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DEFORMED KINDS AND THE FIXITY OF SPECIES

In his biological works Aristotle frequently applies the language of abnormality to those individual members of natural kinds which fail through various defects to live up to the standard of their kind (e.g. *GA* IV.3 and 4). Aristotle extends this language of abnormality to natural kinds themselves, and will often speak of kinds as 'deformed' (πεπηρωμένος or ἀνάπηρος) or 'warped' (διεστραμμένος).[1] In the vast majority of his references to abnormal kinds,[2] Aristotle represents them as defective only because they do not measure up to some standard of excellence, and not because of any genuine distortion of their nature. In one category of cases the defective species belongs to a genus which demands a certain characteristic of its species, but which the defective species does not possess. The lobster, for example, belongs to a genus that possesses claws for prehension and for defence, and thus it too possesses claws. It is, however, 'deformed', because it does not use its claws in the natural way, but rather for locomotion (*PA* IV.8.684a32–b1). Such deformities as these may even conform to Aristotle's teleology and promote the good of the defective species. The seal, for example, belongs to the genus, the viviparous terrestrial, which requires external ears of its members. The seal does not possess them, and consequently is 'deformed' (*PA* II.12.657a22–4). Yet Aristotle also argues that the seal's lack of external ears is an advantage, because of its aquatic life, and Nature acts 'reasonably' in depriving it of them (*GA* V.1.781b22–8). In another category of cases the abnormal kind is defective with respect to a broader standard of excellence that lies outside its genus. Testaceans, such as the snail, are 'deformed' because they move 'contrary to nature'. They do not move like a footed animal, but as if they were footed animals whose legs have been cut off (*IA* 19.714b8–19). This category of abnormality even takes in the whole of the animal kingdom, with the exception of man. For every animal is 'dwarf-like' in comparison with man, which is the best of animals, because the upper part of every animal's body, in contrast with that of man's, is larger than its lower part (*PA* IV.10.686b2–21).

These examples of abnormality provide no case of a genuine deformity or of a genuine disruption in the normal course of development of an organism. The attribution of abnormality applies to a species or a kind only because it is inadequate with respect to some standard of excellence displayed by its genus or by some other superior kind. It does not then signify that the abnormal kind is defective in itself or that it fails through some deformation to meet a standard of normality it would meet in normal circumstances. Each defective kind is just what it should be. Therefore, Aristotle uses the language of abnormality in these sorts of cases in a metaphorical or figurative fashion, as an expression of his evaluative judgement of the place of the

[1] I am indebted to the following for their discussions of abnormal kinds: G. E. R. Lloyd, *Science, Folklore, and Ideology: Studies in the Life Sciences in Ancient Greece* (Cambridge, 1983), pp. 40–2; Anthony Preus, *Science and Philosophy in Aristotle's Biological Works* (Hildesheim and New York, 1975), pp. 160–1, 213–18; A. L. Peck, *Aristotle's Historia Animalium* (Cambridge, Mass., 1965), Introduction, pp. lxxxvi–lxxxvii.

[2] References to abnormal kinds: *Deformed*: the mole, *HA* I.9.491b27–36, IV.8.532b34–533a12; the lobster, *PA* IV.8.684a32–b1; the seal, *PA* II.12.657a22–4, *HA* II.1.498a33; the testacean, *IA* 19.714b8–19; *Warped*: the terrestrial–aquatic, *HA* VIII.2.589b29–30; the flat-fish, *IA* 17.714a6–8; *Stunted* (κεκολόβωται): the tortoise, *PA* III.8.671a16; the fish, *PA* IV.13.695b2–3; *Dwarf-like*: all animals other than man, *PA* IV.10.686b2–21.

'deformed' kind in his evaluative scheme of classification. He expresses the inferiority of the seal to the other species of its genus, because of its lack of some characteristic, by designating it as a 'deformed' kind.

Yet in the case of two deformed kinds, the mole and the terrestrial–aquatic, there is significant evidence that Aristotle appeals to a genuine malformation to account for their deformity. A deformation seems to disrupt the embryonic development of each member of these two kinds and to account for some of their important features. If Aristotle does acknowledge this sort of deformity, then his conception of a natural kind allows for more flexibility in the features of a kind than the traditional interpretation admits.

Although Aristotle never expressly adopts the view that species are eternally fixed in character, it is commonly attributed to him as an obvious implication of other positions he holds.[3] The fixity of species is taken to be an important feature of his conception of a natural kind, which especially puts him at odds with the modern biologist, whose conception of a kind must allow the evolution of new kinds through the transmutation of previously existing ones.[4] The traditional doctrine of fixity rules out any transmutation of kinds because it holds that species, or natural kinds generally, do not suffer a modification in any way of their important or essential features.

