SUBSTANTIAL BEING IN ARISTOTLE’S BIOLOGY

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Approved:
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Substantial Being in Aristotle’s Biology

I. Introduction

This is a study of substantial being and the role it plays in Aristotle’s biology. Substantial being in the biological context can, as an analytic first pass, be defined as the essence or what it is to be an animal of a certain kind. According to the framework I develop, substantial being plays two major roles. The first of these is explanatory, particularly within the method of division. This method, sketched out by Plato in the so-called “late” dialogues, is discussed in detail in two works, the Parts of Animals and Posterior Analytics. The idea in Plato is that by taking a general kind and making two mutually incompatible divisions, we can reach the essence of something. Aristotle wrestled with this Academic legacy, and what we find in his work, on my account, constitutes a radical critique and reworking of it from the foundations. In chapter II of this essay I look at the negative critique and groundwork for Aristotle’s positive vision in the first chapter of the Parts of Animals, and in chapter III I turn to the Posterior Analytics for a positive model. Not only does Aristotle’s own account of the method of division make good sense of his scientific practice, it also is coherent with and, once interpreted at the correct level of abstraction, explicated by the account of division in his Posterior Analytics. Once I have outlined Aristotle’s method of division, I will discuss, in chapters IV-V, what substantial being is ontologically speaking, by turning to the De Anima and Metaphysics respectively, and will argue that it is identical to the soul of an animal, which is itself equivalent to the substance of an animal. In Chapter VI, I will challenge my findings with the doctrine of animal parts as presented in a passage in the Politics and look at how explanation functions in a couple of actual cases from the Parts of Animals. If my task succeeds, we will end with a fuller picture of the work substantial being does in the biological context.¹

A controversial aspect of my methodology is an underlying willingness to understand the biology in light of treatises from the Organon and remainder of the corpus. However, understanding Aristotle’s scientific practice in the biological treatises as an extension of the methodology presented in the Posterior Analytics is, to put it mildly, a controversial move.² If we can show, however, that looking at the treatises together creates a richer and philosophically

¹ My study is indebted to the canvassing of the biological data on substantial being in Gotthelf 2012, 217-241.
² See for contrast the developmentalist model—on which the biological treatises such as the Parts of Animals and Posterior Analytics represent different phases in Aristotle’s thinking—advocated in Lloyd 1996a and 1996b.
more coherent explanation, that gives *prima facie* evidence for considering them in conjunction. What’s more, the various indicators and cross references to other works throughout the Aristotelian corpus provide an obvious sign that Aristotle intended the claims from one treatise to at a minimum be in conversation with those of another. Aristotle’s texts on nature, for example, can be taken as a whole to form a complete system; the foundations of sublunary physics are laid out in a way which gives the physical and conceptual foundations for the natural world in *On Generation and Corruption.*³ What’s more, if we are to take the *Posterior Analytics* seriously at all as a model for science and take its own employment of examples from natural science as meaningful, then the points of agreement or divergence between its theory and scientific praxis must be addressed. I will argue that taking both treatises together will give us the best, and a more illuminating, account of Aristotle on division.⁴ Understanding the *Metaphysics* as in line with the biology is less controversial than the *Posterior Analytics* case, but it has still been contested.⁵ Again, my view is that Aristotle’s corpus becomes substantially less interesting if we deny that the very same concepts which are deployed in multiple treatises are somehow unrelated—nor do I find the “metaphysical” Aristotle a different thinker than the scientific Aristotle enough to conjecture a development or change in his thought with confidence.

II. **Problems with Division in the *Parts of Animals***

In the first book of Aristotle’s *Parts of Animals,* Aristotle programmatically lays out a method of division to be employed in the empirical investigations which occupy the rest of the treatise. In this context, Aristotle asks whether we ought to “take each substantial being singly and define it independently, e.g., taking up one by one the nature of mankind, lion, ox, and any other animal as well; or should one first establish, according to something common, the attributes common to all?” (*PA* I.1, 639a15-20)⁶ Examples of these common attributes are respiration, sleep, growth, and death of living beings. Aristotle claims that it would be absurd to go through these species by species, when they are commonalities and can be discussed more efficiently at a higher level of generality. There are, however, he says, important differences in “form,” including in the “locomotion of animals” as well as in “natural generation” (639b1-15). Despite the lucidity with which Aristotle sets out this initial framework, there are several interpretive

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³ See Burnyeat 2004
⁴ See also Lennox 2001 for further explorations of the continuities between the *An Post.* and the *PA* model.
⁵ As developed in Lloyd 1991
⁶ Translations of *PA* modified from Lennox 2003
problems modern readers face in understanding Aristotle’s account. These consist both in comprehending what methodological requirements exactly he is arguing for in the first book and in determining whether or not these requirements are actually followed in the biological explanations that compose the remaining books the *Parts of Animals*. Despite Aristotle’s own reliance on the method of division, he is critical of the alternative, Academic methodology employed by those who attempt to grasp the particular by dividing the kind into two differences. But this is in one respect not easy, and in another impossible. For of some things there will be only one difference, the others being superfluous, e.g. footed, two-food, split-footed; this single difference is decisive. Otherwise, it will be necessary to say the same things many times (PA I.2, 642b5-10).

Indeed, Aristotle musters a series of powerful, though often obscure, criticisms against the method of dichotomy:

Further, one should avoid tearing each kind apart, e.g. putting some of the birds in one division and some in the other, as the written divisions have done; there, some of the birds end up divided off with the water-dwellers, some in another kind. Now this similarity has an established name, ‘bird’, and another has ‘fish’. Other similarities are nameless, e.g. the blooded and the bloodless; there is no one established name for either of these. If, then, nothing alike in kind should be torn apart, division into two is worthless. For people who divide in this manner necessarily separate and tear apart; some of the many-footed things are among the land-dwellers, while some are among the water-dwellers? (PA I.2 642b10-20).

Division must respect certain previously given kinds; however, the Academic target of the polemic here does not respect these divisions. The standard here will be made explicit later; any division which does not respect the data, that some animals clearly have certain likenesses which form a kind, has gone badly wrong somewhere. Aristotle is not willing to restrict this principle, however, to those kinds which are already established; newly discovered kinds, like blooded and bloodless are also going to be kinds which should not be divided. But dichotomy inherently cannot respect such categorizations, “tearing apart” these kinds—whether they are provided by folk belief, like birds and fish, or not antecedently named. What this suggests is that the kinds Aristotle is interested in are not merely linguistic construction, but are found by empirical

7 Ἐτι δὲ προσήκει μὴ διαίρεσιν ἐκαστὸν γένος, οἷον τοὺς ὄρνιθας τοὺς μὲν ἐν τῇδε, τοὺς δὲ ἐν ἀλλῇ διαιρέσει, καθάπερ ἔχουσιν αἱ γεγραμμέναι διαιρέσεις· ἐκεὶ γὰρ τοὺς μὲν μετὰ τῶν ἐνόδρων συμβαίνει διαμένει, τοὺς δὲ ἐν ἄλλῳ γένει. Ταύτῃ μὲν οὖν τῇ ὁμοιότητι ὄρνις ἄνωμοι κεῖται, ἐπερὰ δὲ ἰγθεί. Ἀλλαὶ δὲ εἰσίν ἄνωμοι, οἷον τὸ ἐναμόν καὶ τὸ ἄναμον· ἐφ’ ἐκατέρω γὰρ τούτῳ ὑπ’ ἐκήτα ἐν ὑμνιᾷ. Ἐπεὶ οὖν μηδὲν τῶν ὑμογενῶν διασπαστέων, ἢ εἰς δύο διαιρέσεις μέταπος ἐν ἑνῇ· οὕτως γὰρ διαροίητας ἄναγκαθον χωρίζειν καὶ διαισπάν· τῶν πολυπώδων γὰρ ἐστὶν τὰ μὲν ἐν τοῖς πεζοῖς τὰ δὲ ἐν τοῖς ἐννόδροις.
research. This suggests that something deeper is going on than merely respecting the categories of folk belief, but that the dichotomist has missed the very phenomenon he intended to explain, the kinds of animals. Aristotle continues, however, to criticize the dichotomist, as he will throughout the first book of \textit{PA}. For another issue is that the dichotomist cannot correctly divide by privation:

Again, it is necessary to divide by privation, and those who dichotomize do so divide. But there is no difference within a privation as a privation; for there cannot be forms of what is not, e.g. forms of footlessness or winglessness, as there are of winged or footed; and there \textit{must} be forms of a general difference; for if this were not the case, why would it be general rather than particular? And some differences are general and have forms, e.g. wingedness—one wing is unsplit, the other split.

In the same way too one form of footedness has many splits, another two, like the cloven-hoofed animals, and another is unsplit and undivided, like the solid-hoofed animals. So it is difficult to distribute animals even into such differences as these, of which there are forms, so that any given animal belongs in them and the same animal does not belong in more than one, e.g. in both winged and wingless (For the same animal is both of these, e.g. ant, glow-worm, and certain others)\footnote{“Ετι στερήσει μὲν ἀναγκαίον διαφέρειν, καὶ διαφοροῦσιν οἱ διχοτομοῦντες. Οὐκ ἦστι δὲ διαφορὰ στερῆσις ἢ στέρησις. ἀδύνατον γὰρ εἶδη εἶναι τῷ μὴ ὄντος, οἷον τῆς ἀποδίας ἢ τοῦ ἀπτέρου ὀσπερ περίκροις καὶ ποδών. Δὲὶ δὲ τῆς καθόλου διαφοράς εἰδὴ εἶναι: εἰ γὰρ μὴ ἦσται, διὰ τί ἢ ἐν τῷ καθόλῳ καὶ οὐ τῶν καθῆς ἐκστατον: Τὸν δὲ διαφορὰν αἱ μὲν καθόλου εἰσὶ καὶ ἐξουσιαστὶ εἶδη, οἷον περίκροις· τὸ μὲν γὰρ ἀσχίστον τὸ δὲ ἀσχισμένον ἐστὶ περίκροι. Καὶ ποδότης ὑσαύτου ἢ μὲν πολυσχίδης, ἢ δὲ δισχίδης, οἷον τὰ ὀδοντά, ἢ δὲ ἀσχιδής καὶ ἀδιαιρέτος, οἷον τὰ μόνιμα. Χαλεπὸν μὲν οἷον διαλαβένην καὶ εἰς τοιαύτας διαφοράς ὃν ἦστιν εἰδή, δισθή ὅτι τοὺς ἄνθρωπους καὶ μὴ ἐν πλείοσι ταῦταν, οἷον περικρόν καὶ ἀπτέρον (ἔστι γὰρ ἁμόρων ταῦταν, οἷον μύρμης καὶ λαμπυρίς καὶ ἑπερά τινα).} (642b20-33).

The issue here is that once we have divided into categories, say blooded and bloodless, we can divide the blood into different sorts, if pressed, but animals cannot \textit{lack} blood in a way that can be further divided, however else they may differ. And to lack blood is not a formal attribute of the kind the dichotomists require for their picture. For by dividing dichotomously they are supposed to end up at some last form, which is the essence of a thing. But if dichotomists, as they must, divide by privation, then they end up with an essence which is actually nothing. It is “particular,” τὸν καθ’ ἐκστατον, rather than “general,” τὸν καθόλου since there is no form on which we can universalize, and, as Aristotle says, we must find the “form of the general difference.” But since a privation, as a privation, is a particular, it cannot generalize and perform the work a definition must. In addition, the simple binary of, say, split and unsplit wing, or cloven and solid hoof, fail to respect the actual complexity found in the animal world. It also
threatens to cleave apart the unity of animal kinds, by dividing, say, ants, into two sorts of beings, the winged and unwinged.

This point is developed by Aristotle into a difficult passage which continues the critique of dichotomizing and is interesting for Aristotle’s own, alternative method:

To distribute animals into bloodless differences is most difficult of all, or impossible. For it is necessary that each of the differences belong to one of the particulars, and so too its opposing difference. Yet if it is impossible for some indivisible and unitary form of substantial being to belong to animals that differ in form—rather, the form will always have a difference, as bird differs from mankind (for their two-footedness is other and different)—then even if they are blooded, either their blood is different, or blood should be reckoned as no part of their substantial being. If this is how it is, one difference will belong to two animals. And if this is the case, it is clearly impossible for a privation to be a difference (64b33-a7).  

The point gets off the ground by assuming that, if we are using the method of dichotomy, then each difference and its opposition ends up giving us different particulars, as in the example of wings and winglessness. But if we divide by dichotomy, then either we end up saying that two animals are exactly the same, since we ended up our process of differentiating in the same place of each, or no two animals can have the same “indivisible and unitary form of substantial being,” but they will always have some sort of difference, as in the argument that there is a different “two-footedness” in human beings and in non-human animals. Therefore, according to the dichotomist, an animal that is blooded must be distinguishable on the level of blood—the blood must be “other and different,” or else it cannot be part of their substantial being at all, on pain of the two forms being indistinguishable according to the dichotomist. Aristotle goes on problematically, however, claiming that if this is the case, then “one difference will belong to two animals.” If it turned out to be true that either blood is, since it is common and not differentiated for each animal, or it could always be differentiated into multiple kinds of blood, then the dichotomist could appropriately differentiate animals. But if the dichotomist accepts either of these apparent solutions, then he has trapped himself—he has himself admitted that general terms, which apply to multiple animals, must either not be suitable for division or be specifiable at higher levels of specificity. But privation, by stipulation, can never be elaborated in
this way, since it is impossible for there to be “different forms” of bloodlessness. Aristotle himself, since he is not a dichotomist, need not claim that it is true that blooded animals must have different blood or that it is not part of their substantial being—in fact, as we shall see, he is perfectly comfortable arguing that it is. Purely on a syntactic level, the καὶ should tip us off that Aristotle is using counter-factual reasoning; even if, if (the second εἰ) a being is bloodless, we agree with the dichotomist there are further differences, it presents no salvation. The next passage is textually corrupt and difficult to understand:  

The differences will be equal in number to the indivisible animals, if, that is, both the animals and the differences are indivisible, and there is no common difference. But if it is possible for something common to be present as well, yet not be indivisible, it is clear that, at least in respect of that common feature, animals that are different in form are in the same form. Therefore, it is necessary, if the differences into which all the indivisible animals fall are distinctive, that none of the differences be common. Otherwise animals that are different will end up with the same difference. But the same indivisible animal should not go first into one and then into another division, nor should different animals go into the same one, and all should go into them somewhere (643a7-15). If we divide into individual animals—understood not as particular animals (like this dog), but as the species—through division, then we will finally end up with a number of successful divisions equivalent to the number of animals. What Aristotle considers here is common attributes—exactly like the common form of substantial being mentioned above. An example would be blood, if we do not accept that either blood is individuated in beings or not part of substantial being. But if we employ the method of dichotomy, we end up concluding that any two beings without indivisible properties are the same; so, we will conclude that, due to the shared features, animals which are different are in fact the same. Another option would be to merely arbitrary shuffle animals which are indivisible into various parts of a dichotomous schema—but for Aristotle this state of affairs is intolerable enough to doom the entire endeavor.

