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CONCERNING ARISTOTELIAN ANIMAL ESSENCES

by

Damon Watson

A Dissertation submitted to the Faculty of the Graduate School,
Marquette University,
in Partial Fulfillment of the Requirements for
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ABSTRACT
CONCERNING ARISTOTELIAN, ANIMAL ESSENCES

Damon Watson

Marquette University, 2021

In this dissertation I attempt to clarify Aristotle's notion of essence. In particular, I focus on the essence of animal substances. When looking at Aristotle's biological works and works like the *Metaphysics* it becomes perplexing how the accounts of animal essences in both are to constitute a unified view. In *Parts of Animals* the emphasis seems to be on definitions of animals that are rich enough to further explanatory aims. It is hard to see how such rich but messy definitions will be amenable to the strategies for a definition's unity as are given in the *Metaphysics*.

I argue that there is a consistent account of essence to be found. By bringing Aristotle's discussion on essence from *Parts of Animals* I into his discussions of definitional unity in Zeta 12 and Eta 6, there emerge resources for dealing with the problems plaguing these two sections from the *Metaphysics*. The key is recognizing that Aristotelian animal essences are comprised of terms describing the animal parts and their functions in greater and lesser degrees of determinacy. I argue that there is a kind of closure of function among such animal parts, and this is the basis for the unity of a substance mentioned vaguely in Eta 6. The several differences in an animal's definition reflect this functional closure by exhibiting a kind of explanatory closure. I then build upon recent work concerning the determination relation in Aristotle to show how the several genera and differences contained in the animal essence are a unity.

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Damon Watson

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1. Introduction to the Question and Solution

1.1 The Basic Question

For Aristotle the essence of a substance is the account of the substance (*ho logos tes ousias*); the essence is the statement of what it is to be (*to ti ên einai*) that substance. The essence is the real definition of a thing as opposed to a definition that posits the correct usage for a word. The essence is itself comprised of terms.¹ To put it roughly for the moment, every essence will have one term that is a genus (*genos*) and another term that is the specific difference (*diaphoras*). In a given essence, the pair of a given genus and specific difference taken together make the essence.² However, precisely how the genus and specific difference work together to constitute the essence of a thing is unclear. This unclarity has three dimensions to it.

1) *Terminological Complexity*: It could be that the genus is comprised of multiple terms or only a single term, and this is the case for the specific difference as well.

2) *Logical Relation*: The specific difference might be logically dependent or independent of the genus. 3) *Efficiency*: The terms contained in an essence might be all and only those needed to single out the substance possessing the essence from all others, or the terms

¹ The essence is given by the *horismos*, the definition; a term is a *horos*. The terms work together to make the definition.

² Now, this is not to say that serving this definitional function in the case of essence is the *only* role that the terms themselves, genus and species, can serve. "Genus" can often just be used as a synonym for "class" or "grouping." In terms of hierarchical relationships defined via containment relations, one class can be called a genus in relation to another because it contains the other class, and then such a contained class can be relatively referred to as an *eidos*. Such a relative determination shows that there need be no particular spot occupied in a taxonomy if some term is dubbed an *eidos* or *genos*. I am going to be more focused upon these terms as they play a role in an essence. So in my context, an *eidos* does pick out an infima species, and a *genos* does mean the most universal class(es) needed for the sake of the definition of a substance. So I'm looking at a special usage for these terms. For more on the flexibility of a *eidos* and *genos* to describe terms at multiple levels in a hierarchy. See Pellegrin 1986 and Balme 1962.

contained in an essence might be all and only those necessary to explain everything about a substance. Before moving into the Aristotelian texts, it will be helpful to consider in more detail each of these three questions.

1.1.1 The Three Dimensions of the Question

1.1.1.1 Terminological Complexity

At some places Aristotle appears to endorse a notion of a genus that is comprised of a single term. In other places Aristotle has a notion of a genus that is comprised of a conjunction of given terms. There also is evidence for both multiplicity and singularity when it comes to the specific difference as well. To illustrate what I have in mind by these options, a terminologically single genus for a species like tiger could be "animal." A multiple one might refer to the plurality of parts of which a tiger is comprised, but using descriptions of those parts that would not be peculiar to tigers. A subset of the terms contained in such a genus might look like "carnivore and four-legged and warm blooded." Notice how in this set each term is predicable of more species than tiger. Likewise, we can imagine that the specific difference of a tiger might only mention a single term (whatever that would be), or it could be a conjunction of descriptions of the several parts of the tiger, where the descriptions of these parts are such as only to apply to tigers. So, the specific difference, when considered to be multiple, could include a description of the peculiar way a tiger is four legged and other such peculiarly tiger-like descriptions of a tiger's parts.³

³ There will be occasion to go over particular examples from the text. For now, I just want to present the outlines of the problem, and some makeshift non-textual examples of the ways in which terminological simplicity or complexity could be cashed out is helpful for getting a handle on the what the difference between the two options is.

So concerning the question of terminological complexity alone, we have four logical possibilities: either the specific difference and the genus are each comprised of a single, but different, term (SDSG), the genus is a single term while the difference is multiple (MDSG), both the genus and difference are multiple (MDMG), or finally the genus is multiple yet the difference is a single term (SDMG).

1.1.1.2 Logical Relation

We can identify two inconsistent ways Aristotle has appeared to understand the logical relation between the genus and the difference as they are used to designate an essence. On one conception, any genus and specific difference that are used to designate a single essence are logically dependent in the sense of a necessary, one-way entailment relation. That is, the specific difference for a species necessarily entails the genus of that species; call this LD. On the other conception, a genus and specific difference used to designate a single essence are logically independent of one another. The specific difference does not necessarily entail the genus; call this LI.⁴

To illustrate, let us only deal with a single genus and a single specific difference.⁵

Suppose M is a genus predicate like "mammal" and T is a specific difference predicate of

⁴ Neither LI nor LD hold that the genus entails any one specific difference. Suppose that some species S is defined by the genus G and the specific difference D. Now, S has G in common with all other species in the same genus. But supposing that G entails D, it will also follow that every other species in the genus G also has D in common with S. Thus, this species S will not have anything that sets it apart from the rest of the species in the genus. The specific difference is normally taken to be what sets a given species apart from all other species in the same genus. But this is precisely what could not happen for any species for which its genus would entail its specific difference.

⁵ Recall, because of the issue of terminological complexity, the issues of LI or LD could be showcased in the context of an essence with multiple terms for the genus and specific difference, single terms, or a mix of the two options. For ease of exposition about the question of LI and LD, I am choosing the single difference and single genus. Later on, I will consider LI and LD in the context of the other options concerning terminological complexity.

mammal like "a being that gives live birth," and M and T together are the essence of some species S. So $\text{"(for all } x)[Sx \text{ iff } (Tx \ \& \ Mx)]\text{"}$ is true. Both LI and LD will affirm this proposition. However, LD will also hold it is necessary that $\text{"(for all } x)(\text{if } Tx, \text{ then } Mx).\text{"}$ To put it another way, where T' is the set of all things we can truly say are T, and M' is the set of all things we can truly say are M, T' will necessarily be a proper subclass of M' according to LD.⁶ In contrast to this, LI will hold it is possible⁷ that $\text{"(there exist } x)(Tx \ \& \ \sim Mx).\text{"}$ To put it another way, according to LI, T' is not of necessity a subclass of M'. As is obvious, LI and LD are contradictory.

1.1.1.3 Efficiency

Because the essence is supposed to be the real definition of a species, the essence ought to pick out all and only those beings that are instances of the species in question. So when we look at those things to which both the specific difference and the genus of a given essence apply, we should find only those things that are instances of the species. Moreover, we should not be able to find an instance of the species for which both the

⁶ One might wonder why the entailment of the genus by the specific difference should mean that the class whose membership criterion is D will be a *proper* subclass of the class whose membership criterion is G. Is it not possible that G and D convert? This is not possible for Aristotle since any generic class will always have a wider domain than any specific difference it contains. The reason why is that any generic class must be divided by more than one difference; otherwise it would not be generic. Thus, however we conceive matters with respect to LD and LI, we can always find members of a genus that are not members of one of the specific differences of that genus.

⁷ The modal dimension of LI and LD is needed. To illustrate the point on the side of LD, suppose we have two terms G and D which taken together designate an essence. If everything of which D is said must also have G said of it then it is true that a thing's being D entails its being G. However, there may be little or no intrinsic connection between G and D as such. For instance, if there were a world in which every red thing were also round, then an entailment relation would obtain; in that world, something's being red entails its being round. Nonetheless, red and round have no intrinsic connection. Thus, attempting to put my finger on this sense of intrinsic connection, I add the necessity qualification. Even if it might turn out that everything that is red is also round, it is still not necessary that every red thing should also be round. On the LI side then, the point is just that it is possible to find an individual having D that is not G.

genus and specific difference of the essence in question would fail to apply. There are at least two possible varieties of what I am calling “efficiency” that would guarantee us that our essence pick out all and only those things that are instances of the species of the essence. One variety is logical efficiency, and the other is explanatory efficiency.