Some interpreters of Aristotle maintain that he is committed to fixity when, for example, in *GA* II.1 he argues for a version of eternity for individual animals and plants. These, according to him, cannot partake of the best condition, which is that of eternal life, as individuals, since they perish. But they do achieve an eternity appropriate to them, through their species; for which reason, Aristotle maintains, there is always a 'genus of men, animals, and plants' (731b35–732a1). Individual animals and plants of every species partake of eternity, according to the defenders of fixity, inasmuch as there will always exist some member of their species, and this circumstance requires that their species be eternal.[5]

John Cooper has recently argued that the fixity of species is even at the very heart of Aristotle's teleology.[6] Natural processes give rise to well-adapted animals and plants, which are the ends of these natural processes and serve as their explanation or justification. It is an 'irreducible fact' about the world that it permanently contains these specific kinds of animals and plants, and is so arranged as to ensure their continued existence. These kinds, then, can be appealed to in order to explain the processes that maintain them, but nothing further can be appealed to in order to

[3] A few of those who attribute fixity of species to Aristotle: John Cooper, 'Aristotle on Natural Teleology', *Language and Logos: Studies in Ancient Greek Philosophy*, eds. M. Schofield and M. Nussbaum (Cambridge, 1982), pp. 197–222; J. L. Ackrill, *Aristotle the Philosopher* (Oxford, 1981), pp. 133–4; Richard Sorabji, *Necessity, Cause, and Blame* (Ithaca, 1980), pp. 145–6; C. J. F. Williams, *Aristotle's De Generatione et Corruptione* (Oxford, 1982), pp. 193, 208; H. H. Joachim, *Aristotle's on Coming-to-be and Passing-Away* (Hildesheim and New York, 1970), p. 276; G. E. R. Lloyd, *Aristotle: The Growth and Structure of His Thought* (Cambridge, 1968), p. 88; Marjorie Grene, *A Portrait of Aristotle* (Chicago, 1963), pp. 136–7 (hereafter cited as *Portrait*). The passages typically referred to in the defence of the doctrine of fixity are *GA* II.1.731b24–732a1, *De An.* II.4.415a26–b7, and *GC* II.11.338b11–19. These passages are generally taken to promote the same conclusion: individual animals and plants partake of eternity through the eternity of their species. Moreover, when, in chapters 7 to 9 of *Metaphysics* Z, Aristotle argues that form does not come to be in the making of some object, natural or artificial, he might be taken to suggest thereby that kinds do not come to be and thus that they exist eternally.

[4] E.g. Marjorie Grene, 'Aristotle and Modern Biology', *Journal of the History of Ideas* 33 (1972), 397.

[5] E.g. A. L. Peck, *Aristotle's Generation of Animals* (Cambridge, Mass., 1942), Appendix A, 573–5; Williams, pp. 193, 208; Cooper, n. 4; cf. Ackrill, pp. 133–4.

[6] Cooper, pp. 212–15.

explain them, except perhaps their inherent goodness. Therefore, on Cooper's interpretation of Aristotle's teleology, it is absolutely essential that natural kinds be eternally fixed in nature.

D. M. Balme, however, has serious misgivings about the traditional doctrine of fixity, and argues that there is nothing intrinsic to Aristotle's conception of a natural kind that rules out the evolution of species, 'a continuous modification of the kinds being transmitted'. Aristotle simply had no occasion to consider evolution because he had no palaeontology to provide him with evidence.[7]

Although Balme's arguments against fixity are not fully convincing,[8] Aristotle's comments on the mole and the terrestrial–aquatic suggest that he does hold a version of the transmutation of kinds. They clearly suggest that Aristotle believes that these deformed kinds arise through a genuine deformation in embryonic development. Therefore, it would seem, these animals possess at conception a set of potencies for a certain nature, but because of their deformity they fail to develop these potencies fully. Instead, they develop characteristics that result in a different nature, which arises from the new set of potencies that emerge from the deformation. Change in the mole and the terrestrial–aquatic, however, does not amount to a minor evolution in species. It is not a change from one nature for a given population at one period to that of a different nature for the descendants of that population at a later period. Rather, it is a change in the direction of embryonic development of each individual animal, which appears always to occur in the same way, and which would consequently seem to be an event of the sort Aristotle would ordinarily describe as occurring 'always or for the most part'. The change in nature occurs then at the level of potencies, in which one set of potencies for a certain nature replaces, through deformation in embryonic development, an original set of potencies for a different nature. Since these changes eternally recur, so that they apply to every member of the kind, it is reasonable to

[7] *Aristotle's De Partibus Animalium I and De Generatione Animalium I* (Oxford, 1972), pp. 97–8, and *Aristotle's Use of Teleological Explanation* (Inaugural Lecture at Queen Mary College, University of London, 1965), p. 13.