If one is going to divide via dichotomy, every given animal should have a stable place in the system. If we understand both of these passages as posing two horns of a dilemma for the dichotomist, the former arguing that if commonalities are denied the dichotomist picture fails,
the latter that even if these attributes are admitted, the picture remains unsustainable. Aristotle continues his critique with another objection:

Apparently, then, it is impossible to grasp the indivisible forms by dividing in the way that those do who divide animals—or any other kind—into two. For even on their account the final differences must be equal in number to all the animals that are indivisible in form. For instance, if there is a certain kind, of which shades of white are the first differences, and of each of them there are other differences, and so down to the invisibles, the final differences will be four or some other quantity achieved by doubling from one; and the forms will also be that many. And the form is the difference in the matter; for no part of an animal exists without matter, nor is it matter alone; neither will a body in any condition whatsoever be an animal, nor will any of its parts, as has been said repeatedly 12 (643a15-26).

The point here is that if we continue to divide without an end point, and *every* apparent difference is taken as suitable for division, we in fact do not end up with differentiae at the level of substantial being, but far below it. In the toy example Aristotle uses, differentiating even colors at a sufficiently fine-grained level will bottom out not in a color but in an “invisible.” And so, if we continue to make differentiations of animals we end up not with macroscopic objects like animals or even their parts, but simple pieces of matter.

This line of reasoning also gives us insight into what would be a requirement for Aristotle’s own method, which is one that presumably dichotomists will endorse, namely that whatever explanatory role division plays, it better end up giving us the species—or rather, on my argument, substantial being—of every species of animal. There follows a second critique of the dichotomous method of division, introduced after Aristotle has given his own account:

That it is impossible to grasp any of the forms of the particulars by dividing the kind into two, as some thought could be done, is apparent from the following points as well. It is impossible for there to be a single difference of the divided particulars, whether one takes simple or interwoven differences. I call a difference simple if it has no difference, e.g. split-footed, and I call it interwoven if it has a difference, as multi-footed is related to split-footed. For the continuity of the differences derived from the kind according to its division means just this, that the whole is a single thing. But

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12 Φανερῶν τοῖνος ὅτι οὐκ ἔστι λαμβένει τὰ ἁτομα εἴδη ὡς διαιροῦνται οἱ εἰς δύο διαιροῦντες τὰ ζώα ἢ καὶ άλλο ὅτιον γένος. Καὶ γὰρ κατ’ ἐκεῖνους ἀναγκαῖον ἴσας τὰς ἐσχάτας εἶναι διαιρομένης τεῖς ζώοις πάσι τοῖς ἁτομοῖς τῷ εἶδε. Ὅντος γὰρ τοῦτο τὸν γένους, οὐ διαιροῦσι πρῶτα τὰ λεπτά, τούτου δ’ ἐκατέρων ἄλλα, καὶ οὕτως εἰς τὸ πρόσω ἔος τῶν ἁτομῶν, αἱ τελευταῖαι τετταρεῖς ἐλοῦνται ἢ ἄλλο τι πλήθος τῶν ἄρ’ ἐνὸς διπλασιαζομένον· τοσαύτα δὲ καὶ τὰ εἶδη. Ἡ ἐπὶ δ’ ἢ διαιρομένη τὸ εἶδος ἐν τῇ ὑλῇ. Οὔτε γὰρ ἄνευ ὑλῆς οὐδὲν ζῶον μόριον, οὔτε μόνη ἢ ὑλῆ· οὐ γὰρ πάντως ἔχειν σώμα ἐστι ζῶον, οὐδὲ τῶν μορίων οὐδὲν, ὀδηγεῖς πολλάκις εἰρηταί.
the mode of expression makes it seem that the final one alone is the difference, e.g. ‘multi-split-footed’ or ‘two-footed’, and that ‘footed’ and ‘many-footed’ are superfluous13 (643b26-36).

The point Aristotle makes here is that the sorts of differences that the dichotomist uses cannot be suitable for identifying animals. There are two sorts of differences he references in this portion of the argument, which are apparently meant to be exhaustive. The difference between what is “simple” or “interwoven” is unclear, but it seems that multiple differentiae can interact; something can be split-footed and multi-footed, and if the former is taken as explanatorily basic and the latter as a differentia of that, it becomes complex. In this way, the multiple differences are interrelated into one. But Aristotle argues the following:

That there cannot be many such differences is clear; for by proceeding continuously one arrives at the last difference, though not at the final difference and the form. This last difference is either split-footed alone, if one is dividing mankind, or the entire complex, e.g. if one were to combine footed, two-footed, and split-footed. And if mankind were split-footed alone, by proceeding in this way one might arrive at this single difference. But since mankind is not merely split-footed, it is a necessity that there be many differences that are not under a single division. There cannot, however, be many differences under a single dichotomous division—at least not of the same thing. Rather, one must end with one difference according to each division. So it is impossible for those who divide in two to grasp any of the particular animals14 (644a1-11).

Aristotle here argues that although this method may reach a singular “last” differentia, it will not be the “final” differentia, which is connected to the form of an animal. It will either be a given last differentia, using the framework above, or a complex differentia chain, as in the “interwoven” difference. The issue here is that even a difference like this cannot possibly give the form of an entire animal; after all, people are not only split-footed. Nor are they primarily split-footed; it would be absurd to give that as the most important fact about a human being. But if the division is supposed to help us understand what a human being is, as I shall argue in the

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13 Ὅτι δ’ οὐκ ἐνδέχεται τὸν καθ’ ἐκαστὸν εἶδὸν λαμβάνειν οὐδὲν διαιροῦσι δίχα τὸ γένος, ὡσπερ τινὲς φώθησαν, καὶ ἐκ τῶν δέ φανερών. Ἀδύνατον γὰρ μίαν ὑπάρχειν διαφόραν τὸν καθ’ ἐκαστὸν διαιρετῶν, εἰν τῇ ἀπλῇ λαμβάνῃ εἰν τῇ συμπλεγμένα λέγῳ δὲ ἀπλάμαν, ἢν μὴ ἢ διαφόρον, οἷν τὴν σχιζοποίησιν, συμπλεγμένα δὲ, ἢν ἢμι, ὀἷν τὸ πολυσχιζὲς πρός τὸ σχιζόμενον. Τοῦτο γὰρ ἑ τὴν συνέχεια βουλεῖται τῶν ἀπὸ τοῦ γένους κατὰ τὴν διαίρεσιν διαφορὰν ὡς ἐν τῷ πάν ὕμ, ἀλλὰ παρὰ τὴν λέξιν συμβαίνει δικαίως τὴν τελευταίαν μόνην εἶναι διαφόρον, οἷον τὸ πολυσχιζὲς ἢ τὸ διαιροῦν. τὸ δ’ ὑπόσουν καὶ πολυσουσαν περιέργα.

14 Ὅτι δ’ ἀδύνατον πλείους εἶναι τοιαύτας, δήλων—ἀλλ’ ἂν γὰρ βαδίζουν ἐπὶ τὴν ἀσχάτην διαφόραν ἄφικνεται, ἀλλ’ οὐκ ἐπὶ τὴν τελευταίαν καὶ τὸ εἰδὸς. Αὕτη δ’ ἐστὶν ἡ τὸ σχιζόμενον μόνον, ἢ πάσα καὶ συμπλεγμένες, ἢν διαιρεῖται ἄνθρωπον, οἷν εἰ τῇ συνθεί ὑπόσουν, δίσουν, σχιζόμενον. Εἰ δ’ ἢν ἐν ἀνθρώπου σχιζόμενον μόνον, οὕτως ἐγένετ’ ἢν αὕτη μία διαφορά. Νῦν δ’ ἐπειδῆ ὡδίκες ἐστίν, ἀνάγκη πολλὰς εἶναι μὴ ὑπὸ μίαν διαίρεσιν. Ἀλλὰ μὴν πλείους οἱ τοῦ αὐτοῦ οὐκ ἐστίν υπὸ μίαν διαφοράς εἶναι, ἀλλὰ μίαν κατὰ μίαν τελευταν. Όστε ἀδύνατον ὡτιον λαβεῖν τὸν καθ’ ἐκαστὸν ἀνδρὶ δίχα διαιρουμένους.
next section, then it is a total failure. So there cannot be a dichotomizing division which gives the entire animal, or the division will be haphazard (imagine if we divided split-footed animals into those which are capable of speech, say, and those not; it is no longer clear by what principle we are dividing.) So, since it will at best give only a singular division per any given animal, we must reject the dichotomous method of dividing animals.

Having given these arguments against dichotomy, Aristotle introduces requirements for his own methodology before explicating it in more detail. This project is already implicit, as we have seen in his discussion of form, but here it becomes explicit. The same is true, however, in reverse; the method of dichotomy will turn out to fail to meet the standards Aristotle is imposing for his own account, which are thus of double interest:

Further, one ought to divide by features in a thing’s substantial being, and not by its special attributes, as would happen if someone were to divide figures on the ground that some have angles equal to two right angles, while others have angles equal to more; for having angles equal to two right angles is a sort of attribute of the triangle\(^\text{15}\) (643a27-30).

The distinction drawn here is between dividing via certain features which are part of the substantial being of an animal, those which are “special attributes,” or intrinsic accidents, τοῖς συμβεβηκόσι καθ’ ἀντί. The example given is between having angles equal to two right angles; this is true, even essentially so, of a triangle, in the sense that any polygon with right angles unequal to two right angles would not be a triangle. Nevertheless, it is not in the definition of a triangle; it is instead a (trivial) consequence of the actual definition of a triangle. In the same way, if we use in our division features which are merely intrinsic accidents, then we will end up with a distorted view of the essence of a thing\(^\text{16}\).

Substantial being, then, plays a central role, as it is by appeal to substantiality that we distinguish successful divisions, those that reach the essence, from spurious ones. As we have previously seen, the inability of dichotomous methods of division to grasp substantial being

\(^{15}\) Ἐτι διαμεῖν χρή τοῖς ἐν τῇ οὐσίᾳ καὶ μὴ τοῖς συμβεβηκόσι καθ’ ἀντί, οἷον εἶ τις τὰ σχήματα διαμοιρά, ὅτι τὰ μὲν δυσὶν ὀρθᾶς ίσας ἔχει τὰς γωνίας, τὰ δὲ πλείοσιν- συμβεβηκός γάρ τι τῷ τριγώνῳ τὸ δυσὶν ὀρθᾶς ἱσας ἔχειν τὰς γωνίας.

\(^{16}\) Following Lennox 2003, 161-3, which distinguishes three levels; the explanatorily and definitionally basic substantial being, the necessary attributes which follow incidentally, as in the example given, and merely incidental properties. The same passage raises a worry about how we distinguish essential and incidental properties. Presumably, however, the essential properties will be the most basic explanatory facts about a given being, so there is no special epistemological difficulty beyond general questions about explanation and theory choice in the sciences.
constitutes part of its failure. Not only should the features we divide by be parts of a thing’s substantial being, but the division must proceed according to certain principles:

Again, one should divide by opposites. For opposites are different form one another, e.g. paleness and darkness, straightness and curvature. So if one of the two is a difference, one should divide by its opposite and not in the one case by swimming and in the other by color\(^\text{17}\) (643a31-34).

Aristotle will divide in a given string of differentiae only by attributes which are properly opposite to each other. This is opposed to the dichotomist, who must apparently divide by features which are unrelated; the picture itself does not require division by dichotomy itself, since the scope is restricted to the occasions on which we make differentiations of a given differentia. If we are, for instance, dividing via color (itself not a good candidate for inclusion in the substantial being of an animal), we would divide by different colors, not by two unrelated attributes, as swimming and color. The dichotomist, however, unless they are willing to argue that an animal is a single simple differentia, as Aristotle has previously pointed out, will be forced to divide by contingent factors:

Moreover, ensouled things, at least, should not be divided by the common functions of the body and of the soul, e.g. in the aforementioned divisions, walkers and flyers; there are certain kinds to which both differences belong and that are flyers and wingless, just like the ant kind. Nor should these kinds be divided into wild and tame; for in the same way this would seem to divide forms that are the same. For in a manner of speaking everything that is tame is also wild, e.g. human beings, horses, cattle, Indian dogs, pigs, goat, and sheep. Each of these kinds, if homonymous, has not been divided apart, and if these are one in form, wild and tame cannot be a difference. Speaking generally, this is a necessary result of dividing any sort of difference by a single division\(^\text{18}\) (643a35-b9).