To illustrate, suppose one were asked to say where the president of the United States lived. It would not be false to say any one of the following: the USA, the Mid-Atlantic, Washington D.C., or the White House. No one answer here conveys exactly the same information in terms of location as any other, and one answer, “the White House,” contains all the information, in terms of location, given by the other three answers. In this case, the logically efficient response would be “the White House” since that description of the president’s home would get us all the other descriptions. Thus, to go back to Aristotle and essences, the logically efficient version of an essence will include all and only those individuals really belonging to the species having the essence, but it will do this by means of the fewest possible number of terms. That is, the genus and specific difference, under this account of efficiency, will include only so many terms as to mark off the species defined from all others in logical space.

Now, we have to consider the explanatory version of efficiency. Suppose a large winter storm was piling on snow in the Mid-Atlantic region of the USA, and one asked why the president’s yard had been covered in snow. Clearly it would not be accurate to say his yard was covered in snow because he lived in the USA, since it was not the entire USA that was hit by the storm. However, it is also not right to answer “because he lives in Washington D.C.” Yes, it is true that Washington D.C. is in the Mid-Atlantic, and so because of this containment in the Mid-Atlantic, and the president’s home being in

Washington D.C., the president's yard was covered in snow. However, the cause of the snow falling on all these regions was the storm. There is nothing peculiar about Washington D.C. in distinction from the rest of the Mid-Atlantic that accounts for its having snowfall; the storm struck the entire Mid-Atlantic. So, the appropriate answer would be to observe that the president resides in the Mid-Atlantic and observe that a winter storm struck the Mid-Atlantic.

The above explanation required a description of the president's home that would not be explicitly mentioned in the logically efficient version presented above. Recall, the logically efficient version needed only to mention "the White House" as this was enough to set apart the location of the president's home from all other locations. However, we can also find questions whose answers would best be given by the logically efficient version above. For example, in answer to the question "Why is it that, where the president lives, he sees Lincoln's ghost?" the better answer from the above list would make reference to the fact that the president lives in the Whitehouse, and then observe it to be a place haunted by Lincoln's ghost.

The moral of these two stories involving the president's home is that when it comes to explanations about a single thing, one must characterize that thing in the right way in order to have the proper explanation "hook up" with that thing for which, in some respect, we are seeking an explanation. In the above two cases, I focused on the ability to characterize a thing via descriptions of greater and lesser generality. For one explanation, we characterized the president's home using a description that only picked out the president's home; for another explanation, we characterized the president's home by a

description that picked out a location that included several other places than just the president's home.

Logical extension is not the only way that descriptions of one and the same thing can vary,⁸ but the variation of the descriptions of one thing by logical extension is enough to show there is a difference between logical and explanatory efficiency. According to what I am calling explanatory efficiency, an essence is to contain all and only those characterizations of a species required to explain the features of that species. So, assuming for the moment that there will be features about all species not peculiar to them that ought to be explained,⁹ then the essences of species must possess characterizations of species that are broader in extension than the species in question. Granted there are features of any given species that can only be explained by reference to peculiar facts about that species, then an essence of a species must also contain descriptions that pick out only the species in question. Thus, like the logically efficient version of an essence, the genus and specific difference taken together will have a logical extension identical to the species in question; however, the explanatorily efficient version will have some descriptions that are broader in extension than just the species in question.

⁸ For instance, if it turns out that we must refer to an animal's parts in giving its definition, and there are several animal parts peculiar only to a given species, then the descriptions of animals having any of these peculiar parts would pick out one and the same species in logical space, yet the two descriptions would not be identical.

⁹ Though we will look into this more in what follows, we should expect there to be features of every composite being that are shared by other composite beings. Though I believe there are other reasons too, the simple fact that a composite being is made out of the four elements, or elemental powers rather, suggests that of necessity there will be some features a species has that are not peculiar to it. Moreover, it seems clear that some kinds of explanations will need to refer to just these sorts of elemental, material facts.

1.1.2 The Set of Possible Solutions

Any possible solution to the overall question I am considering will provide an answer to each of the three sub-questions that together makeup the overall question I am considering. I want to answer whether for Aristotle a genus and specific difference are terminologically multiple or singular. I also want to answer whether Aristotle holds that there can be specific differences that are conjoined with multiple genera to designate multiple essences, or if Aristotle holds that a given specific difference can only be conjoined with a unique genus to designate an essence. Finally, I want to answer if Aristotle holds to the logically efficient or explanatorily efficient notion of an essence. Since there are four possible answers to the first question, and there are two possible answers to both the second and third question, then there are sixteen options in the set of possible solutions. To put it all in view neatly, we can represent this by the following: Possible Solutions Set= {SDSG, MDSG, SDMG, MSMG} x {LI,LD} x {LE,EE}.¹⁰

1.2 The Possible Solutions in Aristotle's Texts

As just described, there are at least three dimensions to be considered when it comes to the question of how exactly a genus and specific difference work together in an essence. In consideration of these three options, there are sixteen possible options one can take in accounting for the work that a genus and specific difference do in an essence.

What I want to do now is to turn to places throughout the corpus where we can find

¹⁰ By "LE" I mean "logically efficient. By "EE" I mean "explanatorily efficient. The notation I am using to express the set of possible solution denotes a cross product between sets. In the present context is just denotes a set of sixteen elements, where each element is an ordered triple. For every possible combination of elements from the three sets, there will be an ordered triple in the possible solutions set.

prima facie evidence for Aristotle's endorsing the various options in the possible solution set. Let me emphasize that for the moment I am only showing that there are texts reasonably construed as Aristotle's holding certain positions with respect to terminological complexity, logical relation, or efficiency. My aim here is to exhibit that the above sixteen possible solutions do count as at least apparent answers to questions which come up in the Aristotelian texts. That is to say, there are at least plausible interpretations of passages that show Aristotle adopting a position out of the possible solution set I have offered above.

My order of procedure will be to set out some texts with a focus on the issue of the logical relation between the genus and specific difference. After this I will return to some of these same texts while also considering others with a focus on the issue of terminological complexity. In considering the issue of terminological complexity, I will also bring up the issue of efficiency. I do this because the textual evidence and issues overlap so much that it would be both redundant and artificial to separate these issues into two separate sections.

1.2.1 Logical Relation

The inconsistency between LI and LD has not gone unnoticed in the literature.¹¹ Works such as the *Metaphysics* and *Posterior Analytics* are observed by Granger to favor the LD conception whereas works like *Categories* and *Topics* appear to favor the LI conception. In addition, these works do not seem to be internally consistent on the matter. For example, Aristotle claims:

¹¹ See Granger 1980 and Lloyd 1961.

Animal (e.g.) is predicated of man and ox and other terrestrial animals, not of the differentia itself, which we predicate of the species. For if animal is to be predicated of each of its differentiae, then many animals will be predicated of the species; for the differentiae are predicated of the species. Moreover, the differentiae will be all either species or individuals, if they are animals; for every animal is either a species or an individual.¹²

One way to understand this passage is as follows.¹³ If animal could be predicated of its differences, then whenever something can be said to be one of the differences of animal it would amount to an implicit predication of animal in virtue of predicating a difference. If the genus "animal" is predicated of its difference, then notice that the difference must entail the genus, and this evinces the LD position. Therefore, since this passage is rejecting the predication of the genus of the difference, this passage is rejecting LD and supporting the LI position.

How is it though that the entailment of the genus by the difference is understood as problematic here? Following the lead of Loux,¹⁴ in part at least, I take it that the phrase

¹² Aristotle, *Top* 144a27-b3.

¹³ I qualify the interpretation I am giving of the passage here as only being one way to understand the passage. All I wish to show here is that some have taken the passage to evince a commitment to LI. However, if one is seeking to find consistency in the *Topics* and holds to LD, there is another way of reading the passage. Such a reading would observe that there is a distinction between the term being used for predicable here (*katēgoreitai*) and the term used later in the *Topics* for imports (*epipherei*). According to this distinction, we can say that even if Aristotle denies the predicability of the genus concerning a differentia, he might still allow for the importation of the genus by the differentia. The reason why is that to say one term A (where A is a genus) is predicable of another B is not merely to say that Bx entails Ax, but rather to say something ontological about the nature of B or the things that are B just as they are B. It is to say that B or individuals as they are B, are the right sort of beings to bear genus predicates. For instance, the species term "dog" or individuals just as they are dogs are the sorts of items that can bear genus predicates. However, neither the differentia term "footed" nor individuals just as they are footed are the sorts of things that can bear genus predicates. Thus, if B is not the sort of thing that can bear genus predicates, then we cannot predicate any genus of B. However, Bx might still entail Ax, and this would be to say that B imports A.

¹⁴ See Loux 1973.

