπαλλάττειν φησίν.] εἰ δὲ συμ- βαίνει εἷς ἐνὸς σπέρματος πλεῖω γίνεσθαι καὶ μίας συνουσίας, ὅπερ φαίνεται, βέλτιον μὴ κύκλῳ περι- λέναι παρέντας τὴν σύντομον· τοῖς γὰρ τοιούτοις μάλιστ' ἀναγκαῖον τοῦτο συμβαίνειν ὅταν μὴ διακριθῶσιν ἄλλ' ἀμα τὰ σπέρματα ἐλθοῦσιν. εἰ 5 μὲν οὖν ἀπείπασσαι δεῖ τὴν ἀπὸ τοῦ ἀρρενος γονῆν, τούτων ἀν τὸν τρόπον εἰν substantia. ὅως δὲ μάλλον τὴν αἰτίαν οἰητέον ἐν τῇ ὕλῃ καὶ τοῖς συνυστα- μένοις κυήμασιν εἶναι. διὸ καὶ γίνονται τὰ τοιαῦτα τῶν τεράτων ἐν μὲν τοῖς μονοτόκοις σπάνια πάμπαν, ἐν δὲ τοῖς πολυτόκοις μάλλον, καὶ μάλιστ' 10 εἰν ὅρνισι, τῶν δ' ὅρνισιν ἐν ταῖς ἀλεκτορίσιν· αὐταὶ γὰρ πολυτοκοῦσιν, οὐ μόνον τῷ πολλάκις τίκτεων ὡσπερ τὸ τῶν περιστερῶν γένος, ἀλλὰ καὶ τῷ πολλά ἀμα ἔχειν κυήματα καὶ πᾶσαν ὃραν ὥχειςθαι. διόπερ καὶ πολλά δίδυμα τίκτοσιν.

1 εὐθὺς pro εἴθειν E.
2 loc. corrupt. monet Platt. quia duo spermata cadunt in matricem, et prius cadit unum sperma et permanesit et non exivit (et non egredientem habet Gul. vers.), deinde continuatur cum secundo spermate remanente etiam in matrice, et sic, etc. Σ.
3 seclusi. locum senso carere monet Platt. pro ἀεὶ Aldus habet ἀγειλε. credo haec de avibus dicta ex adnot. quae ad 770 a 9 seqq., al. locc., spectaverit irrepsisse; conferas 717 b 29.

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*a* This sentence, as Platt points out, is corrupt. The general sense is clear. I have given Scot’s translation in the *apparatus criticus.*

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into the uterus,† with the result that the parts grow on to one another and get thrown into disorder. [In the case of birds, since copulation is a quick business with them always, the eggs and their colour as well, he says, get thrown into disorder.]‡ But if it is a fact that several offspring are formed from one semen and from one act of copulation, as is evidently the case, we should do better not to neglect the shortest route and go a long way round, since in cases of this sort it is absolutely necessary that this should happen when the semens have not been separated but proceed together.§ Now if we are really obliged to refer the cause to the semen that comes from the male, then, I suppose these are the lines on which we should make our explanation; but from every point of view we ought preferably to hold that the seat of the cause is the material and in the fetations as they take shape. And that too explains why monstrosities of this sort, while they occur very seldom in animals that produce one offspring only, occur oftener in those that are prolific, and most of all in birds, and especially in the common fowl.¶ This species is prolific, not only in laying eggs frequently, as the pigeon tribe does, but also in carrying many fetations at once and in copulating at every season of the year. Hence also fowls lay many twin-eggs,

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† This sentence (which may be a note on 770 a 15 ff.) seems to be from the same author as the interpolation at 717 b 29: the speed of birds’ copulation obviously was a favourite point with him, but it has nothing to do either with this passage or with that in Bk. I. In the present passage, birds are introduced later by Aristotle (a 10).

‡ And this is a contingency for which Democritus’s explanation does not allow.

§ Supplied by the female.

¶ For monstrosities, see references, p. xi.
15 συμφύεται γὰρ διὰ τὸ πληθίον ἄλληλων εἶναι τὰ κυήματα, καθάπερ ἐνίοτε πολλὰ τῶν περικαρπίων. τοῦτων δὲ ὅσων μὲν ἂν αἱ λέκιθοι διορίζωνται κατὰ τὸν ὤμενα, δύο γίνονται νεοττοί κεχωρισμένοι, περιττὸν οὐδὲν ἔχοντες· ὅσων δὲ συνεχεῖς καὶ μὴ διείργει μηθέν, ἐκ τοῦτων οἱ νεοττοὶ γίνονται
teratώδεις, σώμα μὲν καὶ κεφαλὴν μίαν ἔχοντες, σκέλη δὲ τέτταρα καὶ πτέρυγας, διὰ τὸ τὰ μὲν ἀνωθὲν ἐκ τοῦ λευκοῦ γίνεσθαι καὶ πρότερον, ταμιευομένης ἐκ τῆς λεκίθου τῆς τροφῆς αὐτοῖς, τὸ δὲ κάτω μόριον ύστερίζειν μὲν, τὴν δὲ τροφῆν εἶναι μίαν καὶ ἀδιόριστον.

"Ἡδὲ δὲ καὶ ὁφις ὑπται δικέφαλος διὰ τὴν
25 αὐτὴν αἰτίαν· ὕστοκεὶ γὰρ καὶ πολυτοκεὶ καὶ τοῦτο τὸ γένος. σπανιώτερον δὲ τὸ τερατώδες ἐπ’ αὐτῶν διὰ τὸ σχῆμα τῆς ύστερας· στοιχεύον γὰρ κεῖται τὸ πλῆθος τῶν ὕδων διὰ τὸ μῆκος αὐτῆς. καὶ περὶ τὰς μελίττας καὶ τοὺς σφήκας οὐδὲν γίνεται τοιοῦτον· ἐν κεχωρισμένοις γὰρ κυτταρίως
30 ὁ τόκος ἐστίν αὐτῶν. περὶ δὲ τὰς ἀλεκτορίδας τούναντίον συμβέβηκεν, ἢ καὶ δῆλον ὡς ἐν τῇ ὕλῃ τὴν αἰτίαν δεῖ νομίζειν τῶν τοιούτων· καὶ γὰρ τῶν ἄλλων ἐν τοῖς πολυτοκοῖς μᾶλλον. διὸ ἐν ἀνθρώπῳ ἦττον· ὡς γὰρ ἐπὶ τὸ πολὺ μονοτόκον ἐστὶ καὶ τελευγόνον, ἐπεὶ καὶ τούτων ἐν οἷς τόποις
35 πολύγονοι αἱ γυναῖκες εἰσὶ, τοῦτο συμβαίνει μᾶλ-

a i.e., yolk only, not white as well; and as there are two yolks these parts are formed double. For the distinction between “nutritive” (i.e., formative) and “growth-promoting” nourishment, see 744 b 32 ff. Cf. also 751 b 2 ff.

b Not huddled up together.
since the fetations, on account of being situated close to each other, grow on to each other, just as many fruits sometimes do. Of these twin-eggs, those in which the yolks are kept apart by the membrane develop into two separate chicks, and there is nothing extraordinary about them; those in which the yolks are continuous, with nothing to hold them apart, give rise to chicks that are monstrosities: they have one body and one head, but four legs and wings, the reason for which is that the upper parts of the body are formed out of the white and before the rest, the nourishment being dispensed to them from the store in the yolk, whereas the lower part \( (a) \) is formed afterwards, \( (b) \) its nourishment is uniform and homogeneous.\(^a\)

A snake, too, has been seen with two heads, and the cause is the same—this also is a class of animal which lays eggs and is prolific. Monstrosities occur less frequently, however, with snakes owing to the shape of their uterus, in which, on account of its length, the numerous eggs lie one after another in a row.\(^b\) Nothing of this kind occurs with bees and wasps, because their offspring are laid in separate cells. With the common fowl, however, the opposite is the case—a fact which clearly goes to show that we are bound to hold that the cause of such things is in the material,\(^c\) since with other animals too they occur more frequently in those that are prolific. Hence they occur less frequently in human beings, for the offspring which these produce is as a rule one in number, and it is perfected by the time of birth, since even in this species the occurrence of monstrosities is more common in those regions where the women are

\(^{a}\) Not in the semen.
λον, οίνον περὶ Ἀγωντον. ἐν δὲ ταῖς αἰξὶ καὶ τοῖς προβάτοις γίνεται μᾶλλον. πολυτοκωτέρα γὰρ ἔστων. ἔτι δὲ μᾶλλον ἐν τοῖς πολυσοχιδεῖσιν. πολυτόκα γὰρ ἐστι τὰ τοιαῦτα1 τῶν ζῶν καὶ οὐ τελειωγόνα, καθάπερ ἢ κύων. τὰ γὰρ πολλὰ τίκτει τυφλὰ τούτων. δι᾿ ἧν δ᾿ αἰτίαν τοῦτο συμβαίνει καὶ δι᾿ ἧν αἰτίαν πολυτοκοῦσιν, ὕστερον λεκτέον. ἀλλὰ προ-ωδοποίηται τῇ φύσει [πρὸς]2 τὸ τερατοτοκεῖν τὸ3 5 μὴ γεννᾶν ὄμοια διὰ τὴν ἀτέλειαν. ἔστι δὲ καὶ τὸ τέρας τῶν ἀνομοίων. διόπερ ἐπαλλάττει τούτο τὸ σύμπτωμα τοῖς τοιούτοις τὴν φύσιν. ἐν γὰρ τούτοις μάλιστα γίνεται καὶ τὰ μετάχοιρα καλούμενα, ταῦτα δ᾿ ἔστι κατὰ τι πεπονθότα τερατῶδες. τὸ γὰρ ἐκλείπειν ἡ προσείναι τι τερατῶδες. ἔστι γὰρ 10 τὸ τέρας τῶν παρὰ φύσιν [τι],4 παρὰ φύσιν δ᾿ οὐ πᾶσαν. ἀλλὰ τὴν ὡς ἐπὶ τὸ πολὺ. περὶ γὰρ τὴν ἀεὶ καὶ τὴν ἐξ ἀνάγκης οὐθέν γίνεται παρὰ φύσιν, ἀλλ᾿ ἐν τοῖς ὡς ἐπὶ τὸ πολὺ μὲν οὕτω γινομένοις, ἐνδεχομένοις δὲ καὶ ἀλλως, ἐπεὶ καὶ τούτων ἐν ὅσοις συμβαίνει παρὰ τὴν τάξιν μὲν ταύτην, ἀεὶ 15 μέντοι μὴ τυχόντως, ἢπτον εἶναι δοκεῖ τέρας διὰ τὸ καὶ τὸ παρὰ φύσιν εἶναι τρόπον τινὰ κατὰ

1 see PSYZ*: ἔστι γὰρ τὰ τ. π. vulg.  2 secl. Btf.
3 τῷ Α.-W.: τῷ Υ: τὸ vulg.  4 τι om. P.

a Cf. H.A. 584 b 7, 31: the passage in Hippocrates, π. αέρων ὑδάτων τῶν 12 (ii. 54 Littré) τὰ τε κτήθεα τίκτειν τε πυκνότατα καὶ ἐκτρέφειν κάλλιστα may refer to Egypt and Libya.
 b Ch. 6 below.
 c 771 a 18 ff.
 d Viz., which produce imperfect offspring.
 e See 749 a 2.  Cf. 772 a 35, etc.
 f See Introd. § 9.

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prolific—in Egypt, for instance. Monstrosities occur more frequently in goats and sheep, because they are more prolific; and still more frequently in the fissipede animals, because animals of this sort are prolific and the offspring is not perfected when born (e.g., the dog)—most of these creatures' young, of course, are born blind. The cause why this occurs and the cause why they are prolific must be stated later. But the way to the production of monstrosities has been already prepared for Nature by the fact that they generate offspring which, owing to its imperfect state, is unlike its parents:—for monstrosities come under the class of offspring which is unlike its parents. And that is why this particular accident extends its range to affect animals of that nature, and, to bear this out, it is among these animals especially that metachoira as they are called occur. These metachoira are creatures which have in some respect undergone some "monstrous" affection, since the lack of any part or the presence of an extra part is such an affection. A monstrosity, of course, belongs to the class of "things contrary to Nature," although it is contrary not to Nature in her entirety but only to Nature in the generality of cases. So far as concerns the Nature which is always and is by necessity, nothing occurs contrary to that; no; unnatural occurrences are found only among those things which occur as they do in the generality of cases, but which may occur otherwise. Why, even in those instances of the phenomena we are considering, what occurs is contrary to this particular order, certainly, but it never happens in a merely random fashion; and therefore it seems less of a monstrosity because even that which is contrary to Nature is, in a
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φύσιν, οταν μὴ κρατήσῃ τὴν κατὰ τὴν ύλην ἢ κατὰ τὸ εἶδος φύσις. διόπερ οὔτε τὰ τουαίτα τέρατα λέγουσιν, οὔτ' ἐν τοῖς ἄλλοις ἐν ὅσοις εἰσήκοντος τοις γίνεσθαι, καθάπερ ἐν τοῖς περικαρπίοις. ἦστι

20 γάρ τις ἀμπελος ἡν καλούσι τυνες κάτω, ἄν, 1 ἂν ἐνέγκη μέλανος βότρυας, 2 οὐ κρίνουσι τέρας διὰ τὸ πλευστάκις εἰσήκοντος τούτων ποιεῖν. αὕτων δ' ὀτι μεταξύ λευκῆς ἐστὶ τὴν φύσιν καὶ μελαίνης, ὅστ' οὐ πόρρωθεν ἡ μετάβασις οὐδ' ὄσπερανεὶ παρὰ φύσιν· οὐ γὰρ εἰς ἄλλην φύσιν.

25 Ἐν δὲ τοῖς πολυτόκοις ταῦτα3 συμβαίνει διὰ τὸ τὴν πολυτοκίαν ἐμποδίζει4 τὰς τελείωσεις ἄλληλων καὶ τὰς κινήσεις τὰς γενητικὰς.

Περὶ δὲ τῆς πολυτοκίας καὶ τοῦ πλευνασμοῦ τοῦ τῶν μερῶν, καὶ τῆς ὀλυγοτοκίας καὶ μονοτοκίας καὶ τῆς ἐνδείας τῶν μερῶν, ἀπορήσειεν ἄν τις.

γίνεται γάρ ἑνίοτε τὰ μὲν πλεύος ἔχοντα δακτύλους, τὰ δ' ἕνα μόνον, καὶ περὶ τὰ ἄλλα μέρη τὸν αὐτὸν τρόπον· καὶ γάρ πλευνάξει καὶ κολοβά γίνεται, τὰ δὲ καὶ δύο ἔχοντα αἴδοια, τὸ μὲν ἄρρενος τὸ δὲ θήλεος, καὶ ἐν ἄνθρώποις καὶ μάλιστα περὶ τῶν αἰγασ. γίνονται γάρ ἃς καλούσι τραγάνας διὰ τὸ θῆλεσ καὶ ἄρρενος ἔχειν αἴδοιαν. ἦδη δὲ καὶ κέρας αἰς ἔχουσα ἐγένετο πρὸς τῷ σκέλει.


As it can be represented as a case of one "nature" failing to control another "nature," it can be termed "in accordance with nature." See Introd. § 14.

6 Cf. Theophrastus, Hist. Plant. II. 3. 2, where it is stated that the μάντεις do not consider the vagaries of this plant.
way, in accordance with Nature (i.e., whenever the "formal" nature has not gained control over the "material" nature). Hence, people do not call things of this sort monstrosities any more than they do in the other cases where something occurs habitually—as happens with fruit. Thus, there is a certain sort of vine—"smoky" is the name some people give it—and if it bears black grapes they do not reckon it as a monstrosity, because it often and habitually does this. The reason is that it is intermediate in its nature between white and black, and so the alteration is quite small and not really contrary to nature, because it is not an alteration to a different nature.

These things, then, occur in the case of the animals which produce numerous young, because the numerous offspring which are produced hamper each other’s being brought to perfection and also the movements which effect generation.

A puzzle may be raised about this production of numerous offspring and the redundancy of parts, and the production of few or one offspring and the deficiency of parts: sometimes animals are born having too many toes, some having one only; and the same with the other parts: some have too many; some are mutilated; some actually have two organs of generation, one male and the other female. This happens with human beings, and with goats especially. Goats are born which are called tragainai on account of their possessing both male and female organs of generation. We have also had an instance of a goat being born that had a horn on its leg. Alterations to be sufficiently unusual or unnatural to be of any teratological significance.

Relation of redundancy and deficiency of parts to the number of offspring (a) Instances cited.

(a) Hermaphrodites.
γίνονται δὲ μεταβολαί καὶ πηρώσεις καὶ περὶ τὰ ἐντὸς μόρια, τῷ ἡ μὴ ἔχειν ἕνα ἡ κεκολοβωμένα ἔχειν καὶ πλείω καὶ μεθεστώτα τοὺς τῶνος. καρδίαν μὲν οὖν οὐθὲν πῶς τετελειωθεῖσι καὶ ἐκάτω καὶ τριπαίρον τοὺς τῶνος. εὐφυγίας καὶ ὡσπερ εἰρήνης ἐν τοῖς πλείοις ἐξοντα μιᾶς. ἡδη ἡ ἐγένετο καὶ μεθεστηκότα κατὰ τόπον, τὸ μὲν ἦπαρ ἐν τοῖς ἀριστεροῖς, ὁ δὲ ὀσπῆν ἐν τοῖς δεξιοῖς. καὶ ταύτα μὲν ἐν γε τετελεσμένους ὤπτα τοῖς ἤάγοις, ὡσπερ εἰρήνης ἐν τοῖς πικτομένοις ἐχοντα πολλήν καὶ παντοδαπήν ταραχήν. τὰ μὲν οὖν μικρῶν παρεκβαίνοντα τὴν φύσιν ἦν εἴσωθεν, τὰ δὲ πλείον οὐ ζῆν, όταν ἐν τοῖς κυρίοις τοῦ ἤτον γένηται τὸ παρὰ φύσιν.

Ἡ δὲ σκέψεως ἐστίν ἡ περὶ τούτων πότερον τὴν αὐτὴν αἰτίαν δεῖ νομίζειν τῆς μονοτοκίας καὶ τῆς ἐν- δειας τῶν μερῶν καὶ τοῦ πλεονασμοῦ καὶ τῆς πολυ- τοκίας ἡ μὴ τῆς αὐτῆς.

Πρῶτον μὲν οὖν διὰ τι τὰ μὲν ἐστὶ πολυτόκα τὰ δὲ μονοτόκα, τοῦτ’ ἃν τις δόξειν εὐλόγως θαυμάζειν. τὰ γὰρ μέγιστα μονοτόκα τῶν ἵλων ἐστὶν, οἷον ἔλεφας κάμηλος ὕππος καὶ τὰ μώνυχα· τούτων δὲ τὰ μὲν μεῖξω τῶν ἄλλων, τὰ δὲ πολὺ

1 sic Bekker: γεννωμένος O\* marg.*: in filiiis Σ: ειρημένος PSYZ.

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\(^a\) i.e., have passed beyond the embryonic stage, have reached the end of their period of development.

\(^b\) For a discussion of this see P.A. Bk. IV, ch. 2.
tions and deformations occur in respect of the inward parts too; animals either lack certain parts, or have them in a mutilated form, or have too many of them, or in the wrong places. No animal, it is true, has ever been born without a heart, but there have been animals without a spleen, and with two spleens, and with one kidney; none without any liver at all, but certainly with an incomplete one. These phenomena are found in animals that are perfect and living. We find, also, animals with no gall-bladder which naturally should have one; others with more than one. Instances have occurred of organs in the wrong places: the liver on the left side and the spleen on the right. These things, as I said, have been observed among animals which have reached perfect growth; among newly born animals instances have been seen exhibiting great and varied confusion. Those which depart only slightly from the natural usually live; those which depart more than that do not—i.e., when their unnatural conformation lies in the parts that control the creature’s life.

The point about these which we have to consider is the following. Ought we to hold that one and the same cause is responsible for the production of a single offspring and the deficiency in the parts, and also for the production of many offspring and the redundancy in the parts, or not?

To begin, then, first of all, with the fact that some animals produce many offspring, others a single one only. Surely surprise at this is very reasonable, as it is the largest of the animals which produce one only, e.g., the elephant, the camel, the horse and those with unclawed hoofs; of these, some are larger than
diαφέρει κατὰ τὸ μέγεθος. κύων δὲ καὶ λύκος καὶ τὰ πολυσχιδῆ πάντα σχεδὸν πολυτόκα, ¹ καὶ τὰ μικρὰ τῶν τοιούτων, οἶον τὸ τῶν μυῶν γένος. τὰ δὲ διχηλὰ ὀλιγοτόκα πλὴν ὑός· αὕτη δὲ τῶν 25 πολυτόκων ἐστίν. εὐλογον γὰρ τὰ μὲν μεγάλα πλεῖον δύνασθαι γεννᾶν καὶ σπέρμα φέρειν πλείων. αὐτίον δ' αὐτὸ τὸ θαυμαζόμενον τοῦ μὴ θαυμάζειν· διὰ γὰρ τὸ μέγεθος οὐ πολυτοκοῦσι· ἡ γὰρ τροφὴ καταναλίσκεται τοῖς τοιούτοις εἰς τὴν αὐξήσιν τοῦ σώματος· τοῖς δ' ἐλάττοσιν ἀπὸ τοῦ μεγέθους ἡ 30 φύσις ἀφελοῦσα² πρὸς τὸ περίττωμα προστίθησι τὸ σπερματικὸν τὴν ὑπεροχήν. ἔτι δὲ τὸ γεννῆσαν σπέρμα πλεῖον μὲν τὸ τοῦ μείζονος ἀναγκαῖον εἶναι, μικρὸν δὲ τὸ τῶν ἐλαττόνων. πολλὰ μὲν οὖν³ μικρὰ γένοις· ἡν εὖ ταυτῷ, μεγάλα δὲ πολλὰ χαλεπῶν. [τοῖς δὲ μέσοις μεγέθεσι τὸ μέσον 35 ἀπέδωκεν ἡ φύσις. τοὺς μὲν οὖν τὰ μὲν εἶναι μεγάλα τῶν ζῴων τὰ δ' ἐλάττω τὰ δὲ μέσα πρότερον εἰρήκαμεν τὴν αὐτίαν· μονοτόκα δὲ, τὰ δ' ὀλιγοτόκα, τὰ δὲ πολυτόκα τῶν ζῴων ἐστίν.][]² ὡς μὲν ἐπὶ τὸ πολὺ τὰ μὲν μῶνυχα μονοτόκα, τὰ δὲ διχηλὰ ὀλιγοτόκα, τὰ δὲ πολυσχιδῆ πολυτόκα. τούτου δ' αὑτίον ὅτι ὡς ἐπὶ τὸ πολὺ τὰ μεγέθη

¹ a. p. Ῥ : π. s. vulg.
² ἀφελοῦσα PS : ἀφαιροῦσα vulg.
³ οὖν PSY : οὖν καὶ vulg.
⁴ seclusi : om. Σ.
the other animals, some are really outstanding in respect of size. The dog, on the other hand, and the wolf, and practically all the fissipede animals produce many offspring; even small animals of this class do so, such as the mouse family. The cloven-hoofed animals produce few offspring, except the pig, which is among those that produce many. As I said, this is surprising, because we might have expected the large animals to be able to generate more offspring and to produce more semen. But the very thing that surprises us is the reason why we should not be surprised. Their size is the very reason why they do not produce many offspring, because in animals of this sort the nourishment gets used up to supply the growth of the body, whereas in the case of the smaller animals, Nature takes away from their size and adds the surplus on to the seminal residue. Further, the generative semen of a larger animal must of necessity be greater in bulk, and that of the lesser ones small. Also, though many small ones may very well be formed in one place, it is difficult for many large ones to be. [To the intermediate sizes Nature has allotted the intermediate number. As for the fact that some animals are large, some smaller, and some intermediate, we have stated the cause of this earlier.] For the most part it is the solid-hoofed animals which produce a single offspring, the cloven-hoofed animals which produce few, and the fissipede animals which produce many. The reason for this is that for the most part the distinction of

a But this pro rata merely; so that a large animal has no net advantage over a small one in this respect.

b The preceding words seem to be irrelevant; those which follow immediately in the Greek cannot be construed, and I have omitted them from the translation.
5 διώρισται κατὰ τὰς διαφορὰς ταύτας. οὐ μὴν ἔχει γ' οὖτως ἐπὶ πάντων· αἰτίων γὰρ μέγεθος καὶ μικρότης τῶν σωμάτων τῆς ὀλιγοτοκίας καὶ πολυ-
τοκίας, ἀλλ' οὐ τὸ μᾶλλον ἢ πολυσχίδες ἢ διχηλὸν
eῖναι τὸ γένος. τούτου δὲ μαρτύριον· ὁ γὰρ ἑλέφας
mεγιστὸν τῶν ζώων, ἐστὶ δὲ πολυσχίδες, ἢ τε
10 κάμηλος διχηλὸν τῶν λουτών μέγιστον ὁν. οὐ
mόνον δ' ἐν τοῖς πεζοῖς ἀλλὰ καὶ ἐν τοῖς πτηνοῖς καὶ ἐν
toῖς πλωτοῖς τὰ μὲν μεγάλα ὀλιγοτόκα
ἐστὶ τὰ δὲ μικρὰ πολυτόκα, διὰ τὴν αὐτὴν αἰτίαν.
όμοιως δὲ καὶ τῶν φυτῶν οὐ τὰ μέγιστα φέρει
πλεῖστον καρπὸν.

15 Διὰ τὶ μὲν οὖν τῶν ζώων τὰ μὲν πολυτόκα τὰ
δ' ὀλιγοτόκα τὰ δὲ μονοτόκα1 τὴν φύσιν ἐστὶν,
eἰρηταί· τῆς δὲ νῦν ῥηθεῖσα ἀπορίας μᾶλλον
ἀν τις εὐλόγως2 θαυμάσειν ἐπὶ τῶν πολυτοκούντων,
ἐπειδὴ φαίνεται πολλάκις ἀπὸ μιᾶς ὀχείας κυκάκι-
μενα τὰ τοιαῦτα τῶν ζώων. τὸ δὲ σπέρμα τὸ
tοῦ ἄρρενος, εἴτε συμβάλλεται πρὸς τὴν ὑλὴν
20 μόριον γινόμενον τοῦ κυήματος καὶ τῶ τοῦ θῆλεος
σπέρματι μεγνύμενον, εἴτε καὶ μὴ τούτον τὸν
τρόπον, ἀλλ' ὥσπερ φαμέν συνάγον καὶ δη-
μοῦργον τὴν ὑλὴν τὴν ἐν τῷ θῆλε καὶ τὸ
περίττωμα τὸ σπερματικὸν, καθάπερ ὁ ὅπος τὴν
ὑγρότητα τοῦ γάλακτος, διὰ τὶνα ποτ' αἰτίαν οὐχ
25 ἐν ἀποτελεῖ ζώον μέγεθος έχον, ὥσπερ ἐνταῦθα
ὁ ὅπος,3 ἐὰν τοῦτω τῷ περιττώματι πλείω

1 τὰ δὲ μονοτόκα P : om. vulg.  
2 εὐλόγως P : om. vulg.  
3 ὥσπερ . . . ὅπος fortasse secludenda.

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sizes corresponds to these differences. At the same time, this does not hold good of all of them, because the reason for their producing few or many offspring is the size, great or small, of their bodies, not the fact that that particular kind of animal is cloven- or solid-hoofed or is fissipede. Here is a proof of this. The elephant is the biggest of the animals, but it is fissipede; the camel, which is the next biggest, is cloven-hoofed. And it is not only among the animals that walk but also among those that fly and swim that the big ones produce few offspring and the small ones produce many; and the cause is the same. Similarly, too, it is not the biggest plants that bear the most fruit.

We have stated why the nature of some animals is to produce many offspring, that of others to produce few, that of others to produce one only. So far as the puzzle which has now been mentioned is concerned, one might rather be justifiably surprised in the case of those animals which produce many offspring, in view of the fact that animals of this sort, as we see, often conceive as the result of one act of copulation. Now it may be that the semen of the male contributes to the material (in the female) by becoming part of the fetation and by mixing with the semen of the female; or it may be that it does not act in this way, but, as we hold, acts by concentrating and fashioning the material in the female, i.e., the seminal residue, just as fig-juice acts upon the fluid portion of the milk; but whichever of these views is right, what on earth is the cause why the semen does not turn out one single animal of a fair size, just as the fig-juice acts in our example, (but that instead several off-

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a Cf. 767 b 17, 772 b 32. b See 737 a 15.
γίνεται;[1] [οὐ κεχώρισται τῷ συνιστάναι2 ποσὸν τι,3 ἀλλ' ὁσφερ ἀν εἰς πλεῖον ἐλθῇ καὶ πλείων, 
tοσοῦτῳ το τηνυμενόν ἠστὶ μεῖζον.][4] τὸ μὲν οὖν ἐλκειν 
φάναι τοὺς τόπους τῆς ύστερας τὸ σπέρμα, 
καὶ διὰ τοῦτο πλεῖω γίνεσθαι, διὰ τὸ τῶν τόπων 
πλῆθος καὶ τὰς κοτυληδόνας5 οὐχ ἐν οὔσας,6 οὔθεν 
30 ἐστιν· ἐν ταὐτῷ γὰρ γίνονται τόπω τῆς ύστερας 
δύο πολλάκις, ἐν δὲ τοῖς πολυτόκοις, ὡστε πληρωθῇ 
tῶν ἐμβρύων, ἐφεξῆς κείμενα φαίνεται. τοῦτο δὲ 
δήλον ἐκ τῶν ἀνατομῶν ἐστὶν. ἀλλ' ὁσφερ καὶ 
tελεομένων τῶν ζῴων ἔστιν ἐκάστου τι μέγεθος 
καὶ ἐπὶ τὸ μεῖζον καὶ ἐπὶ τὸ ἐλαττων, ὡν οὔτ' ἄν 
35 μεῖζον γένοιτο οὔτ' ἐλαττων, ἀλλ' ἐν τῷ μεταξὺ 
διαστήματι τοῦ μεγέθους λαμβάνουσι πρὸς ἀλληλα 
tὴν ὑπεροχήν καὶ τὴν ἐλευθερίαν, καὶ γίνεται μεῖζων ὁ 
δ' ἐλάττων ἀνθρώπος καὶ τῶν ἀλλων ζῴων 
ὁμοιών, οὔτω καὶ ἐὰν γίνεται ὡλης σπερματικῆς, 
οὐκ ἐστὶν ἀόριστος οὔτ' ἐπὶ τὸ πλεῖον οὔτ' ἐπὶ τὸ 
ἐλαττων, ὡστ' ἐὰν ὁποσοσοῦν γίνεσθαι τῷ πλῆθει. 
5 ὅσα οὖν τῶν ζῴων διὰ τὴν εἰρημένην αὐτίαν πλεῖον 
προτέται περίττωμа ἥ εἰς ἐνὸς ζῷου ἀρχήν, οὐκ

1 talia desideraverat Platt, ego supplevi (sed generantur in illa materia et superfluitate multi filii Σ).
2 τῶ (sic) συνιστάναι PZ, om. Y. 3 τι om. SZ.
4 procul dubio secludenda (cf. 772 a 22): om. Σ.
5 λέγουσιν addunt YS.
6 oukevnuusos Z. credo etiam διὰ τὸ . . . οὖσας secludenda.

* The words supplied are necessary to complete the argument, as Platt points out; and they are in fact preserved in Scot’s version (see app. crit.). They were no doubt ousted from the Greek text by the additional remarks about fig-
spring are formed out of that residue? \[It is not divided up owing to its causing a certain quantity of milk to set, but the more the amount of milk into which it is put and the more fig-juice there is, so much the greater is the amount that gets curdled.\] It is sometimes said that the regions of the uterus draw the semen, and on that account several offspring are formed, because these regions are several in number and because the cotyledons are not a unity. This theory, however, has nothing in it, because often two embryos are formed in the same region of the uterus, and in the case of animals which produce many offspring, when the uterus is full of embryos, they can be seen lying in a row. This is clear from dissections. No; what happens is this. When animals are being perfected, there is a certain size for each, a limit of bigger and smaller; none will be formed either bigger or smaller than these sizes, but the excess or deficiency of size which they acquire as compared with one another lie within this interval between the two limits, and thus it is that one human being (or any other animal) is formed bigger and another smaller. In precisely the same way, the seminal material out of which (the embryo) is formed is not unlimited in either direction—the amount of it can be neither bigger nor smaller than certain limits; the embryo cannot be formed out of any casual amount of it. Thus, in the case of those animals which (on account of the cause stated) discharge more residue than is requisite for the principle juice, which appear to have formed part of a marginal note (cf. below 772 a 22 ff., with which passage they are obviously connected).

\[b\] For the cotyledons, see above, Bk. II. 745 b end.
ἐνδεχεται ἐκ ταύτης ἐν γίνεσθαι πάσης, ἄλλα τοσαῦτα ὁσα τοῖς μεγέθεσιν ὀρισται τοῖς ἰκνομένοις. οὐδὲ τὸ τοῦ ἀρρενος σπέρμα ἢ ἢ δύναμις ἢ ἐν τῷ σπέρματι οὐθὲν συστήσει πλέον ἢ ἐλαττον 10 τοῦ πεφυκότος. ὁμοίως τ' εἰ πλέον σπέρμα ἀφίησι τὸ ἀρρεν ἡ δυνάμεις πλείους ἐν διαιρουμένω τῷ σπέρματι, οὐθὲν ποιήσει μείζον τὸ πλεῖστον, ἄλλα καὶ τοῦνατίον διαφθερεί καταξηραῖων. οὐδὲ γὰρ τὸ πῦρ θερμαίνει τὸ ὕδωρ μᾶλλον, ὀσφυῖστε ἢ ἡ πλέον, ἄλλα ἐστιν ὀρος τις ἡς θερμότητος, ἢς ύπ- 15 αρχούσης εάν αὔξη τις τὸ πῦρ, θερμόν μὲν οὐκέτι γίνεται μᾶλλον, ἔξατμίζει δὲ μᾶλλον, καὶ τέλος ἀφανίζεται καὶ γίνεται ἔτηρι. ἐπεὶ δὲ φαίνεται συμμετρίας δεῖσθαι τινος πρὸς ἄλληλα τὸ τε περίτωμα τὸ τοῦ θήλεος καὶ τὸ παρὰ τοῦ ἀρρενος, ὅσα προϊέται σπέρμα τῶν ἁρρένων, τὰ πολυτόκα
20 τῶν ξώων εὑθὺς ἀφίησι τὸ μὲν ἀρρεν δυνάμεων πλείω συνυστάναι μεριζόμενον, τὸ δὲ θῆλυ τοσοῦτον ὡστε πλείους γίνεσθαι συστάσεις. (τὸ δ' ἐπὶ τοῦ γάλακτος παράδειγμα λεχθὲν οὐχ ὁμοιὸν ἐστιν· ἢ μὲν γὰρ τοῦ σπέρματος θερμότητις οὐ μόνον συνιστήση ποσὸν ἄλλα καὶ ποιόν τι, ἢ δ' ἐν τῷ ὁπὶ 25 καὶ τῇ πυετίᾳ τὸ ποσὸν μόνον.) τοῦ μὲν οὖν πολλα

1 συστήσει PY: συνίστησι vulg.
2 tis P: om. vulg.
3 ποιόν ἄλλα καὶ ποσὸν P.

a See Bk. I, ch. 21 and Introd. §§ 26 ff.
b Cf. 729 a 18.
c Cf. 723 a 30, 767 a 16.
d See 737 a 15, 771 b 24.
e I suspect that this parenthesis may have come from a marginal annotation; cf. 771 b 24 above.
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of a single animal, it is not possible that the entirety of this should be used to form one embryo; on the contrary, as many are formed as is determined by the sizes proper to those animals. Nor again will the semen of the male or the dynamis\textsuperscript{a} residing in the semen put into shape anything that is greater or less than the natural size. Similarly, if the male emits more semen, or more dynamis\textsuperscript{b} in the semen (in cases where the semen gets divided up), the greatest possible amount will not make anything bigger (than the natural size), but on the contrary will dry the material up\textsuperscript{c} and destroy it. The parallel case of fire and water shows this. An increase in the amount of fire does not mean that the fire increases the heat of the water in the same ratio; on the contrary, there is a limit to the heat, and when that has been reached, you may increase the amount of fire, but the water does not continue to get hotter; instead it evaporates more, and finally disappears and dries up. Now since, as it seems, there must be some proportional relationship\textsuperscript{d} between the residue of the female and that which comes from the male (this applies where the males emit semen), in the case of those animals which produce many offspring the male at the outset emits semen which is able, when divided up into portions, to give shape to a number of fetations, while the female contributes enough material so that a number of fetations can take shape out of it. (The parallel instance of milk, which was cited,\textsuperscript{e} is not comparable, since, in the case of that which the semen’s heat causes to take shape, not only quantity is involved but also quality, whereas in the case of the heat in the fig-juice and the rennet, quantity alone is involved.)\textsuperscript{f} This, then, is the reason why in those
772 a
gίνεσθαι τὰ κυήματα καὶ μὴ σύνεχες ἐν ἐκ πάντων ἐν τοῖς πολυτόκοισ τοῦτος αὐτίων, ὅτι οὐκ ἐξ ὁποσοῦν ἐν γίνεται κύμα, ἀλλ' ἐάν τε ὁλίγον ἦ, οὐκ ἔσται, ἐάν τε πολὺ λιγάν ὄρισται γάρ ἡ δύναμις καὶ τοῦ πάσχοντος καὶ τῆς θερμότητος τῆς ποιούσης. ὁμοίως δὲ καὶ ἐν τοῖς μονοτόκοις καὶ μεγάλοις τῶν ζῷων οὐ πολλὰ γίνεται ἐκ πολλοῦ περιττώματος· καὶ γὰρ ἐν ἐκείνοις ἐκ ποσοῦ τινος ποσὸν τι τὸ ἐργαζόμενον ἔστιν. οὐ προέται μὲν οὐν πλείω τοιαύτην ὑλὴν διὰ τὴν προειρημένην αὐτίαν· ἂν δὲ προέται, τοσούτη κατὰ φύσιν ἔστων ἐξ ὑς ἐν γίνεται κύμα μόνον. ἐάν δὲ ποτε πλείον ἐλθῇ, διτοκεῖ τότε. διὸ καὶ δοκεῖ τερατώδη τὰ τοιαῦτα εἶναι μάλλον, ὅτι γίνεται παρὰ τὸ ὡς ἐπὶ τὸ πολὺ καὶ τὸ εἰσώδος. ὁ δὲ ἀνθρώπος ἐπαμφοτερίζει πᾶσι τοῖς γένεσιν· καὶ γὰρ μονοτοκεῖ καὶ πολυτοκεῖ ποτε καὶ ὀλιγοτοκεῖ, μάλιστα δὲ μονοτόκον τὴν φύσιν ἔστι, διὰ μὲν τὴν ύγρότητα τοῦ σώματος καὶ θερμότητα πολυτόκου, [τοῦ γὰρ σπέρματος ἡ φύσις υγρὰ καὶ θερμή.] διὰ δὲ τὸ μέγεθος ὀλιγοτόκου καὶ μονοτόκου. διὰ δὲ τούτῳ καὶ τοὺς τῆς κυήσεως χρόνους μόνω τῶν ζῴων ἀνωμάλους εἶναι συμβέβηκεν. τοῖς μὲν γὰρ ἄλλοις εἰς ἐστὶν ὁ χρόνος, τοῖς δ' ἀνθρώποις πλείους· καὶ γὰρ ἐπτάμηνα καὶ δεκάμηνα γεννᾶται καὶ κατὰ τοὺς μεταξὶ χρόνους· καὶ γὰρ τὰ ὀκτάμηνα ζῆν μὲν, ἦττον δὲ. τὸ δ' αὐτίων ἐκ τῶν νῦν λεχθέντων

1 τοῦτ' P: τοῦτ' αὐτὸ vulg.
2 ποτε hic P, post ὀλιγοτοκεί vulg.
3 τοῦ . . . θερμή secl. Platt.

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a Cf. 776 a 22.
animals which produce many offspring the fetaions are many in number and a single continuous one does not result instead of many—viz., a fetaion is not formed out of any casual quantity: if there is too little or too much, none will be formed, because there is a definite limit set both to the dynamis of the material which is acted upon and to that of the heat which acts upon it. Similarly also in the case of those animals which are large and produce one offspring only, a large amount of residue does not give rise to a large number of offspring, for the same holds good: here too, the amount of the material and of that which works upon it are definite. So then they do not emit a larger amount of such material, owing to the cause already mentioned; and the material which they do emit is, in the natural course, just sufficient in amount to provide for a single fetaion only. If ever more of it is supplied, then twins are produced. And hence, also, such creatures seem rather to be monstrosities, because their formation is contrary to the general rule and to what is usual. Man, however, has a footing in all the classes, producing one offspring, or on occasion, many, or few, though most naturally and normally one is the number: the production of many offspring is due to fluidity of the body and to heat, [since the nature of semen is fluid and hot;] of few or of one, to the size of the body. And to this it is due also that in man alone among the animals is the period of gestation of variable length: other animals have a single period, but with man there are several: children are born at seven months and ten months and at intermediate times, and indeed eight months' babies live, though less often than the others. The reason may be
ARISTOTLE

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συνίδοι τις άν, εἰρήται δὲ περὶ αὐτῶν ἐν τοῖς προβλήμασιν.

Καὶ περὶ μὲν τούτων διωρίσθω τὸν τρόπον τούτων.

Τῶν δὲ πλεοναζόντων μορίων παρὰ φύσιν τὸ αὑτὸ αὐτιον καὶ τῆς διδυμοτοκίας. ἥδη γὰρ ἐν
15 τοῖς κυήμασι συμβαίνει τὸ αὐτιον, ἐὰν πλείων ὑλὴ συστηθῇ ἡ κατὰ τὴν τοῦ μορίου φύσιν· τὸτε γὰρ
συμβαίνει μὲν μόριον μεδίον τῶν ἄλλων ἔχειν, οἷον
dάκτυλον ἡ χεῖρα ἡ ρόδα ἡ τι τῶν ἄλλων ἀκρω-
τηρίων ἡ μελῶν, ἡ σχισθέντος τοῦ κυήματος πλείω γίνεσθαι, καθάπερ ἐν τοῖς ποταμοῖς αἱ δίναι· καὶ
20 γὰρ ἐν τούτοις τὸ φερόμενον ὄγρον καὶ κύνησιν ἔχων ἄν <τινὶ> ἀντικρούσῃ, δύο ἔξ ἐνὸς γίνονται
συστάσεις, ἔχουσαι τὴν αὐτὴν κύνησιν· τὸν αὐτὸν
dὲ τρόπον καὶ ἐπὶ τῶν κυήματων συμβαίνει. προσ-
φύεται δὲ μάλιστα μὲν πλησίον ἄλληλων, ἐνὸτε
dὲ καὶ πόρρω διὰ τὴν γιγνομένην ἐν τῷ κυήματι
cύνησιν, μάλιστα δὲ διὰ τὸ τὴν τῆς ὑλῆς ὑπεροχὴν
25 οἶθεν ἀφηρέθη ἐκεῖ ἀποδιδόναι, τὸ δ' εἴδος ἔχειν
οἶθεν ἐπλεόνασεν.

"Οσα δὲ συμβαίνει τοιαῦτα ὡστε δύο ἔχειν
αἰδοία, [τὸ μὲν ἄρρενος τὸ δὲ θήλεος,] αἰεὶ μὲν τῶν
πλεοναζόντων γίνεται τὸ μὲν κύριον τὸ δ' ἄκυρον

1 πλείων ὑλὴ συστηθῇ coni. Platt, cui consentit Σ sustentatur multa materia: πλείων ὑλήν συστήσῃ vulg.
2 ἄν τινι Peck: ἄν vulg. 3 seclusit Platt.