This passage is textually very difficult.\(^\text{19}\) The point seems to be that the dichotomous method of division does not give us the correct results in difficult cases, like ants, which seem to possess multiple functions of progression. This would be very problematic if it meant that we are not to divide at all by functions, as we shall see when we reach specific examples, but the juxtaposition of this point with a criticism of the wild/tame dichotomy seems to be that certain

\(^{17}\) Ἐπὶ τούτων ἀντικειμένους διαφέρειν. Διάφορα γὰρ ἀλλήλως τάντακείμενα, οἷον λευκότης καὶ μελανία καὶ εὐθύτης καὶ καμπυλότης. Ἐὰν οὖν θάτερα διάφορα ἢ, τό ἀντικειμένῳ διαφερεντισμὸν καὶ μῆ τὸ μὲν νεῖσθαι τὸ δὲ χρώματι.

\(^{18}\) πρὸς δὲ τούτους τὰ γ’ ἐμψυχή τοῖς κοινοῖς ἐργοις τοῦ σωματος καὶ τῆς ψυχῆς, οἷον καὶ ἐν ταῖς ρηθείσαις νῦν πορευτικά καὶ πτηνά· ἔστι γὰρ τινα γένη οἷς ἁμφοῦ υπάρχει καὶ ἔστι πτηνά καὶ ἂτερα, καθάπερ τό τοῦ μωρμήκον γένος. Καὶ τῷ ἄγριῳ καὶ τῷ ἡμέρῳ διαιρεῖσθαι· ὡσαντός γὰρ ἄν δῦνει ταῦτα εἰδή διαφερή. Πάντα γὰρ οἷς εἰπὲν, σὺς ἡμέρα καὶ ἂγρια τυγχάνειν ὄντα, οἷον ἄνθρωπον, ὑποι, βόες, κύνες ἐν τῇ Ἡνδικῆ, ὦς, αίγες, πρόβατα· ὢν ἑκατον, εἰ μὲν ὁμόωνυμον, οὐ δύσηται χωρίς, εἰ δὲ ταῦτα ἐν εἴδε, οὕτω οἷον τ’ εἶναι διαιφοράς τὸ ἄγριον καὶ τὸ ἡμερον. Ὁλος δ’ ὑποενοντων διαιφορά μια διαιροῦντα τούτῳ συμβαίνειν ἀναγκαῖον.

\(^{19}\) I accept the rendition of Lennox 2003, 163-164
terms which are useful to the dichotomizer either are not sufficiently exhaustive, as the ant’s subversion of a simple walker/flyer dichotomy makes clear, or not natural divisions at all, as Aristotle shows in his critique of “wild” and “tame” as natural categories. The point does not seem to be that they are absolutely useless, but that “tame” and “wild” cannot be themselves divided apart as the dichotomist needs. If they have any value for the natural scientist, then this falls apart when they themselves are subjected to further divisions. The “this” that is a necessary result of dichotomous division is everything that has been discussed—that in general division will, on the dichotomizer’s account, become totally impossible.

Once Aristotle makes the requirements his own account is to satisfy clear, Aristotle gives his own method of division:

Rather, one should try to take the animals by kinds, following the lead of the many in demarcating a bird kind and a fish kind. Each of these has been defined by many differences, not according to dichotomy. For if one uses dichotomy, it is either altogether impossible to grasp something (since the same thing falls into many divisions and opposed things into the same division), or there will be only one difference, and this one, whether it is simple or the result of interweaving, will be the final form.

We follow the “lead of the many” in distinguishing kinds. This is not to assume that the way the many talk will necessarily carve reality at the joints—after all, Aristotle is perfectly happy to say that certain kinds are unnamed by popular speech. But by taking from ordinary speech kinds like “bird” and “fish” we will not make the same mistake as the dichotomist and tear apart what is naturally together. This is something that the dichotomist, again, cannot do; either we will not find any kinds at all, since similar things can fall into separate divisions and things which are naturally opposed into the same kind, or we are forced to rely on a simplistic model on which only one difference—whether “simple” or from “interweaving,” using the language explained

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20 Lennox 2003, 166 argues for an alternative interpretation, on which the issue is not that tame and domesticated are not proper differentiae, but that it is only incidentally related to being a walker or a flyer, but this hardly makes good sense of the second half of the argument, which seems aimed to show that domestication is not a proper attribute to divide by this. Against this, Lennox points out Aristotle elsewhere admits that domesticability can be a differentia; but it might well be a differentia which is not properly in the definition of an animal, and in any case having the potential to be domesticated, and dividing by this feature (which will probably be associated with more fundamental facts about a creature’s nature) is not the same by dividing through what is actually domesticated and not.

21 Ἀλλὰ δὲ πεπάσσθαι λαμβάνειν κατὰ γένη τὰ τέξια, ὡς ὄφηγηνθ’ οἱ πολλοὶ διορίσαντες ὄρθιος γένος καὶ ἔχθος. Τούτων δὲ ἐκαστὸν πολλάς ὀρίσεις διαιροῦσαι, οὐ κατὰ τὴν διχοτομίαν. Οὔτω μὲν γὰρ ἦτοι τὸ παράταν οὐκ ἔστι λαβεῖν (τὸ οὗτο γὰρ εἰς πλείους ἐμπίπτει διαφοράς καὶ τὰ ἱσαντὰ εἰς τὴν αὐτὴν), ἢ μία μόνον διαφορὰ ἔσται, καὶ αὐτὴ ἦτοι ἀπλῆ, ἢ ἐκ συμπλοκῆς τὸ τελευταῖον ἔσται εἰδός.
above. Aristotle’s own method— is asserted as the “final form” of an animal. Aristotle’s own method, however, which we might call conjunctive, manages to avoid the same:

If one does not take a difference of a difference, one will necessarily make a division continuous in the same way that one makes an account one by conjunction. I mean the sort of thing that results by dividing animals into the wingless and the winged, and winged into tame and wild, or pale and dark. Neither tame nor pale is a difference of winged; rather, each is the origin of another difference, while here it is incidental. Accordingly, one should divide the one kind straight away into many, as we say. In addition, in this way privations will produce a difference, while in the method of dichotomy they will not 22 (643b17-26).

Rather than making a single division by continually taking differentiae, according to Aristotle’s method multiple differentiae are connected via “conjunction.” 23 Multiple differentiae which are not themselves interrelated will be strung along on the same level of a hierarchy; if winged animals are divided into tame and wild, for example, 24 it is not meant to be a division of something that is winged into a further differentia, as in split-winged, but a differentia of the entire animal. So, as a result of the division, one kind is itself divided into many attributes which together comprise a single being.

Having laid out his criticisms of dichotomy and an outline of his own methodology, Aristotle proceeds to raise a difficulty for his account:

One might be puzzled why people have not named one kind that embraces both the water-dwelling and flying animals, comprehending both at once by one higher name. For there are some affections common both to these and other animals. Nevertheless, they are correctly defined in this way. For those animals that differ by degree and the more and the less have been brought together under one kind, while those that are analogous have been kept apart. I mean, for example, that bird differs from bird by the more or by degree (for one has long feathers, another short feathers), while fish differs

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22 Ἐὰν δὲ μὴ διαφορᾶς λαμβάνῃ τὴν διαφοράν, ἀναγκαῖον ὃσπερ συνδέσμω τὸν λόγον ἕνα ποιοῦντας, οὕτω καὶ τὴν διαίρεσιν συνεχῇ ποιεῖν. Λέγω δ’ οἶον συμβαίνει τοῖς διαιρουμένοις τὸ μὲν ἄπερον τὸ δὲ πτερωτὸν, πτερωτὸν δὲ τὸ μὲν ἡμερὸν τὸ δ’ ἄγριον, ἢ τὸ μὲν λευκὸν τὸ δὲ μέλαν· οὐ γὰρ διαφορὰ τοῦ πτερωτοῦ τὸ ἡμερὸν οὐδὲ τὸ λευκὸν, ἀλλ’ ἐτέρας ἄρης διαφορὰς, ἐκεῖ δὲ κατὰ συμβεβηκός. Διὸ πολλὰς τὸ ἐν ἑαυτῷ διαιρετέον, ὡσπερ λέγομεν. Καὶ γὰρ οὕτως μὲν αἱ στερήσεις ποιήσουσι διαιροῦν, ἐν δὲ τῇ διχοτομῇ οὐ ποιήσουσιν.
23 But the invocation of conjunction introduces a further problem which will be discussed in detail, that of the unity of definition, as summarized by Lennox 2003, 166. The issue is in virtue of what the various differentiae are linked to form a unified definition. For Aristotle says that “a definition is an account that is one not by being conjoined like the Iliad, but by being of one thing” (Metaphysics H.6 1045b12-12), as pointed out by Reeve 2000. The solution to this will be found, I will argue in parts IV and V of this paper, in Aristotle’s ontology of substantial being.
24 Earlier I suggested that the status of “wild” and “tame” as natural terms is suspect in Aristotle; certainly the use here is not meant to satisfy that they will actually be used in division, but as a toy example picking up on the proposed differentiae the dichotomizer would use.
from bird by analogy (for what is feather in the one is scale in the other). But to do this in every case is not easy; for most animals have the same affections by analogy \(^{25}\) \((PA\ I.4\ 644a11-23)\).

Once we have a method of division at least programmatically laid out, Aristotle moves on to discuss what sorts of kinds we are discussing. He first considers, and rejects, a maximal kind, one which would embrace even seemingly disparate animals such as water-dwellers and flyers. Although there are “some affections” common to all animals, which should also then be grist for the mill of division, he sees utility in keeping the categories of folk belief. Apparently, the standard by which we will judge which animals share a kind is that they differ “by degree and the more and the less,” and those that differ “analogously” are kept apart. Although Aristotle illustrates this with an example, that birds differ based on the nature of their feathers, the “fish differs from bird by analogy,” itself a difficult concept.\(^{26}\) The obscurity of the conceptus employed here do raise a serious problem\(^{27}\); if membership in a kind is based off of this notion, whether it can be understood as coherent and compelling will change our assessment of Aristotle’s project as a whole. What is important to take away, however is that the division into kinds will be based on empirical investigation about different animals. Ordinary talk is the beginning of investigation, but is quickly subsumed under empirical practice. The basis for these divisions are in the last resort particulars:

Since it is the last forms that are substantial beings and these, e.g. Socrates and Coriscus, are undifferentiated in respect of form, it is necessary either to state what belongs generally first, or to say the same thing many times. And things that belong generally are common; for things that belong to many we call general. There is, however, a puzzle about which of these two should be our subject. On the one hand, insofar as what is indivisible in form is a substantial being, it would be best, if one could, to study separately the things that are particular and undivided in form—just as one studies mankind, so too bird; for this kind has forms. But the study would be of any one of the indivisible bird, e.g. sparrow or crane or something of this sort. On the other hand, insofar as this will result in

\(^{25}\) Απορήσεις δ’ ἂν τις διὰ τι σῶκ ἀνωθεν ἐνὶ ὀνόματι ἐμπεριλαβώμενες ἡμα ἐν γένοις ἀμφοὶ προσηγόρευσαν οἱ ἄνθρωποι, ἰ περιέχει τά τε ἐνώπια καὶ τά πτηνά τῶν ζώων. Ἐστι γὰρ ἐνα πάθη κοινά καὶ τούτοις καὶ τοῖς ἄλλοις ζώοις ἀπαντ. Ἀλλ’ ἰ μοὶ ὀρθῶς διώρισται τούτοις τῶν τρίτων. Ὡσα μὲν γὰρ διαφέρει τῶν γενῶν καθ’ ὑπεροχὴν καὶ τὸ μᾶλλον καὶ τὸ ἠκτόν, ταῦτα ὑπεξεκυκλούει ἐν γένει, ὡσα δ’ ἐχεῖ τὸ ἀνάλογον, χορῆς· λέγον δ’ οἶον ὄρνις ὅρνιθος διαφέρει τὸ μᾶλλον ἢ καθ’ ὑπεροχὴν (τὸ μὲν γὰρ μακρόπτερον τὸ δὲ βραχύπτερον), ἵσθες δ’ ὅρνιθος τὸ ἀνάλογον (δ’ γὰρ ἐκείνον πτερόν, θατέρω λεπίς). Τούτο δ’ ποιεῖν ἐπί πάσιν οὐ ράδιον· τά γὰρ πολλά ζώα ἀνάλογον ταύτο πέπονθεν.

\(^{26}\) See Henry 2014 for an explanation but also critical comments by Leunissen. What is important to my project from both is that analogy “of methodological importance,” insofar as it creates differentiations at the most “general level,” and that it tracks a real difference in Aristotle’s biology which supports realism about species.

\(^{27}\) C.f. the discussion in part VI of \(PA\ I.5\).
speaking many times about the same affection because it belongs in common to many things, in this respect speaking separately about each one is somewhat silly and tedious (644a23-37).  

It is the “last forms” that are in the long runs substantial beings. The examples given, however, are beings like Socrates and Coriscus, and they are said to be undifferentiated in “respect to form.” It is puzzling how, if the forms of Socrates and Coriscus are indeed what is being discussed, how they could be undifferentiated in respect of form, but what is clear is that we are discussing not the particular attributes of Socrates or Coricus, but what they have in common, namely human form. It is in virtue of this shared form that we can explain “what belongs generally.” This will be the strategy used on a larger scale, to take the things that are “common” and “belong to many.” This leads to another puzzle, what should be the subject—that, individual beings, or the commonalities. It would be, in an unspecified sense, “best” [κράτιστον] to study all the things separately. The example given is “bird,” but to maintain the analogy with humankind, “bird” would not be studied itself, but different species and varieties of birds. But this option—instead of using division, merely taking detailed ornithological notes and moving the explanatory project along by going species by species—is rejected by Aristotle as involving saying the same common things multiple times. This, he claims, would be both “silly and tedious.”