"many animals will be predicated of the same species" is the crucial point to the passage. Suppose we have a definition of a substance which is the conjunction of genus G and difference D. Granted that G is predicable of D, then really our definition is G and XG, where $XG=D$. The idea here is that since D is not merely identical to G, and yet G is predicable of D, then we can analyze D into a conjunct that is G and some other conjunct X. The generic term is appearing twice in a definition citing the genus and difference as a result of holding that G is predicable of D. This is just what Aristotle said would happen when he let "animal" serve as his generic term in the example. From here we could go two ways: either 1) we hold that every difference will always have the generic term predicated of it, or 2) we hold that at some point the analysis will reach an X_n that is really the difference and does not have the generic term predicated of it. If we adopt 1, then we enter into an infinite regress it would seem. Let me illustrate both options as follows:

1) $\text{Def}(s)=GD=G(GX_1)=G(G(GX_2))=G(G(G(GX_3)))=...$

2) $\text{Def}(s)=GD=G(GX_1)=G(G(GX_2))=G(G(G(GX_3)))=...=G(G(G(G(...(X_n)...)))$

The idea here is that by holding to 1, which is required to hold to LD, every X_i will always implicitly have G as part of its content. Thus a definitional analysis would be futile on 1, provided that the definitional analysis is completed only upon obtaining a specific difference for which it would be false to predicate G.¹⁵ On the other hand, with option 2 there is some term X_n that we will arrive at that is a difference of G and for

¹⁵ One may already see here that the question is being begged in this objection to LD. LD entails that the generic class is predicable of the difference. Thus, LD entails $\sim LI$. The objection merely restates that assuming LD we get $\sim LI$, and holds this as a reason to reject LD. But that only counts against LD provided we already hold to LI. And since LI entails $\sim LD$, then this objection works to show $\sim LD$ provided we hold $\sim LD$. The question is begged.

which G cannot be extracted via analysis. X_n is the difference that is logically independent of the genus G, and so definitional analysis could be completed.

Whether or not this counts as good reasons for LI, the point stands that there is a plausible reading of the passage where LI is being endorsed and LD is being rejected.

However, elsewhere in the *Topics* we find an endorsing of LD. Aristotle says:

Now since of genera that are different without being subordinate one to the other the differentiae also are different in kind, e.g. those of animal and knowledge (for the differentiae of these are different), look and see if the items falling under the same term are differentiae of genera that are different without being subordinate one to the other, as e.g. sharp is of a sound and a body. For being sharp differentiates sound from sound, and likewise also one body from another. Sharp, then, is homonymous; for it forms differentiae of genera that are different without being subordinate one to the other.¹⁶

Briefly put, the claim here is that differences falling under genera that are not subordinate must be different. The only kind of sameness in two such heterogeneous differences is one of homonymy. However, we do not see any explanation for the claim that differences belonging to genera that are not subordinate must themselves be different. It is later in the *Topics* that we get an explanation. He says:

Look and see also if the differentia mentioned belongs to a different genus, neither contained in nor containing the genus in question. For it seems that the same differentia cannot be used of two genera neither of which contains the other. Otherwise, the result will be that the same species as well will be in two genera

¹⁶ *Top* 107b19-26

neither of which contains the other; for each of the differentiae imports its appropriate genus, e.g. terrestrial and biped import with them animal. Hence each of the genera as well is true of that of which the differentia is true; and it clearly follows that the species must be in two genera neither of which contains the other.¹⁷

This passage comes with some qualifications to be discussed shortly, but for now, notice that the reason why the same difference cannot occur in genera neither of which is subordinate in relation to the other is that a difference "imports its appropriate genus." Apparently, Aristotle provides us with "terrestrial" and "biped" as cases in point of two differences that import with them the genus "animal." Figuring out what "import" means exactly here might be tricky, but with respect to the distinction between LI and LD, Aristotle clearly provides an answer. Because of the importation of the genus by the difference it will follow that the genus will be true of whatever the difference is true. That is, the entailment relation will hold between the difference and the genus and so LD is being endorsed here.

There is a complicating qualification that follows. Aristotle says:

Or perhaps it is not impossible for the same differentia to be used of two genera neither of which contains the other, and we ought to add 'if they do not both fall under the same genus'. Thus terrestrial animal and winged animal are genera neither of which contains the other, and biped is a differentia of both. So we ought to add 'if they do not both fall under the same genus'; for both these are subordinate to animal. From this possibility, that the same differentia may be used

¹⁷ *Top* 144b12-16

of two genera neither of which contains the other, it is clear also that there is no necessity for the differentia to carry with it every appropriate genus, but only the one or the other together with the genera that are higher than this, as biped carries with it either winged or terrestrial animal.¹⁸

There will be more to say about this later, but for now all we need to see is that the immediately prior endorsement of LD is not being taken back but rather qualified even if it will be hard to follow Aristotle's reasoning here.

The difference under consideration is "biped" and the two genera are "terrestrial animal" and "winged animal." There are both winged animals and terrestrial animals that are bipedal, and neither of these two genera are subordinate to one another. But this happens because both of these genera are subordinate to the common genus of animal. Aristotle says that we should now see that this shows there is no necessity why a difference should "carry with it every appropriate genus, but only the one or the other together with the genera that are higher than this, as biped carries with it either winged or terrestrial animal." Though Aristotle is trying to maintain a way in which the difference can be said to import and so entail a given genus, there is something to notice here. It is not clear how we would be able to distinguish between genera and differences if we allow that a single difference D can import the disjunction of genera G_1 or G_2 as Aristotle claims. Why not think that what is D in the above will actually be more like a genus, and G_1 and G_2 will be more like differences?¹⁹ For if we are still holding to LD in the

¹⁸ *Top* 144b16-30

¹⁹ One could be inclined here to say that a term is determined to be a genus not in virtue of having a greater extension than some other term it subsumes, but rather by the ontological nature of the items included under it just insofar as they are included. One might cite the fact that a genus term should only be predicated of species or individuals just as they are substantial. However, in the present case of "winged animal," "terrestrial animal," and "biped" it is unclear why in light of such

passage, then a genus will have coordinate differences each of which entails the genus. However, here the genus will only entail the entire disjunction of every possible difference for it, but not any one in particular.²⁰

At any rate, the *Topics* expresses both LI and LD sentiments, and this occurs within a single chapter. This inconsistency occurs elsewhere. Consider *Met* B.3.²¹

Aristotle says:

But it is not possible that either unity or being should be a genus of things; for the differentiae of any genus must each of them both have being and be one, but it is not possible for the genus to be predicated of the differentiae taken apart from the species (any more than for the species of the genus to be predicated of the proper differentiae of the genus); so that if unity or being is a genus, no differentia will either be one or have being.²²

The reason why being or unity cannot be genera is that no genus can be said of its difference as such. Hence, were being to be a genus, we could not differentiate it by something that had being, for then being would be said of the difference. But then a harsh monism would follow, for the only candidate left to differentiate being into beings would

considerations any one has more right than another to be considered a genus term. Perhaps the addition of “animal” in the first two makes the difference, but then, why not just add animal to “biped”?

²⁰ This might make us see the passage as something of a mix between LI and LD. Even if the only reason why a difference like “bipedal” can cut out logical space in the classes “terrestrial animal” and “winged animal” is because both are subsumed under one and the same higher class, “animal,” nonetheless, the LI sentiment here is clear. For it will not hold that if an individual is bipedal, then that same individual must be winged, for instance. In virtue of a thing’s being bipedal, it is only contingent that it be winged or terrestrial. This seems to display the LI view. However, in virtue of a thing’s being bipedal, it does seem necessary that it be animal. This seems to display the LD view.

²¹ The most obvious reading of *Beta* is to take it dialectically. This works fine for my present purposes. All I am after is exhibiting various instances where LI and LD sentiments are expressed. Moreover, the fact of *Metaphysics* likely being an amalgam of other works does not detract from the point that LI and LD sentiments are being expressed.

²² *Met* 998b22-27

be various kinds of non-being. At any rate, all I wish to point out here is that a way of understanding the argument works by relying on an LI sentiment.²³ That is, one can read this passage as presuming that whatever differentiates a genus must be some term that does not entail the genus.

Later in *Met Z*.12 we get a strong endorsement of LD. Aristotle says:

If then the genus absolutely does not exist apart from the species which it as genus includes, or if it exists but exists as matter (for the voice is genus and matter, but its differentiae make the species, i.e. the letters, out of it), clearly the definition is the formula which comprises the differentiae.²⁴

The point here is that the genus will exist only through its species which are determined by divisions that the differentiae carve out of the genus. Thus, the genus has reality only through all its differentiae. Aristotle says concerning the division of being-footed, "we must divide it into cloven-footed or not-cloven; for these are differentiae in the foot; cloven footedness is a form of footedness."²⁵ Notice how a differentiating term will entail the more generic term it differentiates when the differentiating term is appropriately chosen. The difference is appropriately chosen when it could only be a difference of the more generic term. Hence, LD is being supported here; the difference will entail the genus since it specifies it in the right way.

²³ Though it is clear here in this apparently dialectical passage that Aristotle is rejecting the predication of either the genus or difference of one another, there are at least two ways to understand the reason for this rejection. We may think that Aristotle has in mind the passage from *Topics* IV that endorses LI as I interpreted it; that is, the sets defined by the difference and genus of the same species are neither proper subsets of one another. On the other hand, and also as Aquinas suggests in his commentary on the passage, we might say that the predicating of a genus of its difference is unnatural. These two takes are not unrelated, but it is enough to flag them for now.