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a This cannot be traced.
b Cf. Bk. I, chh. 21, 22; 767 b 18, etc.
c e.g., the excessive material is drawn from X; it settles at Y, and therefore begins to take the form of Y during the process of development; but as there are enough Y already, 440
perceived from what has just been said; a discussion of these matters is also to be found in the Problems.a

This, then, may be taken as the way in which we deal with this subject.

With regard to the redundancy of parts which occurs contrary to Nature, the cause of this is the same as that of the production of twins, since the cause occurs right back in the fetations, whenever more material gets "set" than the nature of the part requires: the result then is that the embryo has some part larger than the others, e.g., a finger or a hand or a foot, or some other extremity or limb; or, if the fetation has been split up, several come to be formed—just as eddies are formed in rivers; here too, if the fluid which is being carried along and is in movement meets with any resistance, two self-contained eddies are formed out of the original one, both of which have the same movement. b What happens in the case of the fetations is on the same lines. The normal part and the redundant one are usually attached quite close to one another, although sometimes they are farther away because of the movement which arises in the fetation, and above all because (a) the excess of material recurs again at the place from which it was originally drawn off, and (b) the form which it has is derived from the part where it developed as a redundancy.c

Some creatures develop in such a way that they have two generative organs [one male, the other female]. Always, when this redundancy happens, one of the two is operative and the other inoperative, it goes back to where it came from, viz., X; thus a Y is formed at X.
τῷ κατὰ τὴν τροφὴν άεὶ ἀμαυροῦσθαι ἀτε παρὰ
30 φύσιν οὖν, προσπέφυκε δ’ ὦσπερ τὰ φύματα· καὶ
gάρ ταῦτα λαμβάνει τροφήν, καίτερ ὅντα ὅστερο-
γενῆ καὶ παρὰ φύσιν. γίνεται δὲ κρατήσαντος μὲν
tοῦ δημιουργοῦντος ὁμοίων δύο καὶ κρατηθέντος
ὀλως· ἀν δὲ τῇ μὲν κρατήσῃ τῇ δὲ κρατῆθην, τὸ
μὲν θῆλυ τὸ δὲ ἀρρέν· οὗθεν γὰρ διαφέρει τούτῳ
λέγειν ἐπὶ τῶν μορίων ἡ ἐπὶ τοῦ ὀλού, δι’ ἦν
35 αἰτίαν γίνεται τὸ μὲν θῆλυ τὸ δ’ ἀρρέν. οὐσα δ’
ελλείποντα γίνεται τῶν τοιούτων μορίων, οἶον
ἀκρωτηρίου τὐνὸς ἡ τῶν ἄλλων μελῶν, τὴν αὐτὴν
dεὶ νομίζειν αἰτίαν ἤπερ καὶ ἐὰν ὀλοῦ τὸ γυνόμε-
νον ἄμβλωθην, ἀμβλώσεις δὲ γίνονται πολλαὶ τῶν
κυμάτων.

[Διαφέροντες δ’ αἱ μὲν παραφύσεις τῆς πολυτοκίας
tὸν εἰρήμενον τρόπον, τὰ δὲ τέρατα τούτων τῷ
πολλὰ ἐναι αὐτῶν3 σύμφυσιν.]3 γίνονται δὲ
καὶ μεταβολαὶ, ἐνίοις μὲν ἔπ’ ἐλαττώνων καὶ
ἀτμιστέρων μορίων, ἐνίοις4 δὲ καὶ τοῦτον τὸν
5 τρόπον, ἐὰν ἐπὶ μειζόνων γένονται καὶ κυριω-
τέρων μορίων, οἶον ἐνια ἔχει δύο σπλήνας καὶ

1 ἤπερ καὶ ἐὰν ὀλοῦ Ρ., Α.-\W., Platt: ὁμοίων γάρ, κἂν ὀλόως
vulg. 2 τῷ τὰ πολλὰ αὐτῶν εἴναι Ρ.
3 διαφέροντες . . . σύμφυσιν secl., nam argumento haud
consona. cetera ex Σ versione supplevi: et forte erit alteratio
(=metabolē, cf. 771 a 1) in membris parvis vilibus et in
magnis principalibus Σ.
4 ἐνίοις Peck: ἐνια vulg.

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a Cf. 767 b 17. The semen of the male, the "movement" of the male.
b Cf. 768 b 3.

c The words marked for excision are probably an annotation which has ousted the text (here tentatively restored from Scot's Latin version); and it may be remarked that the 442
since the latter, being contrary to Nature, always gets stunted so far as nourishment is concerned; however, it is attached, just as growths (or tumours) are: these, like it, secure nourishment, although the date of their origin is later than that of the creature itself and they are contrary to Nature. The result of the fashioning agent having gained the mastery, or having been completely mastered, is that two similar generative organs are formed; if it to some extent gains the mastery and to some extent gets mastered, one is formed female and the other male,—for it comes to the same thing whether we apply this explanation of why one is formed female and another male to the case of the parts or to the animal as a whole. And wherever a deficiency occurs in such parts as e.g. an extremity or some other limb, we must take it that the cause is the same as it is if the whole of the forming creature suffers abortion—and abortions of f etations frequently occur.

[Redundant growths differ from the production of numerous offspring at a birth in the way which has been stated; monstrosities differ from redundant growths in that most monstrosities are instances of embryos growing together.] (Alterations, too, occur; in some cases they affect the smaller and less important parts,) whereas others are affected in a different way, i.e., if the alteration occurs in the larger parts, which have more to do with the control of the organism—e.g., some have two spleens, or several meaning borne by τέρατα is at variance from that which it bears elsewhere in the discussion. The words may be an annotation intended for 773 a 13. The lines following (down to μεθυσταμένης) seem to be a similar kind of summary, though more correct, and they too may be out of place or redundant.
πλείους νεφρούς. ἐτὶ δὲ μεταστάσεις τῶν μορίων παρατρεπομένων¹ τῶν κυνήσεων εἰσι καὶ τῆς ὕλης μεθισταμένης. ἐν δ' είναι τὸ ζῷον τὸ περατόδες ἢ πλείω συμπεφυκότα δεῖ νομίζειν κατὰ τὴν ἀρχήν, 10 οἷον εἰ τοιοῦτον ἐστὶν ἡ καρδία μόριον, τὸ μὲν μέν ἕχων καρδίαν ἐν ζῷον, τὰ δὲ πλεονάζοντα μόρια παραφύσεις, τὰ δὲ πλεῖω ἔχοντα δύο μὲν εἶναι, συμπεφυκέναι δὲ διὰ τὴν τῶν κυνημάτων σύναψιν.

Συμβαίνει δὲ πολλάκις καὶ τῶν οὐ δοκοῦντων ἀναπήρων εἶναι ζῷων πολλοῖς ἡδὴ τετελειωμένοις 15 τοὺς μὲν συμπεφυκέναι τῶν πόρων τοὺς δὲ παρεκτεράφθαι. καὶ γάρ θῆλει τισιν ἡδὴ τὸ στόμα τῶν ὕστερῶν συμπεφύκος διετέλεσεν, ἡδὴ δ' ὃρας οὕσης τῶν καταμηνίων καὶ πόνων ἐπιγιγνομένων² ταῖς μὲν αὐτόματον ἐρράγῃ, ταῖς δ' ύπο Iατρῶν διηρέθη. τὰς δὲ διαφθαρῆσαι συνέπεσεν ἡ βιαίας³ 20 γενομένης τῆς ῥέξεως ἡ γενέσθαι μὴ δυναμένης. καὶ τῶν παιδῶν ἐνίοις οὐ κατὰ τὸ αὐτὸ συνέπεσε τὸ πέρας τοῦ αἰδοῦν καὶ ὁ πόρος ἢ διέρχεται τὸ περίττωμα τὸ ἐκ τῆς κύστεως, ἀλλ' ὑποκάτωθεν· διὸ καὶ καθήμενοι οὐροῦσι, τῶν δὲ ὀρχεων ἀνεσπασμένων ἀνω δοκοῦσι τοῖς ἀποθεῖν ἀμα θῆλεος 25 ἔχειν αἰδοῦν καὶ ἄρρενος. ἡδὴ δὲ καὶ ὁ τῆς ἔηρας τροφῆς⁴ πόρος συμπεφυκὼς ἐπὶ των ἡμών ζῴων γέγονεν,

1 παρεκτρεπομένων P.
2 ἐπιγιγνομένων P: γιγνομένων vulg.
3 βιαίας P: βία vulg.
4 fort. <περίττωμάτος> supplendum: exitum superfluitatis sicce Σ.

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generations. Also, there are instances of the parts changing their position, due to diversion of the "movements" and change of position of the material. Whether an animal which is a monstrosity is to be reckoned as one or as several grown together depends upon its "principle"; thus, assuming that the heart is a part answering to this description, a creature which possesses one heart will be one animal, and any supernumerary parts will be merely redundant growths; those, however, which have more than one heart we shall reckon as being two, which have grown together owing to the conjoining of the fetations.

It often happens, even with many animals that do not appear to be deformed and have actually reached complete development, that some of their passages have grown together, and that others have been diverted. We know of instances of women in whom the os uteri was grown together and continued so until the time arrived for the menstrual discharge to begin and pain came on; in some, the passage burst open of its own accord, in others, it was separated by physicians; and in some cases, where the opening either was forcibly made or could not be made at all, the patients succumbed. There have been instances of boys in whom the termination of the penis has not coincided with the passage through which the residue from the bladder passes out, so that the passage came too low; and on this account they sit in order to pass water, and when the testes are drawn up they seem from a distance to have both male and female generative organs. There have also been instances in certain animals, sheep and others too, where the passage (for the

a Viz., the "principle."
καὶ προβάτων καὶ ἄλλων, ἐπεὶ καὶ βοῦς ἐν Περίνθῳ ἐγένετο ἣ διὰ τῆς κύστεως λεπτῆ δυσθομένη τροφῆ διεχώρει, καὶ ἀνατριβέντος τοὺ ἄρχοι ταχὺ πάλιν συνεφύετο, καὶ οὐκ ἐπεκράτουν διαιροῦντες.

30 Περὶ μὲν οὖν ὀλιγοτοκίας καὶ πολυτοκίας καὶ περὶ φύσεως τῶν πλεοναζόντων ἢ ἐλλειπόντων¹ μορίων, ἔτι δὲ περὶ τῶν τερατωδῶν, εἰρηταί.

V Τῶν δὲ ζώων τὰ μὲν ὅλως οὐκ ἐπικυψκεται τα δ' ἐπικυψκεται, καὶ τῶν ἐπικυψκομένων τὰ μὲν 35 δύναται τὰ κυήματα ἐκτρέφειν, τὰ δὲ ποτὲ μὲν ποτὲ δ' οὖ. τοῦ δὲ μὴ ἐπικυψκεθαί αἵτων ὁτι μονοτόκα ἐστίν. τὰ τε γὰρ μόνων οὐκ ἐπικυψκεται καὶ τὰ τοῦτων μείζονα. διὰ γὰρ τὸ μέγεθος τὸ περίττωμα ἀναλίσκεται εἰς τὸ κύμα. πάσι γὰρ υπάρχει μέγεθος τούτωσ σῶματος, τῶν

5 δὲ μεγάλων καὶ τὰ ἐμβρυα μεγάλα κατὰ λόγον ἐστίν· διὸ καὶ τὸ τῶν ἐλεφάντων ἐμβρυόν ἡλίκων μόσχος ἐστίν. τὰ δὲ πολυτόκα ἐπικυψκεται διὰ τὸ καὶ τῶν πλειόνων² τοῦ ἐνὸς εἶναι βατέρῳ βάτερον ἐπικύμη. τούτων δ' ὅσα μὲν μέγεθος ἔχει, καθ' ἀπερ άνθρωπος, έαν μὲν ἡ ἐτέρα ὀξεία τῆς ἑτέρας 10 γένηται πάρεγγυς, ἐκτρέφει τὸ ἐπικυνθεὶν· ἢδη γὰρ ὡπταί τὸ τοιοῦτον συμβεβήκος. αἵτων δὲ τὸ εἰρημένον· καὶ γὰρ ἐν τῇ μιᾷ συνούσια πλεῖον τὸ

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*a Superfetation is a very abnormal occurrence. It happens when a later ovum is fertilized as a result of coitus during*
residue) of the solid nourishment was grown together; in fact, in Perinthus a cow was born which used to pass finely-sifted nourishment through the bladder. They cut its anus open, but it quickly grew together again, and they did not succeed in keeping it apart.

We have now discussed the production of few offspring and many, the nature of supernumerary or deficient parts, and also monstrosities.

In some animals superfetation does not occur at all, in others it does; and among the latter some are able to complete the nourishing of the fetations, others can sometimes do it and sometimes not. The reason why in some animals superfetation does not occur is that they produce one offspring only. Thus, it does not occur in solid-hoofed animals and in larger animals than these, because on account of their size the residue goes to the fettation and gets used up. All of these have large bodies, and large animals have large embryos, proportionate to their size; that is why the embryo of an elephant is as big as a calf. Superfetation, however, does occur in animals which produce numerous offspring at a birth, because where there are more than a single offspring one is really a superfetation upon another. Of these animals, those that are large, such as man, complete the nourishing of the second fettation, if the second copulation has taken place not long after the first; such an occurrence has in fact been observed. The reason is as already stated: Even in a single act of intercourse the semen

pregnancy. The young resulting from the second coitus are usually born at the same time as those resulting from the first coitus, but are smaller. See F. H. A. Marshall, Physiology of Reproduction² (1922), 154.
âpión èstì spérmâ, ò merûsthèn poiei pollutokeîn, òn ùstèrîçei òtàperon.\(^1\) òtan ò' ñyðè òtòv kûmámatos ñvèxèmenòv ñumìbhì gînèsthai tûn ðkeìan, èpikûskeïtai 15 méñ potè, ólìugàkís méntòi dià òtòv òùstèran sùmmìven òs tà pollà méùri tòw koumùènâ tâs gynaiçìn. ãn ðè sùmmìbì potè (kài ãàpò òtût' ñyðè gègonèn), ou ðûnàtai têleìovûn, álâa kûmàmat' èk- pèmpetì² parasplèòsia tòis kaloumènòis èktràmàsvn. ùsper ãàpò èpì tòwv monòtòkow dià òtòv mégeðos eîs 20 òtòv prosùpàrçov òtòv pròtòttwìma têpëtëtai pàn, oûtw kài toûtòs, plèn èkêìnovs mèn eûbûs, toûtòs ð' òtan avèxèthì òtòv èmbrûon: tòte ãàpò èkhùsvi parasplèèsws tòis monòtòkouis. òmòìs ðè dià òtòv ðànðìmwv ðûsì polûtòkòn èvìvì, kài ðërëèvâi tì tòv megèðëì tûs ùstèras kài tòv pròtòttwìmatos, ùh 25 méntòi tòsoùtvon òstè ètèrèn èktrèfein, mòna tòwv ðwv ðkeìan èpìdèêxontai kouònta gûnì kài ìppos, ð' mèn dià tûn eûrìmmènì aëtiàvì, ð' ìppòs dià te tûn tûs fûsèwos stèrròttìtà³ kài òtòv ðërëèvâi tì tûs ùstèras mégeðos, plèon mèn ðì tòv èvì, ëlatâ- tòv ðè ðòstè állo èpìkûsèsthai têleìovûn. èstì 30 ðè fûsì ðàfðòðìyuàstìkòn dià òtòv tàwùtò pèpònènà tòis stèrròsìs: èkêìvà tì ãàpò toùâùt' èstì dià tò

\(^1\) òv... òtàperon hand sanum videtur.  
\(^2\) èkpe/mpetì P: èkpiîpetì vulg.  
\(^3\) stereòttìta PSY.

\(^a\) Viz., those which produce more than one offspring.  
\(^b\) See 748 a 15 ff.
discharged is more than sufficient, and this when divided up into portions causes the production of numerous offspring, one of which is later than another. When, however, the fetation is already advanced in its growth before the copulation takes place, superfetation sometimes occurs, but infrequently, because in women the uterus generally closes up during the time of pregnancy. But if ever it does happen (as in fact it has been known to do), the mother cannot bring the second one to completion, but ejects fetations that are very similar to what are known as abortions. The situation is comparable with that in the one-offspring animals, in which, on account of their size, all the residue is directed to the already existing embryo. So too it happens in these animals, except that in the former it happens straight away, whereas in these it happens when the embryo is already advanced in growth, because then their condition is similar to that of the one-offspring animals. Similarly, because man is by nature an animal which produces numerous offspring, and because there is something over and to spare as regards the size both of the uterus and of the residue (though not enough to bring the nourishing of a second embryo to completion), women and mares are the only animals which admit copulation while they are with young. In women it is due to the reason already stated; in mares it is due to the barrenness of their nature, and because the size of their uterus has something over and to spare—there is more than enough room for one, but not sufficient for a second fetation to be brought to completion. Also, mares are by nature prone to sexual intercourse because they are in the same predicament as females which are barren—
μὴ γίνεσθαι κάθαρσιν (τοῦτο δ' ἐστὶν ὡσπερ τοῖς ἀρρεσὶ τὸ ἀφροδισιάσας) καὶ ἵπποι αἱ θήλεια η̄κιστα προϊενται κάθαρσιν. ἐν πάσι δὲ τοῖς ζωοτοκούσι τὰ στερρὰ τῶν θηλέων ἀφροδισιαστικὰ διὰ τὸ παραπλησίως ἔχειν τοῖς ἀρρεσὶν, ὅταν

35 συνειλεγμένον μὲν ἥ τὸ σπέρμα, μὴ ἀποκρινόμενον δὲ. τοῖς γὰρ θήλεσιν ἡ τῶν καταμηνίων κάθαρσις σπέρματος ἀξοδός ἐστὶν: ἐστι γὰρ τὰ καταμήνια σπέρμα ἀπέπτον, ὡσπερ ἐιρηταί πρότερον. διὸ καὶ τῶν γυναικῶν ὁσι πρὸς τὴν ὁμωλίαν ἀκρατεῖς τὴν τοιαύτην, ὅταν πολυτοκισσαί, παύονται τῆς

5 πτοῆσεως· ἐκκεκριμένη γὰρ ἡ σπερματικὴ περίτωςις οὐκέτι ποιεῖ τῆς ὁμωλίας ταύτης ἐπιθυμίαν. ἐν δὲ τοῖς ὀρνισι αἱ θήλεια τῶν ἀρρενῶν ἕττον εἰσω ἀφροδισιαστικαί διὰ τὸ πρὸς τῷ ὑποξώματι τὰς ὑστέρας ἔχειν, τὰ δ' ἀρρενα τοῦνατίον· ἀνεσπασμένους γὰρ ἔχει τοὺς ὀρχεῖς ἐντός, ὡστ' ἄν

10 ἡ τ' γένος τῶν τοιούτων [ὁρνίθων] φύσει σπερματικὸν, ἀεὶ δεισθὰι τῆς ὁμωλίας ταύτης. τοῖς μὲν οὖν θήλεσι τὸ κάτω καταβαίνει τὰς ὑστέρας, τοῖς δ' ἀρρεσι τὸ ἀναστᾶσθαι τοὺς ὀρχεῖς συμβαίνει πρὸ ὀδοῦ πρὸς τὴν ὀχείαν.

Δι' ἂν μὲν οὖν αὐτίαν τὰ μὲν οὐκ ἐπικυκτεῖαι

15 παντελῶς, τὰ δ' ἐπικυκτεῖαι μὲν, τὰ δέ κυήματα ἐκτρέφει ὅτε μὲν ὅτε δ' οὔ, καὶ διὰ τῶν αὐτίαν τὰ μὲν ἀφροδισιαστικὰ τὰ δ' οὐκ ἀφροδισιαστικὰ τῶν τοιούτων ἐστίν, ἐιρηταί.

1 τι Platt : τὸ vulg.
2 seclusi ; ὀρνίθων τούτων P. fortasse scribendum ὡστε διὰ τὸ τοῦτο τὸ γένος εἶναι φύσει σπερματικόν κτλ. (et indigent multo coitu propter multitudinem spermatis naturaliter Σ.)

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since this also is a condition due to there being no evacuation (which corresponds to the emission of semen in the male), and mares discharge extremely little evacuation. Further, in all the Vivipara those females which are barren are prone to sexual intercourse, because they are in a similar condition to males when their semen is ready, collected together, but is not being emitted, the evacuation of the menstrual fluid in females being the emission of semen, since, as has been stated earlier, the menstrual fluid is semen that is unconcocted. Hence, too, those women who are incontinent in the matter of sexual intercourse, cease from their passionate excitement when they have borne several children, because once the seminal residue has been expelled from the body it no longer produces the desire for this intercourse. Among birds the females are less sexually excitable than the males because their uterus is close up by the diaphragm, whereas the males, on the contrary, have their testes drawn up internally, so that if any class of such creatures tends naturally to abound in semen, they are always wanting to have sexual intercourse. Thus in females it is the descent of the uterus which encourages copulation, whereas in males it is the drawing up of the testicles.

We have now stated the cause on account of which superfetation does not occur at all in some animals, why it does occur in others, and why these can sometimes bring the nourishing of the fetation to completion, sometimes not; and what is the cause why of such animals some are prone to sexual intercourse and others not.

\[a\text{ Cf. 717 b 25, 718 a 6 ff.}\]  \[b\text{ See 717 b 10 ff.}\]
"Ενια δὲ τῶν ἐπικυσκομένων καὶ πολὺν χρόνον διαλειτουσθῆς τῆς ὀχείας δύναται τὰ κυήματα ἑκτρέφειν, ὅσων σπερματικὸν τε τὸ γένος ἐστὶ καὶ μὴ τὸ σῶμα μέγεθος ἐχει καὶ τῶν πολυτόκων ἐστὶν· διὰ μὲν γὰρ τὸ πολυτοκεῖν εὐρυχωρίαν ἐχει τῆς ύστερᾶς, διὰ δὲ τὸ σπερματικόν εἶναι πολὺ προῖται περίττωμα τῆς καθάρσεως· διὰ δὲ τὸ μὴ τὸ σῶμα μέγεθος ἐχειν, ἀλλὰ πλεῖον λόγῳ τὴν κάθαρσιν ὑπερβάλλει τῆς εἰς τὸ κύμα τροφῆς, δύναται τε συνιστάναι 1 ζώα καὶ ύστερον καὶ ταύτ' ἑκτρέφειν. ἔτι δ' αἱ ύστεραι τῶν τουιότων οὐ συμμεμόρκαι διὰ τὸ περιείναι περίττωμα τῆς καθάρσεως· τούτο δὲ καὶ ἐπὶ γυναικῶν ἡδὺ συμβέβηκεν· γίνεται γὰρ τισ κυνούσαι κάθαρσις καὶ διὰ τέλους. ἀλλὰ ταύτας μὲν παρὰ φύσιν (dio βλάπτει τὸ κύμα), τοὺς δὲ τουιότους τῶν ζώων κατὰ φύσιν· οὕτω γὰρ τὸ σῶμα συνεστῆκεν εξ ἀρχῆς, οὐδὲ τὸ τῶν δασυπόδων· τούτο γὰρ ἐπικύσκεται τὸ ζῷον· οὔτε γὰρ τῶν μεγάλων ἐστὶ πολυτόκον τε (πολυσχίδες γάρ, τὰ δὲ πολυσχίδη πολυτόκα) καὶ σπερματικόν. δηλοῖ δ' ἡ δασύτης· υπερβάλλει γὰρ τὸ τριχώματος τὸ πλήθος· καὶ γὰρ ὑπὸ τοὺς πόδας καὶ ἐντὸς τῶν γυνάθων τοῦτ' ἐχει τρίχας μόνον τῶν ζώων. ἥ δὲ δασύτης σημείον πλήθους περιττώματος ἐστὶ, διὸ καὶ τῶν

1 συνιστάναι Λ.-W.: συνιστασθαί vulg.

* I use (a), (b), and (c) to mark respectively the same characteristic all through this passage for clarity of reference.

a Lit., "is seminal"; i.e., the males abound in semen and the females in menstrual fluid (which is unconcocted semen).

b i.e., the embryos produced by way of superfetation.
Some of those animals in which superfetation occurs are able to bring to completion the nourishing of their fetations even when there is a long interval between the copulations; these are animals which

(a)* belong to some kind which is abundant in semen,

(b) are not large in bodily size, and

(c) are among those which produce numerous offspring; the reason being that

(c)* because they produce numerous offspring their uterus is roomy,

(a) because they are abundant in semen they discharge a great deal of residue by way of evacuation,

(b) because they are not large in bodily size, but the evacuation exceeds by a larger measure the nourishment which goes to the fetation, they are able to cause young animals to take shape at the later stage too and to bring their nourishing to completion. Also, in such animals the uterus does not close up, because there is a surplus amount of residue by way of evacuation. This has occurred to our knowledge in the case of women: in some women evacuation continues throughout the time of pregnancy. In them, however, it is contrary to nature (that is why it injures the fetation); but in the animals we are discussing it is natural, because that is the way in which their body took shape from the beginning. The hare is an example of this. This is an animal in which superfetation occurs, for

(b)* it is not one of the large animals,

(c) it produces numerous offspring (since it is fissipede, and fissipede animals produce numerous offspring), and

(a) it is abundant in semen. This is shown by its hairiness. It has an excessive amount of hair; indeed, it has hair under the feet and inside the jaws, and is the only animal which does so. This hairiness is a sign that it has a large amount of residue; and for this
ἀνθρώπων οἱ δασεῖς ἀφροδισιαστικοὶ καὶ πολὺ-σπερμοὶ μᾶλλον εἰσὶ τῶν λείων. ὁ μὲν οὖν δασύποις τὰ μὲν τῶν κυματῶν ἀτελῆ πολλάκις ἔχει, τὰ δὲ προϊέται τετελειωμένα τῶν τέκνων.

VI 5 Τῶν δὲ ζωοτόκων τὰ μὲν ἀτελῆ προϊέται ζῶα τὰ δὲ τετελειωμένα, τὰ μὲν μόνυχα τετελειωμένα καὶ τὰ διχηλὰ, τῶν δὲ πολυσχιδῶν ἀτελῆ τὰ πολλά. τούτων δ' αὐτίον ὅτι τὰ μὲν μόνυχα μονοτόκα ἐστὶ, τὰ δὲ διχηλὰ ἡ μονοτόκα ἡ διτόκα ὡς ἐπὶ τὸ πολὺ, 10 ράδιον δὲ τὰ ὅλγα ἐκτρέφεων. τῶν δὲ πολυσχιδῶν ὁσα ἀτελῆ τίκτει, πάντα πολυτόκα· διὸ νέα μὲν ὄντα δύναται τὰ κυματὰ τρέφεων,2 ὅταν δ' αὐξηθῇ καὶ λάβῃ μέγεθος οὐ δυναμένου τοῦ σώματος ἐκτρέφεων, προϊέται καθάπερ τὰ σκωληκοτόκα τῶν ζῴων. καὶ γὰρ τούτων τὰ μὲν ἄδιάρθρωτα σχεδὸν 15 γεννᾶ, καθάπερ ἀλώπηξ ἁρκτὸς λέων, παραπλη-σίως δ' ἐνα καὶ τῶν ἄλλων τυφλά δὲ πάντα σχεδὸν, οἶον ταῦτά τε καὶ ἐτι κύων λύκος θώς. μόνον δὲ πολυτόκον ὣν ἡ ὤς τελειοτοκεῖ, καὶ ἐπαλλάττει τοῦτο μόνον· πολυτοκεῖ μὲν γὰρ ὡς τὰ πολυσχιδῆ,3 διχηλῶν δ' ἐστὶ καὶ μόνυχον· εἰσὶ 20 γὰρ ποι μόνυχες ὑπε. πολυτοκεῖ μὲν οὖν διὰ τὸ

1 τὰ P: om. vulg.
2 τρέφεων PS: ἐκτρέφεων vulg.
3 ὡς πολυσχιδῆ Z: ὡς πολυσχιδὲς PY.

But see the proviso at 771 b 5 ff.

i.e., in an imperfect condition.

See H.A. 499 b 12. The solid-hoofed is the more unusual variety.

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same reason, too, men that are hairy are more prone to sexual intercourse and have more semen than men that are smooth. As for the hare, often some of its fetations are imperfect; others of its offspring, however, it brings to birth in a perfected state.

Among the Vivipara, some bring their young to VI birth in a perfect, some in an imperfect, state. To the former class belong the solid-hoofed and the cloven-hoofed animals, to the latter most of the fissipede animals. The reason for this is that the solid-hoofed animals produce one at a birth, the cloven-hoofed animals produce either one or two, in general, and it is an easy matter to bring the nourishing of a few to completion. Those fissipede animals which produce their offspring in an imperfect state, all produce numerous offspring, and on that account while the fetations are quite young they are able to nourish them, but once they have advanced in growth and have attained some size their bodies are unable to bring the nourishing of them to completion, and so discharge them just as the larva-producing animals do, for indeed their young, like the larvae, are practically unarticulated when born, e.g., those of the fox, the bear, the lion, and similarly with some of the others; moreover, practically all of them are blind, e.g., the ones just mentioned, and in addition those of the dog, the wolf, and the jackal. The only animal which produces numerous offspring that are perfectly formed is the pig; thus it is the only one which has a footing in both classes: (a) it produces numerous offspring, as the fissipede animals do, but (b) it is a species which is cloven-hoofed and solid-hoofed—for solid-hoofed pigs exist, as we know. It produces numerous offspring because the nourishment available for
The distinction which Aristotle makes here corresponds to the distinction now made between nidicolous birds (those here described) and nidifugous birds. The former are born blind, the latter can see at birth.

Or, magpie.

i.e., not enough yolk.

The origin of this story is not clear. It cannot be true if “put out” means “removed,” but lesser degrees of injury might be followed by repair and recovery of function. A somewhat similar phenomenon is the well-known “Wolffian regeneration” in amphibia, where after removal of the lens of the eye a new lens regenerates from the margin of the iris, i.e., from a place other than that of its normal origin.
increase of size is secreted to yield seminal residue—since, for a solid-hoofed animal, the pig is not large in size; at the same time and more commonly, it is cloven-hoofed, as though it were at odds with the nature of the solid-hoofed animals. On account of this, then, it not only produces sometimes one offspring, and two, but also and for the most part it produces numerous offspring, and it brings their nourishing to completion because of its fine physical condition: it is like a rich soil which can provide plants with sufficient and indeed abundant nourishment.

The offspring of some of the birds also are hatched in an imperfect state, and blind\(^a\); viz., of those which lay numerous eggs although they themselves are small in physique—e.g., the crow, the jay,\(^b\) sparrows, and swallows\(^c\); and of those birds which lay few eggs and yet do not provide in the egg abundant nourishment\(^d\) for the chick—e.g., the ring-dove, the turtle-dove, and the pigeon. And on this account, if the eyes of a swallow are deliberately put out while the bird is still young, they recover, because the injury is inflicted during the process of their formation and not after its completion; that is why they grow and spring up afresh.\(^e\) In general, then, the reason why offspring are born early before their formation is perfected, is because of inability to bring their nourishing to completion; and the reason why they are born in an imperfect state is because they

\(\text{viz., the young skin. This may happen many times in succession if the experiment is repeated. The connexion between regeneration and embryonic growth is well grasped by Aristotle, but there are of course some animals, such as the newts, where the power of regeneration is retained throughout adult life (cf. } H.A. \, 508 \, b \, 4 \, ff.).\)
ΑΡΙΣΤΟΤΛΕ

774 b δὲ γίνεται διὰ τὸ προτερεῖν. δῆλον δὲ τούτο καὶ

775 a ἐπὶ τῶν ἐπταμήνων: διὰ γὰρ τὸ ἀτελή εἶναι πολ-
lάκις ἐνα αὐτῶν γίνεται οὐδὲ τοὺς πόρους ἔχοντά

πω διηθρωμένους, οἶδον ὁτιον καὶ μυκτήρων,

ἀλλ’ ἐπαυξανομένους διαρθροῦται, καὶ βιοῦσι πολλά

tῶν τοιούτων.

Γίνεται δὲ ἀνάπηρα μᾶλλον ἐν τοῖς ἀνθρώποις

ὅτα ἄρρενα τῶν θηλέων, ἐν δὲ τοῖς ἄλλοις οὐθὲν

μᾶλλον. αἶτιον δ’ ὅτι ἐν τοῖς ἀνθρώποις πολὺ

dιαφέρει τὸ ἄρρεν τοῦ θήλεος τῇ θερμότητι τῆς

φύσεως, διὸ κινητικότερα ἐστὶ κυνύμενα τὰ ἄρρενα

tῶν θηλέων. διὰ δὲ τὸ κινεῖσθαι θραύστηται μᾶλλον·

ἐὐφθαρστον¹ γὰρ τὸ νέον διὰ τῆν ἀσθένειαν. διὰ

10 τῆν αὐτὴν δὲ ταύτην αἶτιαν καὶ τελειώταται τὰ

θῆλεα τοῖς ἄρρεσιν οὐχ ὀμοίως. ἂν γὰρ ὑστέρα

αὐτῶν οὐχ ὀμοίως ἔχουσιν. ἐν δὲ τοῖς ἄλλοις

ζῷοις ὀμοίως τελειῶται. οὐδὲν γὰρ ὑστέρει τὰ

θῆλεα τῶν ἄρρενων ὀσπέρ)² ἐν ταῖς γυναιξίν

dὲ μὲν γὰρ τῇ μητρὶ ἐν πλείον χρόνῳ διακρίνεται

tὸ θῆλυ τοῦ ἄρρενος, ἐξελθοῦσι ³ δὲ πάντα προ-

τερον ἐπιτελεῖται, οἳον ἡ ἴδι σῴζεται καὶ γῆρας,

τοῖς θῆλεσιν ἢ τοῖς ἄρρεσιν. ἀσθενέστερα γὰρ

¹ εὐφθαρστον ΠZ : εὐθραυστον vulg.

² supplevi : quoniam matrices earum sunt secundum

modum divisum (leg. diversum ; v.l. sunt diversae sec. modum

eorum). in alīis autem animalibus non apparat diversītas in

complemento creationis feminarum et masculorum quoniam

non est in feminis diminutio a maribus Σ : in alīis autem

animalibus similiter : nichil enim tardat femella plus mas-

culo, sicut in mulieribus Gul. Moerb. teste Bussemaker ;

similia ex Gul. vers. suppleverat Schneider, ed. H.A. vol. iv.

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³ εξελθοῦσι Peck : εξελθόντα PSYZ : εξελθόντων Bekker.

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are born early. This is plain, indeed, in the case of seven months' children: in some of them, when they are born, because they are imperfect, even the passages (e.g., those of the ears and nostrils) are often not yet fully articulated; as the child grows, however, they become articulated. Many such individuals survive.

In human beings, more males are born deformed than females; in other animals, there is no preponderance either way. The reason is that in human beings the male is much hotter in its nature than the female. On that account male embryos tend to move about more than female ones, and owing to their moving about they get broken more, since a young creature can easily be destroyed owing to its weakness. And it is due to this self-same cause that the perfecting of female embryos is inferior to that of male ones, (since their uterus is inferior in condition. In other animals, however, the perfecting of female embryos is not inferior to that of male ones: they are not any later in developing than the males, as they are in women, for while still within the mother, the female takes longer to develop than the male does; though once birth has taken place everything reaches its perfection sooner in females than in males—e.g., puberty, maturity, old age—because females are weaker and colder in

\[ a \text{ Cf. } H.A. 584 \text{ a } 26 \text{ ff.} \]
\[ b \text{ i.e., it is colder, because the nature of women is colder than that of other female animals, as is stated immediately above, and below; cf. also 776 a 10, where women are said to be alone in suffering from uterine affections, again owing to lack of heat, resulting in inability to concoct; and 775 a 30 ff.} \]
\[ c \text{ See app. crit.} \]
\[ d \text{ Cf. } H.A. 583 \text{ b } 22 \text{ ff.} \]
15 ἐστὶ καὶ ψυχρότερα τὰ θήλεα τὴν φύσιν, καὶ δεὶ ὑπολαμβάνειν ὦσπερ ἀναπηριάν εἶναι τὴν θηλύτητα φυσικῆν. ἦσος μὲν οὖν διακρίνεται διὰ τὴν ψυ-
χρότητα βραδεώς (ἵ γαρ διάκρισιν πέψις ἐστὶ, 
πέττει δ' ἡ θερμότης, εὑπεττοῦν δὲ τὸ θερμότερον), 
ἐκτὸς δὲ διὰ τὴν ἀσθένειαν ταχὺ συνάπτει πρὸς 
20 τὴν ἀκμὴν καὶ τὸ γῆρας. πάντα γὰρ τὰ ἑλάττω 
πρὸς τὸ τέλος ἔρχεται θάπτων, ὦσπερ καὶ ἐν τοῖς 
κατὰ τέχνην ἐργοῖς, καὶ ἐν τοῖς ὑπὸ φύσεως συν-
ισταμένοις. διὰ τὸ εἰρημένον δ' οἰτιον καὶ ἐν 
μὲν τοῖς ἀνθρώποις τὰ διδυμοτοκούμενα θῆλυ καὶ 
ἀρρεν ἦπτον σώζεται, ἐν δὲ τοῖς ἄλλοις οὐθὲν 
25 ἦπτον· τοῖς μὲν γὰρ παρὰ φύσιν τὸ ἱσοδρομεῖν, 
οὐκ ἐν ἰσοις χρόνοις γυνομένης τῆς διακρίσεως, 
Ἄλλ' ἀνάγκη τὸ ἀρρεν ὦστερεῖν ἢ τὸ θῆλυ προ-
τερεῖν, ἐν δὲ τοῖς ἄλλοις οὐ παρὰ φύσιν. συμβαίνει 
δὲ καὶ διαφορὰ περὶ τὰς κυήσεις ἐπὶ τε τῶν ἀν-
θρώπων καὶ ἐπὶ τῶν ἄλλων ζώων· τὰ μὲν γὰρ 
30 εὐθυνεῖ μᾶλλον τοῖς σώμασι τὸν πλείστον χρόνον, 
τῶν δὲ γυναικῶν αἱ πολλαὶ δυσφοροῦσι περὶ τὴν 
κύήσιν. ἐστὶ μὲν οὖν οἰτιόν τι τούτου1 καὶ διὰ 
τὸν βίον· ἐδραῖον γὰρ οὕτω πλείον γέμουσι 
περιττόματος, ἐπεὶ ἐν οἷς ἐθνεσί πονητικὸς ὁ τῶν 
γυναικῶν βίος, οὐθ' ἡ κύησις ὁμοίως ἐπιδηλός 
35 ἐστι, τίκτουσί τε ῥάδιως κάκει καὶ πανταχοῦ αἱ

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1 τούτου Platt: τούτων vulg.

**a** Cf. 767 b 9, and see Introd. § 13.
their nature; and we should look upon the female state as being as it were a deformity, though one which occurs in the ordinary course of nature. While it is within the mother, then, it develops slowly on account of its coldness, since development is a sort of concoction, concoction is effected by heat, and if a thing is hotter its concoction is easy; when, however, it is free from the mother, on account of its weakness it quickly approaches its maturity and old age, since inferior things all reach their end more quickly, and this applies to those which take their shape under the hand of Nature just as much as to the products of the arts and crafts. The reason which I have just stated accounts also for the fact that (a) in human beings twins survive less well if one is male and the other female, but (b) in other animals they survive just as well: in human beings it is contrary to nature for the two sexes to keep pace with each other, male and female requiring unequal periods for their development to take place; the male is bound to be late or the female early; whereas in the other animals equal speed is not contrary to nature. There is also a difference between human beings and the other animals with regard to gestation. Other animals are most of the time in better physical condition, whereas the majority of women suffer discomfort in connexion with gestation. Now the cause of this is to some extent attributable to their manner of life, which is sedentary, and this means that they are full of residue; they have more of it than the other animals. This is borne out by the case of those tribes where the women live a life of hard work. With such women gestation is not so obvious, and they find delivery an easy business. And so do women everywhere who
ARISTOTLE

775 a

εἰς θυνθινον πονεῖν· ἀναλίσκει γὰρ ὁ πόνος τὰ περιττόματα, ταῖς δ' ἐδραίαις ἐνυπάρχει πολλὰ τωιαῦτα διὰ τὴν ἀπονίαν καὶ τὸ μὴ γίνεσθαι καθάρσεις κυνύσας, ἢ τε ὁ ὅδε ἐπίπονος ἐστιν· δ' ὃ δὲ πόνος γυμνάζει τὸ πνεῦμα ὡστε δύνασθαι κατέχειν, ἐν ὃ τὸ τίκτεων ἐστὶ ἐκδίκος ἡ χαλέπως. ἔστι μὲν οὖν, ὥσπερ εὑρηται, καὶ ταῦτα συμβαλλόμενα πρὸς τὴν διαφορὰν τοῦ πάθους τοῖς ἄλλοις ζῷοις καὶ ταῖς 5 γυναιξὶ, μάλιστα δ' ὅτι τοῖς μὲν αὐτῶν ὄλγη γίνεται καθάρσεις, τοῖς δ' οὐκ ἐπίθηλος ὄλως, ταῖς δὲ γυναιξὶ πλείστῃ τῶν ζώων, ὡστε μὴ γινομένης τῆς ἐκκρίσεως διὰ τὴν κύμην ταῖς μὲν ταραχὴν παρέχει· καὶ γὰρ μὴ κυνύσας, ὅταν αἱ καθάρσεις μὴ γίγνονται, νόσοι συμβαίνουσιν· καὶ τὸ πρῶτον 10 δὲ ταράττονται συλλαβοῦσαι μᾶλλον αἱ πλείσται τῶν γυναικῶν· τὸ γὰρ κύμα κωλύει μὲν δύναται τὰς καθάρσεις, διὰ μικρότητα δὲ οὐδὲν ἀναλίσκει πλήθος τοῦ περιττόματος τὸ πρῶτον, ὑστερον δὲ κοψίζει μεταλαμβάνου· ἐν δὲ τοῖς ἄλλοις ζῷοις διὰ 15 τὸ ὄλγον εἶναι σύμμετρον γίνεται πρὸς τὴν αὔξησιν τῶν ἐμβρυών, καὶ ἀναλισκομένων τῶν περιττωμάτων τῶν ἐμποδιζόντων τὴν τροφὴν εὐμερεῖ τοῖς σώμασι μᾶλλον. καὶ ἐν τοῖς ἐνυδροῖς τῶν αὐτῶν τρόπον καὶ ἐν τοῖς ὀρνισὶν. ἤδη δὲ μεγάλων γινομένων τῶν κυημάτων, ὅσοι μηκέτι συμβαίνει

775 b

1 συλλαβοῦσαι P: συλλαμβάνουσαι vulg.