[8] Balme offers three observations as evidence against fixity. First, new species seem to arise from fertile hybrids at *GA* II.7.746a29ff. But in *GA* II.4.738b27–34 Aristotle maintains that hybrids after a few generations revert to the species of the female that brought forth the original hybrid. Reversion of hybrids to the original female kind does not suggest that they form a genuine natural kind independent of the kinds their parents belong to, but rather, as William Jacobs has suggested, that they are only deformities of their parents' kinds (cf. *Met.* Z.8.1033b29–33): 'Preus on Aristotle's *Eide*', *Nature and System* 3 (1981), 116. For his second observation Balme notes that Aristotle often points out that there are kinds that overlap generic classifications, such as the testacean, which cannot with certainty be assigned exclusively to the class of animals or to that of plants (e.g. *PA* IV.5.681a10ff.). It is not clear just what Balme intends with this observation. Perhaps he is suggesting that kinds cannot be fixed because some of them are not rigidly demarcated from others. This point, however, actually tells against the very notion of Aristotle's natural kind, as traditionally interpreted, rather than the issue of fixity. For his natural kinds, on the traditional interpretation, must be discrete and incompatible with one another (e.g. Grene, *Portrait*, pp. 87, 231–2), and even if there are kinds that participate in distinct natural kinds, there would be nothing to prevent the eternity of their fixed participation in those kinds. (There are, however, no such kinds. Where Aristotle seems to sanction such kinds, which he describes as 'equivocals', he does not commit himself to the view that they participate in distinct natural kinds. Elsewhere I have defended at length this interpretation of 'equivocals': 'The *scala naturae* and the Continuity of Kinds', *Phronesis* 30 (1985), 181–200.) Balme's third observation concerns the focus of Aristotle's theory of heredity in *GA* IV.3. Although failure occurs in various ways because of the intractability of matter, the goal of reproduction is to produce an offspring exactly like the sire, and not just another instance of the same natural kind. This is perhaps Balme's best point. If Aristotle were concerned with the perpetuation of the features of fixed species, he would focus on this project in an important way in his account of heredity, or at least would bring it more forcefully forward for consideration.

suggest that a change in the *nature* of the kind occurs, even though it occurs anew for each generation and cannot be passed on to future generations through inheritance. Furthermore, and perhaps more important, since Aristotle does not merely speak of each member of the kind as deformed, but rather speaks of the kind *itself* as deformed, the deformation would represent a genuine change in the nature of the kind. Because the change in nature is a 'deformation', Aristotle must then regard it as an interference in what he would take to be the 'normal' or 'natural' course of development of the embryo, which would be the development it would have taken had there been no interference in its original constitution. Aristotle considers then at least some natural kinds to be mutable in significant ways, through a change in the embryonic nature of their instances, and, although buttressed by much that Aristotle says elsewhere, serious doubt is thus cast on the doctrine of fixity, at least under its traditional formulation.

Aristotle discusses the mole twice in *HA*, in much the same terms, and his sole interest in it is its lack of vision. The mole belongs to a genus that possesses sight, the viviparous terrestrial, and the mole alone of its species is blind. Therefore, Aristotle designates it as a deformed kind.[9] But it does not appear to be deformed merely in a figurative sense, in the way the lobster and seal are deformed, through their failure to measure up to the standard of excellence represented by their genus. Instead, it seems to be really deformed.

In *HA* I.9.491b27–36 and IV.8.532b34–533a12 Aristotle points out that the mole has no externally observable eyes,[10] but that if the skin is removed from the place where eyes are usually found, there is a place for them, and the 'black' parts, presumably the iris, are in the appropriate position. In *HA* IV.8 Aristotle elaborates by saying that the eyes under the skin are in a 'disabled condition' (*οἱ ὀφθαλμοὶ διεφθαρμένοι*), although they possess all the parts of a 'true' eye. In both chapters of *HA* Aristotle seriously considers the possibiility that the blindness of the mole is the result of a deformity in its embryonic development. This consideration he expresses in both chapters in virtually the same terms, and in *HA* IV.8 he puts it this way: 'There is no sign of these parts [i.e. the parts of the eye] on the outside, owing to the thickness of the skin, which suggests that in the course of development its nature is deformed' (*ὡς ἐν τῇ γενέσει πηρουμένης τῆς φύσεως*, trans. after Peck).