²⁴ *Met* 1038a6-9

²⁵ *Met* 1038a15-16

Posterior Analytics shows support for LD. Aristotle says in *APo* II.13:

To establish a definition through divisions, one must aim for three things—
grasping what is predicated in what the thing is, ordering these as first or second,
and ensuring that these are all there are.²⁶

What we are given here is a threefold checklist²⁷ for arriving at a definition via divisions.

In elaborating the second item on the list he says:

[O]rdering them as one should will be achieved if you take the first term; and this
will be achieved by taking the one which follows all the others but is not followed
by them all (for of necessity there will be some such term). And when this is
taken the same now goes for the lower terms; for second will be that which is first
of the others, and third that which is first of the next; for if the upmost one is
abstracted, the next will be first of the others. And similarly in the other cases
too.²⁸

First, to get clear on what "follows" means, take two terms A and B. B follows A
provided that for every x, if Ax then Bx. In other words, the class defined by A is a
subclass of the class defined by B. So suppose that all the terms involved in the definition
for a given substance s are X, Y, and Z. We locate the term that follows the rest. Suppose
this is Z. According to the passage, X will not follow Z, and Y will not follow Z. After
we find Z, we remove it from our list of terms, and we then consider the new list (X and
Y) in order to determine what remaining term follows all the rest of the remaining terms.

²⁶ *APo* 97a24-26

²⁷ It is not clear if this is a list of necessary conditions only or a list that is jointly sufficient, or what exactly. So, by "checklist" I am being agnostic with respect to these options.

²⁸ *APo* 97a29-34

Suppose this is Y. We will repeat this until we end up with a list that is comprised of a single term. In the case of the present example, this term will be X.

So, for any set of terms whose members are identical to all and only those terms involved in the account of the definition of a given substance s , call this set $\$(s)$, there is a kind of ordering defined by the relation "follows." Where the "follows" relation serves as the link in our chain, we will get a linear chain starting from a term D_n that follows no other term in $\$(s)$. Then we have the next term that follows only D_n but no other terms in $\$(s)$. We will wind up on the other end of the chain with a term followed by no other but following every other term.

What Aristotle says next in the following paragraph is sufficient to show that the view entails LD. He says:

And that these are all there are is evident; for you assume of the first term in the division that every animal is either this or this, and that this belongs to it, and again you take the differentia of this whole, and you assume that there is no further differentia of the final whole—or that straightaway after the final differentia this no longer differs in species from the complex.²⁹

When we start from "animal" we are beginning from the term that is to follow all the rest. Next, we make a first division of "animal." Once we get this division, suppose it to be "mammalian and non-mammalian," we now have our term mammalian that follows all the terms in $\$(s)$ but animal. This new term, mammalian, will constitute a sort of whole as taken together with the term that it divides. Aristotle says we do this with each resulting whole until we arrive at the differentia that "no longer differs in species from

²⁹ *APo* 97 a35-b2

the complex." Remember, due to the nature of the "follows" relation, the final term that follows no others will entail all the rest. Each differentia will entail all higher divisions contained within the whole it divides, and so the final differentia will entail all other terms involved in the definition of the substance, including the first term that would be the genus. The fact that every differentia entails the genus shows that this view is LD.

1.2.2 Efficiency and Terminological Complexity

1.2.2.1 Single Specific Difference with a Single Genus (SDSG)

So far we have only considered how in some places Aristotle endorses LI while in others LD. In *Met Z.12*, the final specific difference entailed all the others, just as in *APo* 97a29 every term in the definition followed the very last difference. In both cases, if we take the final difference, we have a single specific difference dividing a single genus, and the relationship between the two is that of LD. The passage at *Top* 144 a27 endorses LI, but it was similar to the *Met Z.12* passage and the *APo* II.13 passage just cited above in that it too conceived of the essence as the conjunction of a single genus and single specific difference arrived at after all the preceding cuts of the non-final differences.

This is what is apparently the case in these sections, but it gets complicated once we introduce the issue of efficiency. Consider the account from *Met Z.12*. Aristotle had wanted to exclude all the intermediary classes between the first genus and final difference from appearing in the definition. But why should one exclude all the intermediary differentia or intermediary genera? One reason might be that Aristotle has the notion of a logically efficient version of an essence here. Since the differentiation accomplished by

all the differentiae together is achieved by the final difference, then the final difference is the only one that need be mentioned.

There is a problem here though. In the context of *Met Z.12* which endorses LD, should not the genus itself be excluded from the essence on the basis of logical efficiency? Remember, the specific difference entails the genus on LD. Aristotle himself, by the end of *Met Z.12* appears to recognize this. He says, “Therefore it is plain that the definition is the formula which contains the differentiae, or, according to the right method, the last of these.”³⁰ A single, final difference is what Aristotle is claiming is the definition. Thus, if one is holding on to logical efficiency, there is no reason to include the genus in the essence any more than the intermediary classes. All that information can be analyzed from the final specific difference by observing the various entailment relations.

An exegetical way to resist this conclusion here is by observing that Aristotle had set out to solve the issue of a definition’s unity in this section. There would be no problem at all that needed to be solved if definitions were each comprised of only a single term. Thus, when Aristotle says that a definition is the formula containing the last of the differences, he must only be excluding the intermediary classes between the first genus and last difference, but he is *not* excluding the first genus itself. Even if this holds for the text in question, it still does not answer why on the logically efficient model of an essence (the model apparently endorsed by this text) one should even include the genus at all provided we buy LD. After all, we could just say that Aristotle was right to see the

³⁰ *Met* 1038a30-31

entailment relation between the genus and specific difference but failed to see that this completely eliminates any sense of terminological multiplicity.

1.2.2.2 Single Specific Difference and Multiple Genera (SDMG)

Consider what could happen if we brought the notion of explanatory efficiency to bear on *Met Z.12*. If, following Aristotle in *Met Z.12*, we were to use the word “genera” to refer to all the intermediary classes occurring between the first genus and final specific difference, and it turned out that for some species some of these intermediary classes were needed as descriptions of the species to secure explanations, then we would have an essence where the specific difference was a single term, and yet the genus would have several terms. Admittedly, the genera here would all be entailed by the specific difference, and each genus, except for the most universal, would entail all the other genera. That is to say, the genera are not logically independent of one another or the specific difference. Nonetheless, there could still be a reason to include them all given explanatory efficiency and Aristotle’s view that explanations must be at the correct level of generality to fit with what they explain.³¹

³¹ At the outset of chapter 5 of *Posterior Analytics*, Aristotle observes how we can be mistaken in thinking we have proven a feature to hold primitively and universally. His example of isosceles illustrates the point. One could prove that isosceles triangles are equal to two right angles. However, it is not *because* an isosceles triangle is isosceles that it is equal to two right angles; rather, it is *because* an isosceles triangle is a triangle that it is equal to two right angles. Explaining why the isosceles equals two right angles will require recognizing a more generic class of which it is a particular form. Applying this to the case of Zeta 12, granting an essence is to provide all the characterizations of the species in question for the sake of explanation, we can see why the final difference will not be enough. There will be things about the species that can only be properly explained when we characterize them at a level of generality that is of greater extension than the final difference, which is coextensive with the species. See *Apo* 74a5-18.

1.2.2.3 Multiple Specific Difference and Single Genus (MDSG)

In the same way, and also following Aristotle in *Met Z.12*, we could use the term “differentiae” to refer to all the intermediary classes occurring between the first genus and final specific difference. Thus, provided we hold on to explanatory efficiency when it comes to an essence, we would have an essence where there would be several terms making up the specific difference and yet one genus. However, this would still be a story where the final specific difference entailed all the others. In other words, no term in the essence would be logically independent of any other.

We can find a very unusual case in Aristotle where there is a single genus for the essence combined with multiple differences as the specific difference, and all these differences are logically independent of one another even though each difference entails the genus. In *APo* II.13 Aristotle says, "let us now say how one should hunt out what is predicated in what a thing is."³² So we are going to be told how to find the terms that are in the essence of a thing.³³ Aristotle continues, "Well, of the things which belong always to something, some extend further—yet not outside its genus. (I say they belong further if they belong to the thing universally but also belong to something else.)"³⁴ There are predicates P in the definition of a substance S that also belong to other things that are not X (this is why he says they extend further), and anything having P predicated of it will also have the genus G of S predicated of it. Then he says, "Well, such things must be taken up to the first point at which just so many are taken that each will belong further

³² *APo* 96a23

³³ There may be reasons here to think that the following definitions are not of substances, but rather of "derived" secondary entities.

³⁴ *APo* 96a24-26

but all of them together will not belong further; for necessarily this will be the substance of the object."³⁵ What Aristotle means here by "such things" are those predicates that individually taken have an extension that outstrips the things that are instances of substance S and yet do not fall outside the range of the predicate that is the genus. He claims that the conjunction of all these predicates together will not outstrip the substance S. Such a conjunction, presumably taken together with the genus, will be the definition of the substance S.