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*a Cf. H.A. 587 a 1 ff., and see De somno et vig. 456 a 16

"strength is required for causing ‘movement,’ and strength

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are used to hard work. The reason is that the effort of working uses up the residues, whereas sedentary women have a great deal of such matter in their bodies owing to the absence of effort, as well as to the cessation of the menstrual discharges during gestation, and they find the pains of delivery severe. Hard work, on the other hand, gives the breath (pneuma) exercise, so that they can hold it; and it is this which determines whether delivery is easy or difficult. All these things, then, as we have said, are in their way factors producing the difference in gestation as between women and the other animals; but the chief one is that whereas in some animals there is but little menstrual evacuation, and in others no visible evacuation at all, in women it is greater in volume than in any other animal; and the result of this is that when it is not being discharged owing to pregnancy it causes them trouble (and indeed even apart from pregnancy, when the menstrual discharge fails to take place diseases are the result); and most women are troubled in this way rather more at the beginning, just after they have conceived, because although the fætation is able to prevent the evacuation, yet as it is so small it does not at first use up any amount of the residue; afterwards, when it does take up some of it, it relieves the trouble. In the other animals, however, as there is but little of it, its amount is just right for the growth of the embryos; and as the residues which obstruct the nourishment get used up, the animals are in better physical condition. The same applies to water-animals and to birds. The reason why some animals are no longer in good is supplied by the holding of the breath." Cf. also M.A. 703 a 18, 9; P.A. 659 b 18, 667 a 29; and App. B §§ 22 ff.
20 ἡ ἐντροφία τῶν σωμάτων, αὐτῶν τὸ τῆς αὐξήσιον
tοῦ κυμάτος δείσθαι πλείονος ἡ τῆς περιττω-
ματικῆς τροφῆς. ὦλγας δὲ τοις τῶν γυναικῶν
βέλτιον ἔχειν τὰ σώματα συμβαίνει κυούσαις:
αὐταὶ δ' εἰσὶν ὀσαις μικρὰ τὰ περιττώματα ἐν τῷ
σώματι, ὥστε καταναλίσκεσθαι μετὰ τῆς εἰς τὸ
ἐμβρυον τροφῆς.

VII 25 Περὶ δὲ τῆς καλουμένης μύλης ῥητέον, Ἡ γίνεται
μὲν ὀλγακις ταῖς γυναιξι, γίνεται δὲ τισι τούτῳ τὸ
πάθος κυούσαις. τίκτουσι γὰρ ὁ καλοῦσι μύλην.
ἡδὴ γὰρ συνεβή των γυναικὶ συγγενομένη τῷ
ἀνδρὶ καὶ δοξάζῃ συλλαβεῖν, τὸ μὲν πρῶτον ὁ τε
ὄγκος ἡμίαντο τῆς γαστρὸς καὶ τὰλλα ἐγίνετο
30 κατὰ λόγον, ἐπεὶ δὲ ὁ χρόνος ἢν τοῦ τόκου, οὔτ'
ἐτικτεν οὔτε ὁ ὄγκος ἐλάττων ἐγίνετο, ἀλλ' ἐτη
τρία ἡ τέτταρα οὔτω διετέλει, ἐως δυσεντερίας
γενομένης καὶ κινδυνεύσασα ὑπ' αὐτῆς ἐτεκε σάρκα
ὅν καλοῦσι μύλην. ἐτὶ δὲ καὶ συγκαταγηράσκει
καὶ συναποθήσκει τοῦτῳ τὸ πάθος. τὰ δὲ θύραζε
35 ἔξιόντα τῶν τοιούτων γίνεται σκληρὰ οὔτως ὑστε
μόλις διακόπτεσθαι καὶ σιδήρῳ. περὶ μὲν ὁν τῆς
τοῦ πάθους αὐτίας εἴρηται ἐν τοῖς προβλήμασιν
πάσχει γὰρ ταυτῶν τὸ κύμα ἐν τῇ μήτρα ὁπερ ἐν
τοῖς ἐφομένοις τὰ μωλυόμενα, καὶ οὐ διὰ θερ-
μότητα, ὥσπερ τινὲς φασιν, ἀλλὰ μᾶλλον δι' ἀσθένειαν
θερμότητος (ἐοικε γὰρ ἡ φύσις ἀδυ-

1 ἦ PZ; om. vulg. 2 μολ. codd.

— The uterine hydatiform mole, deciduoma, etc., are
tumours of the uterine wall; they occur spontaneously and
can be produced experimentally by mechanical stimulus,
given the right glandular conditions.
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physical condition when the fetations are becoming sizable is that the growth of the fetation needs more nourishment than that afforded by the residue. There are some few women who are in better physical condition during pregnancy. This occurs with those whose bodies contain but small amounts of residue, and as a result this is completely used up together with the nourishment that goes to the embryo.

We now have to treat of the *mola uteri,* as it is called. This occurs in women occasionally only, but it does occur in some during pregnancy. They bring forth a "mola." It has been known to happen, in the case of a woman who has had intercourse and thinks she has conceived, that her figure has increased to begin with, and all the rest has proceeded as expected, but when the time for her delivery was at hand, she has neither brought anything to birth nor yet has the size of her girth decreased; instead, she has continued in that condition for three or four years, till she was seized with dysentery which brought her to a dangerous pass, and then she has produced a fleshy mass, known as a "mola." Sometimes, also, this condition lasts on into old age and persists until death. In such instances the objects which make their way out of the body are so hard that it is difficult to cut them in two even by means of an iron edge. Well, I have spoken in the *Problems* of the cause of this occurrence; the case of the fetation in the womb is exactly the same as that of meat, when it is undercooked; and it is due not to heat, as some people allege, but rather to weakness of heat (because it looks as though Nature in these cases suffers from

\* This reference cannot be found.

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vatein kai ou dynasthai telieinou ovd' epitheina
5 t'he genesei peras: dio kai sygkatafraghskei he
polin emenei chronon: oute yap ws tetelesmemenou
ou'the ws pampan allotrimon exe t'hein fusin): t'he
yap sklepertotos h' apefia aitia: apefia yap tas
kai h' molunis2 estin.

'Aporian de' exe, dia ti pot' en tois allois oudi
10 ginetai zwois, ei mh ti pampan lelthen. aitioin de
dei nomizein oti mônon ústerikon esti gynhe twn
alloi zwoin, kai peri tas kathareis pleonazei
kai ou dynatai pettein autas: otan ouv eke dvou-
péttou ikmados synthi to kúmsa, tote ginetai h
caloumeni múly en tai gynaiexin eulóyous h' málsta
h' múnais:

VIII 15. To de galsa ginetai tois òthesin osa zwothokei
en autois xhrismou mev eis ton chronon ton tov
tókou, tis yar trosphs kárwn autó tis thuraize
epoísean h' fusis tois zwois, óst' ou't' elleiptein
autò en to chronon toutw outhèn ouv't' uperballean
outhèn: oper kai fainetai symppítton, an mh ti
20 genvetai para fusin. tois mev ouv alloi zwois,
dia to ton chronon ena tis kynèseis einai, pro's
touton apainta tov kairon h' pèfis autòv: tois de'
anthropous epei pleious oi chronoi, kata tov prwtwn
anagkaion upárchein: dio pro touton éppata mhnwn
akhiriston to galsa tais gynaiexi, tote de' 'h'ge ginetai

1 teteleseménou P: tetelevoménon vulg.
2 mol. codd.

a xhrismou mev, because although it serves a purpose, it
is also (ll. 25 ff.) due to necessity in the sense that its forma-
tion follows inevitably from the circumstances, as Aristotle
explains.
b See 772 b 5 ff. and II.A. 584 a 33.

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some inability, and is unable to complete her work and to bring the process of formation to its consum- 
mation; that is why the mola lasts on into old age or at any rate for a considerable time, for in its nature it is neither a finished product nor yet something wholly alien); since the cause of its hardness is the lack of concoction, just as underdone meat is another instance of lack of concoction.

But there is a puzzle here. Why is it that this phenomenon does not occur in the other animals? (unless of course it does, but has entirely escaped observation). We must take the reason to be that alone of all animals women are liable to uterine affec-
tions; they produce an excess of menstrual evacua-
tions and cannot concoct them; and so, when the 
fetation has been "set," formed out of a liquid which is difficult to concoct, then what is called the mola is produced; and thus it is not surprising that this takes place chiefly in women if not exclusively in them.

Milk is produced towards the time of parturition VIII in those female animals which are internally vivipar-
ous, and it is (1) of a useful and serviceable quality, for Nature has provided animals with it so that they may nourish their young externally, and she has so arranged that it is neither deficient nor excessive in any way at that time; this we actually observe to obtain unless some accident contrary to nature occurs. In the case of the other animals, as there is but a single period of gestation, the concoction of the milk coincides with that; in man, however, as there are more periods than one, the milk must of neces-
sity be available at the earliest of the possible dates; hence in women the milk, which is useless until seven months are up, at that point becomes useful and
25 χρήσιμον. ευλόγως δὲ συμβαίνει καὶ διὰ τὴν ἐξ ἀνάγκης αἰτίαν πεπεμμένον εἰς τοὺς τελευταίους χρόνους· τὸ μὲν γάρ πρῶτον ἢ τοῦ τοιούτου περιττώματος ἀπόκρισις εἰς τὴν τῶν ἐμβρύων ἀναλίσκεται γένεσιν· πάντων δὲ ἡ τροφή τὸ γλυκύτατον καὶ πεπεμμένον, ὅστ' ἀφαιρομένης τῆς τοιαύτης δυνάμεως ἀνάγκη τὸ λουτόν ἀλμυρὸν γίνεσθαι καὶ δύσχυμον. τελευμένων δὲ τῶν κυημάτων πλέον τὸ περίττωμα τὸ περιγυμνέμον (ἐλαττὸν γάρ τὸ ἀναλισκόμενον) καὶ γλυκύτερον, οὐκ ἀφαιρομένου ὁμοίως τοῦ εὐπέπτου. ἂν γὰρ ἐπὶ εἰς πλάσιν τοῦ ἐμβρύου γίγνεται ἡ δαπάνη, ἀλλ' 35 εἰς μικράν αὐξήσεως, ὡσπερ ἐστηκός ἦδη διὰ τὸ τέλος ἔχειν τὸ ἐμβρύον· ἔστι γὰρ τοὺς κυημάτως τελείωσι. διόπερ ἐξέρχεται καὶ μεταβάλλει τὴν γένεσιν, ὡς ἔχον τὰ αὐτοῦ καὶ οὐκέτι λαμβάνει τὸ μὴ αὐτοῦ, ἐν ὧν καιρῷ γίνεται τὸ γάλα χρήσιμον.

Εἰς δὲ τὸν ἀνω τόπον καὶ τοὺς μαστοὺς συλλέγεται διὰ τὴν ἐξ ἀρχῆς τάξιν τῆς συντάσσεως. τὸ μὲν γάρ ἀνω τοῦ ὑποζώματος τὸ κύριον τοῦ ζώου εἴστι, τὸ δὲ κάτω τόπος τῆς τροφῆς καὶ τοῦ περιττώματος, ὅπως ὁσα πορευτικὰ τῶν ζώων ἐν

1 sic interpunxit Bussemaker.
2 pro oú γὰρ ἐπὶ . . . χρήσιμον 776 b 3 habet Σ quoniam non indigetur ea. non ergo accipitur in illo tempore quod accipiebatur ante ex lacte. vide 777 a 22-27.
3 τῆς ἱωθῆς coni. Btf.
4 τόπος P: om. vulg.

a Cf. P. A. 676 a 35.
b Aristotle here notes correctly that growth proceeds long after differentiation has ceased.
c i.e., as well as a creature which has reached an indepen-
serviceable. But the fact that it is fully concocted at the final stages is due also (2) to another cause—the necessary cause, which is what we should expect, for, to begin with, the secretion of this particular residue is used up for the formation of the embryos; and in every animal the nourishment is the sweetest ingredient they possess and the most concocted, so that when this sweet substance is drawn off, what remains is bound to be briny and ill-savoured. When, however, the fetations are approaching their completion, then there is more surplus residue, because less of it is being used up, and it is sweeter, since the well-concocted residue is no longer being drawn off to the same extent: it is no longer being expended upon the moulding of the embryo, but upon the small growth which it is making, as though the embryo had by now, being completed, reached a stationary point (since a fetation, too, has its point of completion). That is why it makes its way out, and changes over to another process of formation as now possessing all that belongs to it, and it no longer takes what does not belong to it; and that is the time when the milk becomes serviceable.

The milk collects in the upper part of the body, in the breasts, and this is accounted for by the original order of the body's construction. The part of the body above the diaphragm is the controlling part of the animal. (The part below is the place for the nourishment and the residue, in order that those animals which move about may have within them a dent state of existence; and even the wind has its γένεσις and φθιός (778 a 2), where see note; and also cf. 737 b 9.

* This remark is obscure, and the sentence may be an interpolation. See the parallel passage, 777 a 22 ff.
αὐτοῖς ἔχοντα τὴν τῆς τροφῆς αὐτάρκειαν μεταβάλλη τοὺς τόπους. ἐντεῦθεν δὲ καὶ ἡ σπερματική
10 περίττωσις ἀποκρίνεται διὰ τὴν εἰρημένην αὐτίκαν ἐν τοῖς κατ’ ἄρχας λόγοις. ἔστι δὲ τὸ τε τῶν ἀρρένων περίττωμα καὶ τὰ καταμήνια τοὺς θῆλευς αἰματικῆς φύσεως. τούτου δ’ ἄρχη καὶ τῶν φλεβῶν ἡ καρδία· αὕτη δ’ ἐν τοῖς μορίοις τοῦτοισ. διὸ πρῶτον ἐνταῦθα ἀναγκαῖον γίγνεσθαι τὴν
15 μεταβολὴν ἐπιδηλον τῆς τοιαύτης περίττωσεως. διόπερ σι’ τε φωναὶ μεταβάλλουσι καὶ τῶν ἀρρένων καὶ τῶν θηλεῶν, ὅταν ἀρχονται σπέρμα φέρειν (ἡ γὰρ ἄρχη τῆς φωνῆς ἐντεῦθεν· ἄλλοια δὲ γίνεται ἄλλοιον γνωμένου τοῦ κινοῦντος), καὶ τὰ περὶ τοὺς μαστοὺς αἴρεται καὶ τοῖς ἀρρεσι ἐπιδήλωσι, μάλλον
20 δὲ τοῖς θῆλευσι· διὰ γὰρ τὸ κάτω τῆν ἐκκρεμόν γίγνεσθαι πολλῆν κενὸς ὁ τόπος γίνεται ὁ τῶν μαστῶν αὐταῖς καὶ σομφός. ὅμως δὲ καὶ τοῖς κάτω τοὺς μαστοὺς ἔχουσιν. γίνεται μὲν οὖν ἐπιδήλος καὶ ἡ φωνὴ καὶ τὰ περὶ τοὺς μαστοὺς καὶ ἐν τοῖς ἄλλοις ξώοις τοῖς ἐμπείροις περὶ ἑκαστὸν
25 γένος, ἐπὶ δὲ τῶν ἀνθρώπων διαφέρει πλείστον. αὕτων δὲ τὸ πλείστην εἶναι τὴν περίττωσιν τοῖς θῆλεσι τούτοις τῶν θηλεῶν καὶ τοῖς ἀρρεσι τῶν ἀρρένων ὡς κατὰ μέγεθος [ταῖς μὲν τὴν τῶν καταμηνίων, τοῖς δὲ τὴν τού σπέρματος πρόεσσαν]. ὅταν
1 οὖν μὴ λαμβάνῃ μὲν τὸ ἐμβρυον τῇ τοιαύτῃ
glossema: om. Σ.

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1 See 738 b 12 ff., 747 a 20.  
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GENERATION OF ANIMALS, IV. viii.

sufficient independent supply of nourishment and be able to go about from place to place.) It is from here, too, that the seminal residue is drawn: the reason is given in the earlier chapters of our discussion. Both the residue in males and the menstrual fluid in females are of a bloodlike nature; now the source of the blood and of the blood-vessels is the heart, which is situated in these parts; therefore of necessity it is here that the change which this sort of residue undergoes must be first of all apparent. For this reason the voice of both male and female undergoes a change when they begin to produce semen, because the source of the voice is there, and the voice changes its quality when that which provides its movement does so; and further, the parts around the breasts rise up plainly in males as well as in females, though more so in the latter, since, as there is a plentiful excretion of matter downwards in females, the region of the breasts becomes empty and spongy; and similarly in the case of those animals whose breasts are down below. Of course, this change in the voice and in the region of the breasts makes itself evident in the other animals as well—to those who have experience of each particular kind; but the change is greatest in human beings. The reason is that women produce more residue than any other female animal, and so do men than other male animals, in proportion to their size [this refers to the excretion of menstrual fluid and of semen respectively]. Thus, when the embryo no longer absorbs

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\* The heart, which is the *ἀρχή* of the organism, is also in particular the source of all physical sexual characteristics; see 766 a 30 ff., and note on 763 b 27. Cf. 787 b 15 et preced. See also App. B § 31.
30 ἀπόκρισιν, κωλῷ ἰὰ πρὲς βαδίζειν, ἀναγκαῖον εἰς τοὺς κενοὺς τόπους ἀθροίζεσθαι τὸ περίττωμα πάν, ὡσιτερ ἄν ὅσιν ἐπὶ τῶν αὐτῶν πόρων. Ἐστι δὲ ἐκάστοις τοιούτοις ὁ τῶν μάστων τόπος δι᾽ ἀμφοτέρας τὰς αὐτίας ἐνεκα τε τοῦ βελτίστου γεγονός τοιούτος καὶ εἰς ἀνάγκης ἐνταῦθα δὲ ἡδὴ συνύσταται καὶ γίνεται πεπεμμένη τροφή τοῖς ἔξωσι. τῆς δὲ πέψεως ἔστι μὲν λαβεῖν τὴν εἰρημένην αὐτίαν, ἔστι δὲ τὴν ἐναντίαν εὔλογον γὰρ καὶ μεῖξον ὅν τὸ ἐμβρυον πλεῖον λαμβάνειν τροφήν, ὥστε ἐλαττόν περιγίνεσθαι περὶ τῶν χρόνων τούτων πέπτεται δὲ ἡδὸν τὸ ἐλαττόν.

"Ὅτι μὲν οὖν ἔστι τὸ γάλα τὴν αὐτὴν ἔχον φύσιν 5 τῇ ἀποκρίσει εἰς ἧς γίνεται ἐκαστόν, δήλου, εἴρηται δὲ καὶ πρῶτον. ἡ γὰρ αὐτὴ ὑλὴ ἡ τρέφουσα καὶ εἰς ἧς συνιστά τὴν γένεσιν ἡ φύσις. ἔστι δὲ τούτῳ ἡ αἰματικὴ ύγρότης τοῖς ἐναίμοις· τὸ γὰρ γάλα πεπεμμένον αἰμά ἐστιν, ἀλλ’ οὐ διεφθαρμένον. Ἐμπεδοκλῆς δ’ ἡ οὐκ ὀρθῶς ὑπελάμβανεν ἡ οὐκ 10 εὖ μετήνυγκε ποιήσας ὡς τὸ γάλα ἡμὸς ἐν ὀγδοάτῳ δεκάτῃ πύον ἐπιλετο λευκὸν.

σαπρότης γὰρ καὶ πέψις ἐναντίων, τὸ δὲ πῦον σαπρότης τις ἐστὶν, τὸ δὲ γάλα τῶν πεπεμμένων. οὐ γίνονται δὲ οὔτε θηλαξομέναις αἰ καθάρσεις

1 τούτοις τὸ Ζ: τοῦτο τὸ A.-W.

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a Cf. Hippocrates, π. φύσιος παῦδον 21 (vii. 512 Littré) καὶ ἐς τὰς μήτρας δὲ ὅλῃν ἔρχεται διὰ τῶν αὐτῶν φλεβῶν τεῖνοντο γὰρ ἐς τῶν μαζών καὶ ἐς τὰς μήτρας φλεβία ταῦτα τε καὶ παραπλήσια ἄλλα.

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this residual secretion but at the same time prevents it from making its way out, the whole of the residue is bound to collect in the empty spaces which are situated on the same passages.\(^a\) In each kind of animal the place around the breasts is just such an empty space, and it is so for both of the two possible reasons: it was formed such as it is (\(a\)) for the sake of the best, and (\(b\)) by necessity. And it is precisely here that the concocted nourishment for the young animals takes shape and is formed. As for its concoction: to explain that, either the reason stated \(^b\) may be taken, or the opposite one, since it is just as reasonable to adopt the view that as the embryo is bigger it takes more nourishment, so that there is less nourishment left over at this particular time; and a smaller amount takes less time to concoct.

It is clear that milk is possessed of the same nature as the secretion out of which each animal is formed (this has in fact been stated already) \(^c\): the material which supplies nourishment and the material out of which Nature forms and fashions the animal are one and the same.\(^d\) And this material, in the case of blooded animals, is the bloodlike liquid, since milk is concocted, not decomposed, blood. As for Empedocles, either he was mistaken, or else his metaphor was a bad one, when he wrote \(^e\) how the milk is formed.

On the eighth moon's tenth day, a whitish pus.

No; putrefaction and concoction are opposites, and pus is a putrefaction, whereas milk is to be classed as something concocted. In the natural course of

\(^a\) Cf. 744 b 35.
\(^b\) Cf. 744 b 35.
\(^c\) Diels, Vorsokr. 51 B 68.
\(^d\) i.e., that the embryo requires less nourishment.
\(^e\) At 739 b 26.
κατὰ φύσιν, οὔτε συναμβάνοντι θηλαζόμεναι· καὶ
15 συνάβασιν, ἀποσβέννυται τὸ γάλα διὰ τὸ τῆς
αὐτῆς εἶναι φύσιν τοῦ γάλακτος καὶ τῶν κατα-
μηνίων· ἢ δὲ φύσις οعظ δύναται πολυχοεῖν οὕτως
ὡς ἐπαμφοτερίζειν, ἀλλ᾽ ἂν ἐπὶ θάτερα γένηται
η ἀπόκρυσις, ἀναγκαῖον ἐπὶ θάτερα ἐκλείπειν, ἐὰν
μὴ γίνηται ἵνα παρὰ τὸ ὡς ἐπὶ τὸ πολύ.
20 τούτῳ δ᾽ ἵδη παρὰ φύσιν· ἐν γάρ τοῖς μὴ ἀδυνάτοις
ἀλλως ἔχειν ἀλλ᾽ ἐνδιχομένους τὸ κατὰ φύσιν ἐστὶ
tὸ ὡς ἐπὶ τὸ πολὺ.

Kalwos de diwrista tois χρόνois kai h geinisi
h toin zowin· otan gar dia to megechos mheketi
iakati h to koumenei h dia to oμfalou τροφῆ,
amina to galα ginetai xrhismon [pros tin ginomenein
25 trophyn], kai ouk eiosouhsi dia to oμfalou τρο-
phihs, suμπιπτουσιν ai flebes peri asi o kaloumenos
oμfalos esti xutwv, kai dia tauta kai totte
suμbaivnei thuraize h exodos.

IX Ἔπι κεφαλῆν δ᾽ ἡ γένεσις ἐστὶ τοῖς ζ̄ωις πᾶσιν
ἡ κατὰ φύσιν διὰ τὸ τὰ ἁνὸς τοῦ ὀμφαλοῦ μείζω
30 ἐχειν ἢ τὰ κάτω· καθάπερ οὖν ἐν ζυγοῖς ἡρτημένα6
ἐξ αὐτοῦ βρέπει ἐπὶ τὸ βάρος. ἔχει δὲ τὰ μείζω
πλεῖον βάρος.

X Οἱ δὲ χρόνοι τῆς κυνήσεως ἐκάστῳ τῶν ζ̄ωιν
ὀρισμένοι τυγχάνουσιν ὡς μὲν ἐπὶ τὸ πολὺ κατὰ
toús βίους· τῶν γὰρ χρονιωτέρων6 καὶ τὰς γεγένεσις
35 εὔλογον εἶναι χρονιωτέρας. οὐ μὴν τούτο γ᾽ ἐστὶν

1 τι Peck. 2 áμα Platt: ἄλλα vulg., seel. A.-W.
3 seclusi; om. Σ: πρὸς τὴν τοῦ γενομένου τροφῆν coni. A.-W.
4 áλλα . . . γίγνηται (Z2*) . . . γενησομένην . . . συμπιπτουσι
coni. Btf. (cum vv. 22-27 conferas 776 a 33 seqq.)
5 εἰσεισι διὰ τοῦ ὀμφαλοῦ ἡ τροφῆ P.

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events, no menstrual evacuations take place during the suckling period, nor do women conceive then; and if they do conceive, the milk dries up, because the nature of the milk is the same as that of the menstrual fluid, and Nature cannot produce a plentiful enough supply to provide both; so that if the secretion takes place in one direction it must fail in the other, unless some violence is done contrary to what is normal. And that ipso facto means something contrary to Nature, because in the case of things which admit and do not exclude the possibility of being other than they are, "normal" and "natural" are identical.

In the actual birth of the young animals we have another instance of good timing. When the nourishment that passes through the umbilical cord is no longer sufficient for the fetus, owing to its size; at that same time the milk is becoming serviceable, and when no nourishment is entering by way of the umbilical cord, then the blood-vessels to which the cord acts as a sheath collapse; and for these reasons and at that time the exit of the fetus takes place.

The natural manner of birth for all animals is head IX first, because they have a larger bulk above the umbilical cord than below it, so that they are suspended from it, as it might be in a balance, and the heavier side (i.e., the larger parts) goes down.

The period of gestation is of a definite length for each of the animals, and normally the periods are proportionate to the animals' span of life; after all, we should expect those which have a longer life-span to take longer over their formation than others.

5 hic in Z spatium xi vel xii litterarum.
6 χρονιωτέρον P: χρονίων vulg.
aítion, ἀλλ' ὡς ἐπὶ τὸ πολὺ τοῦτο σωμβεβηκεν· τὰ
gάρ μείζω καὶ τελειότερα τῶν ἐννέαμων ζώων καὶ
ζώσι πολὺν χρόνον, οὐ μέντοι τὰ μείζω πάντα
μακροβιώτερα. πάντων γὰρ ἄνθρωπος πλείστον ἁὴ
χρόνον, πλὴν ἑλέφαντος, ὥσων ἀξιόπιστον ἔχομεν
5 τὴν πείραν· ἔλαττον δ' ἐστὶ τὸ γένος τὸ τῶν
ἄνθρωπων ἢ τὸ τῶν λοφούρων καὶ πολλῶν ἄλλων.
aítion δὲ τοῦ μὲν εἶναι μακρόβιον ότιον ζώων τὸ
κεκράσθαι παραπλησίως πρὸς τὸν περιέχοντα ἀέρα,
kai δ' ἄλλα συμπτώματ' ἄττα φυσικά, περὶ δὲν
ὑστερον ἐροῦμεν, τῶν δὲ χρόνων τῶν περὶ τὴν
10 κύησιν τὸ μέγεθος τῶν γεννωμένων· οὐ γὰρ ῥά-
dινον ἐν ὁλίγῳ χρόνῳ λαμβάνειν τὴν τελείωσιν τάς
μεγάλας συντάσεις οὔτε ζώων οὔτε τῶν ἄλλων ὡς
ἐπειδ' οὐθείνως. διόπερ ἵπποι καὶ τὰ συγγενῆ ζώα
tούτων ἔλαττω ζώντα χρόνον κὺς πλεῖοι χρόνον·
tῶν μὲν γὰρ ἐναύσιος ὁ τόκος, τῶν δὲ δεκάμηνος
15 ὁ πλείστος. διὰ τὴν αὐτήν δ' αὐτίαν πολυχρόνως
καὶ ὁ τῶν ἑλέφαντων ἐστὶ τόκος· διετής γὰρ ἡ
κύησις διὰ τὴν ύπερβολὴν τοῦ μεγέθους.
Εὐλόγως δὲ πάντων οἱ χρόνοι καὶ τῶν κυήσεων
cαὶ2 γενέσεων καὶ τῶν βίων μετρεῖσθαι βού-
lονται κατὰ φύσιν περιόδους.3 λέγοι δὲ περίοδον

1 πλείστον P: πλεῖώ vulg.  2 καὶ ΡΖ*: καὶ τῶν vulg.  3 δίλαις add. P.

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a This was apparently a popular term meaning “bushy-tailed”; see H.A. 491 a 1 where “the lophouroi as they are called” are the horse, the ass, the mule, etc. Cf. 755 b 19.
b Cf. 767 a 30 ff., and Hippocrates, π. ἀέρων υδάτων τόπων, chh. 1-6; and for “blend,” idem, π. διαίτης I. 32, and Introd. § 40. Cf. 777 b 28, n.
c See De long. et brev. vit. 466 a 15 ff., P.A. 677 a 35 ff.
Still, this is not the reason for it; only, this is what in fact normally occurs. The larger and more perfect of the blooded animals do certainly live a long time, but not all the larger ones are also longer-lived. Man is the longest-lived of them all except the elephant, so far as we have any reliable experience; but human beings are smaller than the lophouroi and many others. The reason why any animal is long-lived really is that its "blend" is about the same in comparison with the air which is around it, and there are other contributory factors inherent in its nature, which will be mentioned later on. The reason for the various times of gestation is the size of the creatures which are generated. It is not easy for any large structure, be it an animal or anything else, almost, to reach its perfection in a short time. Hence horses and kindred animals, though they live a shorter time than men, have a longer time of gestation: in horses birth occurs at the end of a year, in the others, generally, after ten months. And for the same reason it takes a long time in elephants, whose gestation lasts two years owing to their excessive size.

In all cases, as we should expect, the times of gestation and formation and of lifespan aim, according to nature, at being measured by "periods." By a "period" I mean day and night and month and

The following important paragraph is not fully intelligible without reference to Aristotle’s theory of the universe and of movement. A collection of passages from other treatises relevant to this will be found in App. A and App. B § 11, which will provide the best commentary on the present passage.

But Nature cannot always succeed in her aim: see 778 a 5 below.
The meaning of συμβάλλει is obscure. The word occurs twice in Meteor., once (345 b 6) in an astronomical context, and once (376 b 24) in connexion with the rainbow, but neither passage helps to elucidate the present statement. It must, however, have some reference to the fact that the month is a "joint period" of moon and sun (see note below), so the rendering I have given may be offered as at any rate not inappropriate. The importance here attached to the "bisections" of the times is found again in Theophr. De signis 6, where it is said that times and seasons (e.g., the year, the month, the day) are delimited by their bisections (αι διχοτομίαι διορίζοναι τὰς ἡμέρας), the bisections of the month being the full moons, the eighth days and the fourth days (τὸν μήνα ἕκαστον . . . διχοτομοῦσι . . . αἱ τε πανσέληνοι καὶ αἱ ἑγάδαι καὶ αἱ τετράδες, § 8); and changes of weather tend to coincide with these divisions (§ 9).

* Periodos is really a circuit or cycle.

** This phrase, which he translates "the month being a period common to both," is excised by Platt on the ground that it gives no sense, and that "a period common to both sun and moon would be one which contained both the solar and lunar periods exactly." The phrase is, however, in Scot; and, as it can be satisfactorily explained in view of the context, it must be retained. The explanation is this: the month, taken in the sense of a lunation, i.e., the period from one new moon to another, or the time required by the
year and the times which are measured by these; also the moon's "periods" which are: full moon and waning moon, and the bisections of the intervening times,\(^a\) since these are the points at which it stands in a definite "aspect" with the sun, the month being a joint period \(^b\) of both moon and sun.\(^c\) The moon is a "principle" on account of its association with the sun and its participation in the sun's light, being as it were a second and lesser sun,\(^d\) and therefore is a contributory factor in all processes of moon to go through all its phases once, is, literally and properly speaking, not a private period of the moon's, but, as Aristotle says, a joint period of the moon and sun, since it is the moon's position relative to the sun which determines how much of the moon's disk is illuminated. If the moon were self-luminous, there would be no phases, and therefore there could be no "phase-period." This is made even more clear if we consider that the moon does in fact possess a "period" proper to itself, pertaining to the moon's own actual motion, and not to the mere illumination of its surface by another body, and it is a period which differs in length from the lunation or "phase-period"—a fact which was probably better known to Aristotle than to some moderns. This is the period known in astronomy as the "sidereal period," i.e., the time taken by the moon to return again to its same apparent position among the stars—not to return into conjunction with the sun. The duration of this period is roughly 27 days 8 hours, as against an average of 29 days 13 hours for the "phase-period." Aristotle is therefore quite correct in stating that the "month," by which, as the context clearly shows, he means the "phase-period," is a joint period of the sun and the moon. (I should, perhaps, apologize to astronomers for the un-astronomical term "phase-period," which I have used instead of "synodic period" in order to emphasize the point that phases are an incidental phenomenon, and not an essential concomitant of a synodic period.)

\(^a\) This statement reappears in Theophr. De vent. 17 \(\gamma\) ε\(\epsilon\) ἄνη... οὐν ἀσθενής ἦλθος ἐστι, and cf. id. De signis temp. 5, where the moon is described as "the sun of the night."
ARISTOTLE

777 b

'ai γάρ θερμότηται καὶ ψύξεις μέχρι συμμετρίας τών ποιοῦσι τάς γενέσεις, μετά δὲ ταύτα τάς

30 φθοράς· τούτων δ' ἔχουσι τό πέρας καὶ τῆς ἀρχῆς καὶ τῆς τελευτῆς αἳ τούτων κινήσεις τῶν ἀστρων. ὥσπερ γάρ καὶ θάλατταν καὶ πᾶσαν ὅρμον τήν τῶν ὑγρῶν φύσιν ἱσταμένην καὶ μεταβάλλουσαν κατὰ τήν τῶν πνευμάτων κίνησιν καὶ στάσιν, τόν δ' ἄερα καὶ τά πνεύματα κατὰ τήν τοῦ ἕλιου καὶ

35 τῆς σελήνης περίοδον, οὔτω καὶ τά ἐκ τούτων φύσεως καὶ τά ἐν τούτως ἀκολουθεῖν ἀναγκαίον· κατὰ λόγον γάρ ἀκολουθεῖν καὶ τάς τῶν ἀκυροτέρων περίοδους ταῖς τῶν κυριωτέρων. βίος γάρ τις καὶ πνεύματος ἐστὶ καὶ γένεσις καὶ φύσις τῆς δὲ τῶν ἀστρων τούτων περιφορᾶς τάχ' ἀν

5 ἐτεραί τινες ἕνας ἀρχαί. βούλεται μὲν οὖν ἡ φύσις τοις τούτων ἀριθμοῖς ἀριθμείν τάς γενέσεις καὶ τάς τελευτάς, οὐκ ἀκριβοὶ δὲ διὰ τε τήν τῆς ὕλης

1 aι P: καὶ vulg. 2 ταύτας S.

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a Cf. Phys. 246 b 4 τάς μὲν γάρ τοῦ σώματος, οὖν ὑγείαιν καὶ εὐεξίαν, ἐν κράσει καὶ συμμετρία θερμῶν καὶ ψυχρῶν τίθεμεν ἡ αὐτῶν πρὸς αὐτὰ τῶν ἑντός ἡ πρὸς τὸ περιέχον (cf. 777 b 7, and 767 a 30 ff.) ὀμοίως δὲ . . . καὶ τάς ἄλλας ἀρετὰς καὶ κακίας. The language used in the context of this passage is very similar to that of Eth. Nic. Bk. II (dealing with the doctrine of "the mean"), where it is stated that the moral ἀρεταῖ also are produced and preserved by τά σύμμετρα (1104 a 18), whereas they are destroyed by excess and defect, just as the corresponding physical ἀρεταῖ are.

b Cf. Meteor. 339 a 21 ἐστι δ' ἐξ ἀνάγκης συνεχῆς πως οὕτως [i.e., δ' περὶ τήν γήν κόσμος, the sublunar world] ταῖς ἀνω φοραῖς, ὥστε πᾶσαν αὐτοῦ τήν δύναμιν κυβερνᾶσθαι ἐκεῖθεν . . . ὥστε τῶν συμβαινόντων περὶ αὐτῶν πῦρ μὲν καὶ γῆν καὶ τά συγγενῆ τούτως όσ' ἐν ὕλῃ εἴει τῶν γνωμονέον αἵτ' ἄρχη νομίζειν . . . τό δ' οὕτως αἵτιν τοντ' ἐδεν ἡ τῆς κινήσεως ἀρχή τῆς τῶν αἵκινουμένων αἵτιστέον δύναμιν.
GENERATION OF ANIMALS, IV. x.

generation and perfecting. As we know, it is heat and cooling in their various manifestations which up to a certain due proportion\(^a\) bring about the generation of things, and beyond that point their dissolution; and the limits of these processes, both as regards their beginning and their end, are controlled by the movements of these heavenly bodies.\(^b\)

Just as we observe that the sea and whatever is of a fluid nature remains settled or is on the move according as the winds are at rest or in motion, while the behaviour of the air and the winds in turn depends upon the period of the sun and moon,\(^c\) so too the things which grow out of them and are in them are bound to follow suit (as it is only reasonable that the periods of things of inferior standing should follow those which belong to things of higher standing) since even the wind has a sort of lifespan\(^d\)—a generation and a decline. And as for the revolution of these heavenly bodies, there may very well be other principles which lie behind them.\(^e\) Nature’s aim, then, is to measure the generations and endings of things by the measures of these bodies, but she

\(^c\) Cf. 738 a 20: the times about new moon (αἱ τῶν μηνῶν σύνοδοι) are cold because of the failing of the moon, and for the same reason they are stormier than the middle points of the month; a precisely similar statement, using exactly the same terminology that Aristotle uses, is found twice in Theophr. De ventis 17 and De signis 5: in the latter passage the cause given is that the moon’s light “fails” (ἀπολείπει) from the fourth day of the waning moon until the fourth day of the new moon, and this apparently is the time covered by αἱ σύνοδοι τῶν μηνῶν. The way in which the sun determines the weather is discussed at Meteor. 359 b 26 ff.

\(^d\) Cf. above, 776 b 1, and Plato, Timaeus 91 b, c, where the course of a disease is compared with the lifespan of a living organism.

\(^e\) See, e.g., De caelo I, II.
ἀοριστίαν καὶ διὰ τὸ γίνεσθαι πολλὰς ἀρχὰς, αἱ
tὰς γενέσεις τὰς κατὰ φύσιν καὶ τὰς φθορὰς ἐμπο-
dίζουσαι πολλάκις αὕτην τῶν παρὰ φύσιν συμ-
pιπτόντων εἰσίν.

10 Περὶ μὲν οὖν τῆς ἐσωθεν τροφῆς τῶν ζώων καὶ
tῆς θύραζε γενέσεως εἰρηταὶ, καὶ χωρίς περὶ
ἐκάστου καὶ κοινῆ περὶ πάντων.¹

¹ περὶ δὲ (τε Υ) τῶν διαφορῶν αὕτ (ἂς Ζ, αἲ Υ) διαφέρουσι τὰ
μόρια τῶν ζώων, καὶ μάλιστα τὸ τοιοῦτο (τοιοῦτον Π) συμβαίνειν
περὶ τοὺς ἀνθρώπους addunt PYZ: amplius ΥΖ ὁσα μὲν (μὲν
οὖν Ζ) ἔχουσι μόρια τὰ ζῶα πάντα καὶ τῶν ἐντὸς καὶ τῶν ἐκτὸς.
totum vertit Σ, et 778 a 10 initium facit libri incessentis.
cannot bring this about exactly on account of the indeterminateness of matter and the existence of a plurality of principles which impede the natural processes of generation and dissolution and so are often the causes of things occurring contrary to Nature.

Very well: we have now spoken of the nourishment of animals within the parent, and of their birth and exit into the outer world; and we have dealt with each kind separately as well as generally with them all. 

* Some MSS. have an addition here, for which see opposite.
Περὶ δὲ τῶν παθημάτων οἷς διαφέρουσι τὰ μόρια τῶν ζῴων θεωρητέων νῦν. λέγω δὲ τὰ τοιαῦτα παθῆματα τῶν μορίων, οἷον γλαυκότητα ὁμμάτων καὶ μελανίαν, καὶ φωνῆς δὲ ὅζυτητα καὶ 20 βαρύτητα, καὶ χρώματος [ἡ σώματος] καὶ τριχῶν ἡ πτερών διαφορᾶς.1 τυγχάνει δὲ τῶν τοιούτων ἐνια μὲν ὀλοις2 ὑπάρχοντα τοῖς γένεσιν, ἐνια3 δ’ ὅπως ἔτυχεν, οἷον μάλιστ’ ἐπὶ τῶν ἀνθρώπων τούτο συμβεβήκεν. ἑτὶ δὲ κατὰ τὰς τῶν ἥλικιῶν4 μεταβολὰς τὰ μὲν πάσιν ὁμοίως ὑπάρχει τοῖς 25 ζῴοις, τὰ δ’ ὑπεναντίως, ὡσπερ περὶ τε φωνᾶς καὶ περὶ τριχῶν χρώαν· τὰ μὲν γὰρ οὗ πολυούται πρὸς τὸ γῆρας ἑπιδήλως, δ’ δ’ ἀνθρώπως μάλιστα τούτο πάσχει τῶν ἀλλών ζῴων. καὶ τὰ μὲν εὖθυς ἀκολουθεῖ γενομένους, τὰ δὲ προϊούσης τῆς ἥλικίας γίνεται δὴλα καὶ γηρασκόντων. περὶ δὲ5 τούτων 30 καὶ τῶν τοιούτων πάντων οὐκέτι τῶν αὐτῶν τρόπου δεῖ νομίζειν εἰναι τῆς αἰτίας. ὧσα γὰρ μὴ τῆς φύσεως [ἐργα]6 κοινῆ7 μηδ’ ἰδια τοῦ γένους ἐκάστον,

2 δλίγοις P. 3 ἐνια Peck (idem Richards): ἐνιας vulg. 
4 τῶν ἥλικιῶν PZ*: τῆς ἥλικίας vulg.: ἥλικίας SY. 
5 δὴ P. 6 om. Z; secl. Α.-W. 7 κοινά Btf.
BOOK V

We must now study the "conditions" in respect of which the parts of animals differ. I mean such conditions of the parts as the following: blue and dark colour of the eyes, high and deep pitch of the voice, and differences of colour and of hair or feathers. Some of these conditions are found throughout certain classes of animals; some occur irregularly, and a striking instance of this is afforded by the human species. Further, there are some conditions, accompanying the changes in the times of life, which occur in all animals alike, but there are others which are divergent in different animals, as, e.g., those which have to do with the voice and the colour of the hair: thus, some animals do not go noticeably grey towards old age, whereas man is affected by this condition more than any other animal. Again, some of these conditions come on immediately after birth, others make themselves noticed as age advances, or in old age. When we come to consider these conditions and all others like them, we must not suppose that the same sort of cause is operative as before, for there are certain conditions which are not characteristics belonging to Nature in general, nor peculiarities proper to this or that particular class of animal; and whatever the quality of such conditions may be, in

\[a\] See 787 b 1, n.
ARISTOTLE

778 a
toútvn outhèn éneká tou toioútov ou't' éstiv ou'te
γίνεται. ὃφθαλμος μὲν γὰρ ἐνεκά του, γλυκός
d' oux éneká tou, plēn ån idion ἢ του γένους toûto
to pàthos. ou'te d' èp' ènîwv prós tou lógon
35 sùnteînê tou tûs oûsías, all' òws ës ànângkhs
gynoméñon eîs tîn úlhn kai tîn kivήsasahan ārkhîn
ánaktéon tás aîtías. õsper γâr èlêxhîn kai
erchás èn toûs prôtois lógonos, ou diâ tò gînnveshîa
ékastou poiôn tî, diâ toûto poiôn tî èstîn, õsa
tetagmêna kai òrîsmêna èrnga tûs fûseôs èstin,
5 allâ màllon dià tò èînai toudî fînîvetai toudûta:
tû gâr oûsia ëi génesis àkoloutheî kai tûs oûsías
éneká èstiv, all' oux aûth tû èstên. òi d'
ârchaiôi fusiôlôgoi touvnahtîon ðêbhestan. toûtvn
d' aîtîon õti oux èwroîn pleîous oussas tás aîtías,
allâ mônîn tûn tûs ùlhes kai tûn tûs kivήsews,
10 kai taûtas âdîvòstas, tûs ðê tou lógon kai tûs
touv têlous ànepiskeîptos èîxov.
'Èstî mèn ouv ékastou èneká tou, fînîvai d' ëdhe

778 b

a i.e., serves no purpose, is not on account of any Final
Cause.—In view of the discoveries of modern genetics,
Aristotle’s clear-cut distinction may be somewhat misleading;
but it will always remain true that some characteristics are
more “trivial” than others. Whether the genes control
individual characters such as the possession of blue eyes
instead of brown, as well as specific characters such as the
possession of red feathers instead of black, and phyletic
characters such as the possession of a liver instead of a hepatopancreas—is still uncertain; but it is likely that they do.
b The logos defines the thing’s essence, see Introd. § 10;
and cf. below, 778 b 17 toîvûde xiouv ûpókeîtau õn, and the
context.
c i.e., the Material Cause and the Motive Cause. Cf.
Bk. II, init. and Introd. § 6.
d See P.A. I. 640 a 10 ff.
no instance is either its existence or its formation “for the sake of something.” Thus, the existence and the formation of an eye is “for the sake of something,” but its being blue is not—unless this condition is a peculiarity proper to the particular class of animal. And further, in some cases this condition has nothing to do with the logos of the animal’s being; instead of that, we are to assume that these things come to be by necessity, and so their causes must be referred back to the matter and to the source which initiated their movement. Remember what was said at the beginning, at the outset of our discussion. So far as the regular, definite products of Nature’s hand are concerned, whatever a thing may be as regards its quality, the reason why each thing is of such or such a quality is not because it gets formed such while it develops; the truth is that things get formed such because they are such, for of course the process of formation takes its lead from the being, and is for the sake of that; the being does not take its lead from the process. The old physiologers, however, thought the opposite, because they did not see that the causes were numerous; they recognized only the Material Cause and the Motive Cause (and even these they did not clearly distinguish), whereas they paid no attention to the Formal Cause and the Final Cause.