But what Aristotle says here concerning the reasons he has not to treat every animal species individually is unlikely to be satisfactory, and scholars have offered multiple solutions as to what sort of explanatory program the use of division actually amounts to. Lennox identifies the explanations thus yielded with “B-type” explanations.” According to this interpretation, since we know that a certain group of entities possesses a certain feature (considered so at a high level of generality), we can therefore infer that a particular instance of that group does too. For instance, all birds of prey have talons, and once I recognize that owls are birds of prey, I also know that they have talons. But as we have seen, the method of division does not simply group animals such as owls under one kind, in this case bird, but places animals in a multiplicity of
relationships. We can, for example, identify a kind of “lung-possessing” animals just as we can of birds (PA III.6 669b8-12), but to say that animals have lungs by virtue of membership in the lung-having kind is itself vacuous without further explanation. It is reminiscent of the infamous explanation of a certain elixir causing people to fall asleep by a sleep-inducing power—it adds nothing to our previous knowledge. Gotthelf\(^{30}\) makes the connection to explanatory adequacy; to say the same things over and over is a sign that one does not really understand at all. What’s more, when we establish general principles, it brings the *differences* into view which distinguish different animals and potentially form different species. But when offered at a high level of generality, it isn’t clear how this knowledge of similarities and differences increases the explanatory power of Aristotle’s science. Aristotle himself offers little help. He only speaks about “some cases,” which occur “whenever kinds are spoken of by people in a clearly defined manner and have both a single common nature and forms in them not too distant—we should speak in common according to kinds, like bird and fish and any other there may be that, though it is unnamed, embraces, like a kind, the forms within it” (644b1-7). Our kind terms are useful when there is something that “embraces forms,” i.e., when we construct at a higher level of generality a kind-term which is either in common usage, like bird, or new, like “lung-having,” then we should proceed to speak at that level of generality. The provision that the forms are “not too distant” is difficult to understand absent context; however, the point seems to be that there is a relevant similarity in their nature (as yet unclarified) which allows us to make a fruitful division. The differences, although important, cannot be *too* exaggerated, or else explanation becomes impossible.

**III. The PA and Posterior Analytics models**

What I suggest is that the explanatory purposes to which Aristotle puts the method of division are best explained by the principles set out in his *Posterior Analytics* in which he talks about division. First, he defends that division has philosophical value:

> Divisions might indeed be thought to be of no use at all but to assume everything straight off—as if you were to make your assumptions at the beginning without a division. But it makes a difference which of the predicates are predicated first and which later—e.g. whether you say animal tame two-footed or two-footed animal tame. For if every item is made up from two things, and if animal tame constitutes a single item, and if man (or whatever the single thing in question may be) is next made up from this and the difference, then you must make a division before making your postulates.

\(^{30}\) Gotthelf 2012, 202-204
Again, only in this way is it possible to ensure that you omit nothing in what the thing is. For if, when the first kind has been taken, you then take one of the lower divisions, not everything will fall into it. E.g. not every animal is either whole-winged or split-winged—rather, every winged animal is (for it is this of which this is a difference. The first difference of animal is that into which every animal falls; and, similarly, for everything else, both the kinds outside it and the kinds subordinate to it, e.g. the first difference of bird is that into which every bird falls, and of fish into which very fish\textsuperscript{31} (\textit{An. Post.} II.13, 96b25-97a5).\textsuperscript{32}

The conception of division here, like in the \textit{Parts of Animals}, is not dichotomous, but rather works through a series of qualities which make up a given animal. The order of this is important, with there being “higher” and “lower” divisions, so that when we have multiple attributes, such as “animal tame” and “two-footed,” it seems to be of substantial import which comes first. This is because additions within a certain larger kind, such as “animal tame,” represents a further division in an existing kind, a division of tame animals. The order of division presented here starts from the very general, things which are universal, and then goes down to the particulars; a certain species would be the last element in this division. It also helps us to understand how division is explanatory; if the alternative is a list of attributes an animal has without structure, we do not thereby learn anything about what it primarily is, at the highest level of generality, but merely a list without structure.

When we learn that something has wings and lungs, by placing it in a division with a certain order we are able to determine which it is primarily by taking the most general approach. The “first difference” is in fact the most general, and by going down we find the particular which distinguishes a given animal from everything else along a certain register. But by using commonalities, we learn not only what sort of kind we have but hat which we do not have, or what kinds are included in it. What’s more, it is by using these common terms and explanations that we can understand the particular subjects of our divisions:

\textsuperscript{31} Trans. modified from Barnes 1994

\textsuperscript{32} αἱ δὲ διαιρέσεις αἱ κατὰ τὰς διαιρομένας χρήσιμοι εἰσίν εἰς τὸ οὕτως μεταξύναι· ὡς μέντοι δεικνύονται, εἰρηνεῖ ἐν τοῖς πρῶτοι, χρήσιμοι δ’ ἂν εἰσὶν ὡς καὶ μόνον πρὸς τὸ σύλλογον· ἐν τὸ ἄστιν, καθ’ ἑκάστῳ διαφέρει, καὶ διαφέρει δὲ τὸ πρῶτον καὶ διαφέρει τὸν κατηγοροῦμένου κατηγορεύσαι, οἷον εἰπεῖν ζώον ἥμερον δίπον ἢ δίπον ζώον ἥμερον. εἰ γὰρ ἄπαν ἐκ δύο ἑστὶν· καὶ ἐν τῷ ζῷῳ ἥμερον, καὶ πάλιν ἐκ τούτου καὶ τῆς διαιρομένης ὁ άνθρωπος ἢ ἢ τέ διήκου ἐστὶν τῷ ζῷῳ, ἀναγιανίδει διελύομεν αἰτίεσθαι. Ἐπὶ πρὸς τὸ μηδὲν παραστάσειν εἰς τῷ ἄστιν οὕτως μόνος ἐνδέχεται. ὅταν γὰρ τὸ πρῶτόν ληθή γενό, ἂν μὲν τὸν κατωθὲν τινα διαιρεῖσθαι λαμβάνη, οὐκ ἐμπεσεῖται ἄπαν εἰς τούτο, οἷον οὐ πάν ἢ διαιροῦσι διαφέρει, ἀλλὰ τὴν ἥμερον ἰδίαιτε, τῷ τούτον τέ διαιρόμενον αὐτῆ, πρῶτῃ δὲ διαιροίς ἤπις ἦς εἰς ἡνήσσαν ζῷῳ ἐμπεσεῖ. ὅμοιοι δὲ καὶ τὸν ἄλλον ἐκάστος, καὶ τὸν ἢ ἦς ἦς ἦς ἦς ἦς εἰς ἄρνις, καὶ ἒκθέους, εἰς ἦς ἦς ἦς ἦς ἦς
You should look at items which are similar and undifferentiated, and first seek what they all have in common. Then do the same again for other items which are in the same kind as the first group and are of the same form as one another but of a different form from the first group. When you have got what all these have in common, you must do the same for the remaining groups (inquiring next whether the times you have taken have anything in common) until you come to a single account: this will be the definition of the object. If you arrive not at a single account but at two or more, then plainly what you are seeking is not one item but several (An. Post 97b5-15).33

On this account, definition consists of looking at various groupings of similarities—a given object will be specified by one which participates in all of those larger kinds uniquely. All of these will be by construction shared characteristics, so that an account will consist of many commonalities. This is exactly what we see in the Parts of Animals story told by Aristotle; contrary to the method of dichotomy, the last forms are not specified by one given difference which is unique to them, but by the various relationships they partake of, at least in reference to the sorts of beings which are capable of being subjected fruitfully to the method of division. This is, of course, a simplified picture; at a certain level of specificity, even two particular beings like Cephalus and Socrates are distinct, but we have been given the proviso to look at the shared form. We might also think that certain animals are totally unique, and these indeed might pose a problem for Aristotle34, but insofar as they are being defined by the method of division it is the commonalities, not the individual or particular quirks, which concern us. Aristotle says as much in his concluding remarks on division, that “to speak separately about each of these animals as particulars, as we said before, will result in saying the same things many times, whenever we speak about all the attributes; the same attribute belongs to many animals” (PA I.5 645b10-13). Division, then, is a valuable explanatory purpose put in by Aristotle, then; not only have we arrived at an explanatory apparatus for relations of animals, but we have also found a way to structure them and understand them through their common attributes.

As a test case, we can look at what Aristotle says about a humble sort of animal, the fish:

The fish do not have distinct limbs, owing to the fact that the nature of the fish, according to the account of their substantial being, is to be able to swim, since nature makes nothing either

33 εἴδει γὰρ ἂν διέφερε τὸ τελευταῖον, τοῦτο δ᾿ εἰρήτα τῇ διαφέρειν. Ζητεῖν δὲ δὲν ἐπιβλέποντα ἐπὶ τὰ ὅμοια καὶ ἀδιάφορα, πρόδοτο τὸ ἂπαντα ταῦτα ἔχουσιν, εἶτα πάλιν ἕρ ἐπέφως, ἕν ταῦτα μὲν γένει ἐκείνοις, εἰσὶ δὲ αὐτὸς μὲν ταῦτα τὸ εἶδος, ἐκεῖνον δ᾿ ἔτερα, ὅταν δ᾿ ἔπι τούτων ληφθῇ τὶ πάντα ταῦτα, καὶ ἐπὶ τῶν ἄλλων ὁμοιώματι, ἐπὶ τῶν εἰλημμένων πάλιν σκοπεῖν εἰ ταῦτα, ἔος ἄν εἰς ἐνα ἔλθῃ λόγον· ὦτος γὰρ ἄτα τῶν πράγματος ὅρισμός, ἔαν δὲ μὴ βαδίζῃ εἰς ἐνα ἄλλη εἰς δύο ἢ πλεῖον, δὴλον ὅτι οὐκ ἂ σε ἄν εἰς ἐν τὶ εἶναι τὸ ζητούμενον, ἄλλα πλεῖον.
34 Though they might just turn out to be monsters
superfluous or pointless. And since they are blooded in virtue of their substantial being, it is on account of being swimmers that they have fins, and on account of not being land-dwellers they do not have feet; for the addition of feet is useful in relation to movement on land (PA IV.13 695b17-25).35

The “nature of the fish,” on account of their “substantial being,” is to be able to swim, and it is also because of their substantial being that they are blooded. That is to say, the nature of fish here combines two essential features—being able to swim—and being blooded. The objection is raised, however, against this method of division that it makes a feature of substantial being “common;” that is to say, it belongs to every fish, not only one, but also to many other beings; birds, for example, are also blooded in their substantial beings, as are mammals.36 But not only is this objection ill-founded on the Posterior Analytics view, it is also so on the interpretation of the Parts of Animals account I put forward. That is not to say that there is a conjunction lacking internal structure—although there is not a formal account of fish in the Posterior Analytics style, presumably one could be made to make clear the relationship between being blooded and swimming in the substantial being of a fish. We learn that fish have a being of this kind based on empirical observations.37 This is not to say that everything about a fish will be determined by their substantial being, or be an attribute of it; rather, based on a certain central feature or features which are defined through the method of division, and which will be specified by the order of the division, subsequent features can then be discovered.38 The exact same reasoning used on the fish case can also be employed on, for example, the claim that “some animals are blooded while some are bloodless” is “in the account defining their substantial being” (PA IV.5 678a31-4). Once the conjunctive view of essences and the accompanying method of explanation is on the table, Aristotle’s views regarding the nature of this account look not only sensible but a logical extension of his earlier claims.

35 ὁκ ἐγουσὶ δὲ ἀπρητημένα κ commodo οἱ ἱζθεῖς, διὰ τὸ νεοστικὴν εἶναι τὴν φύσιν αὐτῶν κατὰ τὸν τῆς οὐσίας λόγον, ἐπεὶ οἱ περί σεξον οὔδεν ὀστει μάτην ἡ φύσις ποιεῖ. Ἐπεὶ δ’ ἐναμά ἐστι κατὰ τὴν οὐσίαν, ὀστὲ οὐκ ἡ νεοστικὴ εἶναι πεταγία ἐχει, διὰ δὲ τὸ μὴ πεξεύουν οὐκ ἐχει πόδας. ἡ γὰρ τῶν ποδῶν πρόσθεσις πρὸς τὴν ἔπει τῷ πεδίῳ κίνησιν χρήσιμός ἐστιν. Ὅμω δὲ πεταγία τέτταρα καὶ πόδας οὐχ οἶδο τὸ ἐχειν, οὔδ’ ἄλλο κόλον τοιοῦτον οὐδὲν. ἐναμά γάρ. Οἱ δὲ κορύυοι βραγχα ἐχουσε πόδας ἐχουσιν.

36 Lennox 2003, 332
37 Bronstein 2016 goes through the epistemic structure build on this edifice, which includes an account of empirical observation—I discover that this being is winged, and blooded, and since I have certain universal knowledge taken by observing things with this sort of being I make further hypotheses, leading to an account of further beings. I also know why, say, fish are a certain way in respects, and why they are not; for example, their method of laying eggs is not explained by their having fins or blood, but has a properly material or teleological explanation.
38 Putting too much weight on this is complicated by Charles 2000, 333-334
I have argued that the *PA* and *An. Prior* accounts are in accord about what method of division is appropriate to use within an explanatory program that aims at scientific knowledge, and that they make good sense of a certain feature of Aristotle’s zoology, namely his use of explanation through substantial being. Problems remain, however, as to what the nature of substantial being exactly is, and the idea of a conjunctive essence poses a serious problem for the unity of essence within an Aristotelian species. For if all that an essence is composed of is a set, or even an ordered \( n \)-tuple of attributes, then the boundaries between species begin to look porous, and even the light essentialist claim, that there is a certain something there is to being a member of a certain species, will be in jeopardy. To establish this, however, requires going through Aristotle’s psychology and metaphysics.