Let us lay this out with a bit more detail. Once again, we will let $\$(S)$ stand for the set of all and only those terms contained in the essence of substance S. There will exist a unique term in $\$(S)$, call it G for genus, such that for any D_i in $\$(S)$, G follows D_i . So far this appears to be in harmony with the subsequent portions of this chapter that express LD sentiments. However, there is something different in that we will need the entire conjunction of all D_i in order to define the substance S. On the view that the entire conjunction of all the differentiae defines the substance S, it must hold that for any pair of distinct differentiae, D_i and D_j , that D_i is logically independent of D_j , when D_i and D_j fall under a *single* genus.

Here is why. According to the passage we gather that the conjunction of terms $D_1 \& \dots \& D_n$ defines S. A further assumption of the passage is that no conjunction derived from a proper subset of $\{D_1, \dots, D_n\}$ will define S; call this the minimalist assumption. Take the conjunction of all terms in $\{D_1, \dots, D_n\}$ but D_j . Call this conjunction Q. Now, neither Q follows D_j nor D_j follows Q. For if Q followed D_j or D_j followed Q, then D_j alone would be sufficient to define s, or Q alone would be sufficient to define S. But

³⁵ *APo* 96a33-34

because D_j and Q are both proper subsets of $\{D_1, \dots, D_n\}$, this would contradict the minimalist assumption. Therefore, as stated, Q does not follow D_j and D_j does not follow Q . As D_j was arbitrarily selected, the same will hold no matter what term from $\{D_1, \dots, D_n\}$ we let play the role of D_j in the preceding. Hence, no term from $\{D_1, \dots, D_n\}$ follows any other, and so every term D_j in $\{D_1, \dots, D_n\}$ is logically independent from every distinct term D_i .

There is something else worth noting here. On one conception of division, coordinate divisions in the same genus must exclude one another.³⁶ As we've just seen, there are Aristotelian cases where this is not enforced; however, consider the nature of such genera that admit of differentiae all of the same species and have some logical space in common but some logical space distinct from one another. It is easy to obtain mathematical examples here; for instance, consider the set {odd, prime, less than 4}. Each of the terms is 1) logically independent of one another, 2) each is presumably contained in some way within the genus of "number," 3) each of these terms or pair of these terms has an extension wider than the number three, and 4) jointly there is only one number that is picked out by those terms: three. Still, numbers are not instances of substances. Are there any reasons to be worried that such examples would be hard to come by in say an Aristotelian biological context? Or, to put it another way, is there any reason to expect that biological divisions with respect to a single genus should be mutually exclusive of one another?³⁷

³⁶ This is the conception of division where a difference is something like a determinate of the relatively determinable generic class that it differentiates. In subsequent chapters I will consider the determination relation in detail.

³⁷ As we will see, *Parts of Animals* affirms that there are multiple differences that together constitute the specific difference for any given species, and yet no two distinct species have any single

1.2.2.4 Multiple Specific Differences and Multiple Genera (MDMG)

In *Parts of Animals*, we find evidence that Aristotle gives up on the idea of definitions by divisions with respect to a single genus. Aristotle raises several difficulties for the method of dichotomous or bipartite division as a path to definitions, and we will have occasion to consider these all in full. However, the worst problem for the method is fairly simple. He says:

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 one such division. So it is impossible for those who divide in two to grasp any of the particular animals.³⁸

Whether or not the story from *Met Z.12* or *APo II.13 97a24-b2* is of necessity committed to the bipartite method of division, both seem to be committed to the idea that a single specific difference (the final one) for a single genus will yield the definition of a substance. As we already saw, Aristotle says in *Met Z.12*, "Therefore it is plain that the definition is the formula which contains the differentiae, or, according to the right method, the last of these."³⁹ And there does not seem to be a reason why the story from *APo II.13 97a24-b2* should be opposed to this conclusion from Zeta. However, the

difference in common let alone the entire specific difference. Thus, any final division of a genus must correspond to one and only one species.

³⁸ *PA* 1.3 (644a5-11)

³⁹ *Met* 1038a30-31

passage from *Parts of Animals* is rejecting that a single specific difference is sufficient for definitions. Since we have seen that Aristotle has an idea of a definition where the specific difference is comprised of several differences all with respect to the *same* genus, then just because Aristotle rejects that definitions could be obtained where the specific difference is only a single difference, it does not at once follow by that fact that he rejects that each definition will have a single genus. We need to dig a bit more to see why he will be rejecting the idea of a single genus for a definition in *Parts of Animals*.

To start the digging, notice that a different emphasis for definitions is found here than was made explicit in any of the preceding passages. Aristotle said that if mankind were nothing more than a split-footed animal, that split-footed would duly represent mankind's essence. He did not say that the terms would be sufficient for the definition provided that mankind were the *only* split-footed animal, but presumably this is all that Aristotle would have needed to observe if the shortcoming he had in mind were that the proposed definition failed to express a set of terms which together was unique to mankind. Instead the emphasis is on the fact that there is much more to the essence of mankind than to be split-footed. That is to say, we are seeing an implicit emphasis on an explanatorily efficient notion of essence.

Earlier in *Parts of Animals* he says:

Now if it is by virtue of its configuration and colour that each of the animals and their parts is what is, Democritus might be speaking correctly; for he appears to assume this. Note that he says it is clear to everyone what sort of thing a human being is in respect of shape, since it is known by way of its figure and its colour. And yet though the configuration of a corpse has the same shape, it is

nevertheless *not* a human being. And further, it is impossible for something in any condition whatsoever, such as bronze or wooden, to be a hand, except homonymously (like a doctor in a picture). For such a hand will not be able to do its work, just as stone flutes will not be able to do theirs and the doctor in the picture his. Likewise none of the parts of a corpse is any longer such – I mean, for example, any longer an eye or a hand.⁴⁰

The definition that is just a list of configuration of parts or colors of a species is to the real definition that Aristotle is seeking what a pictorial representation of being a doctor is to the real account that a doctor could offer. The first account deals in semblance; the second deals with substance. Aristotle says:

It is clear, then, that these natural philosophers speak incorrectly. Clearly, 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 a bed.⁴¹

The true method of definition will provide the characters that distinguish the animal, but those characters must also be ones that have explanatory power for the animal as well. As we will see, this explanatory power of the definition consists, at least in part, in the capacity to obtain an account of why an animal has the parts it does in connection to its *work*.

The case of the saw example is particularly helpful in showing this connection between the explanation of a part and the work thereof.

⁴⁰ PA 640b30-641a5

⁴¹ PA 641 a14-17

Since every instrument is for the sake of something, and each of the parts of the body is for the sake of something, and what they are for the sake of is 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 sake of the functions in relation to which each of them has naturally developed.⁴²

Couches can be counted as instruments as much as saws, so the point that is made here about the relationship between a function (*ergon*) and the part(s) discharging that function holds for the preceding case that touched on the definition of substances. A function is the *telos* of the part; the part is not the *telos* of the function.

An artifact like a saw is a complex of parts; there is a handle, a serrated edge to its blade, etc. Each of these parts is for the sake of a specific function; the handle allows one to grip the saw and move it, the serrated edge achieves the kind of cutting proper to a saw, etc. All of these particular functions of the parts of the saw are for the sake of achieving the total function of sawing, and so the parts really are for the sake of the total function of sawing. Granting the analogy between natural substances and artifacts, we see that the entire body of a substance is at work as a complex function. It is complex because there are several bodily members which all perform their own function, but it is the total function, which is the function of the whole body, a certain complete action as Aristotle also calls it.

⁴² PA 645b15-20

Going back to the example of "split-footed," walking as a split-footed being does is only one single function that a man has. So, the total function of the whole body (disregarding how the presence of rationality will complicate the situation) will not be exhausted just by the account of a prominent organ involved in walking. There will clearly be others as well. Moreover, these parts as realized in various species are themselves different. Aristotle says:

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.⁴³

So, no matter how identical a given part is under a generic style description in two individuals of distinct species, the part must really be different just in virtue of its being realized in two different species. Though birds and men are both footed, they have a particular kind of footedness in both cases. This also would hold for their blood, provided that it is in their substantial being.

In the second quote, Aristotle says:

Therefore one should first discuss the actions – those common to all, those according to kind, and those according to form. I call ‘common’ those that belong to all the animals, and ‘according to kind’ those whose differences from each other we see in degree; for example, I speak of bird ‘according to kind’, but I

⁴³ *PA* 643a1-4

...speak of mankind and everything without any difference according to its general account, 'according to form'⁴⁴

The word Lennox translates as "kind" here is "*genos*." As I've done before now, I'll translate it as "genus." Notice how there are functions that belong to a genus.⁴⁵ Bird is given as the example. Now, is bird simple or complex? Surely every bird has feathers and feet. Aristotle says:

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 affections too in the same way).⁴⁶

To repeat, feet and feathers are assuredly attributes that the genus "bird" possesses, and Aristotle recognizes these as legitimate attributes had in common between groups. But recall that there was a specification of foot that men had as well. Thus, specification of a class "footed" does not necessarily amount to a partial specification of the genus bird. There are more footed things than birds, so there are specific ways of having feet that correspond to no bird. Still, footed is part of the genus bird. We might specify how something is footed and thereby specify, in part, the genus bird; however, we might be specifying the kind of four-footedness found in some live bearing animals.