Each thing, then, is “for the sake of something,”

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1 àνία here is no doubt, in the first place, the individual existing thing which the process is destined to produce (see 736 b 27, n., and 767 b 34 ff.); but we may also remember the use of àνία with reference to the essential nature of a thing, as in the phase λόγος τῆς àνίας, I. 35 above.

3 i.e., on account of some Final Cause.


ARISTOTLE

778 b

dia τε τάυτην τῇν αὐτίναι καὶ διὰ τὰς λοιπὰς ὀσαπερ ἐν τῷ λόγῳ ἐνυπάρχει τῷ ἐκάστοιν ἢ ἐστιν ἐνεκά του ἢ οὐ ἐνεκα. τῶν δὲ μὴ τοιούτων, οὐσων ἐστὶ γένεσις, ἡδη τούτων το αὐτίνον ἐν τῇ κινήσει δεὶ 15 καὶ τῇ γενέσει ζητεῖν, ὡς ἐν αὐτῇ τῇ συστάσει τῆν διαφόραν λαμβανόντων. ὀφθαλμὸν μὲν γὰρ ἐξ ἀνάγκης ἐξεί (τοιόνδε γὰρ ξῶν υπόκειται οὐ), τοιόνδε δὲ ὀφθαλμὸν ἐξ ἀνάγκης μὲν, οὐ τοιαύτης δ' ἀνάγκης, ἀλλ' ἀλλον τρόπον, ὅτι τοιοῦτοι ἢ 20 τοιοῦτο ποιεῖν πέφυκε καὶ πάσχειν.

Διωρισμένων δὲ τούτων λέγωμεν περὶ τῶν ἐφεξῆς συμβανόντων. πρῶτον μὲν οὖν ὅταν γένωνται τὰ παιδία πάντων, μάλιστα τῶν ἀτελ(ἡ τικτόντ)ων,1 καθεύδειν εἰσθα, διὰ τὸ καὶ ἐν τῇ μητρί, ὅταν λάβη πρῶτον αἰσθησιν, καθεύδοντα διατελεῖν. ἔχει δ' ἀπορίαν περὶ τῆς ἐξ ἀρχῆς γενέσεως, πότερον ἐγρήγορσις υπάρχει τοῖς ξῶους 25 πρότερον ἢ ὑπνός. διὰ γὰρ τὸ φαίνεσθαι προϊόνσης τῆς ἡλικίας ἐγειρόμενα μᾶλλον, εὐλογον τοιναντίον ἐν τῇ ἀρχῇ τῆς γενέσεως υπάρχειν, τῶν ὑπνόν, ἕτε δὲ διὰ τὸ τὴν μετάβασιν ἐκ τοῦ μὴ εἶναι εἰς

1 corrupt. agnovit Platt: correxii (cf. 779 a 24): ἀτελῶν vulg.: et maxime filii qui pariuntur incompleti Σ.

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a i.e., the Final Cause.
b τοιόνδε here=ὅρατικον or ὀφθαλμὸν ἐχον; to use the terminology of a few lines above, τὸ ὅρατικὸν εἶναι ἐν τῷ λόγῳ ἐνυπάρχει τῷ τοῦ ξῆς.
c And since the animal υπόκειται to be e.g. ὅρατικον, the sort of necessity which requires it to be ὅρατικὸν is necessity ἐξ ὑποθέσεως (see Introd. § 7), the necessity which is implied by the Final Cause. For υπόκειται see also 766 b 8. 488
while as regards their process of formation, all those characteristics which are contained in its logos, or are subservient to some end, or are an end in themselves—these come to be formed on account of this Cause as well as the remaining Causes. Other characteristics, however, are formed during the process which do not fall under the headings just given, and the cause of them is to be looked for in the movement, i.e., the process of formation—we must assume that they acquire their differences within the actual process of construction. Thus (to take an example) X will of necessity possess an eye (because that characteristic is included in the essence of the animal as posited), and it will—also of necessity—possess a particular sort of eye, but the latter is a different mode of necessity from the former, and is derived from the fact that it is naturally constituted to act and to be acted upon in this or that way.

Having settled these points we may proceed to sleep. Those which immediately follow. First then: the habit of the young of all animals, especially those of animals which bring forth their young imperfect, once they have been born, is to sleep, because they are in fact continually asleep within the parent from the time that they first acquire sensation. There is, however, a puzzle concerning their original formation, which is this: which state exists first in animals, sleep or waking? From the fact that, as we see, they become more awake the older they get, it seems reasonable to suppose that the opposite state, sleep, is the one that exists at the beginning of their formation—and also from the fact that the transition from

\[ a \] i.e., the necessity implied by the Motive and Material Causes. See Introd. § 7.

ARISTOTLE

778 b
tο εἶναι διὰ τοῦ μεταξὺ γίνεσθαι· ὁ δὲ ύπνος εἶναι
30 δοκεῖ τὴν φύσιν τῶν τουούτων, ὡς τοῦ ᾿ζῃν καὶ
tοῦ μῆ ᾿ζῃν μεθόριον, καὶ οὕτε μῆ εἶναι παντελῶς
ὁ καθεύδων οὐτ' εἶναι. τῷ γὰρ ἐγρηγορέαν τὸ
ἵν μάλισθ’ ὑπάρχει διὰ τὴν αἴσθησιν. εἰ δ’ ἐστὶν
ἀναγκαῖον ἐχειν αἴσθησιν τὸ ᾿ζῳν, καὶ τότε πρῶτον
ἐστὶ ᾿ζῳν όταν αἴσθησις γενήται πρῶτον, τὴν μὲν
35 εξ ἀρχῆς διάθεσιν οὐκ ύπνον ἀλλ’ ὀμοιον ύπνω δεὶ
νομίζειν, οἰαντηρ ἐχεί καὶ τὸ τῶν φυτῶν γένος·
cαὶ γὰρ συμβεβήκε κατὰ τοῦτον τὸν χρόνον τὰ
ξῦνα φυτών βίον ᾿ζῃν. τοῖς δὲ φυτῶις υπάρχειν ύπνων
αὐδύνατον· οὐθεὶς γὰρ ύπνος ἀνέγερτος, τὸ δὲ τῶν
φυτῶν πάθος τὸ ἀνάλογον τῷ ύπνῳ ἀνέγερτων.
5 καθεύδειν μὲν οὖν τὰ ᾿ζῶα τὸν πλεῖς χρόνον ἀναγγ
καίον διὰ τὸ τὴν αἴξησιν καὶ τὸ βάρος ἐπικεισθαι
τοῖς ἀνω τόποις (εἰρήκαμεν δὲ τὴν αἰτίαν τοῦ
cαθεύδειν τοιαύτην οὐδαν ἐν ἑτέροις)· ἀλλ’ ὀμοιο
ἐγειρόμενα φαίνεται καὶ ἐν τῇ μῦτρᾳ (δῆλον δὲ
γίνεται τούτῳ ἐν ταῖς ἀνατομαῖς καὶ ἐν τοῖς ὑπ
10 τοκοῦσιν), εἰτ’ εὔβους καθεύδουσι καὶ καταφέρονται
πάλιν. διόπερ καὶ ἐξελθόντα τὸν πολὺν διαγει
χρόνον καθεύδοντα.
Καὶ ἐγρηγορότα μὲν οὐ γελᾶ τὰ παιδία, καθεύ-
dοντα δὲ καὶ δακρύει καὶ γελᾶ. συμβαίνοντες γὰρ
καὶ καθεύδουσιν αἰσθήσεις τοῖς ᾿ζῳσι, οὐ μόνον

1 οὐτοκομιένοις Ζ.

a Cf. De somno et vig. 457 a 3 ff. See also P. A. 686 b 2 ff.,
G. A. 741 b 28 ff.
b See P. A. 653 a 10 ff., De somno et vig. 455 b 28 ff.,
especially 456 b 17 ff. Sleep is caused by the upper
490
not-being to being is effected through the intermediate state, and sleep would appear to be by its nature a state of this sort, being as it were a borderland between living and not living: a person who is asleep would appear to be neither completely non-existent nor completely existent: for of course it is to the waking state *par excellence* that life pertains, and that in virtue of sensation. On the other hand, assuming it is necessary that an animal should possess sensation, and that it is first an animal at the moment it has first acquired sensation, we ought to regard its original state not as being sleep but something resembling sleep—the sort of state that plants also are in; indeed the fact is that at this stage animals are living the life of a plant. Sleep, however, cannot possibly pertain to plants, because there is no sleep from which there is not an awaking, and there is no awaking from the condition in plants which is analogous to sleep. Anyway, young animals must of necessity sleep for the greater part of the time because the burden of their growth and the consequent weight is laid upon the upper regions of the body. (We have explained elsewhere that such is the cause of sleep.) All the same, animals are clearly found to wake even within the uterus, as is shown by dissections and by the case of the Ovipara; afterwards they immediately drop off and fall asleep again. That is why after birth as well they spend most of their time asleep.

Infants do not laugh while they are awake, but they both laugh and weep while they are asleep, for of course sensations occur in animals during sleep as regions of the body becoming weighed down by various hot substances which are carried up to them.
τὰ καλοῦμενα ἐνύπνια, ἀλλὰ καὶ παρὰ τὸ ἐνύπνιον,
15 καθάπερ τοῖς ἀνυσταμένοις καθεύδουσι καὶ πολλὰ
πράττειν ἀνευ τοῦ ἐνυπνιάζειν. εἰδὸ γὰρ τινες οἱ
cαθεύδοντες ἀνίστανται καὶ πορεύονται βλέποντες
ὡςπερ οἱ ἐγρηγορότες. τούτοις γὰρ γίνεται τῶν
συμβαινόντων αἰσθήσις, οὔκ ἐγρηγορόσι μὲν, οὐ
μέντοι ὡς ἐνύπνιον. τὰ δὲ παιδία ἑοίκασιν, ὡςπερ
20 ἀνεπιστῆμον τῷ ἐγρηγορέαν, διὰ συνήθειαν ἐν
tῷ καθεύδειν αἰσθάνεσθαι καὶ ζῆν. προϊόντος δὲ
tοῦ χρόνου, καὶ τῆς αἴξησεως εἰς τὰ κἀρτ
μεταβαίνουσης, ἐγείρονταί τε μᾶλλον ήδη, καὶ τὸν
πλείω χρόνον οὔτω διάγωσιν. μᾶλλον δὲ τῶν
492 ἀλλών ζῴων ἐν ὑπνῷ τὸ πρῶτον διατελοῦσιν.  
25 ἀτελέστατα γὰρ γεννάται τῶν τετελεσμένων, καὶ
tὴν αἴξησιν ἔχοντα μάλιστα ἐπὶ τὸ ἅνω μέρος
tοῦ σώματος.

Γλαυκότερα δὲ τὰ ὀμματα τῶν παιδίων εὐθὺς
genoméνων3 ἐστὶ πάντων, ύστερον δὲ μεταβάλλει
πρὸς τὴν ὑπάρχειν μέλλουσαν φύσιν αὐτοῖς: ἐπὶ
dὲ τῶν ἀλλών ζῴων οὐ συμβαίνει τοῦτ’ ἐπιδήλως.
30 τούτοις μὲν οὖν αἴτιον τὸ μονόχροα τὰ ὀμματα τῶν
ἀλλών εἶναι μᾶλλον, οἶνον οἱ βόες μελανόθαλμοι,
tὸ δὲ τῶν προβάτων ύδαρες πάντων, τῶν δὲ
χαροπόν ὅλον τὸ γένος ἢ γλαυκόν, ἔνα ὅ αἰγωπά,
kαθάπερ καὶ τὸ τῶν αἰγῶν αὐτὸ πλῆθος. τὰ δὲ
tῶν ἀνθρώπων ὀμματα πολύχροα συμβεβηκεν

1 οἱ om. PZ.  2 τὰ PSYZ*; τὸ Bekker per errorem.  
3 genoméνων P: γεννωμένων vulg.

* Man produces his young "perfect" (see 770 a 33); the
well as in waking hours, and this includes not only what we call dreams but something more besides; thus persons who get up while they are asleep do quite a number of things without dreaming at all. There are those who get up while asleep and walk about and can see as well as anyone awake. The reason is that they are aware through their senses of what is going on, and though they are not awake, still this awareness is different from that of a dream. Infants, it would seem, have not yet acquired the art of being awake, if we may put it so, and thus both their sensations and their life go on during their sleep by force of habit. As time wears on, and the scene of their growth shifts its ground to the lower parts of the body, at this stage they wake up more and spend the greater part of their time awake. To begin with, however, infants spend more time asleep than any other animal, because they are born in a more imperfect condition than any other perfected animal and have made their advance in growth chiefly in the upper part of the body.

The eyes of all infants are bluish immediately after birth; later on they change over to the colour which is going to be their natural colour for life. In the other animals this does not occur noticeably, and the reason is that their eyes exhibit more singleness of colour: thus, cattle have dark eyes; all sheep have pallid \(^b\) eyes; another class of animal will all have greyish-blue, or blue, eyes; some have "goat's-eyes," \(^c\) as indeed the majority of goats themselves have. The eyes of human beings, however, show

\(^{fissipede}\) animals, such as the dog, produce them "imperfect," \(e.g.,\) they are born blind.  
\(^{b}\) Lit., "watery."  
\(^{c}\) \(i.e.,\) yellow.
779 a 35 εἶναι· καὶ γὰρ γλαυκοὶ καὶ χαροποί καὶ μελανοθαλμοί τινές εἶσιν, οὶ δὲ αἰγωποὶ. ὥστε τὰ μὲν ἄλλα ὅσπερ αὐτὰ συμβαίνειν, ἵκαιναν οὐτέον αἰτίαν εἶναι καὶ τούτην, ὅτι τῶν μὲν μονόχρων τῶν δὲ πολύχρων τὸ μόριον ἐστὶν· τοῦ δὲ γλαυκότερα καὶ μὴ χρόαν ἄλλην ἰσχεῖν αἰτίαν ὅτι ἀσθενέστερα τὰ μόρια τῶν νεών, ἀσθενεία δὲ τις ἡ γλαυκότης.

779 b Τού μὲν οὖν τὰλλα ζώα νέα οὖντα καὶ πρεσβύτερα μηθὲν ἐπίδηλον μεταβάλλειν, ἐπὶ δὲ τῶν παιδίων τούτων συμβαίνειν, ἵκαιναν οὐτέον αἰτίαν εἶναι καὶ 10 τούτην, ὅτι τῶν μὲν μονόχρων τῶν δὲ πολύχρων τὸ μόριον ἐστὶν· τοῦ δὲ γλαυκότερα καὶ μὴ χρόαν ἄλλην ἰσχεῖν αἰτίαν ὅτι ἀσθενέστερα τὰ μόρια τῶν νεών, ἀσθενεία δὲ τις ἡ γλαυκότης.

Δεῖ δὲ λαβεῖν καθόλου περὶ τῆς διαφορᾶς τῶν ὀμμάτων, διὰ τῶν αἰτίαν τὰ μὲν γλαυκά τὰ δὲ 15 χαροπά τὰ δὲ αἰγωπα τὰ δὲ μελανόμματ’ ἐστὶν. τὸ μὲν οὖν ὑπολαμβάνειν τὰ μὲν γλαυκά πυρώδη, καθάπερ Ἐμπεδοκλῆς φησί, τὰ δὲ μέλανα πλεῖον ὕδατος ἔχειν ἂ πυρός, καὶ διὰ τούτο τὰ μὲν ἡμέρας οὐκ ὡς βλέπειν, τὰ γλαυκά, δὲ ἐνδεικτικὸς ὕδατος, θάτερα δὲ νύκτωρ δὲ ἐνδεικτικὸς πυρός, οὐ λέγεται 20 καλῶς· εἴπερ μὴ πυρός τὴν ὀψιν θετεῖν ἀλλ’ ὕδατος.

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1 ὥστε τὰ μὲν ἄλλα διόπερ (ὡςπερ Ζ Ζ1*: διό ὅπερ Y: διὸ τὰ μὲν ἄλλα ὅπερ Λ.-W.: διὸ καὶ ὅπερ vulg.
2 sic Platt, Btf.: πλεῖον μιᾶς ἰσχείν χρώας (vel χρῶας) PZ: πλεῖον μιᾶς ἰσχείν vulg.

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a i.e., they do not vary at different times. Or it may mean, “are not odd-coloured.”
b Lit., “blue in one eye.”

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in practice a multiplicity of colour; some are blue, some greyish-blue, some dark, some yellow. Hence in the case of the other animals, just as the individuals of any class do not differ from each other, so they do not differ from themselves, the reason in both cases being that they are not naturally constituted to have more than one colour. The greatest multiplicity of colour, however, among the other animals is found in the horse; indeed in some horses the two eyes are of odd colours. No other animal is noticeably affected in this way, though some human beings are.

Well, then, for the fact that in the other animals, young or old, no noticeable change occurs, whereas in infants a change does occur, we must consider simply this to be a sufficient cause, viz., that in animals this part is single-coloured, in human beings multicoloured; while for the fact that the young have bluish eyes and not some other colour, the reason is that their parts are weaker than those of adults, and blueness is a form of weakness.

We must now determine the general question of why eyes differ, and what is the cause why some are blue, some greyish-blue, some yellow, some dark. There is a theory, stated by Empedocles, that blue eyes are fiery in composition, while dark ones contain more water than fire, and that therefore blue eyes are not keen-sighted in the daytime owing to their deficiency of water, and the other ones suffer in the same way at night owing to their deficiency of fire. But if we ought in point of fact to posit that the sight, in all cases, consists of water, not of fire, then

\[^{c}\text{This is Aristotle's own theory; see De anima 425 a 4; De sensu 438 a 5, 13 ff., b 5. For details, see App. B § 28.}\n\[^{d}\text{i.e., the organ of sight, as often in this discussion.}\]
πᾶσιν. ἐτὶ δ' ἐνδέχεται τῶν χρωμάτων τὴν αὐτίαν ἀποδοῦναι καὶ κατ' ἄλλον τρόπον· ἀλλ' εἰπέρ ἐστὶν ωσπερ ἐλέχθη πρότερον ἐν τοῖς περὶ τὰς αἰσθήσεις καὶ τούτων ἐτί πρότερον ἐν τοῖς περὶ ψυχῆς διωμισμένοις, καὶ ὅτι ὤδατος, καὶ δι' ἥν αὐτίαν ὤδατος 25 ἀλλ' οὐκ ἄερος ἢ πυρὸς τὸ αἰσθητήριον τούτ' ἐστί, ταύτην αὐτίαν ὑποληπτεόν εἶναι τῶν εἰρημένων. οἱ μὲν γὰρ ἔχουσι τῶν ὀφθαλμῶν πλέον υγρόν, οἱ δ' ἐλαττον τῆς συμμέτρου κινήσεως, οἱ δὲ σύμμετρον. τὰ μὲν οὖν ἔχοντα τῶν ὀμμάτων πολὺ τὸ υγρὸν μελανόμματά ἐστι διὰ τὸ μὴ εὐθίσστ' εἶναι τὰ 30 πολλά, γλαυκὰ δὲ τὰ ὀλίγον, καθάπερ φαίνεται καὶ ἐπὶ τῆς θαλάττης· τὸ μὲν γὰρ εὐθίσστον αὐτῆς γλαυκὸν φαίνεται, τὸ δ' ἦττον ὤδατώδες, τὸ δὲ μὴ διωμισμένοι διὰ βάθος μέλαν καὶ κυανοεδές. τὰ δὲ μεταξὺ τῶν ὀμμάτων τούτων τῶ μᾶλλον ἥδη διαφέρει καὶ ἦττον.

35 Τὴν δ' αὐτὴν αὐτίαν οἰητέον καὶ τοῦ τὰ μὲν γλαυκὰ μὴ εἶναι ὀξυωπά τῆς ἡμέρας, τὰ δὲ μελανόμματα τῆς νυκτός· τὰ μὲν γὰρ γλαυκὰ δι' ὀλυγότητα τοῦ υγροῦ κινεῖται μᾶλλον ὑπὸ τοῦ φωτὸς καὶ τῶν ὀρατῶν, ἢ υγρὸν καὶ ἢ διαφάνες. ἐστὶ δ' ἢ τούτον τοῦ μορίου κίνησις ὀρασὶς ἢ 5 διαφάνες, ἀλλ' οὐχ ἢ υγρόν. τὰ δὲ μελανόμματα διὰ πλῆθος τοῦ υγροῦ ἦττον κινεῖται. ἀσθενὲς

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a See references already given in a previous note, a few lines above.
b The meaning of this will be seen later, e.g., 780 a 1 ff., b 24. See also App. B §§ 29 ff.
Empedocles' statement is incorrect. And besides, another method is open for explaining the cause of the colours. But assuming the correctness of what was said earlier in the treatise *Of the Senses*, and before that in the treatise *Of the Soul*, i.e., that the sense-organ of sight is composed of water, and also the correctness of the cause there assigned for its being composed of water and not of air or of fire, then we should take it that the following is the cause responsible for the phenomena just described. Some eyes contain too much fluid, some too little, to suit the right movement, others contain just the right amount; and so those eyes which contain a large amount of fluid are dark, because large volumes of fluid are not transparent; those which contain a small amount are blue. (Sea-water is a parallel instance. Transparent sea-water appears blue, the less transparent appears pallid, and water so deep that its depth is undetermined is dark or dark blue.) Eyes intermediate between these two extremes differ merely by "the more and less." We ought to suppose that to the same cause is due the fact that blue eyes are not keen-sighted during the daytime nor dark eyes at night. Blue eyes, on account of the small amount of fluid in them, are unduly set in movement by the light and by visible objects, in respect both of fluidity and of transparency. It is, however, the setting in movement of this part in respect of its transparency that constitutes sight, not in respect of its fluidity. Dark eyes are set in movement less owing to the amount of

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*e* See Introd. § 70.

*d* For the details of Aristotle's theory of vision, see App. B §§ 26 ff.
The movement already in progress in the eye is so strong that it precludes any fresh movement that comes from outside from making itself felt in the eye.

Dark eyes have so much fluid in them that the weakness of the light at night cannot set them in movement (780 a 5). —Night-blindness is also the sense of the word as defined by Galen; but the term seems to have been used in opposite senses in ancient times; e.g., in Hippocrates, *Prorrh.* II. 33 (ix. 64 Littré) νυκτάλωπες = οἱ τῆς νυκτὸς ὀρῶτες (though one ms. apparently reads οὐχ ὀρῶτες) ; and see L. & S.

But he has said above (779 a 28 and 779 b 11 ; repeated below 780 b 1 ) that the eyes of new-born infants and young
fluid which they contain, for the light is weak during the night, and, in addition to that, fluid generally is not easily set in movement at night. To obtain the best results, it must avoid both (a) not being set in movement at all and also (b) being set in movement too much in respect of its transparency, because the stronger movement ousts the weaker.\textsuperscript{a} That is why people who have been looking at strong, brilliant colours, or who go out of the sunlight into the dark, cannot see: the movement which is already present in their eyes is so strong that it precludes the movement which comes from without. And in general, neither strong sight nor weak sight can see bright things because the action undergone by the fluid in the eye is unduly intense—i.e., the fluid is set in movement unduly. This is borne out by the ailments besetting either kind of sight. Cataract tends to attack the blue-eyed more than the dark-eyed, night-blindness \textsuperscript{b} as it is called attacks the latter. Cataract is a sort of dryness of the eyes, and that is why it occurs oftener in the ageing, as these parts (the eyes), like the rest of the body, become dry towards old age. Night-blindness is superabundance of fluid, and that is why it tends to attack younger people: their brain is more fluid.\textsuperscript{c} The best sight of all is that which is midway between a large amount and a

\textsuperscript{a}  That is why people who have been looking at strong, brilliant colours, or who go out of the sunlight into the dark, cannot see: the movement which is already present in their eyes is so strong that it precludes the movement which comes from without.

\begin{itemize}
  \item \textsuperscript{b}  The best sight of all is that which is midway between a large amount and a.
  \item \textsuperscript{c}  That is why people who have been looking at strong, brilliant colours, or who go out of the sunlight into the dark, cannot see: the movement which is already present in their eyes is so strong that it precludes the movement which comes from without.
\end{itemize}
tis tyipis ouke gar d6i oligi oue dia to tara-
tesbai empodizei tihn tov xromatov kinnsin, ouke
dia to 1 pilhths parheke daskinisiain.

Ou monon de ta eirhmena aitia tov ambli h d6i
orain, alla kai h tov dermatos fuyis tov epo tih
kory kaloumenh. dei gar autvo diaphanes einai,
toiotov de anagkaiou einai to leptov kai leukov
kai omalov, leptov men opoos h thurathen euvthorh

30 kinnsis, omalov de opowus men episkiazh thutidou-
menon (kai gar dia tovdh oi yeronotes ouk d6i
oraiwv wospier gar kai to allo derma, kai to tov
oimatos thutidotaive te kai paixteron ginetai
yphaskousan), leukov de dia tov melan men
35 diaphaiomevnon. diospier oouh oi lamptieres dunantai
fainein ean dows ek toiotov dermatos.

'En men othen tov ghyra kai taiv nosous dia tauto
as aitiai ouw d6i blastous, ta de pайдia di
oligoton tov ygroi glauka fainetai to prwton.
eterglaukoi de ginontai malista ois anbropoi kai
ois ippoi dia tihn autih eitiai de, yntper o mev

5 anbropos polioutai monon, twv de alloi ippos
monon epideilwv yphaskous leuka netai tais treichas.
h te gar polihtis astheniav tis esti tov ygroi tov
en tov egkefaalo kai apeibia kai h glaukotis to
gar liav leptov h liav pahi tihn autin exei du-
navin to men tw oligw to de tw pollw ygrw.

1 to Z*, Aldus; om. vulg.
2 monon Aldus, codd.*: monos Bekker.

a And therefore weak-sighted.
b i.e., unconcocted.
small amount of fluid, because on the one hand it is not so small in volume that it gets disturbed and so hampers the movement produced by the colours, nor on the other hand is it so large in volume that its movement is rendered difficult.

These are not the only causes of dullness and keenness of sight. In addition to them we must mention the nature of the skin upon what is known as the pupil. This skin should be transparent, a condition which must of necessity be satisfied by skin that is thin, and white, and even—thin, in order that the movement that comes from without may take a straight course; even, so that its wrinkles shall not produce a shadow (the reason why old people do not have keen vision is that the skin in the eyes, like that elsewhere, gets wrinkled and thicker in old age); white, because that which is black is not transparent, non-transparency being precisely what blackness is; and that too is why lanterns cannot give any light if they are made of black skin.

In old age and disease, then, these are the causes owing to which the sight is not keen; in children, however, it is the small volume of fluid which makes the eyes appear blue to begin with. And odd-coloured eyes occur more often in human beings and horses than other animals for the same cause that human beings are the only animals that go grey and the horse is the only one of the remainder whose hairs noticeably whiten in old age:—Greyness is a weakness, viz., a lack of concoction, of the fluid in the brain; so is blueness of the eyes; since unduly thin fluid and unduly thick fluid are the equivalent respectively of a small amount and a large amount of

* For ἐχεῖ δύναμιν, cf. 733 b 15 784 b 14, and Introd. § 26.
10 ὅταν οὖν μὴ δύνηται ἀπαρτίσαι ἡ φύσις ὀμοίως ἡ πέψασα τὸ ἐν ἀμφοτέροις ύγρὸν ἡ μὴ πέψασα, ἄλλα τὸ μὲν τὸ δὲ μὴ, τότε συμβαίνει γίνεσθαι ἐτερογλαύκους.

Περὶ δὲ τοῦ τὰ μὲν ὀξυωτὰ εἶναι τῶν ξύλων τὰ δὲ μὴ, δύο τρόποι τῆς αὐτίας εἰσίν. διόγως γὰρ λέγεται τὸ ὀξὺ σχεδόν, καὶ περὶ τὸ ἀκόυειν καὶ τὸ ὀσφραίνεσθαι ὀμοίως τοῦτ' ἕχει. λέγεται γὰρ ὀξὺ ὑπὸ ἐν μὲν τὸ πόρρωθεν δύνασθαι ὄραν, ἐν δὲ τὸ τὰς διαφορὰς ὅτι μάλιστα διασαφέσθαι τῶν ὁρμημένων. ταύτα δ' οὖν ἀμα συμβαίνει τοῖς αὐτοῖς. ὁ γὰρ αὐτὸς ἐπηλυγασάμενος τὴν χεῖρα

15 ἡ δὲ αὐλοῦ βλέπων τὰς μὲν διαφορὰς οὖθεν μᾶλλον οὐδ' ἦτον κρινεὶ τῶν χρωμάτων, ὀψεῖ τὲ πορρώτερον. οἱ γοῦν ἐκ τῶν ὄργυμάτων καὶ φρεάτων ἐνίοτε ἀστέρας ὄρωσιν. ἡστ' εἰ τὶ τῶν ξύλων ἐχεῖ μὲν προβολὴν τοῦ ὁμίματος πολλῆν, τὸ δ' ἐν τῇ κόρῃ ύγρὸν μὴ καθαρὸν μηθὲ σύμμετρον τῇ κινῆσει

20 τῇ θύραθεν, μηδὲ τὸ ἐπιπολήσις δέρμα λεπτὸν, τούτο περὶ μὲν τὰς διαφορὰς οὐκ ἀκριβώςει τῶν χρωμάτων, πόρρωθεν δ' ἔσται ὁρατικόν (ὡσπερ εἰ καὶ ἐγγύθεν) μᾶλλον τῶν τὸ μὲν ύγρὸν καθαρὸν ἐχώς πέρ τὸ πρὸ τῶν ὁμίματων μηθέν. τοῦ μὲν γὰρ

25 τούτως ὀξὺ ὑπὸ ὃστε διασαφέσθαι τὰς διαφορὰς, ἐν αὐτῷ τῷ ὁμίματι ἔστιν ἡ αὐτία· ὡσπερ γὰρ ἐν ἱματίῳ καθαρῷ καὶ αἱ μικραὶ κηλίδες ἐνδηλοῦν τὴν χεῖρα τοῦτον ὕπαρχειν· ἡστ' εἰ καὶ πρὸς τὸν ὁμίματον μηθείν. τοῦ μὲν γὰρ

30 ὡσπερ ... ἐγγύθεν secl. A.-W., om. Σ: ὡστέρ YZ pro ὡσπερ εἰ καὶ.

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1 ἐπηλυγασάμενος P: -γιγς- vulg.
2 κρινεῖ Peck (idem Sus., Richards): κρίνει vulg.
3 ὡστέρ . . . ἐγγύθεν secl. A.-W., om. Σ: ὡστερ YZ pro ὡσπερ εἰ καὶ.

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a Chiefly, as will shortly appear, the differences of colour.
fluid; therefore, whenever Nature cannot make the fluid in both eyes tally, either by concocting it or by not concocting it in both, but instead of that concocts it in one and not in the other, the result is odd-coloured eyes.

The fact that some animals are keen-sighted and others not is due to two sets of causes, for "keen" here has practically two meanings (so it has when applied to hearing and smelling). Thus, keen sight means (a) ability to see from a distance, (b) distinguishing as accurately as possible the differences of the objects which are seen; and these faculties do not occur together in the same persons. The man who shades his eye with his hand or looks through a tube will not distinguish any more or any less the differences of colours, but he will see further; at any rate, people in pits and wells sometimes see the stars. So that if any animal has a considerable projection over his eyes, while the fluid in his pupils is not pure nor suitably proportionate to the movement coming from without, and if the skin on the surface of them is not thin, then that animal will not have accuracy of vision in so far as differences of colours are concerned, but he will be able to see from a distance (just as he would from close quarters) better than animals which though they have pure fluid in their eyes and a pure covering round it, yet have no projecting brow at all in front of their eyes. The reason is that (a) the cause of being keen-sighted enough to distinguish the differences (of colour) lies in the eye itself, since just as quite small stains are plain and distinct on a pure, clean shirt, so quite small movements are plain and
γίνονται, οὖτως καὶ ἐν τῇ καθαρᾷ ὁπει καὶ αἱ μικραὶ κινήσεις δήλαι καὶ ποιοῦσιν ἀίσθησιν. τὸν δὲ τὰ πόρρωθεν ὅραν καὶ τὴν ἀπὸ τῶν πόρρωθεν ὅρατὰν ἀφικνεῖσθαι κίνησιν ἢ θέσις αὐτία τῶν ὀφθαλμῶν· τὰ μὲν γὰρ ἐξόφθαλμα οὐκ εὐθύτατον πόρρωθεν, τὰ δὲ ἐντὸς ἔχοντα τὰ ὄμματα ἐν κοίλῳ κείμενα ὀρατικὰ τῶν πόρρωθεν διὰ τὸ τὴν κίνησιν μὴ σκεδάνυσθαι εἰς ἀχαναὶ ἀλλ᾿ εὐθυτορεῖν. οὗθεν γὰρ διαφέρει τὸ λέγειν ὅραν, ὡσπερ τινὺς φασίν, τῷ τὴν ὁποῖν ἔξειναι (ἀν γὰρ μὴ ἦτο τι πρὸ τῶν 5 ὀμμάτων, διασκεδασταὶ καὶ ἀνάγκη ἐλάττως προσπίπτειν τοὺς ὀρωμένους καὶ ἢττον τὰ πόρρωθεν ὅραν), ἡ τῇ ἀπὸ τῶν ὀρωμένων κινήσει ὅραν. ὡμοίως γὰρ ἀνάγκη καὶ τὴν ὁποῖν τῇ κινήσει ὅραν. μάλιστα μὲν οὐν ἑωρᾶτο ἂν τὰ πόρρωθεν, εἰ ἀπὸ τῆς ὁποίας εὐθύς συνεχῆς ἐν πρὸ τὸ ὀρώμενον 10 οἷον αὐλὸς· οὐ γὰρ ἄν διελύτω ἡ κίνησις ἢ ἀπὸ τῶν ὀρατῶν· εἰ δὲ μὴ, ὀσωπερ ἄν ἐπὶ πλέον ἐπέκεισθι 1 τοσοῦτω ἀκριβέστερον τὰ πόρρωθεν ὅραν ἀνάγκη.

Καὶ τῆς μὲν τῶν ὀμμάτων διαφορὰς ἐστῶσαν αὐταὶ αἱ αὐτίαι.

II Τῶν αὐτῶν δὲ τρόποιν ἔχει καὶ περὶ τὴν ἀκοῆν 15 καὶ τὴν ὀνομήσων· ἐν μὲν γὰρ ἐστὶ τοῦ ἀκριβῶς ἀκούειν καὶ ὀσφραίνεσθαι τὸ τὰς διαφορὰς τῶν ὑποκειμένων αἰσθητῶν ὁτι μάλιστα αἰσθάνεσθαι

1 ἐπέχη Platt: ἀπέχη vulg.: ἕξη Z1.

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a i.e., the substance of the eye.
b This theory is put forward by Timaeus in Plato, Timaeus 45 ν ff. A similar theory seems to have been held by Empedocles.
distinct in a pure, clean sight\(^a\) and they give rise to sense-perception. As for (b) the ability to see things at a distance, and the fact that the movement coming from objects at a distance succeeds in reaching into the eyes, the cause of this is the position of the eyes. Animals with prominent eyes do not see well from a distance, but those with sunken eyes placed in a hollowed recess are able to see things at a distance, because the movement does not get scattered into space but follows a straight course. It makes no difference to this which of the two theories of sight we adopt. Thus, if we say, as some people do, that seeing is effected "by the sight issuing forth,"\(^b\) then on this theory, unless there is something projecting in front of the eyes, the "sight" of necessity gets scattered and so less of it strikes the object, with the result that distant objects are less well seen. If we say that seeing is effected "by a movement derived from the visible object," then on this theory, the clarity with which the sight sees will of necessity vary directly as the clarity of the movement: distant objects would be seen best of all if there were a sort of continuous tube extending straight from the sight to that which is seen, for then the movement which proceeds from the visible objects would not get dissipated; failing that, the further the tube extends, the greater is bound to be the accuracy with which distant objects are seen.

These, then, shall be the causes which we assign to explain the different sorts of eyes.

The same situation is found in connexion with two other senses—hearing and smell—as with sight. To hear and to smell "accurately" means (a) to perceive as well as possible all the differences in the

--Keenness of Smell and Hearing.
πάσας, ἐν δὲ τὸ πόρρωθεν καὶ ἀκούειν καὶ ὀσφραίνεσθαι. τοῦ μὲν οὖν τὰς διαφορὰς κρίνειν καλῶς τὸ αἰσθητήριον αἴτιον, ὀσφρεῖ ἐπὶ τῆς 20 ὄφεως, ἂν ἤ καθαρόν αὐτῷ τε καὶ ἤ περὶ αὐτὸ μὴνιγξ. 1[οἱ γὰρ πόροι τῶν αἰσθητηρίων πάντων, ὀσφρεῖ εἰρηται ἐν τοῖς περὶ αἰσθὴσεως, τείνουσιν πρὸς τὴν καρδίαν, τοῖς δὲ μὴ ἔχουσιν καρδίαν πρὸς τὸ ἀνάλογον. δὲ μὲν οὖν τῆς ἀκοῆς, ἐπεὶ ἔστι τὸ αἰσθητήριον ἀέρος, ἦ τὸ πνεῦμα τὸ σύμφυτον 25 ποιεῖται ἐνίοις μὲν τὴν σφύξιν τοῖς δὲ τὴν ἀναπνοήν [καὶ εἰσπνοήν], 3 ταύτῃ περαινεῖ. διὸ καὶ ἡ μάθησις γίνεται τῶν λεγομένων ὡστε ἀντιφθέγγεσθαι τὸ ἀκουσθεῖν. οἷα γὰρ ἡ κίνησις εἰσῆλθε διὰ τοῦ αἰσθητήριου, τοιαύτη πάλιν, οἶνον ἀπὸ χαρακτήρος τοῦ αὐτοῦ καὶ ἐνός, διὰ τῆς φωνῆς γίνεται 30 ἡ κίνησις, ὥσθ᾽ ὁ ἱκουσε, τοῦτ᾽ εἰπεῖν. καὶ χαριμώμενοι καὶ ἐκπνεοῦντες ἤττον ἀκουσθεῖν ἢ εἰσπνεοῦντες 4 διὰ τὸ ἐπὶ τῷ πνευματικῷ μορίῳ τῆς ἀρχήν τοῦ αἰσθητήριον εἶναι τοῦ τῆς ἀκοῆς, καὶ σεῖσθαι καὶ κινεῖσθαι ἁμα κινοῦντος τοῦ ὀργάνου

1 sequitur (781 a 21–b 6) locus corruptus et sine dubio extraneus. vide pp. 563 sq.
2 ὁ Aldus, vulg.: ἦ PSYZ.*
3 καὶ εἰσπνοήν om. Z, Platt: καὶ εἰσπνοήν τε S: καὶ εἰσπνοήν καὶ Y.
5 καὶ ἐκπνεοῦντες om. Σ.
6 ἢ εἰσπνεοῦντες om. Σ.
7 τελευτὴν SY, Aldus.

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objects perceived, (b) to hear and smell from a distance. As for (a) the ability to distinguish the differences well, the cause of this is the sense-organ, just as it is in the case of sight, i.e., it must be pure and clean itself, and so must the membrane round it.\(^a\) \[^b\] For the passages of all the sense-organs, as is stated in the treatise *Of Sensation*, run to the heart, or to the counterpart of it in animals which have no heart. Now the passage of the hearing, since the sense-organ of hearing consists of air, terminates at the point where the connate *pneuma* causes in some the pulsation, in others, the respiration [and inspiration]. This, too, is why we are able to understand what is said and to repeat what we have heard, for whatever the character of the movement was which entered through the sense-organ, the character of the movement caused by means of the voice is the same in its turn—they might be two impressions from one and the same die. So, if you have heard a thing, you can utter it. Again, people hear less well while yawning and breathing out than they do while breathing in. The reason is that the principle of the sense-organ of hearing is situated upon the part \(^c\) that is concerned with the *pneuma*, and it is shaken and set in movement when the organ sets the *pneuma* in movement [since the organ gets set in

\(^a\) *Cf. De anima* II. 420 a 13: we can no longer hear if the membrane is damaged which encloses the air in the ear, any more than we can see if the skin on the pupil of the eye is damaged.

\(^b\) For the difficulties involved in the following lines, see note, pp. 563 f. For the theories here assumed, see the account of Σύμφυτον Πνεύμα, App. B, especially §§ 26 ff.

\(^c\) Viz., the heart; see App. B §§ 31 f., and 776 b 17, 787 b 28.
τὸ πνεῦμα: [κινεῖται γὰρ κινοῦν τὸ ὀργανόν.]¹ καὶ ἐν ταῖς ύγραῖς ύμαις καὶ κράσει συμβαίνει²
35 τὸ αὐτὸ πάθος,³ καὶ τὰ ὅτα πληροῦσθαι δοκεῖ πνεύματος διὰ τὸ γειτονὰν τὴν ἄρχην τῷ πνευματικῷ τόπῳ.⁴ ἢ μὲν οὖν περὶ τὰς διαφορὰς ἀκρίβεια τῆς κρίσεως καὶ τῶν ψόφων καὶ τῶν ὁσμῶν ἐν τῷ τὸ αἰσθητήριον καθαρὸν εἶναι καὶ τὸν ὑμένα τὸν ἐπιπολής ἔστιν: πᾶσι γὰρ αἱ κινήσεις
5 διάδηλοι, καθάπερ ἐπὶ τῆς ὥσεως, καὶ ἐπὶ τῶν τοιούτων συμβαίνουσιν.] καὶ τὸ πόρρωθεν δὲ αἰσθάνεσθαι [τὰ δὲ μὴ αἰσθάνεσθαι]⁵ ὁμοίως συμβαίνει ὥσπερ ἐπὶ τῆς ὥσεως. τὰ γὰρ ἔχοντα πρὸ τῶν αἰσθητηρίων ἐπὶ πολὺ οἶον ὥσεις διὰ τῶν μορίων, ταύτα πόρρωθεν αἰσθητικά ἐστιν. διὸ οἷον οἱ
10 μικτῆρες μακροῖ, οἶον τῶν Λακωνικῶν κυνιδῶν, ὀσφραντικά· ἀνω γὰρ οὗτος τὸν αἰσθητήριον αἰ πόρρωθεν κινήσεις⁶ οὐ διαστῶνται ἀλλ' εὐθυποροῦσιν, ὥσπερ τοῖς ἐπηλυγαζομένοις⁷ πρὸ τῶν ὁμμάτων. ὁμοίως δὲ καὶ ὅσιος τὰ ὅτα μακρὰ καὶ ἀπογεγεισωμένα πόρρωθεν, οία ἔχουσιν ἐνια τῶν
15 τετραπόδων, καὶ ἔσω τὴν ἐλίκην μακράν· καὶ γὰρ ταύτα ἐκ πολλοῦ λαμβάνοντα τὴν κίνησιν ἀποδίδοσι πρὸς τὸ αἰσθητήριον.