IV. Substantial being and Soul

Substantial being is not merely a concept which Aristotle uses as a biological and explanatory tool, but has deep roots in Aristotle’s metaphysics. Laying them out exhaustively would be to write a monograph on Aristotelian metaphysics; our interest is in how the metaphysics of substantial being provide a basis for Aristotle’s practices of explanation. Aristotle goes as far as to claim that at least one reason predecessors did not successfully give a causal account of natural beings ‘is that there was no ‘what it is to be’ and ‘defining substantial being’’ (*PA* I.3 642a23-26). The focus on definition recalls our earlier discussion if the *Posterior Analytics*, but here substantial being does not only play an explanatory role (understanding why animals have the sorts of attributes they have), it is also contrasted as *form* with *matter* in the causal structure of animal beings. In fact, we will find that the causal structure of animals and their essences will turn out to be identical. Important to the overall metaphysical picture is also Aristotle’s development of the concept of soul in the *Parts of Animals*, as I will elaborate. One should “state that the animal is of such a kind, noting about each of its parts what it is and what sort of thing it is, just as one speaks of the form of the bed,” and further “suppose what one is thus speaking about is soul, or a part of soul, or is not without soul” (641a10-20). That is not to say that a biologist must be a psychologist, but that “it will be up to the natural philosopher to speak and know about the soul; and if not all of it, about that very part in virtue of which the

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39 Rendering the Greek ὅτι τὸ τί ἐἶναι καὶ τὸ ὀρίσεως τὴν οὐσίαν οὐκ ἐν, Lennox argues that the two phrases are “virtually synonymous,” since what it is for something to be defined as something simply is the substantial being of any given substance, as discussed in *Met. Zeta* (Lennox 2002, 151).
animal is such as it is" (641a). After all, without a soul the animal simply cannot exist; but the point is deeper than that the soul is necessary for life. For the part of soul under consideration by the natural philosopher is intimately related to substantial being:

[The natural philosopher] will state both what the soul or that very part of it is, and speak about the attributes it has in virtue of the sort of substantial being it is, especially since the nature of something is spoken of and is in two ways: as matter and as substantial being. And nature as substantial being is both nature as mover and nature as end. And it is the soul—either all of it or some part of it—that is such in the animal’s case\(^{40}\) (PA I.641a23-28).

Quite a bit is packed into this one passage. Two sorts of explanations by nature are referenced, by nature, and substantial being, which I focus on. Aristotle does, however, seem to license here the explanatory pluralism I presume; the nature of something can be fruitfully spoken of via matter. Nevertheless, it is “requisite for the person studying nature to speak about soul more than the matter, inasmuch as it is more that the matter is nature because of the soul than the reverse” (641a32-35). Important for our purpose is that we get the abstract identification of the substantial being of an animal, or the “sort of substantial being it is,” along with that the nature of an animal as substantial being which is its soul. The description of “nature as substantial being” as “nature as mover and nature as end” recalls the definition of nature in Physics II, that “nature is the starting-point and cause of moving and being rest in that to which it belongs primarily in itself and not accidentally” (Physics II.1 192b20–25).\(^ {41}\) I will not here, however, expand on the connection between the Physics passage and the Parts of Animals. Rather, over the course of this discussion I will first turn to the De Anima and further remarks about the functional organization of animals in the Parts of Animals, arguing that soul provides the ontological correlate for essences within natural science, before turning to the notion of substance more generally in Metaphysics Zeta. There are well known issues, however, with understanding the Zeta account of being alongside the Posterior Analytics account. I will not be able to address these issues here; my point will be rather that Aristotle has the resources to give an account of the substantial being of animals which allows for the complex explanatory structure in his mature account of division, in the Posterior Analytics, as previously discussed.

\(^{40}\) Κατ’ αὐτὸ τούτο καθ’ ὁ τοιοῦτο τὸ ζώον, καὶ τι ἐστὶν ἢ ψυχή, ἢ αὐτὸ τούτο τὸ μέριον, καὶ περὶ τῶν συμβεβηκότων κατὰ τὴν τοιαύτην αὐτής οὐσίαν, ἄλλος τε καὶ τῆς φύσεως διήγουσας λεγομένης καὶ οὐσίας τῆς μὲν ὠς ὑπάρχουσας τῆς δ’ ὡς οὐσίας. Καὶ ἔστιν αὐτῇ καὶ ὡς ἡ κινοῦσα καὶ ὡς τὸ τέλος. Τοιοῦτον δὲ τοῦ ζώου ἦτοι πάσα ἢ ψυχή ἢ μέρος τι αὐτῆς.

\(^{41}\) Rendering the Greek ὡς οὐσίας τῆς φύσεως ἄρχης τινὸς καὶ αἰτίας τοῦ κινεῖσθαι καὶ ἱρεμεῖν ἐν ὧν ὑπάρχει πρῶτος καθ’ αὐτὸ καὶ μὴ κατὰ συμβεβηκός.
To more fully understand, first, in what sense the soul of an animal can be its substantial being, we naturally should turn to Aristotle’s discussion of soul in the De Anima. There, too, the soul is equated with substance:

It has now been said in general what the soul is: the soul is a substance corresponding to the account; and that is the essence of this sort of body. It is as if some tool were a natural body, e.g. an axe; in that case what it is to be an axe would be its substance, and this would also be its soul. If this were separated, it would no longer be an axe, aside from homonymously. But as things are, it is an axe.

For the soul is not the essence and account of this sort of body, but rather of a certain sort of natural body, one having a source of motion and rest in itself (De Anima II.1 412b10-18).

To illustrate in what sense the soul is a substance, and can be the essence of an account, Aristotle uses the toy example of an axe. The soul is like the thing in virtue of which we can say that an axe is an axe. Of course, this is not to say that an axe has a soul (and indeed, like all artefacts its ontological status as substance is somewhat suspect), but merely that the soul is the ontological correlate of the “axeness” of the axe. Not only is the soul the substance in virtue of the possession of which any animal of a certain kind is of that kind; we learn that “substance is actuality,” this actuality being of a certain kind which is elaborated upon. (412a20-22). This is a reference to Aristotle’s metaphysics of actuality and potentiality. My argument in this paper will not lean heavily on the distinction between potentiality and actuality as developed in the central books of Aristotle’s metaphysics. The point which I want to draw is that the soul has ontological primacy as the first actuality of a given body. Since “the soul will be an actuality of a body as such,” we should see it not only as what an animal of a given kind, but as a real principle of organization which makes the difference between a living being and inert matter. It fulfills the role of-for-the-sake-of-which that is described in the Parts of Animals:

Since every instrument is for the sake of something, and each of the parts of the body is for the sake of a certain action, it is apparent that the entire body too has been constituted for the sake of a certain complete action. For sawing is not for the sake of the saw, but the saw for the sake of sawing; for sawing is a certain use. So the body too is in a way for the sake of the soul, and the parts are for the

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42 Καθόλου μὲν οὖν ἐξηρτᾶτι τί ἐστιν ἡ ψυχή, ὅτι οὐσία ἡ κατὰ τὸν λόγον. τούτῳ δὲ τὸ τί ἦν ἐκεῖνος τοὐματι, ὡσπερ εἰ ἦν ὁποιόν τῶν ὀργάνων φυσικόν σώμα, οἷον πρίων· ἤν γὰρ ἄν τὸ πρίων εἶναι ἡ οὐσία αὐτοῦ, καὶ ἡ ψυχὴ τούτῳ· διὸ ἀπελθοὺσις οὐκέτ’ ἂν ἦν πρίων, ἀλλ’ ἢ ὀμοιόμοιος, νῦν δ’ ἐστὶ πρίων· οὐ γὰρ τοιοῦτον σώματος ἡ ψυχή τὸ τί ἦν εἰναι καὶ ὁ λόγος, ἀλλὰ ψυκικοῦ τοιουτοῦ ἔχουσον κινήσεως καὶ στάσεως ἀρχήν ἐν ἑαυτῷ.
43 Translation modified from Shields 2016
44 For an account which primarily exploits this distinction see Lennox 2010
The relevance of the saw, that it is for a “complete action,” is explicable by reference to the *De Anima* doctrine of soul as the first actuality of a body. So each of the body parts is going to exist for the sake of the action of the soul. This might seem to be in tension with the obvious; *prima facie*, we might think that the function of a given part of an animal is its own task—that of an eye is to see, an ear to hear, and so on. Aristotle addresses this in *De Anima*, arguing that “if the eye were an animal, its soul would be sight, since that is the substance of the eye corresponding to the account,” but “what has been said in the case of the parts must of course be understood as applying to the entire living body” (*DA* II.1 412b15-25). The complete activity of the soul will be the unified activity of the animal. That is not to suggest that what is predicated of the substantial being can only be a certain activity; rather, the point is that conceptually, to speak of a part of an animal that it has in virtue of its substantial being is an essential function, and to say that without soul it is impossible to speak of an animal at all.

V. **Substantial Being in the Metaphysics**

Aristotle’s most in-depth analysis of the concepts of substantial being and definition come in difficult passages in *Metaphysics Zeta*. We learn more in it, however, as to how a definition should proceed in the case of the souls of animals given Aristotle’s hylomorphism:

Now since the soul of animals (for this is substance of the animate) is the substance that is in accord with the account and is the form and the essence of such-and-such sort of body (certainly each part, if it is to be defined correctly, will not be defined without its function, which it could not have without perception), it follows that the parts of this are prior, either all or some, to the compound animal, and similarly, then, to each particular animal, whereas the body and its parts will be

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45 Ἐπεὶ δὲ τὸ μὲν ὄργανον πᾶν ἑνεκά του, τὸν δὲ τοῦ σώματος μορίων ἐκαστὸν ἑνεκά του, τὸ δ’ οὐ ἑνεκα πράξεις τις, φανερὸν ὅτι καὶ τὸ σύνολον σῶμα συνέστηκε πράξεώς τινος ἑνεκα πολυμεροῦς. Οὐ γὰρ ἡ πρίσεως τοῦ πρίωνος χάριν γέγονεν, ἀλλ’ ἐ πρίον τῆς πρίσεως· χρῆσις γάρ τις ἡ πρίσεως ἑστί. Μέστε καὶ τὸ σῶμα ποιεῖ τῆς ψυχῆς ἑνεκεν, καὶ τὰ μόρια τῶν ἔργων πρὸς ἓ περὶ καστὸ ἐκαστὸν. Λεκτέον ἀρα πρῶτον τὰς πράξεις τὰς τῆς κοινῆς πάντων καὶ τὰς κατὰ γένος καὶ τὰς κατ’ εἶδος.

46 Lennox 2010, 6-8 argues further that the actions of an organism, their way of life or *bios*, is in fact what gives explanatory unity to an organism.
This passage restates the connection between substance and the soul of a given animal, connecting it to form, the main candidate for substance in Zeta, and the essence of a given body, with parts defined, as set out above, with reference to the function of this soul and its account. What Aristotle asserts here, further, is that in terms of definition, that of the form of the animal—its soul—is prior to the compound animal itself. It is not easy to understand what Aristotle means by priority, and glossing it is beyond my task here. I take it, however, in two ways. The first is that it is explanatory; we start from the essence of an animal, and from that we can employ various other subsidiary forms of explanation (e.g. teleological) in a secondary way. What it is for an animal to be of a certain form will then explain certain features that the entire compound has by virtue of its substantial being. The ontological priority claim is that what it is for an animal to be what it is (to use an Aristotelian phase) is its essence, and that this is at least in some respects prior to the entire form-matter compound. But we might hit a difficulty here—it is impossible to imagine what the essence of an animal might be without on some level being in matter (as in, for example, Aristotle’s embryology). Aristotle elsewhere in the Parts of Animals seems to ascribe substantial being both sorts of priorities, first in account:

In generation things are opposed to the way they are in substantial being; for things posterior in generation are prior in nature, and the final stage in generation is prior in nature. For instance, a house is not for the sake of brick and stones, but rather these are for the sake of a house—and so it is with other matter. Not only is it apparent from a consideration of cases that this is the way things are, but it also accords with our account; for every generated thing develops from something and into something, i.e. from an origin to an origin, from the primary mover which already has a certain nature to a certain shape or other such end. For a human being generates a human being, and a plant a plant, from the underlying matter of each. So the matter and the generation are necessarily prior in time, but in account the substantial being and the shape of each thing. This would be clear if someone were to state the account of the generation of something; the account of housebuilding

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47 ἐπεὶ δὲ ἢ τῶν ζῴων ψυχῆ (τοῦτο γὰρ οὐσία τοῦ ἐμψυχοῦ) ἢ κατὰ τὸν λόγον οὐσία καὶ τὸ εἶδος καὶ τὸ τί ἢ ἢ εἶναι τῷ τούτῳ σώματι (ἐκαστὸν γοῦν τὸ μέρος ἐὰν ὄριζηται καλῶς, οὕς ἀνευ τοῦ ἐργου ὀριεῖται, ὀδῆ ὑπάρχει ἀνευ αἰσθήσεως), ὡστε τὰ ταύτης μέρη πρότερα ἢ πάντα ἢ ἕνα τοῦ συνόλου ζώου, καὶ καθ’ ἐκαστὸν δὴ ὠμοίως, τὸ δὲ σῶμα καὶ τὰ τούτον μόρια ὑστερὰ ταύτης τῆς οὐσίας, καὶ διαιρεῖται εἰς ταύτα ὡς εἰς ὄλην οὕς ἢ οὐσία ἄλλα τὸ σύνολον

48 Translation Reeve 2016
includes that of house, while that of the house does not include that of housebuilding\(^49\) (PA II.1 646a24-b4).

We can only get a full explanation of what parts are by referring to the entirety that they are required to fulfill the function of, thereby giving priority in account as Aristotle describes, even though in time the parts come first. He also glosses a sort of priority for substantial being which is more clearly ontological:

It seems we should begin, even with generation, precisely as we said before: first one should get hold of the phenomena concerning each kind, then state their cause. For even with house-building, it is rather that these things happen because the form of the house is such as it is, than that the house is such as it is because it comes to be in this way. For generation is for the sake of substantial being, rather than substantial being for the sake of generation. That is precisely why Empedocles misspoke when he said that many things are present in animals because of how things happened during generation—for example that the backbone is such as it is because it happened to get broken through being twisted he failed to understand, first, that seed already constituted with this sort of potential must be present, and second, that its producer was prior—not only in account but in time. For one human being generates another; consequently, it is on account of *that* one being such as it is that *this* one’s generation turns out a certain way\(^50\) (640a10-26).