⁴⁴ PA 645b21-25

⁴⁵ Let me emphasize once again that, in general, I don't assume Aristotle means anything more by genus than a class that is more general than another, or even just a synonym for class. But in the context of the remarks under consideration it is clear genus *can* mean more. Aristotle is clearly using genus in a way that picks out a fairly definite place in relation to other classes. This genus under consideration is bird.

⁴⁶ PA 645b1-5

Just as a case can be made for an Aristotelian notion of a specific difference where the specific difference is comprised of several differences, so too we could take these above points and make a case for a corresponding account of the genus. That is to say, a genus, like bird for instance, really is a concatenation of several generic classes. These generic classes can be combined with certain other such classes, and one would have a new genus it seems. For instance, footed combined with things like feathered, beaked, etc. would identify generic classes that all go into the genus bird. But footed might equally well go into a genus that contains species like dogs, cows, etc.

1.3 Evaluating the Options

What I want to present briefly now are some Aristotelian desiderata that are affected for better or worse by a decision concerning the above options. After elaborating each desideratum, I will consider how the various options fare in terms of satisfying or frustrating those desiderata. In finding an interpretive solution I will assume that the solution ought to allow us to satisfy all desiderata if possible. So, my method is both exegetical and philosophical. It is exegetical insofar as I introduce the main interpretive options by a consideration of the Aristotelian texts and the following desiderata are all to be derived from Aristotelian texts. However, my method also involves philosophical analysis insofar as the correct interpretive option is to be decided upon through a consideration of what interpretive option will allow us to maintain the desiderata.

1.3.1 Pros and Cons for Each Solution in Light of the Desiderata

1.3.1.1 Unity of Definition

From places like Z.12 of the *Metaphysics*, we gather that, for Aristotle, a definition of a substance should be unified in a very strong way. Aristotle allows that there are other sorts of definitions than those for substances; however, only the definitions of substances will be a unity in a strong sense. For this strong sense of unity to be obtained, the specific difference must entail the genus. Of course, as *Met Z.12* was one of the passages we cited for the sake of showing evidence of LD, it is little surprise that LD as such will work well to meet the desideratum of the unity of definition. LI will fail because the unity that a definition has under the LI account comes down to the brute fact of conjunction. With LD once we have the specific difference, we already have the genus. However, with LI one would no more be able to infer the genus of substance *s* in virtue of knowing the specific difference of *s* than one would be able to guess what number *x* is on the basis that it is divisible by four.

The story is less clear at the moment on how MDSG, SDMG, and MDMG weigh in on the problem of a definition's unity. However, it certainly seems to be the case that all three would fare poorly here. On the version of MDSG that we saw when considering *APo* 96a33-34, even if each difference in the specific difference entails the genus, the problem is that each such difference is logically contingent with respect to one another. So, if the whole reason LI fares poorly is due to items in the definition being logically contingent with respect to one another, then MDSG must fare poorly too.

With MDMG it may be the case that a LD style story can be told for the relation between a single difference from the specific difference and a single generic class from

the full genus. For instance, "human foot" might have a LD style relation to "foot," and in general, "human X" might have a LD style relation to "X." However, the same problem that faced MDSG here is going to face MDMG. How are all the differences making up a specific difference to be understood as a unity? It looks like the relation among these differences would merely be one of logical contingency. If this is all there is to the story, then MDMG fares poorly here too. So, in turn, the SDSG account seems to fare better. It seems the only versions of multiplicity that could be allowed would be those where the LD story like we get from *Met Z.12* could reduce the multiplicity down to a single term that entails all the rest. Thus, assuming that there must be some sense of LI obtaining in a legitimately multiple specific difference or genus, it would seem the unity desideratum cannot be satisfied.

In summary, the LD account along with a rejection of plurality in either the genus or specific difference, SDSG, seems to be the apparent way to go to meet the desideratum of having a strong sense of unity for definitions. LD is better than LI because LD eliminates the kind of logical contingency that LI admits. SDSG seems to be better because it holds there to be only a single term that is the specific difference and some other single term that is the genus. Thus, the apparently logical contingency that results from a true plurality of terms in the genus and specific difference on MDMG or even just the specific difference on MDSG is avoided.

With respect to efficiency, nothing seems to be decided just with respect to the desideratum of definitional unity. It seems that a logically efficient account of an essence coupled with LD and SDSG would satisfy the unity requirement. It is harder to see how the explanatorily efficient model would work with LD and SDSG for the mere fact that

such a thin essence would not seem to explain all that an essence ought to be able to explain according to the explanatorily efficient model.

1.3.1.2 Explanatory Power

Nonetheless, and as we gather from *Posterior Analytics*,⁴⁷ the definition of a substance, which is of course to say the essence of the substance, is explanatorily basic. By reference to the essence of a given substance we ought to be able to explain other features of the substance. However, the essence itself is explanatorily basic. Here is a simple example. Suppose that "dog" is the species under consideration and that "mammal" is part of the essence of dog. Suppose there is a feature F that every dog has, and that F belongs to mammal per se. We can now offer an explanation as to why any given dog has F by referencing that dogs are mammals essentially, but we cannot offer explanations for why dogs are mammals. This is a case in point of what it means to say that essential features of a substance are explanatorily basic. There are at least two component desiderata built into that of explanatory power.

On the one hand, we ought to be able in principle to explain all the necessary propria a given substance has by reference to the essence. If our account of what an essence is prevents us in advance from being able to do this for particular substances, then this counts against such an account. Therefore, any other proposition that entails such a shortcoming in the essence will likewise count against that proposition. Call this desideratum explanatory complexity for short.

⁴⁷ *Apo* II.1-2 & 8-10

On the other hand, there is a distinction between the nature of explanations available for features holding of substances and say features holding of interactions between substances. Indeed, it does not seem that we should count explanations of interactions between substances as proper explanations, but rather it seems we should count these as secondary explanations that are to be derived from the primary kinds of explanations that pertain to features of single substances. For instance, say we want to explain the event type "a tiger preys upon a deer." Here is a mock explanation:

All tigers have features xyz, and we can explain these features in virtue of the tiger's essence. Features xyz entail the capacity to kill substances having the features abc, and features xyz entail that the consumption of the meat of substances abc is the kind of prey for whatever has xyz. Now, all deer have features abc, and we can explain these features in virtue of the deer's essence.

Notice that such event types are contingent. Tigers are linked to deer only in virtue of the link between xyz and abc. Though tigers necessarily have features xyz, other things will too. Though deer necessarily have features abc, other things will too. So other things than tigers could eat deer, and tigers could eat other things than deer. However, it is necessary that a tiger have features xyz, and so necessary that a tiger eat things that are abc. And, it is necessary that a deer have features abc, and so is edible by things having features xyz. So then, the possibility of such interactions between particular substances of different species appears to be entailed by the essences of the different species; however, the actuality of such interaction between particular substances of different species is not

entailed. This is decidedly different when we are talking about the explanation of a tiger having features xyz; every tiger must actually have those features.⁴⁸

Now, why will tigers having features xyz be necessary, supposing that xyz is some combination of features, so that the explanation that tigers have features xyz counts as an explanation proper? Presumably it will be because these complex features get explained on the basis of essential features of the tiger that are of necessity found together. To illustrate this point, let me first show what would happen if such essential features are not of necessity found together. Suppose the essential features of a substance s are x'y'z', and s has features xyz. x' explains why s has x, y' explains why s has y, and z' explains why s has z. Now, this will require that x' entail x, y' entail y, and z' entail z. Now if the fact that substance s is x' is logically independent of its being either y' or z', then fact that substance s is xyz is ultimately contingent in the manner of our above explanation of the event type. One may even go so far now as to say that the fact of s being x is itself contingent. The reason why is because it is now an open question as to what allegedly essential feature should be considered the core of s. Again, suppose we want to say that it is the conjunction x'y'z' that is the essential core of s; the problem is that there is no entailment relation shared among the conjuncts. Thus, the conjunctive core turns out to be contingent as the several conjuncts comprising the core are only contingently unified. Substance s would then turn out to have the same sort of unity as the accidental interaction between two substances.

What would need to obtain in order to preserve explanations for features of s is that somehow x', y', and z' all entailed one another. How this is going to happen is not

⁴⁸ I am not considering at the moment deformities at birth or mutilations.

clear at the moment, but we can at least see this is necessary to preserve the explanations being about some, one substance. Call this desideratum explanatory unity for short. If an account about the essence as such prevents us from enjoying explanatory unity, then we have reason to reject such an account. Likewise, if any other proposition prevents us from enjoying explanatory unity, then we have reason to reject this proposition.