Τὴν μὲν οὖν πόρρωθεν ἀκρίβειαν τῶν αἰσθητήσεων

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¹ seclusi: om. Σ.
² τοῦ σώματος addit Z (corporis post ὅσμών b 3 addit Σ).
³ lacunam statuit Platt.
⁴ sic Platt: τῇ ἄρχῃ τοῦ πνευματικοῦ τόπου vulg.: Σ vertit et implentur aures secundum quod opilatur spiritus propter principium instrumenti in quo est [spiritus].
⁵ aut haec secludenda (om. Z), aut (docente Platt) πόρρωθειν δὲ (τὰ μὲν) αἰσθάνεσθαι scribendum.
⁷ ἐπηλυγαζομένοις P: -γυς- vulg.
movement while it is causing movement]. The same condition occurs during damp seasons and in damp climates, and the ears appear to get filled with pneuma, because the principle is situated close by the region that is concerned with the pneuma. Thus, accuracy in distinguishing the differences both of sounds and smells depends upon the purity of the sense-organ and of the membrane upon its surface, for all the movements turn out plain and distinct in such cases also, just as in the case of sight.] (b) Perception from a distance, too, [and failure to perceive from a distance] occurs in the same way as in the case of sight. Thus, animals which have as it were channels passing through the parts concerned and projecting well out in front of the sense-organs can perceive from a distance; and that is why animals which have long nostrils, like the Laconian hounds, are keen-scented: the sense-organ is set well back in the interior, and therefore the movements which come from a distance do not get scattered but take a straight course, which is just what happens when we shade our eyes with the hand. Another similar case is that of those animals which have ears that are long and jut well out like the cornice of a house—some quadrupeds have ears of this sort—and a long internal spiral passage; these long ears, like the long noses, catch the movement a long way off and transmit it to the sense-organ.

Accuracy of perception by the senses when exer-

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* Lit., "blends"; cf. 767 a 31, 777 b 7.
* There is a long passage about Laconian hounds in H.A. 574 a 16 ff.
* Cf. P.A. 658 b 16.
ΑΡΙΣΤΟΤΕΛЕΣ

781 b

ήκιστα ως εἰπεῖν ἀνθρώπος ἔχει ώς κατὰ μέγεθος τῶν ζώων, τήν¹ δὲ περὶ τὰς διαφορὰς μάλιστα 20 πάντων εὐαίσθητον. αὐτίον δ’ ὅτι τὸ αἰσθητήριον καθαρὸν καὶ ἤκιστα γεώδες καὶ σωματώδες, καὶ φύσει λεπτοδερμότατον τῶν ζώων ώς κατὰ μέγεθος ἀνθρώπος ἔστιν.

Εὐλόγως δ’ ἀπείργασται ἡ φύσις καὶ τὰ περὶ τὴν φώκην· τετράπονον γὰρ ὁν καὶ ζωοτόκον οὕχ ἔχει ὅτα ἄλλα πόρους μόνον. αὐτίον δ’ ὅτι ἐν 25 ὑγρῷ αὐτῇ ὁ βίος· τὸ δὲ τῶν ἄτων μόριον πρόσκειται τοῖς πόροις πρὸς τὸ σῶζει τὴν τοῦ πόρρωθεν ἀέρος κίνησιν· οὕθεν οὖν χρήσιμὸν ἐστιν αὐτῇ, ἄλλα καὶ τούναντιν ἀπεργάζοντ’ ἂν, δεχόμενα εἰς αὐτὰ ὑγροῦ πλῆθος.

Καὶ περὶ μὲν ὁφεὶς καὶ ἀκοῆς καὶ ὀσφρήσεως εἰρηται.

ΠΑΝ 30 Τὰ δὲ τριχῶματα διαφέρουσι καὶ πρὸς αὐτὰ τοῖς ἀνθρώποις κατὰ τὰς ἡλικίας καὶ πρὸς τὰ γένη τῶν ἄλλων ζώων, ὁσαπερ ἔχει τρίχας αὐτῶν. ἔχει δ’ ὁσαπερ ἐντὸς αὐτῶν ζωοτοκεῖ πάντα σχεδόν· καὶ γὰρ τὰ ἀκανθώδεις ἔχοντα τῶν τοιοῦτων τριχῶν 35 εἰδὸς τι ὑποληπτέον, οἷον τὰς τῶν χερσαίων ἐχύνων καὶ εἰ τί ἄλλο τοιοῦτον ἔστι τῶν ζωοτόκων. εἰσὶ δὲ διαφοραῖ τῶν τριχῶν κατὰ τὰ σκληρότητα καὶ μαλακότητα, καὶ κατὰ μῆκος καὶ βραχύτητα, καὶ εὐθύτητα καὶ οὐλότητα, καὶ πλῆθος καὶ ὀλι-

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¹ τὰ ΨΥ.

cised at a distance is possessed by man to a lesser degree, in proportion to his size, than almost any other animal; on the other hand, he is better than any of them at accurately perceiving the differences in the objects perceived. The reason is that in man the sense-organ is pure and least earthy and corporeal, and besides that, nature has given him, for his size, the thinnest skin that any animal has.

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 it 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.

This concludes our remarks about sight, hearing and smell.

The various kinds of growths of hair:—In human beings these differ in the same individuals at different periods of life, and they differ also in comparison with the other animals that have hair. Practically all the animals which are internally viviparous have hair; I say "all," because the spines which some of them have on the body must be considered as being a kind of hair, e.g., the spines of the hedgehog and any other such viviparous creature. Hair exhibits the following differences: it may be hard or soft, long or short, straight or curly, plentiful or

=Gk. "land-echinus," to distinguish it from the "sea-echinus" or sea-urchin.
γότητα, πρὸς δὲ τούτοις καὶ κατὰ τὰς χρόνας,  
κατὰ τὲ λευκότητα καὶ μελανίαν καὶ τὰς μεταξὺ τούτων. ἐνίας δὲ τούτων τῶν διαφορῶν καὶ κατὰ τὰς ἡλικίας διαφέρουσι νέα τε καὶ παλαιόμενα. μάλιστα δὲ τούτων ἐπίθεδιον ἐπὶ τῶν ἀνθρώ- 
πων· καὶ γὰρ δασύνεται μᾶλλον πρεσβύτερα γυνόμενα, καὶ φαλακροῦνται τῆς κεφαλῆς ἐνιοῦ τά 
πρόσθεν. καὶ παῖδες μὲν ὄντες οὐ γίγνονται 
φαλακροί, οὔτ' αἱ γυναῖκες· οἱ δ' ἄνδρες προιόντις ἡ ὅ 
τις ἡλικίας. καὶ πολυοῦνται δὲ τὰς κεφαλὰς 
γνάσκοντες οἱ ἀνθρωποί. τῶν δ' ἄλλων ζῴων 
οὐθεὶς τοῦ οὐς εἰπεὶ γίνεται ἐπίθεδιον, μάλιστα 
δ' ἵππω τῶν ἄλλων. καὶ φαλακροῦνται μὲν οἱ 
ἀνθρωποί τὰ ἐμπροσθεν τῆς κεφαλῆς, πολυοῖ 
δὲ πρῶτον γίνονται τοὺς κροτάφους· φαλακροῦται δ' 
ὁθείς οὔτε τούτως οὔτε τὰ ὅπισθεν τῆς κεφαλῆς. 
ὅσα δὲ τῶν ζῴων μὴ ἔχει τρίχας ἄλλα τὸ ἀνάλογον 
αὕτας, οἶον ὄρνιθες μὲν πτερά, τὸ δὲ τῶν ἰχθύων 
γένος λεπίδας, καὶ τούτους συμβαίνει τῶν τοιοῦτων 
παθημάτων ἕνα κατὰ τὸν αὐτὸν λόγον. 
Τίνος μὲν οὖν ἐνεκα τὸ τῶν τριχῶν ἡ φύσις 
ἐποίησε γένος τοῖς ζῴους, εὑρηταί πρὸτερον ἐν ταῖς 
αὕταις ταῖς περὶ τὰ μέρη τῶν ζῴων: τῶν δ' 
ὑπαρχόντων καὶ διὰ τίνας ἀνάγκας συμβαίνει 
τούτων ἐκαστὸν, δηλώσας τῆς μεθόδου τῆς νῦν 
ἐστίν.

Παχύτητος μὲν οὖν καὶ λεπτότητος αὐτῶν ἔστι

1 καὶ κατὰ P: καὶ S: κατὰ vulg.  
2 τε PZ, om. vulg.  
4 ἐστι 1'Z*: om. vulg.
scanty; beside this, it also shows differences of colour: it may be white or black or any shade between these two. Some of these differences are also exhibited by the hair according to the various times of life, youth and more advanced age. This is noticeable chiefly in the case of human beings. Thus the hair gets shaggier as age advances, and some people go bald in front. Children do not go bald, nor do women; men do, however, when they begin to get on in years. In human beings, the hair on the head turns white as age approaches; in other animals, however, this does not noticeably occur: the horse is the one which shows it most. Human beings go bald on the front of the head, but they go grey first on the temples; none however goes bald either here or at the back of the head. As for those animals which have no hair but the counterpart of hair instead (thus, birds have feathers, and the fish tribe have scales)—in them some conditions of the kind described occur in a corresponding way.

We have already stated in the treatise on the Causes of the Parts of Animals a the purpose for the sake of which Nature has made hair in general and provided animals with it. The business of our present investigation is to show what are the pre-existing circumstances, what are the factors of necessity, on account of which the particular sorts of hair occur.

The chief cause, then, of its thickness and thinness is the skin; which in some animals is thick, in others thin; looseknit in some, compact in others. A con-

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a P. A. 658 a 18; viz., for the sake of shelter and protection.
συναίτιον καὶ τῆς ἐνούσης υγρότητος ἡ διαφορά·
τοῖς μὲν γὰρ ὑπάρχει λιπαρὰ τοῖς δ' ὑδατώδης.
ὡς μὲν γὰρ ἡ τοῦ δέρματος φύσις ὑπόκειται
30 γεώδης· ἐπιτολῆς γὰρ οὕσα ἕξατμιζοντος τοῦ
ὕγρου στερεὰ γίνεται καὶ γεώδης, αἱ δὲ τρίχες καὶ
tὸ ἀνάλογον αὐταῖς οὐκ ἐκ τῆς σαρκὸς γίνονται
ἐλλ' ἐκ τοῦ δέρματος ἕξατμιζοντος καὶ ἀναθυμω-
μένου ἐν αὐτοῖς τοῦ υγροῦ. διὸ παχεῖα μὲν ἐκ
tοῦ παχέος, λεπταὶ δὲ1 ἐκ τοῦ λεπτοῦ δέρματος
35 γίνονται].2 ἀν μὲν οὖν ἢ τὸ δέρμα μανότερον καὶ
παχύτερον, παχεῖαι διὰ τε τὸ πλῆθος τοῦ γεώδους
καὶ διὰ τὸ μέγεθος τῶν πόρων εἰσάν· ἂν δὲ
πυκνότερον, λεπταὶ διὰ τὴν στενότητα τῶν πόρων.
ἐτὶ δ' ἂν ἢ ἡ ὑκμάς υδατώδης, ταχὺ ἀναξηραινο-
μένης οὐ λαμβάνουσι μέγεθος αἱ τρίχες, ἂν δὲ
5 λιπαρά, τοῦνατίον· οὗ γὰρ εὐξήραντον τὸ λιπαρόν.
διόπερ ὡς μὲν τὰ παχυδερμότερα παχυτριχώ-
tερα τῶν ἕψιν, οὗ μέντοι τὰ μάλιστα μάλλον,
dιὰ τὰς εἰρημένας αἰτίας, οἶνον τὸ τῶν ὑών γένος
πρὸς τὸ τῶν βοῶν πέπονθε καὶ πρὸς ἐλέφαντα καὶ
πρὸς3 πολλὰ τῶν ἄλλων. διὰ τὴν αὐτὴν δ' αἰτίαν
10 καὶ αἱ ἐν τῇ κεφαλῇ τρίχες τοῖς ἀνδρώποις παχύ-
tαται· τοῦ γὰρ δέρματος τοῦτο παχύτατον καὶ ἐπὶ4
πλείστη υγρότητι, ἔτι δ' ἔχει μανότητα πολλῆν.
αἰτίον δὲ καὶ τοῦ μακρᾶς [ἡ βραχείας]5 τὰς τρίχας
ἐίναι τὸ μὴ εὐξήραντον εἴναι τὸ ἕξατμιζον υγρόν.
tοῦ δὲ μὴ εὐξήραντον εἴναι δ' αἰτίας, τὸ τε ποσὸν

3 πρὸς PZ*: om. vulg. 4 ἐν Z: ἐν vulg.
5 seclusi; om. Σ.
tributary cause is the difference of the fluid present in it: in some this is greasy, in others watery. In general, of course, the fundamental nature of the skin is earthy in substance: being on the surface of the body it becomes solid and earthy as the fluid evaporates off. Now the hair and its counterparts are formed not out of the flesh but out of the skin [as the fluid in them evaporates and exhales; thus thick hair is formed out of thick skin and thin hair out of thin skin]. If, then, the skin tends to be looseknit and thick, the hair is thick both on account of the large amount of earthy matter and on account of the size of the passages; but if the skin tends to be compact, the hair is thin on account of the narrowness of the passages. Further, if the moisture is watery, it quickly dries off and the hair does not attain to any size, though it does if the moisture is greasy, because greasy matter does not readily dry off. Thus, generally speaking, thick-skinned animals have thick hair; but it is not true that the thickest-skinned have thicker hair than (the others in the same category), for the causes mentioned, an example being afforded by the pig tribe when compared with that of oxen, or with the elephant and many other animals. For the same cause, too, our hair is thickest on the head: the skin there is thickest and situated over the largest amount of fluid, and besides that it is very loosely knit. And the reason why the hair is long [or short] is that the fluid which evaporates is not easily dried off. There are two causes which prevent it being easily dried off: one is its quantity, the other its

a These words are deleted by Platt as partly unintelligible and as not fitting in with what follows.

b But see 783 a 2.

c Viz., the brain.
15 καὶ τὸ ποιόν· ἄν τε γὰρ πολὺ ἢ τὸ ύγρόν, οὐκ εὐξήραντον, καὶ ἂν λιπαρόν. καὶ διὰ τούτο τοῖς ἀνθρώποις αἱ ἕκ τῆς κεφαλῆς τρίχες μακρόταται· ὁ γὰρ ἐγκέφαλος ύγρός καὶ ψυχρός ὃν πολλὴν παρέχει δαμίλειαν τοῦ ύγροῦ.

Εὐθύτριχα δὲ καὶ οὐλότριχα γίνεται διὰ τὴν ἐν 20 ταῖς θριξίν ἀναθυμίασιν. ὃν μὲν γὰρ ἢ καπνώδης, θερμὴ οὐσα καὶ ἔηρα οὐλὴν τὴν τρίχα ποιεῖ. κάμπτεται γὰρ διὰ τὸ δύο φέρεσθαι φοράς· τὸ μὲν γὰρ γεώδες κάτω, τὸ δὲ θερμὸν ἄνω φέρεται. εὐκάμπτου δὲ οὕσης δι’ ἀσθενειαν στρέφεται· τοῦτο δὲ ἐστὶν οὐλότης τριγός. ἐνδέχεται μὲν οὐν οὐτω λαβεῖν τὴν αἰτίαν, ἐνδέχεται δὲ καὶ 25 διὰ τὸ ὀλίγον ἔχειν τὸ ύγρόν, πολὺ δὲ τὸ γεώδες, ὑπὸ τοῦ περιέχοντος ἐξηρανομένας συστάσθαι. κάμπτεται γάρ τοῦ εὐθύ, ἐὰν ἐξατμιζηται, καὶ συντρέχει ὡσπερ ἐπὶ τοῦ πυρὸς καομένη θρίς, ὃς οὕσης τῆς οὐλότητος συστάσεως δι’ ἐνδειαν ύγρόν ὑπὸ τῆς τοῦ περιέχοντος θερμότητος. ση- 30 μεῖον δὲ ὃτι καὶ σκληρότεραι αἱ οὐλαὶ τρίχες τῶν ευθειῶν εἰσίν· τὸ γὰρ ἔξηρον σκληρόν. εὐθύτριχα δὲ δὲ οὕση ύγρότητη ἔχει πολλὴν· βέον γὰρ ἂλλʼ οὐ στάξον προέρχεται ἐν ταύταις τὸ ύγρόν. καὶ διὰ τοῦτο ὃ ἂν ἐν τῷ Πόντῳ Σκύθαι καὶ Ἐράκης εὐθύτριχες· καὶ γὰρ αὐτοὶ ύγροὶ καὶ ὁ περιέχων

1 οὕσης Peck: ὠντος vulg.
2 θρίς PZ, A.-W.: ἡ θρίς vulg.

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*a* For this and other subjects dealt with in Book V, see H. Diller, *Wanderarzt und Aitiologe*, pp. 115 ff., cf. 50 ff. et passim.

*b* According to Aristotle, there were two sorts of “ex-
quality. Thus, if there is a great deal of the fluid, and also if it is greasy, it does not easily dry off. And that is why the hair on our heads is the longest: the brain, being fluid and cold, provides fluid in large abundance.

Straight hair and curly hair is due to the exhalation in it: if this exhalation is smoky, being hot and dry it makes the hair curly; for the hair gets bent because it is subjected to the impulse of two directional motions—the earthy constituent urges its way downwards, the hot constituent upwards; and as the hair will easily bend on account of its weakness, it gets twisted; that is what curliness of the hair really is. Well, that is one cause that may be assigned for it: here is another. It may equally well be that, owing to its containing but little fluid as against a great deal of earthy matter, the hair gets dried by its environment and so contracts. Anything that is straight bends if its vapour is drawn off, and shrinks up like a hair burning on the fire, which would imply that the curliness of hair is a contraction due to lack of fluid caused by the heat of its environment. In favour of this is the fact that curly hair is also harder than straight hair, and of course anything dry is hard. Animals that contain a great deal of fluid have straight hair, because in their hair the fluid advances in a continuous stream and not drop by drop. That is why the Scythians by the Black Sea and the Thracians have straight hair: both their constitution and the environing air are fluid (moist).

halation": the “smoky,” a compound of Air and Earth, which is hot and dry; and the “aqueous,” which is cold and moist. For further details see De sensu 443 a 21 ff., Meteor. 360 a 22 ff., cf. G.A. 784 b 10.
35 αὐτοὺς ἀὴρ ὑγρός. Αἰθίοπες δὲ καὶ οἱ ἐν τοῖς
θερμοῖς οὐλότριχες· ἐξερεῖ ὦρα οἱ ἐγκέφαλοι καὶ
ὁ ἀὴρ ὁ περιέχων.

"Εστι δ’ ἐνα τῶν παχυδέρμων λεπτότριχα διὰ
tὴν εἰρημένην αἰτίαν πρότερον· ἦσω γὰρ ἂν λεπτό-
tεροι οἱ πόροι ὄσιν, τοσούτω λεπτοτέρας ἀναγκαῖον
5 γίνεσθαι τὰς τρίχας. διὸ τοῦ τῶν προβάτων γένος
τοιαύτας ἔχει τὰς τρίχας· τὸ γὰρ ἐρνὸν τριχών
πλῆθός ἐστιν. ἐστὶ δ’ ἐνα τῶν ζῴων ἀ μαλακήν
μὲν ἔχει τὴν τρίχα, ἢττον δὲ λεπτήν, οἷον τὸ τῶν
dαυσυπόδων πρὸς τὸ τῶν προβάτων πέπονθεν. τῶν
γὰρ τοιούτων ἐπιτολῆς ἡ θρίξ τοῦ δέρματος. διὸ
10 μῆκος οὐκ ἵσχει, ἀλλὰ συμβαίνει παραπλήσιον ὥσ-
περ τὰ ἀπὸ τῶν¹ λίνων² ἐξομένα· καὶ γὰρ ταῦτα
μῆκος μὲν οὔθεν ἵσχει, μαλακὰ δ’ ἐστὶ καὶ οὐ
dέχεται πλοκὴν. τὰ δ’ ἐν τοῖς ψυχροῖς πρόβατα
tοῦναντίον πέπονθε τοῖς ἀνθρώποις· οἱ μὲν γὰρ
Σκύθαι μαλακότριχες, τὰ δὲ πρόβατα τὰ Σαυρο-
15 ματικὰ σκληρότριχα. τοῦτον δ’ αὐτίον ταῦτο καὶ
ἐπὶ τῶν ἀγρίων πάντων. ἡ γὰρ ψυχρότης σκλη-
ρώνει διὰ τὸ ἕξηραίνει σηκνύνουσα· ἐκθλιβομένου γὰρ
tοῦ θερμοῦ συνεξεταμίζει τὸ ὑγρόν, καὶ γίνονται καὶ
αἱ τρίχες καὶ τὸ δέρμα γεώδες καὶ σκληρὸν. αὐτίων
dὲ τοῖς μὲν ἄγριοις ἡ θυραυλία, τοῖς δ’ ὁ τόπος
20 τοιούτος ὠν. σημειών δὲ καὶ τὸ ἐπὶ τῶν ποντίων
ἐχίνων συμβαίνον, οἷς χρῶνται πρὸς τὰς στραγ-
γουρίας. καὶ γὰρ οὕτω διὰ τὸ ἐν ψυχρᾷ εἶναι
τῇ θαλάττῃ διὰ τὸ βάθος (καθ’ ξῆκοντα γὰρ καὶ

¹ τῶν PSYZ*: om. Bekker per errorem.
² λινῶν fortasse scrib. monet Platt.
On the other hand, Ethiopians and people who live in hot regions have curly hair, because both their brain and the environing air are dry.

Some, however, of the thick-skinned animals have fine hair owing to the cause previously mentioned: the finer the passages are, the finer of necessity must the hairs be. That is why all sheep have fine hair, wool being just a very large number of hairs. There are some animals whose hair is soft, yet not so fine; this is true of hares, for instance, in comparison with sheep. In such animals the hair is on the surface of the skin; and so it is not long, but turns out to be very much on a par with the scrapings that come off linen cloth, which have no length worth mentioning, but are soft and cannot be used for weaving. In cold climates sheep and human beings exhibit opposite "conditions" from each other: thus the Scythians have soft hair, but Sarmatian sheep have hard hair, the reason for which is the same as it is in all wild animals. The cold congeals them and so dries them, and this makes them hard: in other words, the fluid evaporates at the same time as the heat is expelled, and both hair and skin become earthy and hard. Thus with wild animals the reason is that they live in the open air; but in other cases it is the nature of their situation which is responsible. This is shown by what occurs in the case of the sea-urchins which are used as a remedy for cases of strangury. These creatures, although small in themselves, have long, hard spines, because the seawater they live in is cold on account of its being so deep (60 fathoms or even

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"See 782 b 1.

b Sarmatia is the territory between the Vistula and the Don, part of modern Poland and Russia."
ARISTOTLE

783 a ἔτι πλειόνων γίγνονται ὀργυιῶν), αὐτοὶ μὲν μικροὶ, τάς δὲ ἀκάνθας μεγάλας ἔχουσι καὶ σκληράς, 25 μεγάλας μὲν διὰ τὸ ἑνταῦθα τὴν τοῦ σώματος τετράφθαι αὐξησον (ὅλιγόθερμοι γὰρ ὄντες καὶ οὐ πέττοντες τὴν τροφὴν πολὺ περίττωμα ἔχουσι, αἱ δ' ἀκάνθαι καὶ αἱ τρίχες καὶ τὰ τοιαῦτα γίγνονται ἐκ περιττώματος), σκληρὰς δὲ καὶ λειλιβωμένας διὰ τὴν ψυχρότητα καὶ τὸν πάγον. τὸν αὐτὸν δὲ 30 τρόπον καὶ τάλλα τὰ φυόμενα σκληρότερα συμβαίνει γίνεσθαι καὶ γεωδέστερα καὶ λιθωδέστερα τὰ ἐν τοῖς προσβόρροις1 τῶν πρὸς νότον καὶ τὰ προσήνεμα τῶν ἐν κοίλοις· ψύχεται γὰρ πάντα μᾶλλον, καὶ ἐξατμίζει τὸ υγρόν. σκληρύνει μὲν οὖν καὶ τὸ θερμὸν καὶ τὸ ψυχρόν· ἐξατμίζεσθαι 35 γὰρ ὅπερ ἀμφιτέρων συμβαίνει τὸ υγρόν; ὑπὸ μὲν τοῦ θερμοῦ καθ' αὐτό, ὑπὸ δὲ τοῦ ψυχροῦ κατὰ συμβεβηκός (μετὰ τοῦ θερμοῦ γὰρ συνεξέρχεται· οὐθὲν γὰρ υγρὸν ἄνευ θερμοῦ). ἀλλὰ τὸ μὲν ψυχρὸν οὐ μόνον σκληρύνει ἀλλὰ καὶ πυκνοῖ, τὸ δὲ θερμὸν μανότερον ποιεῖ.

783 b Διὰ τὴν αὐτήν δ' αἰτίαν καὶ προσβυτέρων γιγνο-μένων τοῖς μὲν τρίχας ἔχουσι σκληρότεραι γίγνονται αἱ τρίχες, τοῖς δὲ πετρωτοῖς καὶ λεπίδωτοῖς 5 τὰ πτερὰ καὶ αἱ λεπίδες. τὰ γὰρ δέρματα γίνεται σκληρότερα καὶ παχύτερα προσβυτέρων γιγνομένων· ἐξαραίνεται γὰρ, καὶ τὸ γηράς ἐστὶ κατὰ τούνομα γενρὸν διὰ τὸ ἀπολείπειν τὸ θερμὸν καὶ μετ' αὐτοῦ τὸ υγρόν.

1 προσβόρροις A.-W.: προσβόρροις PSZ: πρὸς βορράν vulg.

a This is an important statement, and should be noted in connexion with Aristotle's theories of the part played by fluid and, heat both in nourishment and in spontaneous 520
more is the depth at which they are found). Their spines are long because the growth of the body is diverted to them, since, as the creatures possess but little heat, they cannot concoct the nourishment, and so contain a great deal of residue; and it is out of residue that spines and hair and the like are formed. Their spines are hard and petrified on account of the cold and its congealing effect. And in the same way plants, too, are harder, and earthier, and more petrified if they grow where the aspect is northerly, or in a windy situation, than if they grow where the aspect is southerly, or in a sheltered spot. It is because they all get more chilled, and their fluid evaporates. Hardening, then, is brought about by both cold and heat: the effect of both is to cause the fluid to evaporate: it is evaporated by heat per se, but by cold per accidens—in the latter case the fluid accompanies the heat when it makes its exit, as there is no fluid without its heat. There is this difference, however: cold causes compression as well as hardening, whereas heat lightens a thing’s consistency.

For the same cause hair, feathers and scales in the various animals respectively become harder as they get on in years: it is because their skins grow harder and thicker then, and that is due to their drying up, and old age or to ‘get on in years’ is something earthy (as the similarity of the word with yearth, the old form of ‘earth,” shows), and this is due to the fact that the heat is failing and with it the fluid.

generation. See also P.A. 652 b 8 ff. and App. B § 11 and § 17 and note.

b This hardly agrees with Aristotle’s statements elsewhere (e.g., 765 b 1 ff.) about the thickening effects of concoction.

c This is a piece of “etymology” comparable with that of the original Greek: geras (old age), gēron (earthly).
Φαλακρούνται δ’ ἐπιδήλως οἱ ἀνθρώποι μάλιστα 
10 τῶν ζωῶν. ἐστὶ δὲ τὶ καθόλου τὸ θεούτον πάθος· 
καὶ γὰρ τῶν φυτῶν τὰ μὲν ἀείφυλλα τὰ δὲ φυλ-
λοβολεῖ, καὶ τῶν ὀρνίθων οἱ φωλεύοντες ἄπο-
βάλλουσι τὰ πτερά. τοιούτον δὲ τὶ πάθος καὶ ἡ 
falakrōντας ἐστίν ἐπὶ τῶν ἀνθρώπων, ὡσπο 
συμβαίνει falakrōνθαι· κατὰ μέρος μὲν γὰρ ἀπορρέει 
15 καὶ τὰ φύλλα τοὺς φυτοὺς πᾶσι καὶ τὰ πτερὰ καὶ 
αἱ τρίχες τοῖς ἔχουσιν, ὅταν δ’ ἄθροον γένηται 
tὸ πάθος, λαμβάνει τὰς εἰρημένας ἐπωνυμίας: 
falakrōνθαι τε γὰρ λέγεται καὶ φυλλορροεῖν. 
1 αὐτὸν δὲ τοῦ πάθους ἐνδεικνύειν θερμῆς, 
toioúton δὲ μάλιστα τῶν ὑγρῶν τὸ λιπαρόν· διὸ 
20 καὶ τῶν φυτῶν τὰ λιπαρὰ ἀείφυλλα μᾶλλον. 
ἀλλὰ περὶ μὲν τοὺτων ἐν ἄλλοις τὸ αὐτὸν λεκτέον· 
kαὶ γὰρ ἀλλα συναίνει τοῦτο τοῦ πάθους αὐτοῖς. 
γίνεται δὲ τοῖς μὲν φυτοῖς ἐν τῷ χειμῶν τὸ 
pάθος (αὐτὴ γὰρ ἡ μεταβολὴ κυριωτέρα τῆς 
ηλικίας), καὶ τοῖς φωλεύοντες δὲ τῶν ζωῶν (καὶ 
25 γὰρ ταῦτα ἑττον τῶν ἀνθρώπων ὑγρὰ καὶ θερμὰ 
tὴν φύσιν ἐστίν): οἱ δ’ ἀνθρώποι ταῖς ηλικίαις 
χειμώνα καὶ θέρος ἄγουσιν. διὸ πρὶν ἀφροδισιά-
ζεν οὐ γίνεται falakrōs οὐδείς· τότε δὲ τοὺς 
tοιούτους τὴν φύσιν μᾶλλον. φύσει γὰρ ἐστὶν ὁ 
ἐγκέφαλος ψυχρότατον τοῦ σώματος, δ’ ἀφρο-
30 διστασιμός καταφύγει· καθαρὰς γὰρ καὶ φυσικῆς

1 <καὶ πτερορροεῖν> addunt A.-W., Bekkerum securi; 
melius πτερορροεῖν Btf.; om. codd.; fort. φυλλο<βολεῖν καὶ 
πτερο>ρρουεῖν scrib.
2 τοioύτο τοῦ ἦ ὑ θούτον vulg.

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*The Gk. has “shedding of leaves,” but as there is no one English word for this, and as all three are referred to in*
Of all animals human beings are the ones which go bald most noticeably; but still baldness is a general and widespread condition. Thus, although some plants are evergreen, others shed their leaves, and birds which hibernate shed their feathers. Baldness, in those human beings whom it affects, is a comparable condition to these. Of course, a partial and gradual shedding of leaves takes place in all plants, and of feathers and hair in those animals that have them; but it is when the shedding affects the whole of the hair, feathers, etc., at once that the condition is described by the terms already mentioned (baldness, moulting, etc.). The cause of this condition is a deficiency of hot fluid, the chief hot fluid being greasy fluid, and that is why greasy plants tend more to be evergreen than others. However, we shall have to deal with the cause of this condition so far as plants are concerned in another treatise, since in their case there are other contributory causes of it. Now in plants this condition occurs in winter: this seasonal change overrides in importance the change in the time of life. The same is true of the hibernating animals; they too are in their nature less fluid and less hot than human beings. For human beings, however, it is the seasons of life which play the part of summer and winter; and that is why no one goes bald before the time of sexual intercourse, and also why that is the time when those who are naturally prone to intercourse go bald. The reason is that the effect of sexual intercourse is to cool, as it is the excretion of some of the pure, natural heat, and the context, I have kept the point by substituting "moulting": the Berlin edition and others actually insert the word for "mouling" into the Gk. text.
783 b

θερμότητος ἀπόκρισις ἔστων. εὐλόγως οὖν ὁ ἐγκέφαλος αἰσθάνεται πρῶτον· τὰ γὰρ ἀσθενῆ καὶ φαύλως ἔχοντα μικρᾶς αἰτίας καὶ ῥοπῆς ἔστων. ὥστ' ἂν τις ἀναλογίσηται ὁτι αὐτός τε ὄλγοθερμος ὁ ἐγκέφαλος, ἐτι δ' ἀναγκαῖον τὸ πέριξ δέρμα
35 τοιοῦτον εἶναι μᾶλλον, καὶ τούτου τὴν τῶν τριχῶν φύσιν, ὅσω πλείστον ἀφέστηκεν, εὐλόγως ἂν δόξει τοῖς σπερματικοῖς περὶ ταύτην τὴν ἥλικιαν συμβαίνειν φαλακροῦσθαι. διὰ τὴν αὐτὴν δ' αἰτίαν καὶ τῆς κεφαλῆς τὸ πρόσθιον μόνον γίνονται φαλακροὶ καὶ τῶν ζώων οἱ ἀνθρωποὶ μόνοι, τὸ μὲν πρόσθιον, ὅτι ἐνταῦθα ὁ ἐγκέφαλος, τῶν δὲ ζώων μόνον, ὅτι πολὺ πλείστον ἔχει ἐγκέφαλον καὶ μάλιστα ὑγρὸν δ' ἀνθρωπος. καὶ αἱ γυναῖκες οὐ 5 φαλακροῦνται· παραπληρείᾳ γὰρ ἡ φύσις τῆς τῶν παιδίων· ἁγώνα γὰρ σπερματικῆς ἐκκρίσεως ἀμφότερα. καὶ εὐνοῦχος ου γίνεται φαλακρὸς διὰ τὸ εἰς τὸ θῆλυ μεταβάλλειν. καὶ τὰς ύστερογενεῖς τρίχας ἡ οὐ φύουσιν ἡ ἀποβάλλουσιν, ἃν τύχασιν ἔχοντες οἱ εὐνοῦχοι, πλὴν τῆς ἡβής· καὶ γὰρ αἱ 10 γυναῖκες τὰς μὲν οὐκ ἔχουσιν, τὰς δ' ἐπὶ τῇ ἡβή φύουσιν. ἡ δὲ πήρωσις αὐτὴ ἐκ τοῦ ἄρρενος εἰς τὸ θῆλυ μεταβολὴ ἔστων.

Τοῦ δὲ τὰ μὲν φωλεύοντα πάλιν δασύνεσθαι καὶ τὰ φυλλοβολήσαντα πάλιν φύειν φύλλα, τοῖς δὲ φαλακροῖς μὴ ἀναφύεσθαι πάλιν, αἰτίων ὅτι τοῖς 15 μὲν αἱ ὄραι τροπαὶ εἰσι τοῦ σώματος μᾶλλον, ὥστ' ἐπεὶ μεταβάλλουσιν αἰτία, μεταβάλλει καὶ τὸ φύειν καὶ τὸ ἀποβάλλειν τοὺς μὲν τὰ πτερά

1 ο Ὁ* : om. vulg.

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brain is by its nature the coldest part of the body; thus, as we should expect, it is the first part to feel the effect: anything that is weak and poorly needs only a slight cause, a slight momentum, to make it react. So that if you reckon up (a) that the brain itself has very little heat, (b) that the skin surrounding it must of necessity have even less, and (c) that the hair, being the furthest off of the three, must have even less still, you will expect persons who are plentiful in semen to go bald at about this time of life. And it is owing to the same cause that it is on the front part of the head only that human beings go bald, and that they are the only animals which do so at all; *i.e.*, they go bald in front because the brain is there,¹ and they alone do so, because they have by far the largest brain of all and the most fluid. Women do not go bald because their nature is similar to that of children: both are incapable of producing seminal secretion. Eunuchs, too, do not go bald, because of their transition into the female state, and the hair that comes at a later stage they fail to grow at all, or if they already have it, they lose it, except for the pubic hair: similarly, women do not have the later hair, though they do grow the pubic hair. This deformity constitutes a change from the male state to the female.

The reason why the hair does not grow again in cases of baldness, although hair and feathers grow again on hibernating animals and leaves on deciduous trees, is that in the case of the animals and trees the seasons are the turning-points of their lives more (than in the case of man), and so when there is a change of season, then they follow suit and grow or

¹ See *P.A.* 656 b 12.
καὶ τὰς τρίχας, τὰ δὲ φύλλα τὰ φυτά. τοῖς δ’ ἀνθρώποις κατὰ τὴν ἥλικιαν γίνεται χειμών καὶ θέρος καὶ ἔαρ καὶ μετόπωρον, ἐστ’ ἐπειδὴ αἱ ἡλικίαι οὐ μεταβάλλουσιν, οὔδὲ τὰ πάθη τὰ διὰ ταύτας μεταβάλλει, καίτερ τῆς αἰτίας ὁμοίας οὖσης.

Καὶ περὶ μὲν τὰλλα πάθη τὰ τῶν τριχῶν σχεδὸν εἰρηται.

Τῶν δὲ χρωμάτων αἴτιον τοῖς μὲν ἄλλοις ζῴοις, καὶ τοῦ μονόχροος εἶναι καὶ τοῦ ποικίλα, ἡ τοῦ δέρματος φύσις: τοῖς δ’ ἀνθρώποις οὔδεν πλήν τῶν πολιῶν ὧν τῶν διὰ γῆρας ἀλλὰ τῶν διὰ νόσουν· ἐν γὰρ τῇ καλομενή κεύκη λευκαὶ γίνονται αἱ τρίχες· ἐὰν δ’ αἱ τρίχες ὅσι λευκαὶ, οὐκ ἀκολουθεῖ τῷ δέρματι ἡ λευκότης. αἴτιον δ’ ὅτι αἱ τρίχες ἐκ τοῦ δέρματος φύσονται· ἐκ νεοσηκότους 30 οὐν καὶ λευκοῦ τοῦ δέρματος καὶ ἡ θριξ συννοσεῖ, νόσος δὲ τριχὸς πολιότης ἐστὶν. ἡ δὲ δ’ ἡλικίαν τῶν τριχῶν πολιότης γίνεται δι’ ἀσθένειαν καὶ ἐνδεικτικήν, καὶ γὰρ ἡλικία πόσα δέπει ἀποκλίνοντος τοῦ σώματος, καὶ ἐν τῷ γῆρα, ἐπὶ ὑμῖν· τὸ γὰρ γῆρας ψυχρῶν καὶ ἄρηρ [ἐστὶν. δεὶ 35 δὲ νοῆσω τὴν εἰς ἐκαστὸν μόρον ἄφικνουμενὴν τροφὴν ὅτι πέπτει μὲν ἡ ἐν ἐκαστῶ 2 οἰκεία θερμοτης, ἀδύνατον δὲ φθείρεται καὶ πήρωσις γίνεται ἡ νόσος. ἀκριβέστερον δὲ περὶ τῆς τοιαύτης αἰτίας ύποτερον λεκτέον ἐν τοῖς περὶ αὐξήσεως καὶ τροφῆς.

1 ἐπειδὴ Z: ἐπεὶ vulg.
2 ἐν ἐκάστω PZ: om. vulg.

ᵃ Cf. 783 b 7, and De long. et brev. vit. 466 a 21; but according to Hippocrates, π. διαίτης 1. 33 (vi. 512 Littré), the aged are ψυχροὶ καὶ ἄρηροι.

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shed their feathers or hair or leaves. In man, however, the spring, summer, autumn and winter of his life are not seasons according to the calendar but seasons of his own age; so that, as these do not go through the cycle of change, neither do the conditions which depend on them; although the cause which controls the change of conditions is a similar one in his case too.

I think we have now discussed all the conditions that affect hair, except that of colour.

In the rest of the animals, the reason for the IV various colours of the hair, and for its being single-coloured or variegated, is the nature of the skin. In man, however, this reason operates only in the case of the greyness of the hair due to disease (as when the hair becomes white during leprosy), not that due to old age, and if the hair is white, the whiteness does not derive from the skin. The reason is that the hair grows out of the skin, and thus when the skin out of which it grows is diseased and white the hair is itself affected by disease, and disease of hair is greyness. On the other hand, the greyness which is due to age is the result of weakness and deficiency of heat. Every age of life tends to gravitate into chilliness when the body's vigour declines, and especially when this happens in old age, since old age is cold and dry.\textsuperscript{a} We must bear in mind that the nourishment which reaches each part of the body is concocted by the heat in each part proper to it; and if this heat is unable to do its work the part suffers damage, and deformity or disease is the result. A more detailed account of this cause will have to be given in the treatise \textit{Of Growth and Nutrition}.\textsuperscript{b} In those persons

\textsuperscript{a} Not extant.
οὕσοις οὖν τῶν ἀνθρώπων ὀλυγόθερμος ἦστιν ἡ τῶν 5 τριχῶν φύσις καὶ πλείων ἡ εἰσιούσα ύγρότης ἦστι, τῆς οίκείας θερμότητος ἀδυνατούσης πέτειν σή-πεται ὑπὸ τῆς ἐν τῷ περιέχοντι θερμότητος. γίνεται δὲ σῆμις ὑπὸ θερμότητος μὲν πάσα, οὐ τῆς συμφύτου δὲ, ῥασπερ ἐὑρηταὶ ἐν ἐτέροις. ἐστὶ δ' ἡ σῆμις καὶ ὑδατος καὶ γῆς καὶ τῶν σωματικῶν
10 πάντων τῶν τοιούτων, διὸ καὶ τῆς γεώδους ἀτμ- μίδος, οἰον ὁ λεγόμενος εὐρώς· καὶ γάρ ὁ εὐρώς ἦστι σαπρότης γεώδους ἀτμίδος. ῦοστε καὶ ἡ ἐν ταῖς θριξί τοιαύτη οὐσία τροφή οὐ πεπομένη σήπεται, καὶ γίνεται ἡ καλουμένη πολια. λευκὴ δὲ, ὅτι καὶ ὁ εὐρώς μόνον τῶν σαπρῶν ὡς εἰπεῖν λευκόν ἦστιν. αἴτιον δὲ τούτον ὅτι πολὺν ἔχει
15 ἀέρα· πάσα γάρ ἡ γεώδης ἀτμίς ἀέρος ἔχει δύναμιν παχέος. ῦοστερ γάρ ἀντεστραμμένον τῇ πάρχῃ ὁ εὐρώς ἦστιν· ἀν μὲν γάρ παγη ἡ ἀνιούσα ἀτμίς, πάρχη γίνεται, ἐὰν δὲ σαπῆ, εὐρώς. διὸ καὶ ἐπιπολῆς ἦστιν ἄμφω· ἡ γάρ ἀτμίς ἐπιπολῆς· καὶ εὖ δὴ οἱ ποιηταὶ ἐν ταῖς κωμωδίαις μεταφέρουσι
20 σκώπτοντες, τὰς πολιάς καλοῦντες γῆρως εὐρώτα καὶ πάρχην. τὸ μὲν γάρ τῷ γένει τὸ δὲ τῷ εἴδει ταυτόν ἦστιν, ἡ μὲν πάρχη τῷ γένει (ἀτμίς γάρ ἄμφω), ὁ δὲ εὐρώς τῷ εἴδει (σῆμις γάρ ἄμφω). σημεῖον δ' ὅτι τοιούτων ἦστιν· καὶ γάρ ἐκ νόσων
25 πολλοῖς πολιαί ἀνέφυσαν, ὥστερον δ' ὑγιασθεὶσι μέλαιναι ἀντὶ τούτων. αἴτιον δ' ὅτι ἐν τῇ ἁρρω-

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a At Meteor. 379 a 16 ff. See App. B § 11, add. note.
b See 782 b 20, note.
where the nature of the hair has but little heat and the fluid which enters it is unduly plentiful, the heat proper to the hair is unable to do its work and the hair is putrefied by the heat present in the environment. All putrefaction, of course, is caused by heat, but not by the innate heat. This has been stated elsewhere. Water and earth and all such corporeal bodies are liable to putrefaction, and therefore the earthy vapour is liable to it as well; an example of this is what is called mould: mould is in fact the putrefaction of earthy vapour. So too the nourishment in the hair, being of this kind, putrefies if it does not get concocted, and what is called greyness results. It is white, because mould too is white. This is practically the only putrefied substance which is white, and the reason for that is that it contains a good deal of air: actually all earthy vapour is the equivalent of thick air. In fact, mould is as it were the "opposite number" of hoar-frost, since if the vapour which rises up gets congealed, hoar-frost is the result; if it gets putrefied, mould. And that is why both occur on the surface, because vapour is on the surface. So we see that the poets use a good metaphor in their comedies when they jokingly call white hairs the "mould" and "hoar-frost of age": one of them is generically, the other specifically, the same as greyness: hoar-frost is the same generically (both being vapour), mould is the same specifically (both being putrefactions). Here is a sure sign that this is its character: there are many instances of people having grown grey hair as an aftermath of disease, but later on when they were restored to health dark hair took its place. The reason is that

\[\text{For } \varepsilon \chi \epsilon\ \delta \nu \alpha \mu \nu\ \text{cf. 780 b 9, and Introd. § 26.} \]
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784 b

στις, ὡσπερ καὶ τὸ ὅλον 1 σῶμα ἐν ἑνδεια φυσικῆς θερμότητος ἑστιν, οὔτω καὶ τῶν [ἄλλων] 2 μορίων καὶ τὰ πάνω μικρὰ μετέχει τῆς ἄρρωστίας ταύτης, περίττωμα δὲ πολὺ ἐγγίνεται ἐν τοῖς σώμασι καὶ
30 ἐν 3 τοῖς μορίοις. διόπερ ἦ ἐν ταῖς σαρξίν ἀπεβία
ποιεῖ τὰς πολιάς. ὑγιάντες δὲ καὶ ἱσχύσαντες
πάλιν μεταβάλλουσι, καὶ γίνονται ὡσπερ ἐκ γε-
ρότων νέοι: διὸ καὶ τὰ πάθη συμμεταβάλλουσιν.