Although again generation is prior in time to the realization of a given substantial being, it is the causal role that substantial being plays that it is a generation towards a certain end. If the two sorts of priority seem to be almost identical, this is no accident; if substantial being had only explanatory or only ontological priority, it seems that the tight link Aristotle is at pains to maintain between explanatory and causal relations will be undone. There remain, however, further questions about equating definition, substantial being, and the soul. To think of the

\(^{49}\) Ἐπεὶ δ’ ἐναντίος ἐπὶ τῆς γενέσεως ἦσε καὶ τῆς οὐσίας· τὰ γάρ ὑστέρα τῇ γενέσει πρότερα τὴν φύσιν ἦστι, καὶ πρῶτον τὸ τῇ γενέσει τελευταῖο· οὐ γὰρ οἰκία πλίθην ἐνεκέν ἦστι καὶ λίθων, ἀλλὰ τὰτα τῆς οἰκίας· ὑμῶν δὲ τοῦτ’ ἦσε καὶ περὶ τὴν ὄλλην ὑλήν. Οὐ μόνον δὲ φανερῶν ὅτι τοῦτον ἦσε τὸν τρόπον ἐκ τῆς ἐπαγωγῆς, ἀλλὰ καὶ κατὰ τὸν λόγον· πάν γὰρ τὸ γενόμενον ἐκ τινος καὶ εἷς τι ποιεῖται τὴν γένεσιν, καὶ ἂν’ ἀρχήν ἐπ’ ἀρχήν, ἀπὸ τῆς πρώτης κινούσης καὶ ἐχθόνης ἡδὲ τινά φύσιν ἐπί τινα μορφήν ἢ τοιοῦτον ἄλλο τέλος· ἄνθρωπος γὰρ ἄνθρωπον καὶ φυτὸν γεννᾷ φυτὸν ἐκ τῆς περὶ ἔκαστον ὑποκειμένης ὑλῆς. Τὸ μὲν οὖν χρόνῳ προτέραν τὴν ὑλήν ἀναγκαῖον εἶναι καὶ τὴν γένεσιν, τὸ λόγῳ δὲ τὴν οὐσίαν καὶ τὴν ἐκάστου μορφήν. Δήλον δ’ ἄν λέγῃ τις τὸν λόγον τῆς γενέσεως· ὃ μὲν γάρ τῆς οἰκοδομῆσσες λόγος ἦσε τὸν τῆς οἰκίας, ὃ δὲ τῆς οἰκίας οὐκ ἦσε τὸν τῆς οἰκοδομῆσσες.

\(^{50}\) Δεῖ δὲ μὴ λειπθῆναι καὶ πότερον προσιτὰ λέγειν, ὅπερ οἱ πρότερον ἐποιοῦντο τὴν θεωρίαν, πῶς ἐκαστὸν γεγενθαί πέρακε μᾶλλον ἢ πῶς ἦστιν. Οὐ γὰρ τι μικρὸν διαφερεῖ τούτῳ ἔκεινον. Ἐνακ δ’ ἐνετέθην ἀρκτέων ἦν, καθάπερ καὶ πρότερον εἰπομεν, ὅτι πρῶτον τὰ φαινόμενα λιπτέον περὶ ἔκαστον γένος, εἰθ’ ὑπό τις αὐτίας τοῦτον λεκτέον, καὶ περὶ γενέσεως· μᾶλλον γὰρ τάδε συμβαίνει καὶ περὶ τὴν οἰκοδόμησιν, ἐπεὶ τοιοῦτ’ ἐστι τὸ εἴδος τῆς οἰκίας, ἢ τοιοῦτ’ ἐστὶν ἢ οἰκία, ὅτι γίνεται οὕτως. Ἡ γὰρ γένεσις ἐνεκα τῆς οὐσίας ἦστιν, ἀλλ’ οὗ ἡ οὐσία ἐνεκα τῆς γενέσεως. Διόπερ Ἐμπεδοκλῆς οὐκ ὀρθῶς ἁρπήκε λέγον υπάρχει πολλά τοῖς ζώοις διά τὸ συμβάνιν οὕτως ἐν τῇ γενέσει, οἷον καὶ τὴν ράχιν τοιαύτην ἦσαν, ὧν στραφέντος καταστάθηναι συνεβή, ἀγνώσων πρῶτον μὲν ὧν δεῖ τὸ στέρμα τὸ συνιστᾶν υπάρχειν τοιαύτην ἦσαν δύναμιν, εἴτε ὧν το ποιησάν πρότερον υπήρχεν οὐ μόνον τὸ λόγῳ ἄλλα καὶ τὸ χρόνον· γεννᾷ γὰρ ὁ ἄνθρωπος ἄνθρωπον, ὥστε διὰ τὸ ἔκεινον τοιοῦτ’ εἶναι ἡ γένεσις τοιαύτης συμβαίνει τοιαύτης.
essence of, for example, blood, without it being in any sort of matter sounds incoherent. But if we think of soul, as I have suggested, as a principle of functional organization which is realized in matter, then we can understand how within Aristotle’s hylomorphism about the soul we might recognize this as prior to any real instantiation of it. What’s more, Aristotle recognizes that certain parts are in fact going to be of equal priority to the entire account. He claims that “some of these parts, however, are simultaneous, namely, the ones that are controlling and in which the account and the substance are first found—for example, the heart, perhaps, or the brain (for it makes no difference which of them is of this sort)” (10365b23-28). More than a remark on his developmental biology, the metaphysical significance of this remark is that the ontological correlate of an essence—whatever it is in reality that first corresponds to the “account and the substance” (and we might here remember that the soul is the first activation of the body—it is not something abstract, but always something real and efficacious) will be simultaneous with the essence. Blood might also turn out to be of this sort, as present within any organism from the beginning.\footnote{A problem related to those of definition I have brought up is how hylomorphic compounds of form and matter can themselves form a unity—for it seems that if we have an essence of some animal which is instantiated in matter which itself has properties, we now have a complex instead of a unity. Or we might have two essences; one “pure” form, and the other form in matter. A feature such as blood would seem to belong only to the latter, raising difficulties. But this is to assume that we have two things, form instantiated and “pure” form, which is manifestly not the case of an animal. A solution along the lines of Gill 2010 will then complete this picture.}

Aristotle introduces further considerations, however, about definition in light of his expanded metaphysical project; he will “speak—to the extent that we have not already discussed it in the Analytics—about definition” (Z.12 1038B5-10). He poses a certain aportia for himself:

Now I mean this puzzle: why on earth is something one when the account of it is what we call a definition? For example, let the account of the human be the two-footed animal. Why, then, is this one and not instead many—animal and two-footed? For in the case of human and pale they are many when one does not belong to the other, but they are one when it does belong and the underlying subject, the human, has a certain attribute (for, then, one thing comes to be and we have the pale human). In the present case, by contrast, one does not participate in the other. For the genus does not seem to participate in the differentiae (in fact if it did the same thing would participate in contraries at the same time, since the differentiae that divide the genus are contraries). But even if it did participate, the argument would be the same, if indeed the differentiae are many—for example, footed, two-footed, featherless. Why are these one and not instead many? For it is not because they are present [in one genus], since that way there will be one from all. But surely the things in the definition must be one. For the definition is a certain account that is one and of substance, so that it
must be the account of one something. For the substance signifies one something and a this something as we say52 (Z.12 1037b10-28).

The issue is related, but not identical to, the one we raised earlier about the unity of an essence for Aristotle. The issue there was how the multiplicity of differentia which compose animals are united, whereas here it is how, when there are multiple terms in a definition, they manage to compose a unity at all. The contrast is between the predication of a quality, such as pale, which does not form part of the definition, and “two-footed animal,” which form a unity. It is easy to see how a pale human is a unity; one is a quality predicated of a certain substance (speaking generally, not in the specific sense of substance developed in Zeta). But the mutual relationship—what is pale is human and human pale—which exists in the case of the pale person does not exist in the case of the differentia and genus, for the apparent reason that it is not strictly correct to say of what is animal participates in being two-footed—for it equally participates in what is not two-footed, since it covers all animals, but to have two incompatible attributes risks incoherence. But even this worry aside, Aristotle still poses a problem—there are multiple differentiae that we can see for a human being. What gives them their unity? It is not as though they are all predicated of the same genus—otherwise we again risk meaninglessness, since we are now putting every differentia into one genus. But the definition must be one, because of its tight connection with substance. Aristotle revisits division to solve the problem:

We should first investigate definitions that are by division. For there is nothing else in the definition except the genus that is mentioned first and the differentiae; the other genera are in fact the first one along with the differentiae combined with it. The first, for example, may be animal, the next two-footed animal, and next again featherless two-footed animal, and similarly if it is said by means of more differentiae. And in general it makes no difference whether it is said by means of many or of few—nor, therefore, whether by means of few or by means of just two. And of the two one is differentia and the other genus—for example, in the two-footed animal, the animal is genus and the other differentia. If, then, the genus is unconditionally nothing beyond the species as a species of a genus, or if it is, it is as matter (for the voiced sound is genus and matter, and the differentiae produce

52Λέγω δὲ ταῦτα τὴν ἀπορίαν, διὰ τι ποτε ἐν ἐστὶν οὐ τὸν λόγον ὀρισμοῦ εἶναι φαμεν, οἷον τοῦ ἀνθρώπου τὸ ζῶον δίπουν· ἐστιν γὰρ οὗτος αὐτὸν λόγος. διὰ τί δὴ τούτῳ ἐν ἐστὶν ἄλλον οὐ πολλά, ζῶον καὶ δίπουν· ἐπὶ μὲν γὰρ τοῦ ἀνθρώπου καὶ λευκὸν πολλά μὲν ἐστίν ὅταν μὴ υπάρχῃ θατέρῳ θάτερον, ἐν δὲ ὅταν υπάρχῃ καὶ πάθῃ τι τὸ ὑποκείμενον, ὁ ἀνθρώπος (τότε γὰρ ἐν γίγνεται καὶ ἐστὶν ὁ λευκὸς ἀνθρώπος)· ἐνακάθα ʹ ὦ μετέχει θατέρου θάτερον· τὸ γὰρ γένος οὐ δοκεῖ μετέχει τῶν διαφορῶν (ὡς γὰρ ἐν τοῖς ἐναντίον τὸ αὐτὸ μετέχει· αἱ γὰρ διαφοραὶ ἐναντίαι αἷς διαφέρει τὸ γένος). εἰ δὲ καὶ μετέχει, ὃ αὐτὸς λόγος, εἶπεν εἰς αἱ διαφορὰι πλείους, οἷον πεζόν δίπουν άπτερον. διὰ τί γὰρ ταῦτ’ ἐν ἄλλον οὐ πολλά; οὐ γὰρ ὅτι ἐνυπάρχει· οὕτω μὲν γὰρ ἐξ ἀπάντου ἐστὶν ἐν. δεῖ δὲ γε ἐν εἶναι ὅσα ἐν τῷ ὀρισμῷ· ὁ γὰρ ὀρισμός λόγος τις ἐστίν εἰς καὶ οὐσίας, ὡστε ἐνός τινος δεῖ αὐτὸν εἶναι λόγον· καὶ γὰρ ἡ οὐσία ἐν τι καὶ τόδε τι σημαίνει, ὡς φαμέν.
the phonetic element form these), then it is evident that the definition is the account composed of the differentiae\(^3\) (1037b28-1038a8).

In this model of division, Aristotle proceeds by taking the most general differentia, such as animal, and then taking a differentia, such as two-footed, then a further one, such as featherless. So far this looks to be in accord with the procedure from the *Posterior Analytics* previously discussed. We have a certain *genus* at the most general level, that of animal, and we propose certain differentiations within it. The force of the account is on the differentiae, not the genus, which is taken as merely material for making further differentia. The work is being done not by knowing a human being is an animal, but in finding the major features which differentiate it from others and form certain biological commonalities. Previously, Aristotle had the problem of how we can find a genus large enough to contain all differentia; his first step, then, seems to be to point out that we can in the case of substances like living things find a broad level of description, plant or animal, to work from. He further specifies what is unique about this procedure:

But in addition, the division should take the differentia of the differentia—for example, the footed is a differentia of animal, and next again we should know the differentia of the footed animal insofar as it is footed. So we should not say that of the footed there is on the one hand the feathered and on the other the featherless, but rather the differentiae of foot, and son, until we reach what can no

Here, Aristotle claims that not only should we take what is predicated of a genus, but take the differentia of each differentia. The example is that we should not divide the footed into the feathered and featherless, but rather the differentiae of foot, and son, until we reach what can no

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53 δεῖ δὲ ἐπισκοπεῖν πρῶτον περὶ τῶν κατὰ τὰς διαφέρεσις ὀρισμῶν. οὐδὲν γὰρ ἐτερόν ἐστιν ἐν τῷ ὀρισμῷ πλὴν τὸ πρῶτον λεγόμενον γένος καὶ ἀἱ διαφοραῖ: τὰ δ’ ἄλλα γένη ἐστὶ τὸ τε πρῶτον καὶ μετὰ τοῦτοι αἱ συναλλαμβάνομεναι διαφοραῖ, οἷον τὸ πρῶτον ζῷον, τὸ δὲ ἐχόμενον ζῷον δίπου, καὶ πάλιν ζῷον δίπου ἄντερπον· ὡμοίως δὲ καὶ πλὴν πλείουν λέγηται. ὅλως δ’ οὖν διαφέρει διὰ πολλῶν ἢ δ’ ὀλίγων λέγεσθαι, ὡστ’ οὐδὲ δι’ ὀλίγων ἢ διὰ δυσῶν· τόν δυνὸν δὲ τὸ μὲν διαφορά ὅ τὸ γένος, οἷον τοῦ ζῴου δίπου τὸ μὲν ζῷον γένος διαφορά δὲ θάτερον. εἰ οὖν τὸ γένος ἀπλάς μὴ ἐστὶ παρὰ τὰ ὡς γένους εἴδη, ἢ ἐς τοῦ μὲν νῆς ὑλῆς δ’ ἐστίν (ὥ ἢ μὲν γὰρ φοινή γένος καὶ ὑλή, αἱ δὲ διαφοράι τὰ εἴδη καὶ τὰ στοιχεῖα ἐκ ταύτης ποιοῦσιν), φανερὸν διὰ τὸ ὁ ὀρισμός ἐστιν ὁ ἐκ τῶν διαφορῶν λόγος.