HA I.9 and IV.8 suggest that the mole would be a sighted creature, just like all the other viviparous terrestrials of its genus, except for an interference that arises in the embryonic development of the eyes of each mole. The eyes fail to develop properly, in accord with the potency of its original constitution at conception, with the result that the mole turns out to be importantly different from what it would have been without the interference: a blind, rather than a sighted, viviparous terrestrial. Its nature in the embryonic state changes from one possessed of the capacity for sight to one deprived of that capacity. A change then in the character of the species, not just a change in some individual cases, occurs through the deformation of the embryonic potency, and thus Aristotle holds a version of the transmutation of species.

A. L. Peck, in a note on I.9 in his translation of *HA*, suggests that Aristotle's views on the deformity of the mole are incompatible with his criticism of Empedocles in *PA* I.1.640a19–23. In his criticism Aristotle upbraids Empedocles for maintaining that many characteristics of animals occur because of some accident that happens in

[9] At *De An.* III.1.425a9–11 Aristotle alludes to the mole's lack of sight, but tries to avoid labelling it as deformed by maintaining that even it possesses eyes under the skin.

[10] This is true of the *Talpa caeca* of Southern Europe, according to D'Arcy Thompson, *Aristotle's Historia Animalium* (Oxford, 1910), n. on I.9.

embryonic development. The vertebrae of the backbone, according to Empedocles, arise because the backbone is broken into pieces in the embryonic state. Yet Aristotle's criticism of Empedocles is perhaps consistent with his analysis of the mole. In the case of the mole he appeals to deformity to account for a characteristic in a deformed, not a normal, species, which perhaps he would argue must be regarded as obviously deformed by anyone familiar with the facts, because of the mole's complete but undeveloped eyes located just beneath the skin. Empedocles, Aristotle might complain, uses accidents to explain the normal or unimpeded course of development in normal species. This defence of Aristotle, however, would be fully convincing only if there were clear-cut criteria for the distinction between normal and deformed species. Unfortunately, Aristotle offers no such criteria.

In *HA* VIII.2 Aristotle takes up an extended discussion of the terrestrial–aquatic, which is any sort of animal there are reasons for classifying as both terrestrial and aquatic. The terrestrial–aquatic forms a large class, which includes such animals as the dolphin, whale and seal, and even such animals as the otter, hippopotamus and frog.[11] All of these are terrestrials because they take in air for the sake of cooling the blood, which is Aristotle's explanation of respiration (*Resp.* 10), and aquatics because they take in water incidental to their feeding or because they make their habitat in or pursue their food in water. Because there are reasons for classifying them as both terrestrial and aquatic, Aristotle describes these animals as 'ambiguous' or 'equivocal' animals (τὰ ἐπαμφοτερίζοντα). Throughout the biology Aristotle labels many other animals, such as the bat and the ostrich, 'equivocals', because there are reasons for placing them in what appear to be incompatible categories (e.g. *PA* IV.13.697a15ff.).[12]

In *HA* VIII.2 Aristotle's remarks on the terrestrial–aquatic concern primarily problems of classification, but toward the end of his discussion, at 589b29–590a11, he expounds on the defective nature of the terrestrial–aquatic:

> The nature of all these seems, as it were, to have been warped [ὥσπερανεὶ διεστράφθαι], just as some males become feminine, some females masculine. For animals that receive a difference in small parts come to differ greatly as regards the nature of the whole body. This is evident in the case of those that are castrated; for when a small part is maimed [πηρωθέντος] the animal changes into a female. So that it is evident that also in the animal's original conformation if some small part be changed in magnitude, and if it should be a principle [ἀρχοειδές], the animal comes to be in one case female, and in the other male; but if it has been altogether destroyed, neither. So that the terrestrial and aquatic animals exist in both ways, because a change comes to be in small parts.[13] And some animals do not 'equivocate', and some do 'equivocate' because something of the matter, from which they make their food, participates [μετέχειν] in their conformation while in the embryonic condition [ἐν τῇ συστάσει τῆς γενέσεως]; for pleasing to each animal is that which is in accord with nature...