35 Τοὺς δὲ κροτάφους πολιοῦνται πρῶτον. τὰ μὲν
gὰρ ὅπισθεν κενὰ υγρότητος ἑστι διὰ τὸ μὴ ἐχεῖν
ἐγκέφαλον, τὸ δὲ βρέγμα πολλὴν ἐχει υγρότητα·
tὸ δὲ πολὺ οὐκ εὐσεβὲν. αἱ δ’ ἐν τοῖς κροτάφοις
τρίχες οὕθ’ οὕτως ὀλίγον ἐχουσιν υγρὸν ὡστε πέτ-
tein, οὔτε πολὺ οὔτε μὴ σήπεσθαι: μέσος γὰρ ἦν
5 ὁ τόπος ἀμφοτέρων ἐκτὸς ἀμφοτέρων τῶν παθῶν ἑστιν.
Περὶ μὲν οὖν τῆς τῶν ἀνθρώπων πολιοτητος
ἐιρηται τὸ αὐτίον.

V Τοῖς δ’ ἄλλοις ζῴοις τοῦ μὴ γίνεσθαι διὰ τῆς
ηλικίας ταύτης τῆς μεταβολῆς ἐπιδῆλως τὸ αὐτὸ
αὐτίον ὑπ’ ἐστὶν καὶ ἐπὶ τῆς φαλακρότητος·
10 ὀλίγον γὰρ ἐχουσὶ καὶ ῥητοῦν 4 υγρὸν τὸν ἐγκέ-
φαλον, ὡστε μὴ ἐξαδυνατεῖν τὸ θερμὸν πρὸς τὴν

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1 ὅλον Em*, Aldus, A.-W.: ἄλλο vulg.; cf. 780 a 19.
2 ἄλλων secl. Bft.
3 ἐν PZ.: om. vulg.: καὶ ἐν om. S.
4 ῥητοῦ coni. Bekker, ut videtur; om. PSYZ.

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See 784 a 35, b 6, 786 a 20, and Introd. § 62.
See 784 a 2, n.
during a period of infirmity just as the whole body is afflicted by a deficiency of natural heat,\(^a\) so the parts, including even the very small ones, share in this infirmity; also, a great deal of residue is formed in the body and in its parts: hence the lack of concoction in the flesh produces grey hairs. But when health and strength is restored, people accomplish a change, as it might be old men renewing their youth, and, in consequence, the conditions also accomplish a corresponding change. In fact, we might justifiably go so far as to describe disease as "adventitious old age" and old age as "natural disease"; at any rate, some diseases produce the same effects as old age does.

The temples are the first part to go grey, and the reason is this. The back of the head, since it contains no brain,\(^b\) is empty of fluid. The *bregma*\(^c\) contains a great deal; but a large volume of fluid does not easily putrefy. On the other hand, the hair on the temples has neither a small enough amount of fluid to secure concoction for it, nor a large enough amount for it to avoid putrefaction, as this region of the head is intermediate between the two extremes, and therefore stands outside both of these two conditions.

We have now given the reason for greyness so far as man is concerned.

The reason why this change does not noticeably occur on account of age in the other animals is the same as the one already given in the case of baldness: their brain is small and \(\text{less}\) fluid,\(^d\) thus the heat does not become completely unable to effect concoction.

\(^{a}\) See 744 a 25, n.

\(^{b}\) The insertion of "less" is necessary to the sense: man's brain is the most fluid of all (see 784 a 4).
πέσιν. τοῖς δ᾽ ἵπποις [αὐτῶν]¹ ἐπισημαίνει μάλιστα ὅν ὦσμεν ζῷων, ὅτι λεπτότατον τὸ ὀστοῦν ὡς κατὰ μέγεθος ἔχουσι τὸ² περὶ τῶν ἐγκέφαλον τῶν ἄλλων. τεκμήριον δ᾽ ὦτι καύριος ἡ πληγή³ εἰς τὸν τόπον
15 τοῦτον γίνεται αὐτοῖς. διό καὶ Ὅμηρος οὕτως ἐποίησεν

ίνα⁴ τε πρῶται τρίχες ἵππων
κρανίω ἐμπεφύσει, μάλιστα δὲ καύριον ἔστιν.

ῥαδίως οὖν ἐπιρρεούσης τῆς ὕγρότητος διὰ τὴν
λεπτότητα τοῦ ὀστοῦ, τῆς δὲ θερμότητος ἐλλει-
πούσης διὰ τὴν ἡλικίαν, ἐπιπολοῦνται αἱ τρίχες
αὐταί. καὶ αἱ πυρραὶ δὲ θάττον πολιοῦνται τρίχες
20 τῶν μελαίνων· ἔστι γὰρ καὶ ἡ πυρρότης ὅσπερ
ἀρρωστία τριχός, τὰ δ᾽ ἀσθενὴ γηράσκει πάντα
θάττον. μελαντέρας δὲ γίνεσθαι γηρασκούσας
λέγεται τὰς γεράνους. αὐτιον δ᾽ ἂν εἴη τοῦ πάθους
τὸ φύσει ὕγροτέραν⁵ αὐτῶν εἶναι τῇ τῶν πτερῶν
φύσιν, πλέον τε γηρασκόντων εἶναι τὸ ὕγρόν ἐν
25 τοῖς πτεροῖς ἡ ὥστε εὐσηπτον⁶ εἶναι.

"Οτι δὲ γίγνεται ἡ πολια σήψει τινι, καὶ ὦτι οὐκ
ἔστιν, ὅσπερ οἶονται τινες, αὐάνασεις, σημεῖον τοῦ
προτέρου ῦμηθέντος" τὸ τὰς σκεπαζομένας τρίχας
πίλοις ἡ καλύμμασι πολιοῦσθαι θάττον (τὰ γὰρ

² τὸ Z*: om. vulg.
³ ἡ πληγή PZ: ἡ πληγή ἡ vulg.
⁴ δὴ text. Hom.
⁵ ὕγροτέραν A.-W.: λευκοτέραν vulg.: λεπτοτέραν Btf.
⁶ εὐσηπτον Platt: εὐσηπτότερον vulg.
⁷ τοῦ προτέρου ῦμηθέντος secl. A.-W., om. Σ.
Of all the animals known to us, it is most marked in the horse, the reason being that in the horse the bone which surrounds the brain is, in proportion to the animal's size, thinner than that of any other animal. A proof of this is that a blow delivered on this spot is fatal to a horse. Homer's lines \(a\) fit in with this too:

Where on a horse's skull his hairs first grow,
And where he suffers his most fell and fatal blow.

Therefore, since the thinness of the bone makes it easy for the stream of fluid to flow to the hair at this place, and as the heat begins to fail on account of age, the result is that this hair goes grey. Reddish hair goes grey more quickly than black, as redness too is a sort of infirmity of the hair, and everything that is weak ages more quickly.\(^b\) Cranes, however, so it is alleged, go darker as they get older. If this allegation is true, the reason for this condition would be that the nature of their feathers is more fluid, and that as the birds grow old the fluid in their feathers is too plentiful to putrefy easily.\(^c\)

Here are proofs \((a)\) that greyness is produced by putrefaction of some sort, and \((b)\) that it is not, as some people imagine, a process of withering. Proof of \((a)\). Hair that is protected by hats or other coverings goes grey more quickly, the reason being that the effect of the wind blowing is to prevent putrefac-

\(^a\) Iliad VIII. 83-84.  
\(^b\) See 775 a 19 ff.  
\(^c\) See above, 785 a 2.
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πνεύματα κωλύει τὴν σήμειν, ἢ δὲ σκέπτῃ ἀπνοιαν 30 ποιεῖ), καὶ τὸ βοηθεῖν τὴν ἀλευρίν τὴν τοῦ ὑδατος καὶ τοῦ ἐλαίου μιγνυμένων. τὸ μὲν γὰρ ὕδωρ ψύχει, τὸ δ' ἐλαιον μιγνύμενον κωλύει εξηραίνεσθαι ταχέως: τὸ γὰρ ὕδωρ εὐξήραντον. ὅτι δ' οὐκ ἔστων αὐσάνοις, οὔδ' ὀσπερ ἢ ποά αὐσανομένη λευκαίνεται, οὔτω καὶ ἡ θρίξ, σημεῖον ὅτι φύονται 35 εὐθέως ἐνιαὶ πολιαὶ· αὖν δ' οὔθεν φύεται. λευκαίνονται δὲ καὶ ἐπ' ἀκρον πολλαί· ἐν γὰρ τοῖς ἔσχατοις καὶ λεπτοτάτοις ἐλαχίστη θερμότης ἐγ γίνεται.

Τοῖς δ' ἄλλοις ζῷοις ὅσοις γίνονται λευκαί αἱ τρίχες, φύσει ἀλλ' οὖ πάθει συμβαίνει γίνεσθαι τούτῳ. αὕτιον δὲ τῶν χρωμάτων τὸ δέρμα τοῖς ἄλλοις· τῶν μὲν γὰρ λευκῶν λευκόν τὸ δέρμα, τῶν 5 δὲ μελάνων μέλαν, τῶν δὲ ποικίλων καὶ γιγνομένων ἐκ συμμίξεως τῇ μὲν λευκῶν τῇ δὲ μέλαιν φαίνεται ὁμ. ἐπὶ δὲ τῶν ἀνθρώπων οὔθεν αὕτιον τὸ δέρμα· καὶ γὰρ οἱ λευκοὶ σφόδρα μελανὰς ἔχουσιν. αὕτιον δ' ὅτι λεπτότατον πάντων δέρμα δ' ἀνθρωπος ἔχει ὡς κατὰ μέγεθος, διὸ περὶ οὐθέν ἵσχυε πρὸς τὴν 10 τῶν τριχῶν μεταβολήν, ἀλλὰ διὰ τὴν ἀσθένειαν τὸ δέρμα καὶ μεταβάλλει αὐτὸ τὴν χρόαν, καὶ γίνεται ὑπὸ ἥλιων καὶ πνευμάτων μελάντερον· αἱ δὲ τρίχες οὔθεν συμμεταβάλλουσιν. ἐν δὲ τοῖς ἄλλοις τὸ δέρμα χώρας ἔχει δύναμιν διὰ τὸ πάχος· διὸ αὐ

1 ενιαὶ πολιαὶ conieceram, quod et ipsi codd.* habent: ενιοι πολοι Bekker (per errorem, ut vid.*).
2 ο' Ζ: om. vulg.
tion, and the protection keeps off the wind. Also, it is an assistance if the hair is anointed with a mixture of oil and water. This is because, although the water cools it, the oil which is mixed with it prevents the hair from drying off quickly, water being easily dried off. (b) The following proves that greyness is not a form of withering, and that when hair goes white it is not due to withering, as it is in the case of grass. Some hairs are grey from the very beginning of their growth, and nothing begins its growth in a withered condition. In many instances, too, hairs go white at the tip; this is because very little heat gets into parts which are at the extreme end and very thin.

In certain of the other animals white hairs make their appearance; but this is natural and not due to any affection. The reason of the colours in these other animals is the skin: thus, if they are white, the skin is white; if black, the skin is black; if piebald, made up of a mixture of colour, the skin is, we find, white in some places and black in others. In the case of human beings, however, the skin has nothing whatever to do with it, for even people with white skin have intensely black hair. The reason for this is that, for his size, man has the thinnest skin of all animals, and on that account it has no power at all to effect any change in the hair; instead of that, the skin, by reason of its own weakness, changes its colour itself, and also is darkened by the action of the sun and the wind, while the hair undergoes no simultaneous change at all. With the other animals, the skin, on account of its thickness, possesses the character of the region in which the animal lives; and that is why the hair changes in accordance with
μὲν τρίχες κατὰ τὰ δέρματα μεταβάλλουσιν, τὰ δὲ δέρματα οὐθέν κατὰ τὰ πνεύματα καὶ τὸν ήλιον.

VI Τῶν δὲ ζύων τὰ μὲν ἐστὶ μονόχρωα (λέγω δὲ μονόχρωα οὐ τὸ γένος ὅλον ἐν χρώμα ἔχει, οἶον λέοντες πυρροὶ πάντες· καὶ τοῦτο καὶ ἐπ’ ὀρνίθων καὶ ἐπ’ ἵππους ἐστὶ καὶ τῶν ἄλλων ζώων ὄρμωσ),

20 τὰ δὲ πολύχρωμα μὲν, ὀλόχρωα δὲ (λέγω δὲ οὐ τὸ σώμα ὅλον τὴν αὐτὴν ἔχει χρόαν, οἶον βοῦς ἐστὶν ὅλος λευκός καὶ ὅλος μέλας), τὰ δὲ ποικίλα. τοῦτο δὲ διιχώς, τὰ μὲν τῷ γένει, ὡσπερ πάρδαλις καὶ ταύς, καὶ τῶν ἵππων ἐνοῖς, οἶον αἱ καλούμεναι ἀράτται· τῶν δὲ τὸ μὲν γένος ἀπαν οὐ ποικίλον,

25 γίνονται δὲ ποικίλου, οἶον βόες καὶ αἴγες, καὶ ἐν τοῖς ὀρνίσιν, οἶον αἱ περιστεραί· καὶ ἄλλα δὲ γένη τὸ αὐτὸ πᾶσχει τῶν ὀρνίθων. μεταβάλλει δὲ τὰ ὀλόχρωα πολλῷ μάλλον τῶν μονοχρῶν, καὶ εἰς τὴν ἄλληλων χρώαν τὴν ἀπλήν, οἶον ἐκ λευκῶν μέλανα καὶ ἐκ μελάνων λευκά, καὶ μεμιγμένα ἐξ ἀμφοτέρων, διὰ τὸ ὀλὼ τῷ γένει ὑπάρχειν ἐν τῇ φύσει τὸ μῆ μιᾶν ἔχειν χρόαν· εὐκρίνητον γὰρ ὑπάρχει ἐπ’ ἀμφότερα τὸ γένος, ὡστε καὶ εἰς ἄλληλα μεταβάλλει καὶ ποικίλλεσθαι μᾶλλον. τὰ δὲ μονοχρῶα τούναντίων· οὐ γὰρ μεταβάλλει, ἃν μή διὰ πάθος, καὶ τοῦτο σπάνιον ἡδὴ γὰρ ὄπται καὶ πέριξ λευκή καὶ κόραξ καὶ στρουθὸς καὶ ᾳρκτος. συμβαίνει δὲ ταῦτα, ὡτιν ἐν τῇ γενέσει

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\(^a\) A fish called *thritta* is mentioned at *H.A.* 621 b 16 (and fragment 285, 1528 a 40), which is supposed to be the shad.  
\(^b\) Aristotle’s diagnosis is essentially correct. Albinism is not “natural,” but an “affection” due to absence of pigment.
the skin in the various instances, whereas the skin does not change at all in accordance with the winds and the sun.

Of the animals, some are single-coloured (by which I mean that the whole class has a single colour only, e.g., all lions are tawny; and a similar thing obtains in the case of birds, fish, and the other animals); others are many-coloured, yet at the same time whole-coloured (by which I mean that the whole body is of the same colour, e.g., an ox is white all over, or dark all over); others still are variegated. "Variegated" has two meanings: (a) as referred to a class of animals—like the leopard, and peacock, and certain fishes, for instance the thratia, as it is called; (b) sometimes the class as a whole is not variegated, but variegated individuals are found: examples are, oxen and goats, and certain birds, e.g., pigeons, and there are other classes of birds where this same condition is found. Change of colour is much commoner among the whole-coloured animals than among the single-coloured, both (a) the reciprocal change between the individual colours (found in the class), i.e., one simple colour changes into another, e.g., white animals produce black ones and black ones white; and also (b) the change which results in a mixture of the two. The reason for this is that it is a natural attribute of the whole class not to have one single colour: the class is mobile in both directions, and so provides more examples of interchange of colours and also of variegation. The single-coloured animals behave in the opposite way to this: they do not change, unless owing to some affection, and then but rarely; thus, cases have been observed of a white partridge, raven, sparrow, and bear. These results occur when the
786 a διαστραφῇ εὐθθαρτον γὰρ καὶ εὐκίνητον τὸ μικρόν, τὸ δὲ γεγονόμενον τοιοῦτον ἐν μικρῷ γὰρ ἡ ἄρχη τοῖς γεγονομένοις.

Μάλιστα δὲ μεταβάλλουσι καὶ τὰ φύσει ὀλόχροα μὲν ὄντα, τῷ γένει δὲ πολύχροα, διὰ τὰ ὑδατα. τὰ δὲ μὲν γὰρ θερμὰ λευκὴν ποιεῖ τὴν τρίχα, τὰ δὲ ψυχρὰ μελαναν, ὠσπέρ καὶ ἐπὶ τῶν φυτῶν. αὐτίον δὲ ὅτι τὰ θερμὰ πνεύματος πλέον ἔχει ἡ ὑδατος, ὃ δ' ἀρχι διαφαινόμενος λευκότητα ποιεῖ, καθάπερ καὶ τῶν ἀφρῶν. διαφέρει μὲν οὖν, ὠσπέρ καὶ τὰ δέρματα τὰ διὰ πάθος λευκὰ τῶν διὰ τὴν φύσιν,

10 οὕτω καὶ ἐν ταῖς θριέτες ἡ τε διὰ νόσουν ἡ καὶ ἡλικίαι καὶ ἡ διὰ φύσιν λευκότητα τῶν τριχῶν τῶ το αὐτίον ἐτερον εἶναι: τὰς μὲν γὰρ ἡ φυσικὴ θερμότητας ποιεῖ λευκᾶς, τὰς δ' ἡ ἀλλοτρία. τὸ δὲ λευκὸν ὃ ἀτμιδώδης ἀρχ παρέχεται ἐγκατακλείομενος ἐν πᾶσιν. διὸ καὶ ὅσα μὴ μονόχροα ἔστι, 15 τὰ ὑπὸ τὴν γαστέρα πάντα λευκότερα ἔστων. καὶ γὰρ θερμότερα καὶ ἡ δυκρεώτερα πάντα τὰ λευκὰ ὡς εἰπεῖν ἔστι διὰ τὴν αὐτὴν αὐτίαν· ἡ μὲν γὰρ πέψις γλυκέα ποιεῖ, τὴν δὲ πέψιν τὸ θερμὸν. ἡ δ' αὐτὴ αὐτία καὶ τῶν μονοχρώμων μὲν, μελάνων δ' ἡ λευκών. θερμότης γὰρ καὶ ψυχρότης αὐτία τῆς

20 φύσεως τοῦ δέρματος καὶ τῶν τριχῶν. ἔχει γὰρ ἕκαστον τῶν μορίων θερμότητα οἰκεῖαν.

1 ὀλόχροα Z*₂*m (non E*), Aldus, A.-W.: μονόχροα Z₁, vulg.: et alteratio colorum generum animalium que sunt naturaliter multorum colorum erit multociens propter etc. Σ.

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a Cf. 775 a 9.

b Cf. 735 b 8—736 a 20.

c See 784 b 7, n.

d Cf. 784 a 34, b 6, 27, and Introd. § 62.
creature suffers some distortion during the process of its formation, for, since the beginning of things that pass through such a process is on a small scale, they are small at that time, and what is small can easily be given a different turn and spoilt.

The ones that change most are those which, though whole-coloured by nature, belong to a class which is many-coloured. This is due to the varieties of water involved. Hot water makes the hair white, cold water makes it dark, which is exactly what happens in the case of plants. The reason is that the hot ones contain more pneuma than they do water, and it is the air shining through that causes the whiteness, just as it makes froth white. Therefore, just as there is a difference between skins that are white by nature and those that are white owing to some affection, so there is a difference between the whiteness of hair which is due to nature and that which is due to disease or age—and the difference lies in the fact that the cause is different. In the former case, the whiteness is caused by the natural heat, in the latter, by extraneous heat. It is the vaporous air shut up inside them which produces whiteness in all things; and that, too, is why those animals which are not single-coloured are all whiter under the belly than elsewhere. Thus too practically all white animals are hotter and tastier for the same cause: their good flavour is produced by concoction, and concoction is produced by heat. And the same cause holds also in the case of those animals which, being single-coloured, are either dark or white; since it is heat and cold which are the cause of the nature of the skin and of the hair, each of the parts of the body having its own proper heat.
786 a

"Ετεὶ δ’ αἱ γλώτται διαφέρουσι τῶν ἀπλῶν τε καὶ ποικίλων καὶ τῶν ἀπλῶν μὲν διαφερόντων δὲ,
οἶνον λευκῶν καὶ μελάνων. αὔτιον δὲ τὸ εἰρημένον
πρότερον, ὅτι τὰ δέρματα ποικίλα τῶν ποικίλων,
25 καὶ τῶν λευκοτρίχων καὶ τῶν μελανοτρίχων τῶν
μὲν λευκά τῶν δὲ μέλανα. τὴν δὲ γλώτταν δεὶ
ὑπολαβεῖν ὁσπέρ ἐν μόριον τῶν ἐξωτερικῶν εἶναι,
μὴ ὅτι ἐν τῷ στόματι σκεπάζεται, ἀλλ’ οἶνον χεῖρα
ἡ πόδα· ὡστ’ ἐπεὶ τῶν ποικίλων τὸ δέρμα οὐ
μονόχρων, καὶ τοῦ ἐπὶ τῇ γλώττῃ δέρματος τούτ’
αὔτιον.

30 Μεταβάλλουσι δὲ τὰ χρώματα καὶ τῶν ὀρνίθων
tινές καὶ τῶν τετραπόδων τῶν ἀγρίων ἐνα κατὰ
tὰς ὄφρας. αὔτιον δ’ ὅτι ὁσπέρ οἱ ἀνθρώποι κατὰ
τὴν ἡλικίαν μεταβάλλουσι, τούτ’ ἐκεῖνοι συμβαί
νει κατὰ τὰς ὄφρας· μείζων γὰρ διαφορὰ αὕτη τῆς
κατὰ τὴν ἡλικίαν τροφῆς.

35 Εἰσὶ δὲ καὶ τὰ παμφαγότερα ποικιλότερα ὡς
ἐπὶ τὸ πλεῖστον1 εἰπεῖν εὐλόγως, οἶνον αἱ μέλιτ
ται μονόχρωα μᾶλλον ἢ αἱ ἀνθρῆναι καὶ σφῆκες·
eἰ γὰρ αἱ τροφαὶ αὐτίας τῆς μεταβολῆς, εὐλόγως
αἱ ποικίλαι ποικίλαι παντοδαπωτέρας ποιοῦσι τὰς
κινήσεις καὶ τὰ περιττῶματα τῆς τροφῆς, ἐξ ὧν
5 καὶ τρίχαι καὶ πτερὰ2 καὶ δέρματα γίνεται.
Καὶ περὶ μὲν χρώματων3 καὶ τρίχων διωρίσθω
τὸν τρόπον τούτον.

VII Περὶ δὲ φωνῆς, ὅτι τὰ μὲν βαρύφωνα τῶν ζῴων

1 πλεῖστον Z: πλήθος vulg. 2 πτερὰ Z: πτίλα vulg.
3 χρώματος YZ: δερμάτων P: δερμάτων χρώματος coni.
A.-W. a

a This apparently means the same as “whole-coloured.”

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Further, the tongues of animals differ: those of the simple-coloured animals, those of the variegated ones, and those of the ones which, though simple-coloured yet differ among themselves (as, e.g., dark and white)—the tongues of these are all different. The reason is that which has been stated already, viz., that the skins of variegated animals are variegated, the skins of white-haired ones are white and of dark ones dark. The tongue we should look upon as being, as it were, one of the external parts of the body, comparable, e.g., with the hand or foot, disregarding the fact that it is being covered in by the mouth. So that, as the skin of the variegated animals is not single-coloured, this will be the reason responsible for the skin on the tongue as well.

Some birds and some wild quadrupeds change their colour according to the seasons of the year. The reason is that, just as human beings change according to their age, so these change according to the seasons, because this constitutes a greater difference so far as they are concerned than the change according to age.

Speaking generally, the more omnivorous animals are more variegated, as we should expect (for instance, bees are more single-coloured than hornets and wasps), for of course if the various sorts of nourishment they take are the causes of the change, we shall expect to find that variegated kinds of nourishment make the movements which the nourishment undergoes and the residues which result from it more variegated, and it is out of the residues that hair, feathers, and skin are formed.

This concludes our account of the various colours, and the various kinds of hair.

With regard to the voice: some animals have a VII voice.
ésti, tά δ' ὀξύφωνα, tά δ' εὐτόνα καὶ πρὸς ἀμφοτέρας ἔχοντα τάς ὑπερβολὰς συμμέτρους, ἔτι δὲ
tά μὲν μεγαλόφωνα τά δὲ μικρόφωνα, καὶ λειτήσαν
cαὶ τραχύτητι καὶ εὐκαμψία καὶ ἀκαμψία δια-
φέροντα ἄλληλων, ἐπισκεπτέον διὰ τίνας αἰτίας
ὑπάρχει τούτων ἑκαστον. περὶ μὲν οὖν ὀξύτητο
καὶ βαρύτητος τήν αὐτήν αἰτίαν οὐχεῖν εἶναι
ηπερ ἐπὶ τῆς μεταβολῆς ἥν μεταβάλλει νέα οντα
καὶ πρεσβύτερα. τά μὲν γὰρ ἄλλα πάντα νεώτερα
ὄντα ὀξύτερον φθέγγεται, τῶν δὲ βοῶν οἱ μόσχοι
βαρύτερον. τό δ' αὕτῳ συμβαίνει καὶ ἐπὶ τῶν
ἀρρένων καὶ θηλεών· ἐν μὲν γὰρ τοῖς ἄλλοις
gένεσι τὸ θῆλυ ὀξύτερον φθέγγεται τού ἄρρενος
(μάλιστα δ' ἐπίθηλον ἐπὶ τῶν ἀνθρώπων τούτω).
μάλιστα γὰρ τούτως ταύτην τήν δύναμιν ἀπο-
δέδωκεν ἡ φύσις διὰ τὸ λόγῳ χρησθαί μόνοις τῶν
ξώμων, τοῦ δὲ λόγου ὑλήν εἶναι τῆν φωνήν), ἐπὶ
dὲ τῶν βοῶν τούναντίον· βαρύτερον γὰρ αἱ θηλεῖαι
φθέγγονται τῶν ταύρων. τίνος μὲν οὖν ἐνεκα
φωνήν ἔχει τά ἥρα, καὶ τί ἐστι φωνὴ καὶ ὅλως ὃ
μόφος, τά μὲν ἐν τοῖς περὶ αἰσθήσεως εἰρηται, τά
d' ἐν τοῖς περὶ ψυχῆς. ἐπεὶ δὲ βαρὺ μὲν ἐστιν
ἐν τῷ βραδεῖαν εἶναι τῆν κίνησιν, ὃς δ' ἐν τῷ
tαχεῖαν, τοῦ1 βραδεῖως ἡ ταχείως πότερον τὸ κινοῦ
αίτιον ἡ τὸ κινούμενον, ἐχεῖ τίνα ἀπορίαν. φασὶ
gὰρ τινές τὸ μὲν πολὺ βραδεῖως κυνεῖσθαι τὸ δ'
ἐλίγον ταχεῖως, καὶ ταύτην αἰτίαν εἶναι τοῦ τά μὲν
βαρύφωνα εἶναι τά δ' ὀξύφωνα, λέγοντες μέχρι
tῶν καλῶς, ὅλως δ' οὐ καλῶς. τῷ μὲν γὰρ

1 τοῦ Y, Platt, Hayduck: τοῦ δὲ vulg.: τοῦ δὴ Οᵇ*, Btf.

a See 787 b 1, n. b See 446 b 5 ff.
deep a voice, others a high-pitched voice, others a well-pitched voice, suitably proportionate between the two extremes; some, too, have big voices, others small ones; also they differ in respect of being smooth, or rough, flexible and inflexible. So we must consider what are the causes to which each of these is due. With regard to the pitch, the same cause is to be held responsible as that which controls the change which they undergo in passing from youth to age. All animals when younger have a higher voice, except calves, which have a deeper one. The same occurs as between male and female as well: in all animals (except cattle) the female has a higher voice than the male, and this is especially noticeable in human beings, for Nature has given them this faculty in an exceptional degree because they alone among the animals use the voice for rational speech, of which the voice is the "material." In cattle the reverse obtains: cows have a deeper voice than bulls. We have explained partly in the treatise Of Sensation, b partly in that Of the Soul, c for what purpose animals have a voice, and what "voice" is, and generally what sound is. But since deepness of pitch consists in the movement being slow, and height of pitch in its being fast, the question is whether the speed is caused by that which initiates or that which experiences the movement, and this is somewhat puzzling. Some people hold that the movement of a large volume is slow and that of a small volume fast, and that this is the cause why some animals have deep voices and others high ones. Up to a point this statement is satisfactory, but not completely so. It is, of course, correct to say that,

a See 419 b 3—420 b 23.
γένει ὀρθῶς ἔσσεκε λέγεσθαι τὸ βαρὺ ἐν μεγέθει τῳ εἶναι τοῦ κινουμένου. εἰ γὰρ τοῦτο, καὶ μικρὸν καὶ βαρὺ φθέγξασθαι οὐράδιον, ὀμοίως δὲ οὐδὲ 35 μέγα καὶ ὀξὺ. καὶ δοκεῖ γενναιοτέρας εἶναι φύσεως ἢ βαρυφωνία, καὶ ἐν τοῖς μέλεσι τὸ βαρὺ τῶν συντόνων βέλτιον· τὸ γὰρ βέλτιον ἐν ὑπεροχῇ, ἢ δὲ βαρύτης ὑπεροχή της. ἀλλ’ ἐπειδὴ ἑστὶν ἐτερον τὸ βαρὺ καὶ ὀξὺ ἐν φωνῇ μεγαλοφωνία καὶ μικροφωνίας (ἐστὶ γὰρ καὶ ὀξὺφωνα μεγαλόφωνα, καὶ μικρόφωνα βαρύφωνα ὡσάυτωσ), ὀμοίως δὲ καὶ κατὰ τὸν μέσον τόνων τούτων· περὶ ὧν τίνι ἃν τις ἀλλω διωρίσειν (λέγω δὲ μεγαλοφωνίαν καὶ μικροφωνίαν) ἡ πλῆθει καὶ ὀλιγότητι τοῦ κινουμένου; εἰ οὖν κατὰ τὸν λεγόμενον ἑσται διωρισμὸν τὸ ὀξὺ καὶ βαρὺ, συμβῆσεται τὰ αὐτὰ 10 εἶναι βαρύφωνα καὶ μεγαλόφωνα καὶ ὀξὺφωνα καὶ μικρόφωνα. τοῦτο δὲ ψεύδος. αἰτιον δ’ οτι τὸ μέγα καὶ τὸ μικρὸν καὶ τὸ πολὺ καὶ τὸ ὀλίγον τὰ μὲν ἀπλῶς λέγεται, τὰ δὲ πρὸς ἀλληλα. μεγαλόφωνα μὲν οὖν ἑστὶν ἐν τῷ πολὺ ἀπλῶς εἶναι τὸ κινουμένου, μικρόφωνα δὲ τῷ ὀλίγον, βαρύφωνα 15 δὲ καὶ ὀξὺφωνα ἐν τῷ πρὸς ἀλληλα ταύτην ἐχειν τὴν διαφοράν. ἐὰν μὲν γὰρ ὑπερέχῃ τὸ κινουμένον τῆς τοῦ κινουτος ὅρχυος, ἀνάγκη βραδέως φέρεσθαι τὸ φερόμενον, ἃν δ’ ὑπερέχῃται, ταχεῖως. τὸ

1 μέγα coni. Λ.-W.: vociferatio vocis magne acute est impossibilis Σ: barvi vulg.

This, as appears from the next sentence, means the amount producing the movement as compared with the amount undergoing it.

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in general, deepness depends upon a certain size of that which is set in movement; but if the statement were wholly true, it would not be easy to utter a noise simultaneously small and deep, nor, similarly, large and high. Further, a deep voice seems to be the mark of a nobler nature, and in melodies, too, that which is deep-pitched is better than the high-pitched, since deepness is a form of superiority, and it is in superiority that betterness resides. In fact, however, deep and high pitch of the voice is a different matter from largeness and smallness of the voice, for some animals which have high-pitched voices are large-voiced, and in the same way some which have deep-pitched voices are small-voiced; and the same applies to the intermediate pitch between the two. And what other means is there for defining largeness and smallness of voice apart from the volume of that which is set in movement? So then, if high and deep pitch are to be distinguished according to the definition mentioned above, the result will be that any animal which has a deep voice will also have a large one, and any which has a high voice will also have a small one. And this is not true. The reason is that the terms "large," "small," and "large amount," "small amount" are sometimes used in an absolute sense, sometimes relatively to each other. If an animal has a large voice, this is because the amount of that which is set in movement is large absolutely, if small, the amount is small absolutely; whereas high pitch and low pitch are due to the amounts involved being large and small relatively to each other. Thus, if that which is set moving exceeds the strength of that which sets it moving, then that which is propelled is bound to go slowly; if it is exceeded, it
δ' ἵσχυον διὰ τὴν ἵσχυν ὅτε μὲν πολὺ κινοῦν βραδεῖαν ποιεῖ τὴν κίνησιν, ὅτε δὲ διὰ τὸ κρατεῖν ταχεῖαν. κατὰ τὸν αὐτὸν δὲ λόγον καὶ τῶν κινου-τῶν τὰ ἀσθενή τὰ μὲν πλεῖον κινοῦντα τῆς δυνά-μεως βραδεῖαν ποιεῖ τὴν κίνησιν, τὰ δὲ δὲ ἀσθένειαν ὀλίγον κινοῦντα ταχεῖαν.

Αἱ μὲν οὖν αὐτία τῶν ἐναντιώσεων αὐταί, τοῦ μήτε πάντα τὰ νέα ὄξυφωνα εἶναι μήτε βαρύφωνα, μήτε τὰ πρεσβύτερα, μήτε τὰ ἄρρενα καὶ θήλεα, πρὸς δὲ τούτοις καὶ τοῦ τοὺς κάμνοντας ὀξὺ φθέγγεσθαι καὶ τοὺς εὗ τὸ σῶμα ἔχοντας, ἐτὶ δὲ καὶ γέροντας γυνομένους μᾶλλον ὄξυφωνοτέρους γίνεσθαι, τῆς ἡλικίας ἐναντίας οὖσας τῇ τῶν νέων.

Τὰ μὲν οὖν πλεῖστα νεώτερα ὄντα καὶ θήλεα δι’ ἀδυναμίαν ὀλίγον κινοῦντα ἀέρα ὄξυφωνά ἐστιν ταχύ γὰρ ὁ ὀλίγος φέρεται, τὸ δὲ ταχὺ ὀξὺ ἐν φωνῇ. οἱ δὲ μόσχοι καὶ αἱ βόες αἱ θήλειαι, οἱ μὲν διὰ τὴν ἡλικίαν, αἱ δὲ διὰ τὴν φύσιν τῆς θηλύτητος, οὐκ ἴσχυρον ἔχουσι τὸ μόριον ὃ κινοῦσι, πολὺ δὲ κινοῦντα βαρύφθογγα ἐστιν. βαρύ γὰρ τὸ βραδέως φερόμενον, ὁ δὲ πολὺς ἄηρ φέρεται βραδέως. πολὺν δὲ κινοῦσι ταῦτα, τὰ δὲ ἄλλ’ ὀλίγουν, διὰ τὸ τὸ ἁγγεῖον δι’ οὗ πρῶτον φέρεται τὸ πνεῦμα, τούτους μὲν διάστημ’ ἔχειν μέγα καὶ

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a The Greek word includes both meanings; and this circumstance explains a good deal of what Aristotle says in the present discussion.

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will travel quickly. So then, the movement which a strong agent produces is sometimes slow (i.e., when, in virtue of its strength, it is moving a large amount), and sometimes fast (i.e., when the agent has the upper hand). In accordance with the same line of argument, in some cases the movement which a weak agent produces is slow (i.e., when the agent is setting in movement an amount which is too large for its strength), in other cases the movement is fast (i.e., when owing to the agent's weakness the amount which it sets moving is small).

Such, then, are the causes to which these contrarieties are due. We have shown (a) why neither young, nor old, nor male nor female animals all have high-pitched voices or all have deep voices; (b) why sick and healthy alike speak in a high-pitched voice; and (c) why, as men reach old age, the pitch of their voice rises, although old age is the opposite of youth.

On account of their debility, most animals when young, and most females, set but a small amount of air in movement and therefore have high-pitched voices, because a small amount is propelled at a fast speed, and where the voice is concerned fast means high. In calves, however, owing to their age, and in cows, owing to the nature of femininity, the part by means of which they set (the air) in movement is not strong, and as they set a large amount of it in movement, they have deep voices, for a large amount of air travels slowly, and anything that travels slowly is heavy (deep). A large amount (of air) is set in movement by these animals, but only a small amount by the others, the reason being that in the former the vessel through which their breath first travels has a large opening and is therefore forced to set a large
5 πολὺν ἀναγκάζεσθαι ἀέρα κινεῖν, τοῖς δὲ ἄλλοις εὔταμένους εἶναι. προϊόνσης δὲ τῆς ἡλικίας ἵσχυε μᾶλλον τοῦτο τὸ μόριον τὸ κωδὸν ἐν ἐκάστοις, ὥστε μεταβάλλουσιν εἰς τούναντίον, καὶ τὰ μὲν ὀξύφωνα βαρυφωνότερα γίνεται αὕτα αὐτῶν, τὰ δὲ βαρύφωνα ὀξυφωνότερα. διόπερ οἱ ταῦροι
10 ὀξυφωνότεροι τῶν μόσχων καὶ τῶν θηλείων βοῶν· ἐστὶ μὲν οὖν πᾶσιν ἡ ἵσχυς ἐν τοῖς νεῦροις, διὸ καὶ τὰ ἀκραίζοντα ἵσχυε μᾶλλον. ἀναρθρα γὰρ τὰ νέα μᾶλλον καὶ ἀνεφα. ἐτὶ δὲ τοῖς μὲν νέοις οὕτω ἐπιτεταίατο, τοῖς δὲ γεγηρακόσιν¹ ἡθὶ ἀνείται² ἡ συντονία· διὸ ἄμφω ἀσθενῆ καὶ ἀδύνατα πρὸς
15 τὴν κίνησιν. μάλιστα δ’ οἱ ταῦροι νευρώδεις, καὶ ἡ καρδία. διόπερ σύντονον ἔχουσι τοῦτο τὸ μόριον ὃ κινοῦσι τὸ πνεῦμα, ὡσπερ χορδὴν τεταμένην νευρίνην. δηλοὶ δὲ τοιαύτη τὴν φύσιν οὔσα ἡ καρδία τῶν βοῶν τῷ καὶ ὀστοῖν ἑγγίνεσθαι ἐν ἐνίας αὐτῶν· τὰ δ’ ὀστᾶ ζητεῖ τὴν τοῦ νεῦρον φύσιν.

20 Ἐκτεμνόμενα δὲ πάντα εἰς τὸ θῆλυ μεταβάλλει, καὶ διὰ τὸ ἀνίσθατω τὴν ἵσχυν τὴν νευρώδη ἐν τῇ ἀρχῇ ὑμοίων ἀφύσει φωνὴν τοῖς θῆλεσιν. ἡ δ’ ἀνείς εἰς παραπλησία γίνεται ὡσπερ ἄν εἰς χορδὴν κατατείνασε σύντονον ποιήσει τῷ ἐξάψι τῷ βάρος, οἶνον δὴ ποιοῦσιν αὐτοῖς ιστοὺς υφαίνουσιν· καὶ
25 γὰρ αὐταί τῶν στήμονα κατατείνουσι προσάπτουσι τὰς καλουμένας λαίας. οὕτω γὰρ καὶ ἡ τῶν

¹ γεγηρακόσιν Z, Ἀ.-W. : γηράοκουσι vulg.
² ἀνείται PZ, Ἀ.-W. : ἀνείται vulg.
³ καὶ ἡ καρδία seclusit Btf. Σ tamen vertit et tauri proprie sunt fortiorum nervorum et cordis.

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amount of air in movement, whereas in the latter the breath is under better control. In every animal, as age advances, this part which sets <the air> in movement becomes stronger, so that a change-over to the opposite is effected: high-pitched voices become deeper than they were, and deep-pitched ones higher. That is why bulls have higher-pitched voices than calves and cows. Now in all animals their strength lies in their sinews, and that actually is why animals in their prime are stronger than the others: young ones are less well articulated and less well supplied with sinews, and furthermore, their sinews have not yet become taut, whereas in ones that are aged their tautness has slackened off. Hence both young and old are weak and powerless so far as producing movement is concerned. Bulls however, being especially sinewy, have especially sinewy hearts; hence this part, by which they set the breath in movement, is taut, just like a sinewy string stretched tight. Bull’s hearts are shown to be sinewy by the fact that in some of them a bone actually occurs, and bones seek the nature of sinew.