54 ἄλλα μὲν καὶ δεῖ γε διαφέρεσθαι τῇ τῆς διαφορᾶς διαφορά, οἷον ζῴῳ διαφορά τὸ ὑπόπουν· πάλιν τοῦ ζῷου τοῦ ὑπόποδος τὰ διαφοράν δεί εἶναι ἢ ὑπόπουν, ὡστ’ οὐ λεκτεῖν τοῦ ὑπόποδος τὸ μὲν πτερωτόν τὸ δὲ ἄντερπον, ἐνέπερ λέγη καλῶς (ἄλλα δὲ τὰ ἄνωθεν ποιήσει τοῦτο, ἀλλ’ ἢ τὸ μὲν σχῆμα σχῆμα τὸ δ’ ἄσχημον· αὕτη γὰρ διαφορά ποδώ· ἢ γὰρ σχῆμα σχῆμα ποδώς τις, καὶ οὕτως οὐκ ἴησθε πεποιημένοι ἐως ἐν ἐλεύθερον τὰ ἀδιάφορα· τότε δ’ ἐστοναι τοσάτα εἴδη ποιῶς διαφοράς αἱ διαφοράς, καὶ τὰ ὑπόποδα ζῳα ἵστα ταῖς διαφοράς.
longer be differentiated. But this seems to be plainly in conflict with what we said earlier, and to return to the model rejected in the *Parts of Animals* on which we divide one attribute until we reach the ultimate end, which will turn out to be the substance of the animal.\(^{55}\) With what follows, however, an alternative picture can at least be sketched out:

If, then, this is how thing stand, it is evident that the ultimate differentia will be the substance of the thing and its definition, if indeed we should not state the same thing many times in the definitions, since that would be wasted work. And this is certainly what does happen. For when we say two-footed footed animal we have said nothing other than animal with feet with two feet. And if we divide this too by a proper division, we shall be saying the same thing several times over—as many times as there are differentiae. If, then, we take a differentia of a differentia, one differentia—the ultimate one—will be the form and the substance. But if we divide coincidentally—for example, if the footed were divided into the pale and the dark—there will be as many differentiae as there are cuts. Thus it is evident that the definition is the account composed of the differentiae, or, if it is in accord with the correct procedure, the ultimate one. This would be clear if we were to change the order in such definitions—for example, in that of the human, saying footed two-footed animal. For it was wasted work to say footed when two-footed has been said. And there is no order in the substance, since how could we understand one thing as being prior and another posterior?\(^{56}\) (1038b18-34).

Although he Aristotle uses having two feet as a toy example, I think we may surmise that Aristotle does not assume we can divide, for example, footed-ness in such a way that we will end up at one, ultimate differentia of a given animal species, however useful it is as a toy example.

We should not take its use in metaphysical agenda-setting example here as indicating a deep truth about natural philosophy. Besides these considerations, the quest of finding precisely as many differentiae of feet as there are animals is represented as merely a way we “try to proceed,” not as indicative of successful biological practice\(^{57}\). But, turning to address a deeper problem, we

\(^{55}\) Bostock 1994, 182-184 takes this line. He argues that this very passage is what Aristotle has in mind to criticize in *PA*, instead embracing a picture like the one traced earlier, on which there are multiple lines of differentiation. Bostock argues from this that this passage must antedate Aristotle’s serious biological work. Lloyd 1991, 379-381 similarly suggests that either animals, as described in Aristotle’s zoology, must fail the test of实质性 or this picture must be radically revised.

\(^{56}\) Πει δέ ταύτα οὕτως ἦσει, φανερὸν δὴ ἡ τελευταία διαφορὰ ἡ οὔσια τοῦ πρῶτου ἐστὶ καὶ ὁ ὀρισμός, εἴπερ μὴ δὲι πολλάκις ταύτα λέγειν ἐν τοῖς ὅροις· περίεργον γάρ, συμβαίνει δὲ γε τούτο· ὅταν γὰρ εἴη ἥδην ὑπόστου ὕποστον, οὐδὲν ἀλλὰ ἐξηκεν ἢ ἥδην πόδας ἔχων, δύο πόδας ἔχων· κάν τούτῳ διαφορὰ τῇ οὐσίᾳ διαφέρει. διαφοράς ἔρει καὶ ἓσκακες τῆς διαφοράς. ἕαν μὲν δὴ διαφορᾶς διαφορὰς γίγνεται, μια ἐστι τῇ τελευταίᾳ τὸ εἶδος καὶ ἡ οὔσια· ἕαν δὲ κατὰ συμβεβηκός, οἶνοι εἰ διαμόρι τοῦ ὑπόστος τὸ μὲν λεικόν τὸ δὲ μέλαν, τοσαῦτα ἐσθαί αἱ τοιαὶ ὅσαι. ὅστε φανερὸν δὴ ὁ ὀρισμὸς λόγος ἐστὶν ὁ ἐκ τῶν διαφορῶν, καὶ τούτων τῆς τελευταίας κατὰ γε τὸ ὀρθὸν. δήλων δ’ ἐν εἴῃ, εἰ τὰς μετατάξα τοῖς τουτοῖς ὀρισμοῖς, ὁποῖον τὸν ἀνθρώπον, λέγων ἥδην ὑπόστον· περίεργον γάρ τὸ ὑπόστον εἰρημένον τοῦ δίκτος· τάξις δ’ οὐκ ἔστιν ἐν τῇ οὔσιᾳ· ποῦ γὰρ δὲι νοῆσαι τὸ μὲν ἠστερὸν τὸ δὲ πρότερον.

\(^{57}\) Aristotle seems to suggest something much like this in his critique of dichotomizing division in the *Parts of Animals* discussed in chapter II. A difference like “two-footed” may end up being the last differentia in a dichotomizing
have already learned that the substance of an animal will turn out to be its soul; therefore, our division must ultimately arrive at something that is the soul of a given animal. But we do not have the means to find the essence of a given animal directly, without painstaking biological work; the simplified model of Zeta is incapable of accounting for the difficulties the empirically minded zoologist will come across, and Aristotle’s own science of soul addresses it in general, not in the particular mode required (indeed, the fundamental tension here should not be taken to be between two accounts of division, but between a view of the soul as universal and common to, in three broad categories, all animals, and as the substantial being of an animal). That aside, what we can take from these two passages is the importance of differentiae for determining substantiality. Just as we have seen in the Parts of Animals, Aristotle uses a criterion of parsimony—not including extraneous material within the essence of a given substance. Rather than listing the entire genus-differentiae complex, as in an animal with two feet, that has feet, that is an animal, Aristotle notes that when it is possible to take another differentia of a given differentia (or the genus we begin with), taking the last differentia always presupposes the previous ones. By taking the last differentia, we can arrive at what features of the animal it has in virtue of its substantial being. In the idealized Zeta account, this comes down to one feature, but in the non-idealized conditions of empirical work, as I have argued we point out several features. The tension this raises is how this fits in with Aristotle’s picture of simplicity. This raises an issue, however; essence in Zeta must be simple but I have argued that definition in the Posterior Analytics have a certain structure. The first response is to rely on the picture of soul I have just drawn, on which we are imperfectly attempting to track soul, which is fundamentally simple. But even on its own merits, I think we can defend the sort of definitions we find in the Posterior Analytics. The Posterior Analytics method of division, as I have argued is interested in explanations at the general level, for which it is useful to include common features which do not nevertheless cut close to the substance of a given animal. By including these larger genera, the method of division makes clear interconnections between various animals. This does, however, introduce a level of complexity to a Posterior Analytics division, as certain differentiae are lower-level than higher genera. Zeta achieves simplicity in essences by eliding those higher genera, leaving only the ultimate ones which demarcate it. But as long as in both cases the same division, but it is not the final difference, which is the form. This remark seems, furthermore, to posit a difference between Academic dichotomizing and the Zeta methodology.
bottom-level essences are arrived at, then using concept, that of essence, for two ends seems to be, if messy, not critically dangerous to Aristotle’s project. And it seems that this is so; for if the final differentia is the ultimate substance and essence in Zeta, and in Posterior Analytics we find an extended definition with some internal structure that is elided in the Metaphysics procedure, then we have reached two different ways of explaining the very same essence—one in terms of shared features, the other in terms of that which is found when these shared features run out.

Two lessons can be drawn, then, from our quick stop in Zeta. We have found some evidence for thinking that, for animals, no one given differentia is the ultimate differentia and thus the essence, but rather the form of the animal itself, which is the soul, thus preempting an unequivocally negative conclusion on the relation between Zeta and the zoology. There remains a question, however, about the relationship of the whole function, as in the soul, to the parts of a given animal.

VI. Parts and Wholes in the Biology

Moving to the final part of my argument, we must understand first the relation of parts of an animal to its substantial being, and then how the explanatory concept of substantial being is actually deployed in the Parts of Animals. First, however, we will turn to the Politics, in which Aristotle unveils a doctrine about the parts of animals while making analogy to different constitutions:

Now if we wanted to grasp the kinds of animals, we would first determine what it is that every animal must have, for example, some of the sense-organs, something with which to masticate and absorb food, such as a mouth and a stomach, and in addition to these parts by which each of them moves. If, then, there were only this many parts, but there were differences in them (I mean, for example, if there were several kinds of mouths, stomachs, and sense-organs, and further also of parts for movement), then the number of ways of combining these will necessarily produce several kinds of animals. For the same animal cannot have many different sorts of mouth, nor of ears either. So, when all the possible ways of coupling them have been grasped, they will produce kinds of animals, and as many kinds as there are combinations of the necessary parts\(^58\) (Politics IV.4 1290b25-40)\(^59\).

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\(^{58}\) ὀσπερ σὺν εἰ ζῷον προηρούμεθα λαβεῖν εἰδὴ, πρῶτον ἃν ἀποδιώριζομεν ἀπερ ἀναγκαίον πᾶν ἔχειν ζῷον (οὗν ἐνα τοῦ αἰσθητηρίου καὶ τῆς τροφῆς ἐργαστικῶν καὶ δεκτικῶν, ὕστομα καὶ κοιλία, πρὸς τοῦτοις, οἷς κινεῖται μορίος ἔχαστον αὐτῶν). ἐὰν δὲ τοσάτα εἰς μόνον, τοῦτον δὲ εἰς διαφορὰς (λέγω δὲ οὗν στόματός τινα πλείον γένη καὶ κοιλίας καὶ τῶν αἰσθητηρίων, ἔτι δὲ καὶ τῶν κινητικῶν μορίων), ὡς ἐτι καὶ τῶν κινητικῶν μορίων, ὡς δὲ τῆς συζεύξεως τῆς τούτων ἄρθρως έξ ἀνάγκης ποιήσαι πλείον γένη ζῴων (οὐ γὰρ οὗν τοῦτον ζῷον ἔχειν πλείους στόματος διαφοράς, ὡμοίως δὲ οὐδὲ όστεν), ὡσθ’ ὅταν λημόθαι τοῦτον πάντας οἱ ενδεχόμενοι συνώσιμοι, ποιήσουσιν εἰδὴ ζῴου, καὶ τοσαύτ’ εἰδὴ τοῦ ζῴου ὅσα περ αἱ συζεύξεις τῶν ἀναγκαίων μορίων εἰσίν.

\(^{59}\) Translations of Politics from Reeve 2017
While some want to dismiss this passage as irrelevant to real natural science, it has something interesting to say about Aristotle’s biological thought. For according to the methodology, every animal has a series of “necessary” parts. From the examples given, these are the parts that fulfill all of the functions of the animal—seeing, working, absorbing food, and so on. All of these in different configurations will allow us to grasp kinds of animals. This is of course a vague sketch; Aristotle presumably does not mean for any imaginary combinations of parts that we might dream up, we can thereby identify a certain actually existing species. This is a serious challenge, however, to an account on which the entire soul, not individual parts, are the substance of an animal. There is something intuitively missing about this picture, however, and it stems from the use of “necessity” here. Aristotle’s use of necessity in biology can be roughly divided into three kinds, unqualified, material, and conditional. The first two refer to the behavior of matter, so are clearly irrelevant here, leaving conditional necessity. Roughly, conditional necessity is necessity given another outcome. So to speak of necessary parts in this way, there must be a certain end which is achieved by them. As much is stated by Aristotle:

Hence it would be best to say that, since this is what it is to be a human being, on account of this it has these things; for it cannot be without these parts. If one cannot say this, one should say the next best thing, i.e. either that in general it cannot be otherwise, or that at least it is good thus. And these things follow. And since it is such, its generation naturally happens in this way and is such as it is. (This is why this part comes to be first, then that one.) And in like manner one should speak in precisely this way about all the things constituted by nature (640a35-640b4).

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60 While it is true that the results of political science may have little or nothing to do with biology, we should make a distinction between a claim in political science and the claim made in the treatise entitled the Politics. Aristotle is perfectly willing to employ, for the sake of an example, a biological principle—and one which we may then utilize. Pellegrin 1985, 101-103 most forcefully that this passage corresponds to nothing in the biological works, and should thereby be discarded as only meant to be an analogy with constitutions. But even if the methodology is inappropriate to biological sciences (since we proceed by looking at actual organisms, not conceptually, there is an interesting question of why this methodology is incompatible with the biology or whether it, contra Pellegrin, maps onto a real way of proceeding. But Pellegrin’s hypothesis itself faces issues; it is difficult to see how Aristotle would be making the political arts clearer by means of an analogy with biology if the latter had no basis in fact whatsoever.