As should be obvious, this settles matters when it comes to the question of logical versus explanatory efficiency. Clearly, the notion of an essence Aristotle has is one of explanatory efficiency. But how do LI, LD, SDSG, MDSG, SDMG and MDMG stand with respect to the desiderata of explanatory complexity and unity? Beginning at one pole, we can see that an LD and SDSG perspective as is reflected in Z.12 and elsewhere would do very well to satisfy explanatory unity. But it does this in a sort of degenerate way. Since the specific difference will really entail all the higher classes, then the definition of a substance on Z.12's version of the LD story that accepts SDSG amounts to one term. All the terms in the essence are logically dependent. This highlights how poorly an SDSG version of LD will do with respect to explanatory complexity. One term has got to explain all the necessary propria of a given substance, and anything else that an essence ought to explain. This seems to just be impossible.

Suppose for the moment that a blue jay essentially has a blue jay beak. How will this entail something about the shape of its skull? According to the sorts of divisions that Aristotle lays out in Z.12, it would seem that there is one unique linear chain of classes that terminates at "blue jay beak," and there is one unique linear chain of classes that terminates at "blue jay skull." The same would go for every other such essential blue jay feature. To use an image, the only way we would get from one such chain to another

would be by swinging and jumping; the chains are independent of one another in logical space. Thus, the only reason why a SDSG version of LD, like the account in *Z.12*, is so successful at satisfying explanatory unity is because it is so poor at satisfying explanatory complexity. It might be that the *Z.12* method allows us to arrive at a necessary and sufficient condition for a substance, provided that every specifically described part of a given substance occurs only in that substance. However, this alone is not enough for someone whose notion of an essence is one of explanatory efficiency and in the twofold way described. Now, this does not immediately rule out LD. However, if we are to hold on to LD, we need a version that satisfies explanatory complexity and unity. So, we must give up SDSG, but once we do this, it isn't clear how we are to have LD be satisfied when we adopt MDSG, SDMG or MDMG. That is, it isn't clear when the multiplicity is legitimate multiplicity that does not just reduce itself to a single term as we find in the *Met Z.12*.

LI is going to fare poorly with respect to explanatory unity no matter if we have one genus and specific difference, or several; LI just holds that the relation between the genus and specific difference is contingent. One might wonder if we could then just drop the genus for instance, but that will not do. On LI, the genus and the specific difference are only jointly sufficient to define the substance. Leaving the obvious negative aside, LI might seem more capable of getting past the complexity hurdle, but this would need to be a version that was committed either to MDSG or MDMG.⁴⁹ To see why, go back to the case of the blue jay beak. There are surely several other differences that are needed than

⁴⁹ Notice I am leaving out the mention of SDMG as this only was possible in terms of the *Met Z.12* story where the multiplicity was only apparent insofar as all terms were logically dependent upon one another. For both MDSG and MDMG there are stories in the Aristotelian texts where the multiplicity is not just reducible to a single term.

this. Once one includes these differences, then we would apparently be into a legitimate version⁵⁰ of MDSG or MDMG, and so we would get the logical contingency infecting the relation between all the differences and the relation between each difference to the genus.

As already pointed out above, MDMG and MDSG appear to speak better to explanatory complexity, and MDMG better than MDSG. However, both seem to fare poorly concerning explanatory unity, and MDMG worse than MDSG. The reason why is that both involve an apparently logically contingent relationship between all the differences that would make up the specific difference, but MDMG repeats this at the generic level as well through its plurality of genera. Even though each difference might entail its respective genus, all the genera appear to only be contingently related to one another. Since it is clear, though, that only a complex of essential features will be able to satisfy explanatory complexity, then one of these will be the only way to go. So SDSG must be ruled out.

1.3.1.3 Matter/Form, Genus/Difference Isomorphism

Aristotle would seem to suggest some kind of an isomorphism between the parts of the substance and the parts of the definition of the substance.⁵¹ The details of this account are hard to spell out without going into considerable detail. One might think that the genus of the definition somehow corresponds to matter, and that the specific difference to form. However, the point for now is just that it seems clear some kind of

⁵⁰ Again, by "legitimate" I mean to indicate the multiplicity is not reducible to a single term.

⁵¹ Consider places like Zeta 12 where Aristotle says the final difference (*teleutaia diphora*) of the process of division will correspond to the form (*eidos*) and being (*ousia*), and that the genus (*genos*) exists but only as matter (*hylê*). See *Met* 1038a6 and 1038a26-27. Also, the beginning of Zeta 10 seems to introduce such an isomorphism as well. See *Met* 1034b20-22.

relationship between the parts of the substance and the definition obtain. Indeed, in places like Zeta 12 or Eta 6, this seems to be used, more or less explicitly, as a means to answer the question of a definition's unity. Zeta 12 and Eta 6 both, though in different ways, think of the unity of form and matter as somehow similar to that of the specific difference and genus.

How do LI, LD, SDSG, MDSG, or MDMG stand in light of this isomorphism? LD in tandem with SDSG seems the best candidate at a glance. First, LD just states that there is such an entailment relation between the specific difference and genus, and this is one of the relations we need to even start observing the above isomorphism. If we assume that the form of a substance is to be denoted by a single term and the matter is to be denoted by a single term, then SDSG is the natural choice. It almost goes without saying that LI will fail to maintain the isomorphism. However, one may contend that some other complex logical relationship could be maintained in place of entailment in the above isomorphism. Nonetheless, it is not clear what that relation could be given that LI is just the commitment to the logical independence of the genus and specific difference.

What about MDSG and MDMG? Right now, it seems all there is to say is that if either of these would work, we would have to reject the assumption that the matter or the form of a substance could be denoted by a single term. This might be correct if it should turn out that an animal is comprised, in its substance, of several kinds of material stuffs.

Finally, the explanatory as opposed to logically efficient account of an essence would seem to fare better in light of this isomorphism. Granted that all animals are to be comprised of material parts that reduce to the four elements ultimately, and even before

that there will be uniform parts like bone, blood, etc. that they have in common,⁵² then a logically efficient version of the essence would not have terms in it that pick out such non-peculiar features. However, it is sensible to expect that an explanatorily efficient essence would have to pick out just such features. This is good given that we already discovered in light of the desideratum concerning explanatory power that Aristotle must ultimately have in mind an explanatorily efficient notion of the essence.

1.3.2 Summary of the Pros and Cons

With respect to LD and LI, LD is a better choice. LD fares well when it comes to the unity of definition and LI does poorly. With respect to explanatory power, there were two dimensions proposed for consideration. For reasons of explanatory unity, LD will do well with a qualification. The only version we have of LD at the moment that is explicit in Aristotle's text is attached to SDSG. Thus, the only reason LD does well with respect to explanatory unity when paired with SDSG is because it fails miserably at meeting the desideratum of explanatory complexity. So, LD can get support in virtue of a consideration of explanatory power, provided we find a way to get an account of it up and running that is not limited to SDSG. However, LI fails the test of explanatory unity no matter how we conceive it. Even though it is not yet evident how LD will satisfy explanatory complexity, there is no reason in advance to guarantee that we cannot find a way. With LI, it is guaranteed to fail to satisfy explanatory unity. Finally, the consideration of the isomorphism between the form/matter pair and the specific

⁵² However, that is not to say that the bones, blood, etc. are realized exactly the same way in each species.

difference/genus told in favor of LD. Whatever the ideal account of the relationship between the genus and specific difference will be, provided there is some such, it ought to be LD and not LI.

Things are not as clear cut when it comes to SDSG, MDSG, and MDMG. With respect to a definition's unity, SDSG is the clear favorite since we have an explicit account of a definition's unity in Z.12 that appears to assume SDSG. That said, there is no final reason yet to rule out MDSG or MDMG on the basis of a definition needing to be unified in a very strong sense. It is just that we do not yet have any account as to how a definition could be unified provided we reject SDSG. When it comes to explanatory power, again, it seems that SDSG does well concerning unity, but it fails at complexity. It is difficult to account for how either MDSG or MDMG would satisfy the unity requirement (and MDMG seems on the surface more vexing here), but there is no reason yet to guarantee there is not an account. Moreover, both MDSG and MDMG would trump SDSG when it comes to complexity. So, either MDSG or MDMG is recommended, when it comes to explanatory power, over SDSG. SDSG leaves us with essences that are too simplistic, and there is nothing to do about that problem.

Finally, with respect to the isomorphism, SDSG with LD looks better in one respect than either MDSG or MDMG. This is because every term in the specific difference (there is only one on this view) can entail the genus, and so exhibit on the logical side of the isomorphism what is a presumed unity of form and matter. But we aren't guaranteed to be unable to find a way to incorporate either MDSG or MDMG into the solution. Moreover, given that some things like bones, blood, etc. are going to be part of the matter of animals, and it is not clear how these would entail each other along a

single linear line like would be found in an essence on a SDSG story, then MDMG would seem to be better. With MDMG the multiple materials stuffs could show up on the terminological side as multiple generic terms, though apparently logically independent of one another.