All animals when castrated change over to the female state, and as their sinewy strength is slackened at its source they emit a voice similar to that of females. This slackening may be illustrated in the following way. It is as though you were to stretch a cord and make it taut by hanging some weight on to it, just as women do who weave at the loom; they stretch the warp by hanging stone weights on to it.

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*a* For μεταβάλλειν see 766 a 17 ff., 768 a 15 ff.

*b* See also *P.A.* 666 b 19.

*c* This is a literal translation of the Greek. See 744 b 25, 36 ff., and Introd. § 64.

*d* Cf. 717 a 35. Lit., “what are called ‘laiai’ (stones).”
ορχευν φύσις προσήρτηται πρὸς τοὺς σπερματικοὺς πόρους, οὕτω δὲ ἐκ τῆς φλεβὸς ἢ ς ἡ ἀρχὴ ἐκ τῆς καρδίας πρὸς αὐτῷ τῷ κυνοῦτι τῆν φωνήν. διόπερ¹ καὶ τῶν σπερματικῶν πόρων μεταβαλλόντων πρὸς τὴν ἡλικίαν ἐν ἢ ἡ ἡ ἀρχὴ δύνανται τὸ σπέρμα ἐκκρίνειν, συμμεταβάλλει καὶ τούτῳ τῷ μόριον. τούτου δὲ μεταβάλλοντος καὶ ἡ φωνή μεταβάλλει, μάλλον μὲν τοῖς ἁρρεσιν, συμβαίνει δὲ ταῦτα καὶ ἐπὶ τῶν θηλείων, ἀλλὰ ἄδηλότερον, καὶ γίνεται ὅ ς καλοῦσί τινας τραγίζειν, ὅταν ἀνώμαλος ἢ ἡ φωνή. μετὰ δὲ ταῦτα καθίσταται εἰς τῆν τῆς ἐπιούσῃς ἡλικίας βαρύτητα ἢ ἀξιωφωνίαν. ἀφαιρομένων δὲ τῶν ὀρχευν ἀνίεται ἡ τάσις τῶν πόρων, ὡσπερ ἀπὸ τῆς χορδῆς καὶ τοῦ στῆμονος 5 ἀφαιρομένου τοῦ βάρους. τούτου δὲ ἀνεμένου καὶ ἡ ἀρχὴ ἢ κυνοῦσα τὴν φωνὴν ἐκλύεται κατὰ τὸν αὐτὸν λόγον. διὰ μὲν οὖν ταύτην τὴν αὐτίαν τὰ ἐκτεμνομένα μεταβάλλει εἰς τὸ θῆλυ τὴν τε φωνὴν καὶ τὴν ἄλλην μορφὴν, διὰ τὸ συμβαίνειν ἀνίεσθαι τὴν ἀρχὴν ἐξ ἢς ὑπάρχει τῷ σώματι ἢ

30 συντονία, ἀλλ’ οὐχ ὡσπερ τινὲς ὑπολαμβάνουσιν αὐτοὺς τοὺς ὀρχεις εἴναι σύναμμα πολλῶν ἀρχῶν· ἀλλὰ μικρὰ μεταστάσεις μεγάλων αὐτίαν γίνονται, οὐ δὲ αὐτάς, ἀλλ’ ὅταν συμβαίνῃ ἀρχὴν συμμεταβάλλειν. αἱ γὰρ ἀρχαὶ μεγέθεις οὐσαί μικραὶ τῇ δυνάμει μεγάλαι εἰσίν· τούτῳ γὰρ ἐστὶ τὸ ἀρχὴν 10 εἶναι, τὸ αὐτὴν μὲν αὐτίαν εἴναι πολλῶν, ταύτης δὲ ἀλλὸ ἀνωθεν μηθέν.

¹ διόπερ Ῥ : διὸ vulg.

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ᵃ Cf. 776 b 17, 781 a 27 ff.
This is the way in which the testes are attached to the seminal passages, which in their turn are attached to the blood-vessel which has its starting-point at the heart near the part which sets the voice in movement. And so, as the seminal passages undergo a change at the approach of the age when they can secrete semen, this part undergoes a simultaneous change. And as this changes, so too does the voice—to a greater extent in males, but the same happens with females as well, though the change there is less obvious; and one result of this is that, as we say, the voice "is breaking" during the time that it is uneven. After that, it settles down into the deep or high pitch belonging to the age of life which is to succeed. If the testes are removed, the tautness of the passages is slackened, just as when the weight is removed from the cord or from the warp; and as this slackens, the source (or principle) which sets the voice in movement is correspondingly loosened. This then is the cause on account of which castrated animals change over to the female condition both as regards the voice and the rest of their form: it is because the principle from which the tautness of the body is derived is slackened. The reason is not, as some people suppose, that the testes themselves are a ganglion of many principles. No; small alterations are the causes of big ones, not in virtue of themselves, but when it happens that a principle changes at the same time. The principles, though small in size, are great in power: that is what it means to be a principle—something which is itself a cause of many things, while there is nothing more ultimate which is the cause of it.

Lit., "'bleating like a goat' as some people call it."

Cf. 716 b 3, etc.
Τῷ¹ δὲ φύσει τὰ μὲν τοιαύτα συνιστάσθαι τῶν ζώων ὡστε βαρύφωνα εἶναι, τὰ δὲ ὀξύφωνα, συμβάλλεται καὶ ἡ θερμότης τοῦ τόπου καὶ ἡ ψυχρότης. τὸ μὲν γὰρ θερμὸν πνεύμα διὰ παχῦ-20 τητα ποιεῖ βαρυφωνίαν, τὸ δὲ ψυχρὸν διὰ λεπτότητα τούναντίον. δήλων δὲ τούτῳ καὶ ἐπὶ τῶν αὐλῶν ὁ γὰρ θερμοτέρῳ τῷ πνεύματι χρώμενοι, καὶ τοιοῦτον προϊέμενοι οἶον οἱ αἰάζοντες, βαρύτερον αὐλοῦσιν. τῆς δὲ τραχυφωνίας αἴτιον, καὶ τοῦ λείαν εἶναι τῆν φωνήν, καὶ πάσης τῆς τοιαύτης 25 ἀνωμαλίας, τὸ δὲ μόριον καὶ τὸ ὁργανὸν δι' οὖν φέρεται ἡ φωνὴ ἡ τραχύ ἡ λείαι εἶναι ἡ ὀλως ὀμαλὸν ἡ ἀνώμαλον (δήλων δὲ ὁταν ψυχρότης τις ὑπάρχῃ περὶ τῆς ἀρτηρίας ἡ τραχύτης γένεται υπὸ τινὸς πάθους· τότε γὰρ καὶ ἡ φωνὴ γίνεται ἀνωμαλός): τῆς δὲ εὐκαμψίας,² ἂν μαλακὸν ἡ σκληρὸν
30 ἡ τὸ ὁργανὸν· τὸ μὲν γὰρ μαλακὸν δύναται ταμιεύεσθαι καὶ παντοδαπὸν γίνεσθαι, τὸ δὲ σκληρὸν οὐ δύναται. καὶ τὸ μὲν μαλακὸν καὶ μικρὸν δύναται καὶ μέγα φθέγγεσθαι, διὸ καὶ ὀξὺ καὶ βαρύ· ταμιεύεται γὰρ ῥαδίως τοῦ πνεύματος, καὶ αὐτὸ γινόμενον ῥαδίως μέγα καὶ μικρὸν· ἡ δὲ σκληρότης ἀταμεντον.

Περὶ μὲν οὖν φωνῆς ὁσα μῆ πρότερον ἐν τοῖς περὶ αἰσθήσεως διώρισται καὶ ἐν τοῖς περὶ ψυχῆς, τοσαυτ' εἰρήσθω.

VIII Περὶ δὲ ὀδόντων, ὅτι μὲν οὖς ἐνός χάριν, οὐδὲ πάντα τοῦ αὐτοῦ ἐνέκειν τὰ ζῶα ἔχονσιν, ἀλλὰ 5 τὰ μὲν διὰ τὴν τροφῆν, τὰ δὲ καὶ πρὸς ἀλκην καὶ

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1 tō Aldus: τοῦ Bekker, per hypothetae errorem, ut videtur.
2 Kai tēs akamphias Bonitz.
The heat and cold of their place of habitation is another factor contributing to the fact that the natural construction of some animals is such that they have deep voices, and of others, that they have high voices. Breath that is hot produces deepness (heaviness) of voice, owing to its thickness; breath that is cold produces the opposite result, owing to its thinness. This is plain in the case of musical pipes as well: people who blow comparatively hot breath into the pipe—i.e., if they breathe it out as though they were saying "Ah!"—play a deeper note. The reason for roughness and smoothness of voice and all unevenness of that sort is that the part or organ through which the voice travels is rough, or smooth, or, to put it generally, is even or uneven. This is apparent when there is any fluid about in the trachea, or if there is any roughness due to an affection: in such circumstances the voice becomes uneven too. Flexibility depends upon whether the organ is soft or hard, since anything that is soft can be controlled and made to assume all sorts of shapes, whereas anything hard cannot. Thus this organ if it is soft can utter a small sound or a large one, and therefore a high one or a deep one as well, because it controls the breath easily, as it easily becomes large or small itself. Hardness on the other hand cannot (so) be controlled.

This will be a sufficient account of those points concerning the voice which we have not already settled in the treatises *Of Sensation* and *Of the Soul*.

We have already said,* on the subject of the VIII teeth, that their existence is not for one purpose only, nor do they exist for the same purpose in all animals: some have teeth on account of nourishment, some for self-defence and (some) for rational...
πρὸς τὸν ἐν τῇ φωνῇ λόγον, εἴρηται πρότερον· διότι δὲ οἱ μὲν πρόσθοι γίνονται πρότερον οἱ δὲ γόμφῳ ὑστερον, καὶ οὕτωι μὲν οὐκ ἐκκέπτουσιν, ἐκεῖνοι δὲ ἐκκέπτουσι καὶ φύονται πάλιν, τοῖς περὶ γενέσεως λόγοις τὴν αἰτίαν συγγενῆ δεῖ νομίζειν.

10 Ἐἴρηκε μὲν οὖν περὶ αὐτῶν καὶ Δημόκριτος, οὐ καλῶς δ′ εἴρηκεν. οὐ γὰρ ἐπὶ πάντων σκεφάμενος καθόλου λέγει τὴν αἰτίαν. φησὶ γὰρ ἐκκέπτειν μὲν διὰ τὸ πρὸ ὀρας γίνεσθαι τοῖς ζῷοις· ἀκμάζοντων γὰρ ως εἰπεῖν φύεσθαι κατὰ γε φύον. τού δὲ πρὸ ὀρας γίνεσθαι τὸ θηλάξειν αἰτίαται.

15 καὶ τοι θηλάξει γε καὶ ὦς, οὐκ ἐκβάλλει δὲ τοὺς ὀδόντας· ἔτι δὲ τὰ καρχαρόδοντα θηλάξει μὲν πάντα, οὐκ ἐκβάλλει δ′ ἐνια αὐτῶν πλὴν τοὺς κυνόδοντας, οἴον οἱ λέοντες. τοῦτο μὲν οὖν ἦμαρτε καθόλου λέγων, οὐ σκεφάμενος τὸ συμβαίνον ἐπὶ πάντων. δεὶ δὲ τούτῳ ποιεῖν· ἀνάγκη γὰρ τὸν 20 λέγοντα καθόλου τι λέγειν περὶ πάντων. ἐπεὶ δὲ τὴν φύσιν ὑποτιθέμεθα, ἕξ ὁν ὀρῶμεν ὑποτιθέμενοι, οὐτ' ἐλλειποῦσαν οὕτε μάταιον οὐθὲν ποιοῦσαν τῶν ἐνδεχομένων περὶ ἕκαστον, ἀνάγκη δὲ τοὺς μέλλουσι λαμβάνειν τροφὴν μετὰ τὴν τοῦ γάλακτος ἀπόλαυσιν ἔχειν ὀργανα πρὸς τὴν ἔρ- 25 γασίαν τῆς τροφῆς—εἰ οὖν συνέβαινεν, ως ἐκεῖνος λέγει, πρὸς Ἧβην, ἐνέλειπεν ἄν ἡ φύσις τῶν ἐνδεχομένων αὐτῇ τι ποιεῖν, καὶ τὸ τῆς φύσεως

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*a* This is repeated from *H.A.* 501 b 4, but it is incorrect.

*b* Lit., “which are saw-toothed.” See *P.A.* 661 b 19.

*c* Also stated at *H.A.* 579 b 11. Other animals’ habits in teeth-shedding are noticed at *H.A.* 501 b 1 ff., 575 a 5.

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speech. But why are the front teeth formed first and the molars afterwards? And why are the molars not shed, whereas the front teeth are, and grow again? We must take it to be appropriate to examine the cause of these things in a treatise on Generation.

Now Democritus has treated of these matters, but his treatment is not correct, because he assigns a cause to apply generally although he has not undertaken an exhaustive investigation of the facts. He says that the reason why animals shed their teeth is that they are formed prematurely, since it is when animals are in their prime or thereabouts that they grow their teeth according to nature. Suckling is the cause he names for their being formed prematurely. Still, the pig suckles, yet does not shed its teeth; and so do all the animals with sharp interfitting teeth, but some of them (e.g., the lion) do not shed any teeth except the canine ones. Democritus, then, made this mistake because he made a general statement without investigating the facts in all cases; but this is precisely what we ought to do, because whenever anyone makes a general statement it must apply to all cases. Now the assumption we make—and it is an assumption founded upon what we observe—is that Nature neither defaults nor does anything idly in respect of the things that are possible in every case; and further, if an animal is going to get any nourishment after the period of its suckling is over, it must of necessity possess instruments with which to deal with its nourishment. So that if this took place, as Democritus says, about the time of maturity, Nature would be defaulting in one of the things which it is possible for her to do, and we should have Nature
Το τῶν πλατέων πρώτον μὲν ὅτι καὶ τὸ ἔργον τὸ τουτον πρῶτον (πρῶτον γάρ ἔστι τοῦ λεάναι τὸ διελεῖν, εἰςὶ δὲ ἐκεῖνοι μὲν ἐπὶ τῷ λεάνειν, οὕτως δὲ ἐπὶ τῷ διαφεῖν), ἐπειδ' ὅτι τὸ ἔλασσον, κἂν ἄμα δρμήθη, θάττον γίνοιτο πέμπυκ τοῦ μείζονος. εἰςὶ δὲ ἐλάσσον οὕτω τῷ μεγεθεὶ τῶν γομφίων, τῷ τὸ ἔστιν τῆς σιαγόνος ἐκεῖ μὲν πλατὺ εἶναι, πρὸς δὲ τῷ στόματι στενὸν. ἐκ μὲν οὖν τοῦ μείζονος πλεῖον ἀναγκαίον ἐπιρρέειν τροφῆν, ἐκ δὲ τοῦ στενοτέρου ἔλασσον.

Τὸ δὲ θηλάζειν αὐτὸ μὲν οὖθεν συμβαλλεῖ, ἢ δὲ τοῦ γάλακτος θερμότης ποιεῖ θάττον βλαστάνει τοὺς ὀδόντας. σημείον δὲ ὅτι καὶ αὐτῶν τῶν θηλαζόνων τὰ θερμοτέρῳ γάλακτι χρώμενα τῶν παιδίων ὀδοντοφυεῖ θάττων. αὐξητικῶν γὰρ τὸ θερμόν.

Ἐκπίπτουσι δὲ γενόμενοι τοῦ μὲν βελτίονος χάριν, ὅτι ταχὺ ἀμβλύνεται τὸ ὀξὺ. δεῖ οὖν ἔστερους διαδέχεσθαι πρὸς τὸ ἔργον. τῶν δὲ πλατέων οὐκ ἔστιν ἀμβλυτῆς, ἀλλὰ τῷ χρόνῳ τριβόμενοι λεινοῦνται μόνον. ἐξ ἀνάγκης δὲ ἐκπίπτουσιν, ὅτι τῶν μὲν ἐν πλατείᾳ τῇ σιαγόνι καὶ ἱσχυρῷ ὀστὶ ἀἱ

2 sic Platt: ἐκ δὲ τοῦ ἐλάσσονος στενοτέρων vulg.
3 γενόμενοι τοῦ μὲν] γ’ ἐνοι τοῦτον τοῦ Ζ: γ’ ἐνοι μὲν τοῦ μῆ S.

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working contrary to Nature (because he says that the formation of the teeth is brought about by force, and "by force" means "contrary to Nature"). So then it is apparent, both from these considerations and others like them, that this view is untrue.

The teeth of which we are speaking are formed earlier than the flat teeth (1) because the work they have to perform comes earlier: breaking up (which is the purpose of these teeth) comes before grinding (which is the business of the flat ones); (2) because a smaller thing naturally forms more quickly than a larger one, even if they both start off together, and these teeth are smaller in size than the molars, because the jawbone at that point is flat, whereas it is narrow by the mouth; and, of necessity, a larger amount of nourishment will flow out from the larger part, and a smaller amount from the narrower.

Suckling, in itself, contributes nothing to the formation of the teeth, though the warmth of the milk makes them come through more quickly. A proof of this is that within the actual class of those which suckle, those young ones which get hotter milk grow their teeth quicker, because that which is hot tends to promote growth.

After having been formed, these teeth are shed (a) for the sake of the better, the reason being that anything sharp quickly gets blunted, and so a fresh relay of teeth is needed to carry on the work. (The flat ones, on the other hand, cannot get blunted; they only get worn down in the course of time by friction.) They are shed also (b) as a result of necessity, because, whereas the roots of the grinders are situated in the wide part of the jaw and upon good strong

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*a* But see Introd. § 14.

*bi.e.,* form the teeth.
ρίζαι εἰσι, τῶν δὲ προσθίων ἐν λεπτῷ, διὸ ἀσθενεῖς
15 καὶ εὐκάνητοι. φύονται δὲ πάλιν, ὅτι ἐν φυομένων
ἐτι τῷ ὁστῷ ἡ ἐκβολὴ γίνεται καὶ ἐτι ἁρα νῦνται υEDURE
γίνεσθαι οἴκοντας. τούτων δὲ σημεῖον ὅτι καὶ οἱ
πλατεῖς φύονται πολὺν χρόνον. οἱ γὰρ τελευταίοι
ἀνατέλλουσι περὶ τὰ εἰκόσι ἐτῆς, ἔνιοι δὲ ἔδη καὶ
gηράσκουσι γεγένηται οἱ ἐσχατοί παντελῶς διὰ
20 τὸ πολλῆν εἶναι τροφῆν ἐν τῇ εὐρυχωρίᾳ τοῦ ὁστοῦ.

tὸ δὲ πρόσθιον διὰ τὴν λεπτότητα ταχὺ λαμβάνει
tέλος, καὶ οὐ γίνεται περίττωμα ἐν αὐτῷ, ἀλλ'
eis τὴν αὐξήσιν ἀναλίσκεται ἡ τροφὴ τῆς οἰκείαν.

Δημόκριτος δὲ τὸ οὗ ἐνεκα ἄφεις λέγειν, πάντα
ἀνάγει εἰς ἀνάγκην οἷς χρήται ἡ φύσις, οὔσι μὲν
5 τοιούτοις, οὐ μὴν ἀλλ' ἐνεκά τινος οὔσι, καὶ τοῦ
περὶ ἕκαστον βελτίωνος χάρων. ὡστε γίνεσθαι μὲν
οὐθὲν κωλύει οὗτω καὶ ἐκπίπτει, ἀλλ' οὐ διὰ
tαῦτα, ἀλλὰ διὰ τὸ τέλος· ταῦτα δ' ὡς κυνοῦσα
καὶ ὅργανα καὶ ὡς υλὴ αἴτια, ἐπεὶ καὶ τὸ τῶν
πνεύματι ἐργάζεσθαι τὰ πολλὰ εἰκὸς ὡς ὅργανως.
10 οἷον γὰρ ἐνα πολύχρωστα ἐστὶ τῶν περὶ τὰς
tέχνας, ὡσπερ ἐν τῇ χαλκευτικῇ ἡ σφῦρα καὶ ὁ
ἀκμῶν, οὗτως καὶ τὸ πνεῦμα ἐν τοῖς φύσει συν-
εστώσιν. ὃμοιον δ' ἐοικε τὸ λέγειν τὰ αἴτια ἐξ

a "The 'for the sake of which.'"
b See Introd. § 6.
c i.e., "of necessity," a result of mere mechanical causation.
d Cf. above, 741 b 37, 742 a 16, and App. B §§ 7 ff.
bone, those of the front teeth are in a thin part, and in consequence the teeth are weak and can easily be removed. They grow a second time, because they are shed while the bone is still growing and while the age for growing teeth is still going on. A proof of this is that even the flat teeth take a long time growing: the last of them are cut at about twenty years of age; in fact, some people have been quite aged before their last teeth finished growing. The reason for this is that there is a great deal of nourishment in the wide part of the bones. The front part, however, quickly reaches its completion owing to its thinness, and no residue finds a place in it; instead of that, the nourishment is consumed to supply that part's own growth.

Democritus, however, omitted to mention the Final Cause, and so all the things which Nature employs he refers to necessity. It is of course true that they are determined by necessity, but at the same time they are for the sake of some purpose, some Final Cause, and for the sake of that which is better in each case. And so there is nothing to prevent the teeth being formed and being shed in the way he says; but it is not on that account that it happens, but on account of the Final Cause, the End; those other factors are causes' qua causing movement, qua instruments, and qua material, since in fact it is probable that Nature makes the majority of her productions by means of pneuma used as an instrument. Pneuma serves many uses in the things constructed by Nature, just as certain objects do in the arts and crafts, e.g., the hammer and anvil of the smith. But to allege that the causes are of the necessary type is on a par with
άνάγκης κἂν εἰ τις διὰ τὸ μαχαίριον οὐκετο τὸ ύδωρ ἐξεληλυθέναι μόνον τοῖς υδρωπιῶσιν, ἀλλ' 15 οὐ διὰ τὸ ύγιαίνειν οὐ ἕνεκα τὸ μαχαίριον ἔτεμεν.

Περὶ μὲν οὖν ὀδόντων, διότι οἱ μὲν ἐκπίπτοντο καὶ γίνονται πάλιν, οἱ δ' οὐ, καὶ ὀλίγας διὰ τὴν αἰτίαν γίνονται, εἴρηται. εἴρηται δὲ καὶ περὶ τῶν 20 ἄλλων τῶν κατὰ τὰ μόρια παθημάτων, ὡσα γίνεσθαι συμβαίνει μὴ ἕνεκα τοῦ ἀλλ' ἐξ ἀνάγκης καὶ διὰ τὴν αἰτίαν τῆν κινητικῆν.
supposing that when water has been drawn off from a dropsical patient the reason for which it has been done is the lancet, and not the patient’s health, for the sake of which the lancet made the incision.

We have now dealt with the subject of the teeth, and we have stated why some of them are shed and grow a second time and why some of them do not, and generally, to what cause their being formed is due. We have also dealt with the other conditions which affect the parts of the body, conditions which occur not for the sake of any Final Cause but of necessity and on account of the Motive Cause.
Additional Notes on the Text

I add here four textual annotations for which there was no room in the body of the work.

I. 719 a 2 ff. The mss. and editions have various readings, and several proposals have been made for emendation.

Bekker has:    τον αυτον τρόπον τα πλείστα γίνεται ονπερ ἐν τοῖς ὄρνισι (ὄρνιθοις SYΖ): καταβαίνει γὰρ κάτω, καὶ...

Z:    . . . γίνεται ονπερ . . . καὶ καταβαίνει κάτω . . .

P:    . . . γιγνόμενον ονπερ . . . καταβαίνει κάτω . . .

S:    . . . γίνεται οσπερ . . . καταβαίνει κάτω . . .

(Hence Y must be the authority for γὰρ.)

Aldus:    γίγνεται ονπερ . . . ὄρνιθοις καταβαίνει κάτω . . .

A.-W. coni.:    <ή τελεώσις> γίνεται ονπερ ἐν τοῖς ὄρνισιν· <τὰ φαί> καταβαίνει κάτω . . .

Susemihl coni.:    . . . ὄρνισιν <ή τελεώσις: τὰ δ' φαί> καταβαίνει κάτω.

If loss of this sort is likely, which I doubt, a more probable emendation would be καταβαίνει γὰρ κάτω <τὰ φαί>, καὶ . . . But I suspect that the corruption is more serious, for Scot reads: et similiter multis ovis avium; et quedam animalia ovant interius, et exit ab eis animal parvum; et cum pervenit tempus partus> descendent <ocas> ad partem inferiorem apud iuncturas et exit ab eis animal sicut accidit animalibus generantibus animalia ex prima creatione. The Greek original of the words in brackets has disappeared from our text.

II. 738 a 8 ff. I suspect that the original reading here was τοῖς περιττόμαι τοῖς τ' ἄχρηστοις <καὶ τοῖς χρησίμοις>, and that the rest of our present text is part of a gloss, for τῆ τε . . . ύγρα cannot be construed, and the reference to blood seems to consider blood as a "residue," which is incorrect. If my suggestion is right, the gloss will have ousted the reference to useful residues from our text, and the reference to useless ones from Scot's ultimate original, for Scot reads omnia ista habent membra recipiencia superfluitatem qua indigent (his regular equivalent for χρησίμοι) sicut sanguis qui habet locum in venis; ergo ipse vadit in ea sicut in vasa. Clearly, too, Scot incorporates more of the latter part of the 562
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gloss than the Greek text does, and the reference to *vasa*
(=άγγεια) leads me to think that the gloss was founded on
a misunderstanding of the passage at *P.A.* 650 a 33 (*q.v.*).
The blood-vessels are often described as άγγεια in *P.A.*;

II. 746 a 32. Here Bitterauf, following the suggestion of
Bussemaker, proposes to insert *καὶ θώσων* after *καὶ λύκων* on
the strength of William's and Scot's versions. The latter
reads *in canibus et vulpibus et lupis et in genere quod dicitur
grece comez* (Buss. and Btf. give *comex*). This is supported
by the fact that at 774 b 17 Scot translates *κώνον λύκος θώσ
canis et lupus et animal quod dicitur grece noz.* (Such
variation in the spelling of proper and other unusual names
is not infrequent in Scot.) At 742 a 9 θώσ is not represented
in Scot's version.

(According to A.-W., θώσ, usually translated "jackal," is
most probably the civet or genet: see D. W. Thompson,
*H.A.* 580 a 29, n.)

V. 781 a 10 οἱ γὰρ πόροι . . . 781 b 5 συμβαίνουσιν. The
main arguments against this passage being an original and
genuine part of the text may be stated as follows:
(1) The introductory γὰρ introduces no real explanation or
expansion of the preceding statement. The passage is in
fact completely extraneous to the argument.
(2) The reference to *De sensu* at 781 a 21 is incorrect, as
A.-W. point out. There is no such clear statement in *De
sensu*; at 439 a 1 the *αισθητήριον* of touch and taste is said
to be *πρῶς τῇ καρδίᾳ*, but nothing is said to suggest that sight
and smell have any further connexion beyond their connexion
with the brain. At *P.A.* 656 a 29, on the other hand, there
is a more exact reference to *De sensu*: "The correct view, that
the ἀρχή of the senses is the region around the heart, has
already been defined in the treatise *Of Sensation*, where also
I show why it is that two of the senses, touch and taste, are
evidently (φανερῶς) connected to the heart." Shortly before
(656 a 20 ff.) Aristotle has stated that the brain is not the
cause of any of the sensations; it is ἀναίσθητος.
(3) The passage is concerned exclusively with that part of
the mechanism of hearing which is internal, not with the
superficial sense-organ, whereas the reason given for accuracy
of hearing and smelling is concerned only with the super-
ficial sense-organ (just as the similar argument for sight,
which is referred to, is concerned only with the eye itself and the skin on it).

(4) The passage has nothing whatever to say about smell.
(5) It concludes with a mere repetition of 781 a 18-20, to the effect that accuracy depends upon the purity of the organ and its membrane, ignoring the whole of the intervening discussion about the internal mechanism.
(6) The reference to a place where the connate pneumata causes "in some" pulsation and "in others" respiration and inspiration is, as Platt points out, meaningless, for no animal respirest unless it has a heart.

The inference would appear to be that the passage, though probably of Aristotelian origin, has been corrupted, and that, so far as Book V is concerned, it began as a marginal annotation, intended to supply an account of the inner mechanism of sensation, etc., which would supplement the account of the mechanism of the superficial sense-organs of hearing and smell which no doubt originally stood here in the text. No such account, however, is there now; and it seems reasonable to suppose that it has been ousted and supplanted by the passage which now stands there.

To understand the background of the passage, the reader may find it useful to refer to the account of Aristotle's theory of hearing in App. B §§ 29 ff., which I have compiled from various passages here and elsewhere in his works. I have suggested in the critical note some corrections, based on Scot's Latin version, which may help to bring the text into agreement with Aristotle's doctrine as ascertained from these other passages.

For the sake of completeness, I give the remainder of Scot's translation between the two passages already quoted in the app. crit.: [et] propter hoc addiscuntur res per (v.l. propter) sensum auditus, quoniam sicut sermo intrat per sensum auditus, ita exit per linguam [et] per motum vocis. manifestum est ergo quod homo dicit (v.l. discit) quod audit. et cum homo gannit debilitatur auditus, quoniam principium instrumenti sensus istius est positum super membrum in quo est spiritus, et movetur cum eo quando spiritus movebitur instrumento in quo est. et hoc accidens accidit temporibus humide complexionis.

The passage is discussed at considerable length by F. Susemihl, Rhein. Mus. XL (1885), 583 ff.
The first modern work on the breeding migration of the European eel (*Anguilla vulgaris*) is that of Grassi a and Calandruccio, who, following some previous work on the reproductive organs, made observations of eels in the Mediterranean, and showed that *Leptocephalus*, already known and described as a different animal, was the larval form of the eel. The whole subject has been fully worked out by Schmidt b in recent years. The facts are these. During the time when eels live in fresh water, their reproductive organs do not reach maturity, as Aristotle pointed out; but after a number of years, which may vary from five to twenty, the body takes on a metallic sheen ("silver eels") and the fish set out on their migration to their breeding-places in the deep waters between the West Indies and Bermudas. The eggs float in the sea, and the larvae are carried by the ocean currents eastwards across the Atlantic: upon arrival at the Continental shelf two and a half years later they metamorphose into elvers, and these then move up into the estuaries and rivers of Europe, sometimes passing over damp grass to isolated pools. During the period of growth which follows, they are yellowish and greenish in colour ("yellow eels"). The old eels never return to fresh waters. The story (mentioned by Aristotle) of the development of eels out of horsehair worms was current until recent times.

Aristotle discusses the hyena both here and at *H.A. VI.* The *Hyena.* 579 b 15 ff.

An important piece of research on the spotted hyena recently carried out in Tanganyika Territory by L. Harrison Matthews c has established that externally the female of

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c *Reproduction in the Spotted Hyena* (Crocuta crocuta), in *Phil. Trans. Roy. Soc.* (B) CCXXX (1939), 1-78.
the spotted hyena closely resembles the male: it has a peniform clitoris, similar in form and position to the penis of the male, and scrotal pouches closely simulating those of the male. Indeed the male and non-parous female are indistinguishable externally. Matthews points out that Aristotle did not distinguish between spotted and striped hyenas: the legend "relates to the spotted hyena, but Aristotle's refutation of it to the striped, the genital anatomy of which he correctly describes" (Matthews refers to the description in H.A.). Of 103 specimens collected by Matthews, 63 were males; this is a lower percentage than that given by the hunter with whom Aristotle discussed the subject: he found ten out of eleven were males, but these may have been striped hyenas.
APPENDIX A

MOVEMENT IN THE UPPER COSMOS AND IN THE LOWER COSMOS: THE HEAVENLY BODIES; γένεας AND φθορά; TIME, PERIODS, CYCLES

(Supplement to Book II, init. and Book IV, fin.)

It will be seen that the terminology of the two passages above mentioned reappears in the following account, much of which is taken verbatim from the several passages to which reference is given. I have not thought it necessary to draw attention to all the parallels, as these will be obvious to the reader who has the passages of G.A. before him.

(1) Met. A 1069 a 30 ff. There are three kinds of ὄσια:

{(a) eternal (ἀδιόν);

(1) sensible (αἰσθητή); (b) perishable (φθαρτός), e.g.,

animals and plants;

(2) immutable (ἀκάκτος).

Immutable ὄσια is the ὄσια of the unmoved mover (see below, § 3);

sensible and eternal ὄσια belongs to the "heaven" and the heavenly bodies (the stars and planets, including the Sun and Moon);

sensible and perishable ὄσια belongs to the things of the sublunary world (Earth, Air, etc., and the organisms made out of them, animals, plants, etc.).

(2) De caelo, e.g., 268-269, 289 a, 300 a 20 ff., etc. There are five natural substances which compose the physical universe:

Aither, whose nature it is to move eternally in a circle; this is the substance out of which the whole of the Upper Cosmos is made, viz., the "first heaven" (the outermost shell or sphere) in which the stars are

a See also App. A § 18.

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fixed, and also the planetary “heavens” together with the planets themselves which they carry; Fire, Air, Water and Earth, whose natural movement is rectilinear (e.g., Air moves naturally outwards from the centre, Earth moves naturally towards the centre; hence they would if left to themselves arrange themselves in concentric strata, with Fire outermost, next to the innermost “heaven”; after that Air, then Water, and Earth at the centre). These are the substances out of which all the Lower Cosmos, the sublunary world, is composed.

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The Unmoved Mover and the φορά of the First Heaven.

Movement in the Upper Cosmos.

(3) \( \text{Met. A 1072 a, b.} \) The ultimate source of all movement is the Unmoved Mover, which is pure, self-thinking thought, or God; and since the “actuality” of thought is life, we can say that ζωὴ καὶ αἰῶν συνεχῆς καὶ ἄδιός ὑπάρχει τῷ θεῷ. This “first principle” causes movement without itself being in movement; it is therein analogous to objects of desire or of thought, which κινεῖ ὁ Κῦναμενα\(^{b}\); in fact, it κινεῖ ὁς ἐρώμενον (it causes movement by being an object of love).\(^{c}\) Upon this first principle the Heaven and Nature depend. What it first sets in movement is the πρῶτον κῦναμενον, the primum mobile, viz., the “first heaven,” or outermost sphere; and since this movement is an unceasing movement, so the first heaven will be ἄδιός. This movement, then, is one and eternal; it is simple φορά, simple uniform circular movement.

(4) All other things beside the Unmoved Mover which produce movement do so in virtue of being themselves in movement (κῦναμενα τᾶλα κινεῖ). Thus the “first heaven” communicates movement to the inner “heavens,” the whole system of concentric spheres, which are in contact with each other; and the movements of these, although still continuous and eternal, are no longer uniform, because they are the resultants of more revolutions than one.\(^{d}\)

\(^{a}\) As in fact they are not (see § 12; cf. § 9). Nor, according to Aristotle, are the elements occupying their “proper” places when acting as the components of living bodies (De caelo II. 288 b 17 ff.).

\(^{b}\) Cf. App. B § 1.

\(^{c}\) Cf. Dante, Paradiso, vers. ult., l’amor che move il sole e l’altra stelle.

\(^{d}\) It is not necessary here to give details of the system of spheres as worked out by Aristotle, based on the mathematical theories of Eudoxus and Callippus.

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(5) In the "region about the centre," i.e., the Lower Cosmos or sublunary world, there is no circular movement at all as such. The form in which movement is found here is in the "movements," i.e., transformations of the four sublunary "simple" bodies, Fire, Air, Water, Earth, and in the "movements" of living creatures, animals and plants, viz., γένεσις and φθορά, "alteration," growth and diminution. "Movement" is mediated to the things in the Lower Cosmos through the heavenly bodies, chiefly the Sun, as is stated at the end of G.A. IV.

(6) Meteor. I. 339 a 28. We should regard Fire, Earth, etc., as the "material" causes of phenomena in the sublunary world; but the cause in the sense of the origin of movement (the "motive" cause) is to be found in the dynamis of the eternally moving bodies.

(7) Ibid. 340 b, 341 a. The "first element" (alias the "fifth element," viz., aither; see 737 a 1, n.) and the bodies in it revolve in a circle, and as they do so, that portion of the Lower Cosmos which is next to the aither gets inflamed and produces heat. Thus, although not made of Fire, and although not themselves hot, the heavenly bodies produce heat by their mere movement. Aristotle explains this more fully at De caelo II. 289 a 29, when he says that the heat and light which proceed from them are produced by the friction set up in the Air by their φθορά (cf. § 9 fin. below). The Sun, which is considered to be the hottest of them all, is really white (λευκός), not fiery in colour. The Sun's φθορά is sufficient to produce warmth and heat: it is fast enough and near enough, whereas the φθορά of the stars though fast is distant, and the Moon's though near is slow (cf. De caelo II. 289 a 20-34).

(8) Ibid. 346 b, 359 b. Rain and winds are explained as being caused by the Sun's approaching and receding in its φθορά. It when it approaches it draws up the moist exhalation; when it retires this vapour cools and congeals again into water; hence there is more rain during winter and during the night. It also draws up the dry exhalation, and this is the substance which makes the winds.

(9) It is pointed out in De caelo II. 286 b 2 that in order to...

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a See Introd. §§ 47 ff., κίνησις.
b Quoted in Greek at 777 b 31, n.
account for the transformations of the four "elements" Fire Air Water Earth, i.e., for the γένεσις of them out of one another, some additional φορά or φορεῖ beside that of the "Whole" (or the πρῶτον κυνωμένον) is required: if this were the only φορά, no transformation would take place and the four elements would be static.

And with regard to the γένεσις of living things, Aristotle describes in other treatises more strikingly and in fuller detail than he does in G.A. the important part played by these other φοραί (i.e., those of the heavenly bodies). Thus in Phys. II. 194 b 13 we read ἀνθρωπος ἀνθρωπον γεννᾷ καὶ ἠλιός a; and at Met. A 1071 a 13 ff. the "causes" of a man are listed as (a) the "elements," viz., (i) his matter (Fire and Earth), b and (ii) his own form (ἐδών εἴδων); also (b) something external, viz., his father; and besides these (c) the Sun and the circle of the ecliptic (ὁ λοξὸς κύκλος)—and these last stand to him neither as matter, nor as form, nor as privation, nor as being identical with him in form, but as κυνωμένα, i.e., "efficient" or "motive" causes (cf. §§ 5 and 6 above). Cf. also G.A. II. 737 a 3: the heat of the Sun and the heat of animals as contained in semen is able to cause generation, whereas Fire cannot.

The whole question of γένεσις and φορά is more fully discussed at the end of the treatise G. & C. (II. chh. 10 and 11), where the meaning of the statements about the Sun and the ecliptic is explained. Here Aristotle states that γένεσις is continuous because the circular revolution of the "first heaven" is eternal (ἡ κατὰ τὴν φορὰν κύριας is αἴδιος); and this φορά produces γένεσις by bringing τὸ γεννητικὸν (the generative agent, viz., the Sun) nearer and by taking it further away. This φορά however is a single movement (as we saw above, § 3), and therefore will only explain γένεσις; it will not also ex-

a This would not, however, have sounded so strange to a Greek; cf. G.A. 716 a 17 οὐρανὸν ἐκαὶ ἠλιόν . . . ὡς γεννώντας καὶ πατέρας προσαγορεύουσιν.—It is a statement which caught the fancy of the Middle Ages, and is quoted by Dante (from the Latin translation of Physics II) in his De monarchia I. 9 init.; cf. Paradiso XXII. 116 quegli ch' è padre d' ogni mortal vita.

b Aristotle regularly takes these two as the elements par excellence, standing for all four (see De caelo III. 298 a 29, 298 b 8)—because Fire "has not heaviness" and Earth "has not lightness" (IV. 311 b 27). Cf. App. B §§ 20, 22, 23.
plain φθορά. Thus γένεσις-and-φθορά is to be explained not as being due to the primary φθορά (i.e., the φθορά of the "first heaven"), but as being due to the φθορά κατὰ τὸν λοξὸν κύκλον—the movement along the circle of the ecliptic, which is tilted. This, like the other, possesses continuity; but also it is double, not single. Thus we may say that the continuity is caused by the φθορά of "the Whole" (i.e., the "first heaven"; the primary φθορά), while the alternation is produced by the inclination of the ecliptic, which makes the Sun alternately approach and retreat. When the Sun approaches it will cause γένεσις, when it retreats it will cause φθορά.

(11) Now in consequence of this, natural (κατὰ φύσιν) γένεσις and φθορά occupy equal times for their accomplishment. Hence both the times and the lives of all several things have a "number" and by that number they are delimited . . . and every life and time is measured by a period . . .: for some, this period is the year; for others, the period, which is the measure, is greater, for others, smaller (διὸ καὶ οἱ χρόνοι καὶ οἱ βίοι ἐκάστων ἀριθμὸν ἔχουν καὶ τούτῳ διορίζονται . . . καὶ πᾶς βίος καὶ χρόνος μετρεῖται περιόδῳ . . . τοῖς μὲν γὰρ ὁ ἐνιαυτός, τοῖς δὲ μείζων, τοῖς δὲ ἐλάττων ἡ περιόδος ἐστὶ τὸ μέτρον). He then repeats that natural γένεσις and φθορά occupy an equal time; but, he adds, in point of fact things often φθείρεται in a shorter time than this; for since matter is uneven (ἀνώμαλος; cf. his statement in G..I. IV fifth. about its "indeterminativeness"), the γενέσεις of things are uneven too, some being quicker and some slower than they should be; and as a result of this the φθορά of other things is affected, because the γενέσεις of one set of things is the φθορά of another. (See also App. B §§7-11.)

(12) Γένεσις-and-φθορά is continuous, and shall never fail. The reason is that Nature always strives after τὸ βέλτιον, and being is better than not-being; but since being cannot be possessed by all things because they are too far away from the ἀρχή (i.e., from God, the Unmoved Mover), God "filled in" the Whole in the manner that remained open, viz., by making γένεσις continuous; that was the way to ensure that as far as possible there should be an unbroken chain of "being" throughout the universe, for the next best thing to "being" is that
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γένεσις should be continually going on (τὸ γίνεσθαι ἰη τὴν γένεσιν); and the cause of this is the circular φορά; for this is the only continuous form of movement. Hence also the things which get transformed into each other (viz., the "simple bodies," such as Water, Air, Fire) imitate the circular φορά: Water is transformed into Air, Air into Fire, Fire into Water, and we say that their γένεσις has come round a full "circle." (So, too, rectilinear φορά is continuous in virtue of its imitating circular φορά.) And this also provides a solution of the problem, Why is it that the "simple bodies," in spite of their natural tendency to make each for its own proper place in the universe, have not during the enormous stretches of time which have passed become separated out each into its own proper place, into concentric layers (see § 2)? The reason is that they are continually being transformed to and fro one into the other, and the cause of their transformations is the φορά —i.e., the double φορά.