The terrestrial–aquatic is, 'as it were, warped', a qualification of the sort Aristotle uses on one other occasion in his characterization of a kind as deformed,[14] which perhaps reflects his doubts about just how to describe them. Aristotle bases his analysis of the terrestrial–aquatic on his analysis of change in sexual characteristics, and the 'warping' the terrestrial–aquatic undergoes is analogous to that undergone by those animals that suffer a change in sexual character. Consequently, he draws an analogy

[11] In addition to *HA* VIII.2, *HA* I.1.487a14–27 provides many examples of the terrestrial–aquatic.

[12] The 'equivocals' do not participate in incompatible categories. For a full discussion of them, see my paper, 'The *scala naturae* and the Continuity of Kinds', *Phronesis* 30 (1985), 181–200.

[13] With Thompson and Dittmeyer, I treat as a gloss the succeeding words διὸ συμβαίνει γίγνεσθαι τὰ μὲν πεζὰ τὰ δ' ἔνυδρα τῶν ζώων. They seem to repeat what has just been said, and it is difficult to see how to integrate them into the text grammatically.

[14] At *HA* II.1.498a33 Aristotle says that the seal is ὥσπερ πεπηρωμένον τετράπουν.

between the characteristics of 'terrestrial' and 'aquatic' and those of 'masculine' and 'feminine'.

According to Aristotle, if, in its embryonic development, an animal suffers a change in a small bodily part, which serves as a principle that directs the constitution of its nature, the animal will undergo a change in sexual character, or even the complete destruction of any sexual character, if that part be altogether destroyed. This position is an inference he bases on an analogy with what he observes about castrated males, which, when 'maimed' in a small part, take on great bodily changes and change into the feminine form. Aristotle generalizes further by maintaining that a change that affects any small directive part of the body results in great changes in bodily constitution.

Aristotle applies this generalization to the case of the terrestrial–aquatic. Because of a change in a small, but directive, bodily part, a terrestrial animal undergoes a significant change and becomes an aquatic, or an aquatic animal undergoes a correspondingly significant change and becomes a terrestrial. In effect the animal becomes a terrestrial–aquatic, an 'equivocal' animal possessed of both terrestrial and aquatic characteristics, because its original nature, be it terrestrial or aquatic, is not completely destroyed. Aristotle must hold this view, since he has undertaken to explain in this passage the nature of the terrestrial–aquatic, an animal there are reasons for considering to be *both* terrestrial *and* aquatic.

Aristotle expands on his explanation of the terrestrial–aquatic by maintaining that something of the 'matter', from which the animal subsequently gathers its nourishment, 'participates' in its conformation while in the embryonic state. The suggestion is that the animal's embryonic development is disrupted through the 'participation' of a matter other than that of which it would have been composed in the course of the development of its original constitution, and that the intrusion of this new matter is the change in a small bodily part that brings on the change in the animal's character and thus its deformation. The extrinsically introduced matter, therefore, becomes part of the animal's constitution, with the result that the animal undergoes a change in nature in the embryonic condition and gains a taste for food composed of the extrinsically introduced material. Presumably, the animal turns then at birth to an environment in which it may satisfy its desire for this foodstuff, which has become natural to it, and in which it may exercise the new abilities it acquires with the augmentation of its nature.

This interpretation of *HA* VIII.2 does not exaggerate when it concludes that the terrestrial–aquatic arises through a deformation in embryonic development. It would appear to be justified in its conclusion, because the terrestrial–aquatic falls under Aristotle's generalization that from changes in small directive bodily parts issue great changes for the overall bodily configuration, and because this generalization is founded on the phenomenon of castration. By placing the terrestrial–aquatic under this generalization, Aristotle draws a parallel between the change it undergoes and that suffered by maimed animals, and such a parallel argues strongly for the emergence of the terrestrial–aquatic from a deformation. Besides, Aristotle plainly suggests the occurrence of a genuine disruption in the development of the terrestrial–aquatic merely by holding that there is a *change* in a small part through the 'participation' of the matter of its food in its constitution.

The terrestrial–aquatic represents, then, as well as the mole, a kind that arises through Aristotle's version of the transmutation of a kind, in which the transmutation arises, as in the case of the mole, in each generation through a deformation occurring regularly in embryonic development. Since the terrestrial–aquatic includes numerous

species, Aristotle's version of the transmutation of kinds has an extensive application and hardly represents a rare anomaly in his biology. Consequently, deformed kinds like the terrestrial–aquatic and the mole indicate that Aristotle's conception of a natural kind allows for more flexibility in the nature of a kind than the traditional doctrine of fixity takes into account.[15]

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