61 Aristotle also says that this will allow us to λαβεῖν εἰδή, to grasp the form, but we should not take this to mean that the form of an animal is equivalent to a series of parts; rather, as I will sketch out, it will give us an understanding of the animal which will indirectly point towards the form of the animal, which is its functional organization or soul. Taking it in a specifically metaphysical sense makes it plainly incompatible with both Aristotle’s metaphysics and the biological praxis.

62 After Leunissen 2011, 100-103

63 Διό μάλιστα μέν λεκτέον ὡς ἐπειδῆ τούτ’ ἦν τὸ ἀνθρώπῳ εἶναι, διὰ τούτο ταῦτ’ ἔχει· οὐ γὰρ ἐνδέχεται εἶναι ἄνευ τῶν μορίων τούτων. Εἰ δὲ μὴ, ὅτι ἐγράφατα τούτον, καὶ ἢ ὅλως ὥστε ἢ ἄλλοι δὲ ἢ καλῶς γε οὕτως. Ταῦτα δ’ ἔπειτα, ἔπει δ’ ἐστι τοιοῦτον, τὴν γένεσιν ὤδι καὶ τοιούτην συμβαίνειν ἀναγκαῖον. Διό γίνεται πρῶτον τῶν μορίων τόδε, εἶτα τόδε. Καὶ τούτον δὴ τὸν τρόπον ὁμοίως ἐπὶ πάντων τῶν φύσεων συνισταμένων.
The necessary parts are directly tied to those necessary for someone to be a human being, though they themselves do not serve as parts of substantial being. But to speak of a sort of functional organization is to invoke functions, and since we are talking about animals, to thereby invoke soul. What’s more, while the passage does talk only of parts, not their unity, when discovering the kinds of animals, the background picture Aristotle has guarantees that parts are ontologically secondary in nature. As Aristotle says even in the Politics, “it is necessary for the whole to be prior to the part. For if the whole body is put to death, there will no longer be a foot or a hand, except homonymously, as one might speak of a stone ‘hand’ (for, once dead, the hand will be like that). For everything is defined by its function and by its capacity” (Politics I.2 1253a18-25). This discovery is confirmed by a remark in the Metaphysics, that “bodily parts, then, are in a way prior to the compound, but in a way not, since they cannot exist when they are separated. For it is not a finger in any and every state that is the finger of an animal; rather, a dead finger is only homonymously a finger” (Metaphysics Z.11 1035b22-25). To speak of the part of an animal is then only to speak of it in conjunction with other parts as actual, that is, in an ensouled, living organism. We can illustrate the tight relationship between the necessary parts of an animal and their substantial being through a simple illustration, that of the octopus:

Now while the other octopuses have two rows of suckers, one kind of octopus has a single row. This is because of the length and thinness of their nature; for it is necessary that the narrow tentacle should have a single row of suckers. It is not, then, because it is best that they have this feature, but because it is necessary owing to the distinctive account of their substantial being (PA IV.9 685b12-18).

What is being explained here is a particular part of this octopus—that is has only one row of suckers. This is a particular characteristic of the octopus, but it is itself not claimed to be part of its substantial being. What is in fact ascribed to the substantial being of this kind of octopus is the “length and thinness of their nature.” Apparently, a particular differentia of this sort of octopus, what makes it distinct from other sorts, is that very length and thinness. Since we have learnt that the best candidates for the substantial being are these ultimate differentia (and, in the Zeta fashion, the genus that is being divided to result in “length and thinness” is elided), and that the length and thinness are how this octopus has been divided from the others, the explanation is

64 τὰ μὲν οὖν ἀλλὰ δικατουλὰ ἔστι, γένος δὲ τι πολυπόδων μονοκότυλων. αἵτινον δὲ τὸ μῆκος καὶ ἡ λεπτότης τῆς φύσεως αὐτῶν: μονοκότυλων γὰρ ἀναγκαῖον εἶναι τὸ στενὸν. οὐκ οὖν ὡς βέλτιστον ἔχωσιν, ἀλλ’ ὡς ἀναγκαῖον διὰ τὸν ἱδιὸν λόγον τῆς οὐσίας
65 Rendering τὸ μῆκος καὶ ἡ λεπτότης τῆς φύσεως αὐτῶν.
on the level of substantial being. The relation between the part and the whole octopus is exactly that of the pattern earlier described in the *Parts of Animals*. Aristotle seems to be saying here that it would be impossible for an animal as long and thin as the octopus of this sort to have two rows of tentacle, but at the same time to be an octopus, whatever sort of substantial being that turns out to be, it must have suckers; therefore, it is necessary that it has this very kind.

There are a few choice examples of Aristotle explicitly appealing to the substance of an animal for explanatory purposes, as in this example regarding birds:

They are two-footed of necessity; for the substantial being of the bird is that of the blooded animals, but at the same time that of the winged animals, and blooded animals do not move by more than four points. Accordingly, the attached parts are four—as in the other locomotive land-movers, so too in the birds. But four arms and legs are present in the one group, while in the birds, instead of forelimbs or arms, wings are a common feature; and in virtue of these they are able to stretch out, and the ability to fly is in the substantial being of the bird\(^66\) (*PA* IV.12 693b5-15).

This follows the same pattern of explanation seen in the fish example earlier used in the *Posterior Analytics*. A common feature is listed, at the level of maximal specificity (which happens to be very general, in this case), namely blood. But we also reach that of the winged animals. The wings are part of their substantial being as well, as a general attribute, but it is fit for the level of generality, not a specific animal but of a bird. But by looking at essential biological traits and a functional principle, that the bird can fly, we arrive at a specific essence of the bird which can differentiate it from other sorts of animals. Thereby, through Aristotle’s procedure as described, we are justified in ascribing the specific features to the animal’s substantial being. Another example, however, seems to confound our expectations:

Generally then, the lung is for the sake of breathing, while it is bloodless and of such a kind for the sake of certain animals. But what is common to these animals is nameless; that is, no name has been applied them as the name ‘bird’ has been applied to a certain kind of animal. For this reason, just as being for a bird is \(^67\) (*PA* III.6 669b-12).

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\(^{66}\) δύτους δ᾽ εἴς ἀνάγκης ἐστίν· τὸν γὰρ ἐναίμων ἢ τοῦ ὅρνιθος οὐσία, ἀμα δὲ καὶ πετριγωτός. τά δ᾽ ἐναίμα οὐ κινεῖται πλείστως ἢ τέτταρα σημεῖα. τὰ μὲν οὖν ἄπερ σημεῖα, μόρια, τέτταρα, ὅσπερ τοῖς ἄλλοις τοῖς ἄλλοις καὶ τοῖς πιστοῖς, ἕσται καὶ τοῖς ὅρνισιν, ἄλλα τοῖς μὲν βραχίονες καὶ σκέλη, τοῖς δὲ τετράποδοικαισκέλη τέτταρα ὑπάρχει, τοῖς δ᾽ ὅρνισιν ἀντὶ τῶν προσθήκης σκέλους ἢ βραχίονοις πετρύγοις κοινόν ἔστιν κατὰ ταύτας γὰρ τοιούκικα εἴσι, τὸ δ᾽ ὄρνιθέν τῇ οὐσίᾳ τὸ τετρακόντεστιν

\(^{67}\) ὅλους μὲν οὖν ὁ πλεύσμων ἐστίν ἀναπνοὴς χάριν, ἀναμειστὸς δὲ καὶ τοιοῦτος γένος τινός ἔνεκεν ὅφιον· ἄλλως μὲν οὖν τὸ κοινὸν ἐπ’ αὐτοῖς, καὶ οὐ γάρ ὅσπερ ὁ όρνις ὀνομάσαται ἐπὶ τίνος γένους. διὸ ὅσπερ τὸ ὅρνιθε εἶναι ἐκ τινὸς ἔστι, καὶ ἐκείνων ἐν τῇ οὐσίᾳ ὑπάρχει τὸ πλεύσμων ἐχεῖν.
What makes this passage peculiarly difficult is that Aristotle seems to put a particular part, having a lung, in the substantial being of an animal. But this would be too hasty; Aristotle is not saying that the lung itself is part of the substantial being of an animal, but that there is a yet unnamed property which necessarily has the part of a lung. The comparison with birds is instructive; it is not that the wing of a bird is in the substantial being, but that a certain property, wingedness, πτερυγωτός, a coinage of Aristotle, is present. Aristotle is trying to pick out a similar property for the property which requires a lung, but lacks the vocabulary to do so. What’s more, as Gotthelf points out, we can identify a functional role for lungedness; “The issue is complicated by the fact that the possession of a lung, stated to be present in the ousia of all animals that have one, is itself explained by reference to the lung's respiratory (i.e., cooling) function, a function which is needed by virtue of these animals’ unusually hot nature.”

Lungedness will turn out then to be a functional term. The issue Gotthelf raises is that if we are keeping essences as thin as possible, putting only in them what is required to get the functional organization of an animal (its soul), then this looks unnecessary. But the property of having a lung might turn out to be like blood; although we might a priori think it is superfluous in substantial being, when we consider that animals are form-matter compounds, we might be surprised to discover certain necessary formal features of an animal that are necessitated because of facts about matter. In order for the remainder of the features in the substantial being of a lunged animal to come about, given the matter we find in the world it would necessarily overheat, unless lungs were present to perform a cooling function. This is not to say that matter enters into the form, but merely that the hylomorphic structure of an animal may lead to additional necessary functions, in this case cooling. There is another problem, however, stemming from Aristotle’s explanation of analogy within division:

It is necessary first to divide the attributes associated with each kind that belong in themselves to all the animals, and next to try to divide their causes. Now it has been said before that many common features belong to many of the animals, some without qualification (such as feet, wings, and scales, and affectations too in the same way), and other analogously. By analogously I mean that, while some have a lung, other have, not a lung, but instead something different which is to them what a

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68 Gotthelf 2012, 238
lung is to those that have one; and some have blood, while others have its analogue, with the same potential that blood has for the blooded (PA I.5 645b1-10).

The complex model of division previously developed helps us to understand how Aristotle will proceed by dividing through common features, but what Aristotle says about dividing analogously proves difficult. His claim is that some animals have lungs but others have, instead of lungs, “something different which is to them what a lung is to those that have one,” and so on with lungs—both, as we have seen, paradigm cases of features in the substantial being of a given animal. But if analogy is defined through the function of parts such as lungs and blood, and if lung and its counterpart or blood and its counterpart fulfill the same functional role, then there will be, from the perspective of functional organization, no way of distinguishing between lungs and not-lungs except by bringing in other features, such as matter. But the difference in substantial being is supposed to be entirely formal—thus generating a vicious paradox. We can define a lung formally by reference to functional organization without fulfilling a part, but we can only separate between lungs and not-lungs by reference to anything but functional organization, apparently. A way out, however, seems to be provided by Aristotle. The function of a lung is not independent, but embedded within the extremely complex structure of any living animal. It is at least plausible that a lung plays a function similar to a lung-analogous part, but not quite the same given the entirely different internal organization of the sort of animal which has a lung and that which has a lung-analogue, and so on with the various parts of a division. One upshot of this picture is that it would show the interwoven nature of animals even with conjunctive definitions; since every single feature within the substantial being must fit together to build a functioning whole, animals possess an essential unity.

VII. Conclusion

The account of substantial being I have argued for functions as a sketch for an Aristotelian research project which is never quite brought to fruition; the texts in which this sort of explanation is actually put to use are frustratingly scarce, yet I am confident that this picture

69 Ἀναγκαῖον δὲ πρῶτον τὰ συμβεβηκότα διελεῖν περὶ ἕκαστον γένος, ὡσα καθ’ αὐτὰ πάσιν ὑπάρχει τοῖς ζῴοις, μετὰ δὲ ταύτα τὰς αἰτίας αὐτῶν πειράσθαι διελεῖν. Εἴρηται μὲν οὖν καὶ πρὸτερον ὅτι πολλὰ κοινὰ πολλοῖς ὑπάρχει τῶν ζῴων, τὰ μὲν ἄπλοδα, οίον πόδες πετά λεπίδες, καὶ πάθη δὴ τὸν αὐτὸν τρόπον τούτοις, τὰ δ’ ἀνάλογαν. Λέγω δ’ ἀνάλογον, ὅτι τοῖς μὲν ὑπάρχει πλεύμον, τοῖς δὲ πλεύμον μὲν οὖ, δ’ δὲ τοῖς ἔχουσι πλεύμονα, ἔκεινος ἔτερον ἀντὶ τούτου· καὶ τοῖς μὲν αἷμα, τοῖς δὲ τὸ ἀνάλογον τὴν αὐτὴν ἔχον δύναμιν ἂν περὶ τοῖς ἐναίμοις τὸ αἷμα.

70 It became apparent to me after writing this essay that a very similar answer was first proposed to the problem of unity by Gill 1993.
gets something essentially right about Aristotle’s scientific practice and his metaphysics. What we end up with is an essentialism of a kind, but it is a thin kind of essentialism—the bare minimum necessary to ensure that a thing is what it is lies in the essence, and as much as possible is left to be derived from that essence through the various explanatory schemata Aristotle utilizes. We will find these essences only, it seems, after much empirical work, and they will play a diminished role compared to other methods—which may well explain the scarcity of examples where Aristotle uses explanation by substantial being. Good history of philosophy often makes us reflect on our own philosophical situation and what our philosophical predecessors can impart to us; this is less the case when studying ancient science, nor has this been the sort of paper which attempts to take classical thought and apply it to a contemporary program. Nonetheless, perhaps the conceptual space Aristotle opens for a middle ground between essentialists and anti-essentialist in philosophy broadly construed is still fertile, whatever the substitute for an ancient and outdated, though fascinating, biology might be.
Bibliography