Measure- (13) Phys. IV. 219 b 3 ff. We cognize movement by means of some body which is in movement; so too we cognize φορά by means of some body which is φερόμενον: that is how we cognize the "before-and-after" factor in movement, for it is the "now" (i.e., the moment at which the body is observed to be at some particular point in its course) which is "most cognizable." And just as φορά and the φερόμενον are thus closely allied, so too are the ἀριθμός of the φορά and the ἀριθμός of the φερόμενον. Now time is the ἀριθμός of the φορά. We see then that time is not movement, but it is "the aspect of movement whereby movement has an ἀριθμός," i.e., the aspect of movement whereby movement can be numerated or counted (ἄριθμον ἔχει ἡ κίνησις): time is that which is counted, not that by which we count (τὸ ἀριθμοῦμεν, not ὁ ἀριθμοῦμεν); time is an ἀριθμός which is counted, not an ἀριθμός which we use as a means for counting (220 b 8). Time is the ἀριθμός of continuous movement generally (223 b 1; cf. G. § C. II. 337 a 23), not of any movement in particular; nevertheless, what we usually mean by time, and what really

a This meaning of ἀριθμός is of course quite distinct from that in §§ 15-17 below.
has the best claim to the name, is the ἀριθμός of the circular movement (ἡ κύκλῳ φορά), because the ἀριθμός of this even, uniform, circular revolution is "most cognizable" (223 b). And as everything is measured by some standard which is cognate to it (e.g., horses are measured or counted by the unit "a horse," see 220 b and 223 b), so time is measured by "a time," viz., by a determinate length of time; and the time taken by the sphere of the universe to revolve is the "measure" par excellence: all other movements are measured by that movement, and time too is measured by that movement (cf. De caelo II. 287 a 23 ff., Phys. VIII. 265 b 8 ff.). Hence human affairs and all other things which have a natural movement and γένεσις and φθορά are spoken of as being a "cycle": they are all discriminated by time, and their beginning and their end occur as it were according to some "period" (223 b). And further, since a movement may be the same over and over again, so too may time, e.g., year, spring, autumn (220 b 12).

(14) G. & C. II. 338 a 1 ff. If a thing's "being" is "necessary" (i.e., absolutely necessary; see Introd. §§ 7-9), then it is eternal (ἀιώνιος); and if it is eternal, then its "being" is "necessary." a And also, if a thing's γένεσις is "necessary," then its γένεσις is eternal; and if its γένεσις is eternal, "necessary." Thus, if a thing's γένεσις is absolutely, not conditionally, "necessary," its γένεσις must of necessity be cyclical and return upon itself (ἀνακυκλάθη καὶ ἀνακάμπτειν). [Proof of this.—Γένεσις must be either limited or not limited. We agree it not limited. If it is not limited, it must be either rectilinear or cyclical. If it is to be eternal, it cannot be rectilinear; hence it must be cyclical.] Thus it is in circular movement and in circular γένεσις that we find absolute necessity. This fits in with the doctrine (proved on other and independent grounds) that circular movement (i.e., the movement of the Heavens) is eternal; for it is the movements which belong to this eternal movement, and the movements which are caused by it, which γίνονται and ἔλαύν "of necessity." That which is moving round in a circle is always setting other things in movement, so that their movement too must be circular.

a Eternal being and eternal γένεσις are mentioned at G.A. 742 b 27, 31.
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Thus the upper φορά is a circular movement, hence the Sun’s is too, hence the seasons γίνονται cyclically, hence τὰ ὑπὸ τοῦ τῶν (cf. G.A. IV. 777 b 35—778 a 2) γίνονται cyclically. Thus Water → Air → Water; cloud entails rain, rain entails cloud.

νέσεις (15) Ibid. So far, so good. Why then do not men and animals apparently show this cyclical movement? Why do they not return upon themselves, so that the same individual γίνεται a second time? In other words, why is it not “necessary” that you should γίνεσθαι if your father does, although it is necessary that if you do, he should? This looks like rectilinear, not cyclic, νέσεις. Well, we must make a distinction and say that there are two ways in which things “return upon themselves”:

some (a) do it numerically (ἄρθρμῶ, i.e. the individual is numerically identical); others (b) do it specifically only (εἴδει μόνον, i.e., the specific form, not the individual, is identical). The difference depends upon the character of the οὐσία (see § 1) which is experiencing the “movement”:

if (a) their οὐσία is “imperishable,” then obviously they will be the same άρθμῶ as well as εἴδει;

if (b) their οὐσία is “perishable,” then they recur εἴδει only, not άρθμῶ. That is why when Water γίνεται from Air, and Air from Water, it is the same εἴδει only, not άρθμῶ. Nothing, in fact, whose οὐσία γίνεται, i.e., nothing whose οὐσία is subject to γένεσις and φορά, whose οὐσία is such that it admits of not-being, can remain same and identical άρθμῶ.

(16) The meaning of the last preceding paragraph will be clearer when we recall which are the things whose οὐσία is “imperishable,” not subject to γένεσις and φορά. They are the stars and planets. Their οὐσία is free from all forms of change except circular movement; hence each persists as an eternally identical individual; its cycle is just its cyclical movement, φορά. As against these eternal οὐσίαι, we have such things as Air and Water, men and animals, whose οὐσία is liable to not-being, is “perishable.” At first sight, says Aristotle, there seems to be a difference between Air and Water on the one hand and men and animals on the other. The “cycle” in the case of the former is obvious: rain is followed by cloud, cloud by rain, rain by cloud, continually; but it is not so obvious in the case of men and
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animals. Although rain entails cloud, and cloud rain, in a continuous cycle, your father’s γένεσις does not necessarily entail yours, though yours entails his. But fundamentally the situation is the same in both cases, for (a) γένεσις and φθορά shall never fail (§§ 12 and 14); there must always be a γένος of men, animals and plants (G.A. II), and the race will be continued even if one particular individual does not reproduce itself (this at any rate seems to be implied by Aristotle); (b) in neither case is there persistent identity of the individual: just as you are different ἀριθμῶ from your grandfather, so is the rain which falls to-day different ἀριθμῶ from the rain which fell yesterday or last year.

(17) De anima II. 415 a 25 ff. Reproduction is one of the functions of θρεπτικὴ ψυχή (nutritive Soul; see Introd. §§ 41 ff.); and the “most natural” function of all living things is to produce another one like themselves “so that they may partake in the eternal and divine in the way that they can” (ἵνα τοῦ ἄει καὶ τοῦ θείου μετέχουσιν ἵ δύναται), since all things strive after this, and for the sake of this they do all that they do κατὰ φύσιν. But they are unable to partake in the eternal and divine by uninterrupted continuance (σωνεχεία), because no thing that is φθορτόν may persist as one and the same ἀριθμῶ; hence they partake in it each in the way in which they can do so, some more, some less; and so the thing persists not as itself but as something like itself (οὐκ αὐτὸ ἄλλ’ οἷον αὐτὸ)—i.e., as one, not ἀριθμῶ, but ἑσεῖ.

(18) Aristotle states more than once that the “matter” for “perishable” things is τὸ δυνατόν εἶναι καὶ μὴ εἶναι. E.g., (1) in G. § C. II. 335 a 24 ff. For things which are εἶναι καὶ μὴ εἶναι δυνατά, the “material cause” (αἰτίον ὡς ὑλή) is τὸ δυνατόν εἶναι καὶ μὴ εἶναι, which = τὸ γενητὸν καὶ φθορτόν. (This is twice stated.) Hence, the field in which γένεσις and φθορά take place must be τὸ δυνατόν εἶναι καὶ μὴ εἶναι; that, then, is their “material” cause. Their “final” cause is their figure or “form”; and there is a third cause or ἀρχή, viz., the “motive” cause. (2) In Met. Z 1032 a 15 ff, we read that οὐσία par excellence, the things which “we consider to have the fullest title to be called οὐσία,” are animals and plants. And all φύσει γενόμενα (as well,
of course, as all τέχνη γιγνόμενα) have “matter,” for each of them is δυνατόν εἶναι καὶ μὴ εἶναι, and this is the “matter” which is in each of them.

APPENDIX B

Σύμφυτον Πνεῦμα

I. THE FUNCTION OF Σύμφυτον Πνεῦμα IN GIVING PHYSICAL EFFECT TO THE MOVEMENT OF ὁρεκτικὴ ψυχή.

The movement of animals is also caused by an unmoved mover.

(1) M.A. 700 b 15 ff., De anima III. 433 b 11 ff. All the various stimuli (such as intellect, imagination, purpose, wish, appetite, sensation) which “move” animals are reducible to mind and desire (νοῦς and ὀρεξὶς); hence the πρῶτον κινοῦν of animals is the object of intellect and the object of desire (τὸ ὁρεκτὸν καὶ τὸ διανοητὸν). And the πρῶτον κινοῦν κυνεὶ ὃ ἑνοὐμενον, in virtue of being apprehended in thought or imagination: it is, in fact, τὸ πρακτόν ἀγαθὸν, the good which can be attained in the field of action. We thus have first (1) the object of desire, τὸ ὁρεκτὸν, which κυνεὶ ὃ κινοῦμενον; next (2) is desire itself, ὀρεξὶς (or τὸ ὁρεκτικὸν, the faculty of desire), and this κυνεὶ κινοῦμενον; last (3) is the animal, which is a κινοῦμενον ὃ κινοῦν—it gets moved without causing any further movement: it is the last term in the series.

(2) M.A. 700 b 30. Thus it is evident that in one respect every animal gets set in movement (κινεῖται) in the same manner as that in which the ᾗ κινοῦμενον gets “moved” by the ᾗ κινοῦν (which κυνεὶ ὃς ἑρώμενον; see App. A § 3); in another respect, however, there is a difference, for it is not “moved” ᾗ, but its every movement has a limit. This limit is τὸ ὃ ἐνεκα, the purpose aimed at by the movement, and when the purpose is achieved the movement ceases.
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(3) M.A. 701 b 34 ff. (ch. 8). Putting the statement in § 1 above in a slightly different form, we can say that the origin of movement in the animal is τὸ ἐν τῷ πρακτῷ διωκτὸν καὶ φευκτὸν—the object of pursuit and avoidance in the field of action; and since τὸ φευκτὸν is painful and τὸ διωκτὸν is pleasant, and since pain and pleasure are generally accompanied by cooling and heating, therefore the apprehension of these objects in thought or imagination produces of necessity (ἐξ ἀνάγκης) cooling and heating. Or again, in other words (ch. 7), desire (ὁρεῖτις), which as we have just seen (§ 1) is the ultimate, i.e., immediate cause of movement, is effected either through sensation, imagination, or thought, and these bring about ἄλλοιωσις (“alteration,” i.e., qualitative change) of various sorts—heating, cooling, expansion, contraction.

(4) M.A., chh. 8-10. This ὁρεῖτις, which brings about the seat of desire, and this ἀρχή is the heart, or the counterpart of the heart in creatures which have no heart (703 a 14); besides, we can show independently that the ἀρχή of the κωνύσα ψυχή must be in a central position (702 b 15); and of course ὁρεῖτις is the ὅρεκτικὸν faculty of the ψυχή. Thus (701 b 28) when a sensation, or imagination, or thought produces an ἄλλοιωσις in respect of heating or cooling at the region of the heart, a great change or difference is produced in the body—e.g., blushing, blanching, shivering, etc.

(5) It is important to notice that, according to Aristotle, the movements of the living organism are not mechanically caused. In M.A., ch. 7 he compares the small original stimulus (κυνηγίας) required to set going an automatic puppet (cf. G.A., II. 734 b 8 ff., 741 b 9) with the small change (μεταβολή) that occurs at the ἀρχή (viz., the heart) of a living organism and produces great and numerous changes or “differences” at a distance from the ἀρχή (cf. G.A. I. 716 b 3, V. 788 a 11); but he takes care to point out that whereas in the automaton there is no ἄλλοιωσις, no qualitative change—the action being entirely mechanical or “clockwork”—in the animal there is ἄλλοιωσις; in an animal one and the same part can become hotter and colder, larger and smaller—it ἄλλοιωται.
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Connate (6) *M.A.*, ch. 10. We have now established that it is ὅρεξὶς—i.e., ψυχὴ operating in its faculty of desire—which is the "formal" cause of movement: it κινεῖ κινοῦμενον. But ψυχὴ is not material; and in living bodies there must be some physical substance (σῶμα) too which κινεῖ κινοῦμενον. And this is the ΣΠ. It κινεῖ κινοῦμενον—κινοῦμενον by the ὅρεξὶς which is the ψυχὴ; and that is why the ΣΠ is where it is. In fact, ΣΠ is the "organ" or "instrument" of movement (see also De anima III. 433 b 18), capable of expanding and contracting, and in virtue of that capability it can exert force and so cause movement. And it causes movement by other means than ἀλλούωσις (μὴ ἄλλοιωσι); it undergoes no qualitative change itself, although it brings about changes of that sort in the parts of the body (and in the embryonic material, as we shall see).

Summary. Thus we must insert a fourth term in the series as originally stated in § 1:

(1) The object of desire, τὸ ὅρεκτὸν, which κινεῖ οὐ κινοῦμενον;
(2) Desire itself, ὅρεξὶς, which κινεῖ κινοῦμενον;
(2a) Σύμφυτον Πνεῦμα, which also κινεῖ κινοῦμενον;
(3) The animal, which κινεῖται, but κινεῖ nothing further.

For further references to the action of the heart and the *pneuma*, see below, §§ 31, 32.

II. THE FUNCTION OF Σύμφυτον Πνεῦμα IN GIVING PHYSICAL EFFECT TO THE MOVEMENT OF θρεπτικὴ (= γεννητικὴ) ψυχή.

Embryo formed by means of connate *pneuma.*

(7) *G.A.* II. 741 b 37 ff. The parts of the embryo get delimited, marked out from each other (διοίκονται), by *pneuma*, but this is neither the *pneuma* of the female parent nor the embryo’s own *pneuma*. This is proved by the case of birds, fishes and insects: some are separate from the parent, since they get their articulation in the egg; some do not breathe at all, being produced out of larvae or eggs; and even those which breathe and get articulated in the womb do not breathe until their lungs
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are perfected, and both the lungs and the parts which precede them get articulated before the creatures breathe. Further, the fissipede quadrupeds (dogs, etc.) are born blind, and the articulation of the eyelid is effected later. Thus we conclude that the same causes that are responsible for delimiting the young creature qualitatively are also responsible for its quantitative development—for actualizing its latent quantitative potentialities.² And of necessity pneuma must be present, ὅτι ὑγρὸν καὶ θερμὸν, τοῦ μὲν ποιοῦντος, τοῦ δὲ πάσχοντος.

(8) The understanding of this last remark may be helped by a passage in M.A., ch. 8 and other passages. As we saw (§ 3), the ᾱπαντά of movement in the animal is "the object of pursuit and avoidance in the field of action"; and the thought and imagination of such objects is of necessity (ἐξ ἀνάγκης) accompanied by heat and cooling (§ 3). Bodily pleasures and pains are accompanied by heat and cooling either in some part of the body or all over the body. Hence there is good reason in the way the inner regions of the body and the regions around the ᾱπαντὰ of the instrumental parts have been fashioned—these regions change from solid to fluid and from soft to hard and vice versa. This being so, and "the passive factor" and "the active factor" (more exactly, "that which is so constituted as to act," and "that which is so constituted as to be acted upon") having the character which they in fact have, when it so happens that the one is active and the other passive, and neither of them lacks any of the ingredients included in its logos, then immediately the one acts and the other is acted upon, and we get simultaneously, e.g., the thought "I must walk" and the movement of the limbs in walking—because the imagination produces the desire, the desire produces the affections, and these suitably prepare the instrumental parts.

(9) Now we must remember that the "organ" or "instrument" of movement, that which bridges the gap between the immaterial ὅρεξις on the one hand and the material limbs of the body on the other, is the ΣΗ (§ 6); it is this which gives actual physical effect to the ὅρεξις. ὅρεξις (a) in desire; thus, as Aristotle says, stands to the limbs in the relation...

² This means that the same causes produce both the "uniform parts" (flesh, sinew, etc.) and also the "non-uniform parts" (face, hand, leg, etc.).
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of ποιοῦν to πάσχον, κινοῦν to κινούμενον; but so does the ΣΠ too (§ 6). In fact, it is the ΣΠ which brings about the "preparation of the instrumental parts" by causing in them the ἀλλοίωσις of which they are capable: it actualizes their potentialities of changing from soft to hard, etc.

Returning now to the passage of G. A., it would appear that in the developing embryo also the ΣΠ plays a similar rôle. It will be the ΣΠ which gives effect to the formal cause in the semen so as to produce an embryo of a particular kind, just as in the other case it gives effect to the formal cause (viz., ὁρεῖς) and produces movement of the limbs; here, too, then it will actualize the latent potentiality of the material, bringing about in it (741 b 12 ff.) the ἀλλοίωσις of which it is capable—making it soft, hard, etc.

With this in mind we can go on and interpret the rest of the passage which follows in G. A. Π. 742-743. (1) The heart must be formed first, because it is the seat of the ΣΠ. a (2) The φλέβες extend from the heart all over the body, and thus can act as channels for the blood (which is the "matter") and for the ΣΠ a (which is the vehicle of the "form," 729 b 20)—because (De resp. 480 a 10) b all the φλέβες pulsate simultaneously with the heart, and this pulsation is the pneumatization of the fluid as it gets heated in the heart. (3) Some of the "uniform parts" (by which term Aristotle means such things as flesh, nail, horn, sinew, bone) are formed by heat, others by cold; and (740 b 18) the reasons why they are formed are (a) that the female's "residue" is potentially what the fully-formed animal itself is: all the parts are present potentially in the residue; and (b) that (cf. the very similar passage referring to ὁρεκτικὴ ὕψη quoted in § 8 above) when "the active factor" and "the passive factor" come into contact "in that way in which the one is active and the other passive" (which means in the right manner, in the right place and at the right time), then immediately the one acts and the other is acted

a These italicized phrases do not actually occur in the passage G. A. 742-743, but they are to be supplied from the doctrine of other passages here examined (see below, § 32); and we must realize that they represent perhaps the chief consideration, though unexpressed, in Aristotle's mind as he writes the present passage.

b See § 31 below.

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upon; the male supplying the ἀρχή of “movement,” the female supplying the material. It is θρεπτική ψυχή which is the source of this movement (just as in the other case it was ἀρεπτική ψυχή which was the source of the movement)—it brings about both generation and growth, for θρεπτική ψυχή and γεννητική ψυχή are one and the same (see 735 a 17, 18). And the “organs” or “instruments” which it uses are heat and cold: its movement is “in” them. (This last sentence serves to emphasize the dual nature of ΣΠ, dealt with in §§ 20 ff. below; for of course ΣΠ is the primary “instrument” of θρεπτική ψυχή.)

[Further important statements on these subjects are found in Meteor. IV. Hot substance and cold substance, says Aristotle, are “active” (because they bring things together, are συγκριτικά), solid substance and fluid substance are “passive.” Γένεσις, i.e., natural change, is the work of these ἁνάμει: so is natural (κατὰ φύσιν). φθορά; these processes occur in plants, animals, and their parts, and are brought about by hot and cold substance, when those ςελωσι λόγον (cf. G.A. 777 b 28), out of the substrate matter underlying each natural thing, viz., out of the “passive” ἁνάμει. If hot and cold fail to gain the mastery over the matter, ἀπεφίσ results. Apart from destruction by force, the end of all natural objects is putrefaction: it may be defined as the φθορά of the proper and natural (κατὰ φύσιν) heat in any fluid thing by the agency of alien heat (that of the environment), due to lack of proper heat, i.e., owing to cold; hence hot and cold are the causes of putrefaction as they are of γένεσις. Animals are generated in putrefying substances because the heat that was secreted in these substances is natural and is able συνιστάναι (see Introd. § 54). Cf. the whole Book, especially 390 b 2 ff.]

(12) G.A. II. 743 a 20. It is not any chance material which gets made into flesh or bone, nor does it get made in any chance manner or at any chance time, but only the material ordained by Nature, and in the manner and at the time ordained by Nature: that which is potentially X will not be made, actualized, into X by any motive agent other than one which possesses the actuality; nor
will a motive agent which possesses the *actuality* make 
an X out of any chance material. Heat is present in 
the seminal residue, possessing the right movement and 
actuality (ἐνεργεία) to suit each of the parts; and in the 
case of spontaneous generation the heat and movement 
of the season fulfil this same function.\(^a\)

Connate (13)  

G.A. II. 736 b 30 ff. Every faculty of ψυχή is connected 
with \(^b\) a physical substance more divine than any of the 
four "elements" Fire, Air, Water, Earth, and this sub-
stance differs according to the degree of value of the 
ψυχή concerned. There is present in the semen of 
every animal and in "the foam-like stuff" \(^c\) the so-
called "hot substance," which causes the semen to be 
generative: this is not of course Fire, but it is the pneuma which the semen contains, "the substance in the 
pneuma," \(^d\) which is "analogous to the element of 
the heavenly bodies," viz., the *aither*. That is why the 
heat of the Sun (cf. App. A §§ 9, 10) and the heat of 
animals (as contained in semen or any other such 
"residue") is able to generate, whereas Fire cannot: 
the Sun, as we know already, consists of *aither*, and 
here we are told that there is in semen "something 
analogous" to *aither*.

(14) It is now possible to see what Aristotle means when he 
says (737 a 17): "It has now been determined in what 
way fetations and semen have ψυχή: they have it 
*potentially*, but not *in actuality*." This pneuma or 
vital heat is not *in actuality* ψυχή; but semen *κυτείται* 
with a movement that is identical with that which moves 
the animal's body when the body is growing out of the 
"ultimate nourishment" (blood), and therefore when 
the semen gets into the uterus it sets in movement the

\(^a\) See further, § 17 and additional note appended there. 
\(^b\) ἐστὶ ἐνεργεία, a usefully vague term; but at any rate it must 
be intended to denote a close relationship. We might express it per-
haps by saying that this substance (viz., the pneuma, or more preci-
sefully "the substance in the pneuma") with which ψυχή is thus associated 
is the physical vehicle par excellence of ψυχή; anyway, it is the first 
physical substance to give expression to the movements of ψυχή; it 
is its immediate instrument. 
\(^c\) Perhaps intended to include the "frothy bubble" concerned in 
spontaneous generation; see §§ 17, 19 below. 
\(^d\) Cf. the substance which is "in" Air, Water, etc., which is also 
"in" *aither*, and which makes Air, Water, etc., transparent (§ 26).
female’s “residue” with the same movement as that by which it κινεῖται itself.

(15) Thus we have an exact parallel with the action of ὀρέκτικη ψυχή already examined above, § 6: ὀρέκτικη ψυχή sets in movement the pneuma, the pneuma sets in movement the limbs; θρεπτική (= γεννητική) ψυχή sets in movement the pneuma in the semen, the pneuma in the semen sets in movement the material supplied by the female. There is also a close parallel with the art of the carpenter (730 b 15 ff.): the carpenter, in whose ἴππων is the “form” of the chair, moves his hands and instruments with a movement appropriate to the object that is to be made, and they in turn move the material so as to produce the chair. In all three cases no material part passes from the motive agent to the material on which it is working, but the agent imparts the “form” to the material by means of the movement which it sets up in the instrument.

(16) We have thus satisfied the requirement that only what is X in actuality can produce another X out of material which is potentially X: the parent which is X in actuality produces another X out of the female’s residue which is X potentially, but there is an intermediary, viz., the pneuma in the semen, which is an instrument possessing the requisite movement, a movement which is identical throughout, in parent, semen, and embryo (see also 734 b). The semen thus is ψυχή potentially (735 a 8); and the first things which it produces in actuality are θρεπτική ψυχή and the physical seat thereof, viz., the heart. Later it produces in actuality sensitive ψυχή as well. (Rational ψυχή, having no connexion with any physical substance at all, comes in independently from without; 736 b).

(17) A similar situation obtains in the case of spontaneous generation (762 a 18). Animals and plants are formed in earth and in fluid because there is water in earth, and there is pneuma in water, and there is Soul-heat (θερμότης ψυχή) in all pneuma; so that “in a way all things are full of ψυχή.” Hence plants and animals quickly form once this gets enclosed; and when this enclosing

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a For another such reference to pneuma as an instrument used by Nature, see G.A. 789 b 8 ff.
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happens, when the corporeal liquids get heated, a sort of "frothy bubble" is formed. Now the differences between the various creatures which are produced in this way are due to the stuff which makes up the envelope around the Soul-\(\alpha\rho\chi\eta\) (cf. also 738 b 34: foreign seeds produce plants varying according to the soil in which they are sown, for it is the soil that provides them with their material and their body). We can now answer the question, What corresponds in cases of spontaneous generation to the "residue" of the female and the semen of the male in cases of sexual generation? Just as in sexual generation the female by means of its heat concocts the "residue" (the menstrual fluid) out of the nourishment, so here the heat of the season by a similar process of concoction puts into shape a substance out of the seawater and the earth (762 b 14). That which corresponds here to the male principle in sexual generation is "that portion of the Soul-\(\alpha\rho\chi\eta\) which is enclosed in the pneuma" as described above; this, just as the semen does, makes a fetation out of the material and implants movement in it.\(^a\)

\[\text{Note.} - \text{It is, however, not clear in what sense there is anything in the case of spontaneous generation which is X in actuality (i.e., which possesses the "form" of X) comparable to the parent in ordinary sexual generation. The relationship of agent and material here would appear to resemble rather that of carpenter and timber (for which see § 15); but even so, granted that the requisite "movement" is present, it is difficult to see whence its specific character is derived; for the Sun, etc., are "motive," not "formal," causes (App. A § 9).}

In the case of the carpenter, of course, the "form" is in the carpenter’s \(\psi\nu\chi\eta\) (§ 15). From the passage referred to in § 17 it looks as though Aristotle falls back on the surprising explanation that it is the material only that determines what sort of creature is to be formed. If so, then we must assume that, given the agents, or "motive" causes, viz., \(\psi\nu\chi\eta\), pneuma, and the movement therein contained, though they are of no specific quality, the material is formed by them into whatever creature it happens potentially to be.

\(^a\) Cf. § 12 above.
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But in fact Aristotle himself is prepared to go even further than this. At Met. Z 1034 b 5 ff. he actually asserts that in the case of spontaneous generation of natural objects their matter can be set in movement by itself: it can supply itself with the same movement as that which the semen supplies (σων ἡ γη δύναται καὶ υφ' αὐτῆς κινεῖθαι ταύτην τὴν κίνησιν ἣν τὸ σπέρμα κινεῖ). That is to say, it can supply itself with everything in the normal way would have to be supplied by the "form" in the parent creature which is already X in actuality, or (in the case of artefacta) by the "form" in the ψυχή of the craftsman.

Perhaps Aristotle felt that this startling admission was in some degree justified by the notion that even "that out of which" animals are generated is in a sense φύσις (the εἴς οὗ as well as the καθ' ὦ and the υφ' οὗ of their generation is "φύσις," Met. Z 1032 a 24) a; and, as we know, φύσις never acts idly but always has a τέλος in view. Regarded in this way, "matter," the εἴς οὗ of living things, might be looked upon as considerably more than mere lifeless, inert material: and in G.A. Aristotle does in fact ascribe even the possession of ψυχή to it, as we have seen. Thus, to classify the statements he makes in G.A.: (1) The case of Testacea, which arise in sea-water. Water contains pneuma, and pneuma contains Soul-heat (§ 17). (2) The case of animals and plants spontaneously formed out of putrefying matter. Mistletoe and similar plants are formed when either the soil or certain parts in plants or trees become putrescent (715 b 27 ff.). Now (i) Earth contains Water (§ 17), and, as we saw just now (ibid.), Water contains pneuma, which contains Soul-heat. And Soul is obviously present already in the plants and trees upon which mistletoe, etc., grow. (ii) As stated in § 13 above (G.A. 737 a 3 ff.), the heat of the Sun and of animals can effect generation, and not only the heat of animals which operates through semen, but also any other natural residue which there may be has within it a principle of life. This is no doubt intended to cover putrefying animal and vegetable matter (expressly mentioned at H.A. 539 a 23 and 551 a 1 ff.), out of which some insects were supposed by Aristotle to arise, and "putrefying soil" as well, which would also qualify under (i) above.

A further palliative might perhaps be found in the con-

a See also the passages quoted at 741 a 1, n.

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sideration that in the case of animals it is sentient Soul alone which has to be supplied by the male parent, and for plants no sentient Soul is required. Testacea, too, were considered by Aristotle to be plant-like (see 715 b 17, 731 b 8 ff., 761 a 12 ff.).]

III. THE NATURE AND PROPERTIES OF

Σύμφυτον Πνεύμα

Semen contains pneuma.

(18) To repeat first what we have heard so far of the nature of ΣΠ (736 b 30 ff.; see § 13 above): There is in the semen of all animals the so-called θερμόν, which causes the semen to be generative. This θερμόν is not Fire, for Fire cannot generate any animal, but the heat of the Sun and of animals (the heat that operates through their semen or some other residue) can do so: for this does contain a vital principle (ζωτικὴ ἀρχή). This substance which is contained in the semen is pneuma, and it is "analogous to the element of the stars," viz., aither. One obvious way in which it is analogous to aither is that it is generative, for the Sun, which is of aither, is generative (see App. A §§ 9, 10). We shall find other points of analogy later on (§ 25).

Pneuma contains Soul-heat.

(19) In the passage 735 a 29—736 a 20 we are told that semen when it leaves the body is thick and white, because it has in it much hot pneuma owing to the animal's internal heat; when the heat in the semen has evaporated and the Air has cooled, then it turns liquid and becomes dark in colour. Thus semen is a combination of pneuma (here described as "hot Air") and water (κούνον πνεύματος καὶ ὕδατος, τὸ δὲ πνεύμα ἐστὶ θερμὸς ὀψρ, 736 a 1); in fact, it is a foam, a mass of tiny bubbles. Similarly (762 a 20 ff.) in the case of spontaneous generation we have "a sort of frothy bubble" formed, and this too contains pneuma, which contains Soul-heat (see § 17); cf. too the reference to "the foam-like stuff" (736 b 36) in which, as in the semen, there is enclosed pneuma, and in the pneuma a substance analogous to the aither. Thus pneuma is closely associated with heat—a special sort of heat, not the heat of Fire; and at 762 a 20 we read that "there is Soul-heat in all pneuma."
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(20) Now although in all these passages the heat seems to take the chief place, as it also seems to take the leading part in the formation of embryos, Aristotle says more than once that the embryo is formed by means of cold as well as heat (see § 11 above; 743 a, 762 b 15, etc.). And it would seem that pneuma really has a dual nature. This is true of it when functioning as the instrument of ὀρεκτικὴ ψυχή, and also when it is functioning as the instrument of γεννητικὴ ψυχή (see § 10 above). Thus (M.A. 702 a 10) the instrumental parts of the body can change from solid to fluid, soft to hard, and vice versa, and it is pneuma which brings about these changes. Aristotle tells us (703 a 22) that pneuma contracts and expands, and "has heaviness compared with fiery things and lightness compared with the opposite things"; and that this power of contracting and expanding is indispensable to it in view of the functions it has to perform, because the actions of movement are pushing and pulling.

(21) De anima III. 433 b 18 ff. With further reference to pushing and pulling, Aristotle in a brief reference in the De anima to the De motu states that "the instrument used by ὀρεγεῖς in causing movement" is to be found where a beginning and an end coincide, e.g., at a ball-and-socket joint: one remains at rest and the other is moved: and the two though separable in definition are not separable spatially: for everything gets moved by pushing and pulling. (See also Phys. VII. 243 a 12 ff.) Compare too M.A. 703 a 12: The ΣΠ stands in a similar relation to the Soul-ἀρχή as the point in a joint (which κνεῖ κνούμενον) stands to that which is unmoved.

(22) There is a passage in the De caelo (IV. 301 b 20 ff.), where again Aristotle is discussing the way in which movement is brought about, and although he is talking here of Air (ἀέρ) and not specifically of the kind of Air known as pneuma, the passage is apposite to our present subject. Now of course according to Aristotle, some of the movement which takes place in the sublunary world can be accounted for by his theory that the "simple natural substances" Fire, Air, Water, Earth have a "natural" movement (see App. A § 2). But movement is also caused forcibly; and force can either

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accelerate natural movement (e.g., it can make a stone go downwards more quickly than it would do naturally) or it can produce movement contrary to Nature (e.g., it can make a stone go upwards); it is in fact the sole source of unnatural movement. And in either case it uses Air as its instrument (ὡς ὁποῖες ὁμογενεῖς πρὸς ἀέρι), because Air is naturally constituted to be light and heavy (πέφυκε καὶ κοῦφος εἶναι καὶ βαρύς); the Air, qua light, will cause an object to be carried upwards, for the Air gets pushed and receives the ἀρχή from the force which is exerting itself; qua heavy, it will cause the object to be carried downwards: the force “as it were hitched the movement on to (ἐναφάσασα) the Air” and so transmits it to the object in either case. Hence an object which is set moving forcibly (i.e., contrary to Nature) continues travelling although that which set it moving does not follow it up; and if there were no such physical substance as Air there could be no such thing as enforced movement. In the same way, says Aristotle, Air gives a fair wind to (οὐνετευρίζει), helps on, natural movement. This dual nature of Air is not really so surprising as it sounds at first hearing, for (De caelo IV. 311 b 5 ff.) all the physical substances possess heaviness except Fire, and they all possess lightness except Earth. In its own place, each possesses heaviness, even Air; thus, except in Water and Earth, Air possesses heaviness. At 312 a 12 ff. Aristotle lays down that the distinction of “form” and “matter” is to be found in the category of “place” as well as in the categories of “quality” and “quantity”; thus, τὸ ἀνώ belongs to the determinate, τὸ κατω belongs to “matter.” And taking the special instance of the “matter” of “the heavy and light,” qua potentially X it is the matter of the heavy, qua potentially Y it is the matter of the light: it is the same “matter,” but its εἶναι is not the same (cf. 310 b, 311 a).

(24) For the important rôle of Air as a medium between the objects which give rise to sensations and the sense-organ,

a It should be remembered that according to Aristotle nothing can exert any effect upon (“move”) another thing unless it is in contact with it; see Phys. II. 244 a, b, and G.A. II. 734 a 3. That is why the movement must be “hitched on” to the Air; cf. H.A. VII. 586 a 17 ὁδεῖν γὰρ ῥυπετέται πόρρω ἀνευ βίας πνευματικῆς.
and for importance of the rôle of *pneuma* in conveying the effects made upon the sense-organ to the heart and so to the ψυχή, see below, §§ 26 ff.

(25) We may now notice two other ways in which *pneuma* is "analogous" to *aither*. (a) We noted above (§ 6) that *pneuma* causes "movement" (both ἄλλοιώσεις and spatial movement) μὴ ἄλλοιώσει, i.e., without itself undergoing any qualitative change. In this respect it is similar to *aither*, for this too is not liable to any sort of "movement" (except circular φορά); Aristotle expressly says that *aither* is not subject to ἄλλοιώσεις (*De caelo* I. 270 a 14 ff.), and he even goes so far as to suggest that it is "divine" (270 b 10). (b) *Pneuma*, like *aither*, acts as an intermediary between an immaterial mover and material objects. As we have seen, the unmoved mover moves the Heaven and the heavenly bodies which are made of *aither*, and the heavenly bodies in turn "move" sublunar bodies, viz., they bring about the transformation of the elements into one another, and also they bring about γένεσις and φορά. So too the immaterial ψυχή moves *pneuma*, and *pneuma* in turn causes ἄλλοιώσεις, thereby (i) moving the limbs of the body or (ii) causing the "movement" which is the development of the embryo.

IV. THE FUNCTION OF Σύμφωνον Πνεύμα IN SENSATION

The following outline of Aristotle's theory of Sensation will indicate the important part played in it by Air and *pneuma*. It will be seen that just as *pneuma* transmits to the parts of the body the movements caused by ψυχή and thereby produces ἄλλοιώσεις and movement, so in the reverse direction it apparently transmits to ψυχή the movement of the ἄλλοιώσεις caused in the sense-organs by the movements of external stimuli.

It will be convenient to divide this account into two parts:
A. dealing with what goes on outside the sentient body;
B. dealing with what goes on inside the sentient body.
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A

Vision. (26) Vision.—Vision is effected in the following way (De anima II, 418 a 27 ff.). There are three main factors: Colour, the medium, and the sense-organ.

"Colour" means "that which has the power to set in movement that which is actually transparent" (τὸ κατ' ἐνέργειαν διαφανές), and the latter acts as the medium. The medium extends continuously from the object to the sense-organ, and in its turn sets the sense-organ in movement. The medium is indispensable, because colour cannot set the sense-organ in movement direct. According to G. A. V. 780 b 34 ff., accuracy in seeing distant objects depends upon the movement of the medium not being dissipated, but "getting a direct passage" (ἐδυνατεῖν); indeed, the best results would be obtained if there were a continuous tube between the object and the eye (781 a 9). Compare the case of Hearing, § 27.

Examples of transparent media are Air, Water, and certain solids. Their transparency is due not to themselves, but to the fact that they contain a certain substance which is also found in the "eternal substance of the Upper Cosmos" (ἐν τῷ ἀδιάλειπτῳ τῷ ἄνω σώματι), i.e., in the aither. Of this substance the actualization is Light; and its actualization is brought about by the agency of Fire or something of a similar kind as the substance of the Upper Cosmos—for this selfsame substance is present in both.a Thus Light is essential if vision is to take place, because it is only when the substance in the medium is actually (not merely potentially) transparent that it can be set in movement by colour.

Hearing. (27) In the case of the other senses too a medium is indispensable; one example may suffice. In Hearing there are again three main factors: the sounding object, the Air, and the sense-organ.

"A sounding object" (ψοφητικόν) means "an object which can set in movement a continuous volume of Air as far as the ἀκοὴ" (the organ of hearing), and the movement of the Air constitutes sound only when the

a The obscurity of this sentence is due to Aristotle's text, not to my presentation of it.

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Air is thus set in movement as one continuous entity and is prevented from being dissolved. (This requirement necessitates that the object struck should have a smooth surface, otherwise the Air cannot be moved as a unity.) Hence here too the medium must be continuous between the sounding object and the sense-organ; and its movement in turn sets in movement the Air in the ear (De anima II. 420).

B

(28) Since (De sensu 438 b 7) there must be light within the Vision. eye as well as in the external medium, the eye also will have to be transparent; hence the eye, or rather that part of the eye which sees, viz., the κόρη or pupil, is made of Water (H. I. I. 491 b 20, De sensu 438 a 13 ff., P.A. II. 656 b 1, G.A. V. 779 b 23 ff.). Thus the external medium and the internal constituent are both transparent. The substance used for the eye is Water and not Air because Water is more easily kept in a confined space than Air (De sensu 438 a 15; P.A. II. 656 b 2). And it is of course the movement of this part qua transparent, not qua fluid, that constitutes sight (G.A. V. 780 a 4; cf. De sensu 438 a 13 ff.). If the fluid in the eye is already in violent movement owing to some earlier stimulus, it cannot respond to a fresh movement from without (G.A. V. 780 a 8 ff.; cf. a 23).

(29) The sense-organ of Hearing is of Air (De anima III. Hearing. 425 a 4; cf. P.A. II. 656 b 17; G.A. V. 781 a 23); and the Air in the ear is built into a chamber (ἐγκατσκοιδόμηται) in order to keep it free from disturbance (πρὸς τὸ ἀκίνητος εἶναι), so that it may take up the movements conveyed to it from without, ὅπως ἀκριβῶς αἰσθάνηται πάσας τὰς διαφορὰς τῆς κινήσεως (De anima II. 420 a 10; cf. the very similar phrase frequently used in G.A. V. 779 b—781 b). This Air in the ear is also described as "connate" (συμφυής; De anima II. 420 a 12); and it is this Air with which we hear. It is itself always in movement with a proper movement of its own (οἰκεία κίνησις); sound, however, is of course not this proper movement, but a movement derived from something else (ἀλλότριος).
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Sense-organs connected to the **φλέβες.**

(30) Now sensation arises from the heart, the seat of άισθητική ψυχή (ή άισθησις ἀπὸ τῆς καρδίας, P.A. II. 656 b 24; cf. 656 a 28, III. 666 a 12, also II. 647 a 25 and G.A. II. 743 b 25), for no bloodless part has the power of sensation, nor has blood itself; the power resides in "one of the parts that are made out of blood" (P.A. III. 666 a 17, II. 656 b 19). Hence the movement in the sense-organ must somehow be conveyed to the heart. Now it is evident that the senses of touch and taste are connected to the heart (P.A. II. 656 a 29; cf. De sensu 439 a 1); so are the others, though perhaps not so obviously and directly. Thus, from the eyes "passages" (πόροι) run to the φλέβες around the brain, and similarly from the ears a "passage" connects to the back of the head (P.A. II. 656 b 17). This is confirmed and amplified by G.A. II. 744 a 2, where smell and hearing are said to be "passages" full of ΣΠΙ, connecting with the external Air, and terminating at the φλέβες *which come from the heart* and extend around the brain.

In the passage of G.A. V. 781 a 23 ff., which is perhaps out of place and possibly slightly corrupt, some important statements are fortunately clear. We read there that the "passage" of the organ of hearing terminates in the region where the ΣΠΙ produces the pulsation (deriving, as will be seen, from the heart); and we also read of the "movement" which comes through the sense-organ of hearing (presumably to its destination in the heart) being reproduced again through the voice; at any rate, it is clear that the heart is the ἀρχή of the voice (IV. 776 b 12; cf. V. 787 b—788 a). Further details about the pulsation are given in De resp. 479 b 30 ff. Pulsation, says Aristotle, is similar to boiling, which occurs when fluid substance is pneumatized by τὸ θερμὸν: the fluid rises up owing to increase of bulk. Pulsation is produced in the heart by the increase of bulk, caused by heat, of the fluid which is continually being supplied to the heart from the nourishment. This action goes on continuously, because the blood is fashioned first of all in the heart, and the inflow of the fluid out of which the blood is produced goes on continuously. And all the φλέβες pulsate too, simultaneously with each other, because they are all
connected to the heart. Pulsation is, in fact, "the pneumatization of the fluid as it gets heated."

This seems to give us the key to the theory of sensation as well as the explanation of the upkeep of the $\Sigma\Pi$. The fluid, as it gets heated and thereby concocted and turned into blood, is "pneumatized." This no doubt implies that the pneuma which is already present in the fluid (as it is in any fluid; see § 17 above), and which contains Soul-heat, acquires some special character or rather "movement" by being brought into contact with the heart, and with the Soul which has its seat there and whose "instrument" the pneuma is destined to become; indeed, we must assume this, because semen contains the pneuma which possesses the specific "movement" that is to fashion the embryo (§§ 9, 14 above), and it is from blood that semen is made by further concoction. Hence blood will contain $\Sigma\Pi$, and we may say that all the φλέβες are instinct with $\Sigma\Pi$ as well as with blood. Hence there is continuity of $\Sigma\Pi$ (or of "the substance similar to aither," if this is really to be distinguished from $\Sigma\Pi$) from the sense-organ, through the "passages" and then the φλέβες, right up to the heart. We have Aristotle's explicit statement that the "passages" of smell and hearing, which are full of $\Sigma\Pi$, terminate at the φλέβαι which come from the heart, and that the "passage" from the eyes does so too. And the φλέβες of course pulsate owing to the "pneumatizing" action set up in the heart.

As Beare says on the last page of his book, *Greek Conclusion. Theories of Elementary Cognition* (p. 336), "if we could discover all the properties and functions of $\Sigma\Pi$, we should have penetrated to the inmost secrets of sense-perception" as envisaged by Aristotle; for "the $\Sigma\Pi$ was the profoundest cause and the most intimate sustaining agency from the beginning to end of life and sensory power."
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The Index is to be regarded as supplementary to the Contents-Summary on pp. lxxi ff.; see also the Introduction and Appendix.

The method of reference is this:
Roman numerals refer to pages of the Preface.
I denotes paragraphs of the Introduction.
A and B denote paragraphs of Appendix A and B.
The numbers 15a to 89b (standing for 715a to 789b) refer to the pages and columns of the Berlin edition which are printed at the top of each page of the Greek text. The lines are referred to in units of five lines: thus
17a1 = 717a1-4
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f, ff = following section(s) of five lines, following page(s) etc., as the case may be.

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