Since there are irresolvable problems for SDSG and only difficult problems for MDSG or MDMG, then we must go with either MDSG or MDMG. Again, let me point out that we have no textual basis for a kind of SDMG where the multiple genera are logically independent of one another. We only have a version where all the genera and the specific difference are ordered in a unique entailment string, such that is all genera are entailed by the single specific difference. Thus, our only version of SDMG would face the same trouble as the SDSG.

We must go with MDMG. The problem with MDSG shows up when we bring in *Parts of Animals*. Recall, according to MDSG a species is defined by the conjunction of differences that are logically contingent in relation to one another, but each difference entails the genus. Any subset of all the differences involved in the definition of a single species S could be combined with other differences not appearing in the definition of S to define another species. According to *Parts of Animals*, we get a plurality of differences by the different animal parts, and the way that any two generically identical parts appears in two different species is specifically different. So MDSG clearly is in conflict with *Parts of Animals*. To illustrate, suppose we have two different species S_1 and S_2 . Say S_1 is defined by $D_1 \& D_2$, and S_2 is defined by $D_2 \& D_3$. D_2 is identical in both cases, but according to *Parts of Animals*, this just can't be.

There might seem to be a way around this issue for MDSG that can preserve its consistency with *Parts of Animals*. Suppose there is a genus G only containing the differences D₁, D₂, D₃, and D₄, and G only has two species. S₁ is defined by D₁&D₂, and S₂ is defined by D₃&D₄. In such a case, the two different species do not have any one of the differences in common. Notice that now this will contradict the view in *APo* II.13 we are at the moment considering. According to that view, a single difference is not sufficient to define a species but rather needs to be taken in conjunction with all other differences. For given that in a single genus G only S₁ has D₃, then D₃ in conjunction with G will be sufficient to mark off S₁.⁵³

1.4 Sketch of Solution

My position is that we can maintain the unity of definition, explanatory unity and complexity, and the isomorphism between form/matter and specific difference/genus if we adopt a combination of LD, MDMG, and, of course, explanatory efficiency. To see how we can do this, let us go back to the apparent shortcoming of MDMG concerning explanatory unity. For now, let us only focus on the unity of the differences that together make up the specific difference. Suppose without argument for now that specific differences pick out the non-uniform parts of the animal under consideration.⁵⁴ If we have

⁵³ There still might be something like this story from *Apo* II.13 that can be saved. One might decide to hold on to the requirement that all the differences of a single species are logically independent, all belong to a single genus, and yet drop the requirement that any subset of those differences fails to mark off the species in logical space. This is possible; however, it will turn out that there are more generic kinds needed for the sake of explanatory practice in the biological works. Moreover, we would still need an answer as to why the several logically independent differences constitute some kind of unity.

⁵⁴ This is a very vague hint at the solution of course. We still have questions about what terms, if any, in the definition correspond to the uniform parts, the inorganic parts, the functions of groups of parts, etc. Specific differences might also pick out other parts than non-uniform ones.

a basis in Aristotle's text to invoke a kind of functionally closed teleological relationship among those parts, then we don't lose explanatory unity because the multiple differences actually constitute a unified, functional whole. Since each particular part only discharges its function in virtue of the whole function of the organism, then it should be in principle possible to trace out explanatory relations⁵⁵ that circle around when it comes to the differences. We cannot allow that one of the explanatorily primitive essential features is explained without qualification, but we can allow that there is a kind of holistic explanation for every such difference. Showing how the parts work together amounts to showing the explanatory relations among the specific differences.

There will be space ahead to work out the details more fully from both an exegetical and philosophical perspective. For now, observe the remarks Aristotle makes at the end of his lauded defense of studying biology in *Parts of Animals* I.5. He says:

If someone has considered the study of the other animals to lack value, he ought to think the same thing about himself as well; for it is impossible to look at that from which mankind has been constituted – blood, flesh, bones, blood vessels, and other such parts – without considerable disgust. Just as one who discusses the parts or equipment of anything should not be thought of as doing so in order to draw attention to the matter, nor for the sake of the matter, but rather in order to draw attention to the overall shape (e.g. to a house rather than bricks mortar, and

⁵⁵ The nature of this explanatory relation will be different from the kind of entailment we can see at work in the Zeta 12 story. Something x's belonging to a subgenus of a given genus must entail that x belongs to the genus insofar as the extension of the genus properly-include the subgenus. Thus, the kind of entailment here is one that turns on logical extension as, presumably, fixed by the kinds of terms that are the genus and subgenus. For instance, the extension of the genus "footed" is guaranteed to properly-include the subgenus "split-footed" because the phrase denoting the genus is involved in the phrase denoting the subgenus. In contrast to the Zeta 12 story, a kind of entailment that we will find among animal parts is one grounded on the notion of function and driven by teleological considerations and considerations of necessity.

timbers); likewise one should consider the discussion of nature to be referring to the composite and the overall substantial being rather than to those things which do not exist when separated from their substantial being.⁵⁶

We get a list of uniform parts at the outset, but Aristotle extends this to any part. A part of what? He refers to a part of the overall shape or total form (*holês morphês*). Then he gives the artificial example. This helps us to be sure what he means by the total form. He is not talking about how all the uniform parts make up a non-uniform part. For if he had meant that, then his artificial example would have said something like “we study the whole brick and not that of which it is composed.” So clearly, the total form is the entire functioning organism fully at work. This will include all the various non-uniform parts.

Now, notice what he says about these parts. They have no existence independent of the overall substantial being, the composite as he puts it. This composite is not some new non-uniform part; my suggestion here is that it is the functional relationship that all such parts have one to another. They have this relationship precisely through their being at work with one another as they achieve the life of the animal. It is the full, complex function as such that is the total form at work. There is no causal priority granted to one such part or another on the whole; perhaps paradoxically, it is just the whole that is independent here. Each such part considered by itself is dependent. The whole is the total form, and the work of that total form is the telos. I am understanding Aristotle's internal teleology in functionally mereological terms.

Provided that the explanatory relations follow causal relations, and the causal story for these dependent parts must be some kind of interrelated functioning that is the

⁵⁶ PA 645a 25-35

telos of the substance, then we have good grounds to expect that we can tell a story where the specific differences that identify these parts as uniquely occurring within a given species will exhibit a closure with one another under explanation. By saying closure under explanation, all I mean is that if we start at any such part described as it is specifically realized in a given animal substance, after a finite number of explanations we will end up back at that part and we will have to pass through the other parts to arrive back at the first part. This closure exhibits how the substance is a functional whole. In understanding a given substance, we hold in ourselves, though discursively and intelligibly, the same organized whole that stands materially before us as the living substance. And considering such remarks about the relationship between organized wholes and beauty, it is no wonder why Aristotle considers such a study of animals to be an experience of the beautiful.⁵⁷

So, if the several specific differences are explanatorily unified by reflecting the causal relations within the animal, the differences taken together are a unity. As for the genera in the essence, what I want to say is that we can incorporate these into the unity of the several specific differences by understanding them as determinables in relation to the determinate specific differences. A determinable has no independent existence apart from its determinates. Thus, the plurality of genera in the essence is not additional information failed to be contained in the specific differences. Zeta 12 gives us such an account, though in that passage only one such specific difference in relation to one genus is considered. This relation of determination becomes more complex. For one thing, it is not the case that there is always a neat one-to-one correspondence between a given genus and

⁵⁷ I will consider the connection between the form of the animal and beauty in chapter 6.

a difference. *Parts of Animals* gives us examples of genera that are functional relations among various types of determinate parts within different animal species.

In summary, I am grounding the unity of the definition via relation to the unity of the substance. This substantial unity is the functional whole of parts; the whole is the form and the parts are the matter. The point of contact between the definitional parts and the matter and form is the way in which the specific differences describe the animal parts as realized in a given species. Unity of function on the ontological side becomes explanatory unity on the definitional side. The functional unity grounds the explanatory unity. Finally, the determination relation between the several genera and specific differences accounts for the unity of the genera with the specific differences.

2. Intrinsically Material Animal Forms

In the last chapter we considered some various possibilities for what an essence is like according to Aristotle. These possibilities were generated by three distinctions. One distinction was that with respect to terminological complexity as I called it. The genus of an essence could either be comprised of a single term or multiple terms; likewise, a specific difference of an essence could also be comprised of a single term or multiple terms. Thus there are four possibilities total concerning terminological complexity. Another distinction concerned the logical relationship between the genus and specific difference. It might hold that the specific difference of an essence entails the genus of that essence; however, it might instead hold that the specific difference and genus of the same essence are not related via such an entailment relation. Thus we would have eight total possibilities when taking the issue of logical relationship together with terminological complexity. Finally, we could think of an essence as being all those terms that are logically necessary and sufficient for the substance of the essence, or we instead could think of the essence as being all those terms required to get us the explanations of the *propria* of the substance. Thus, from the above distinctions alone, we see that there are sixteen possible ways to understand what an essence is like for Aristotle.

As it turned out, only one of the sixteen possible options considered above will satisfy all the Aristotelian desiderata I identified. Both the genus and the specific difference must be terminologically speaking multiple, and even granting this multiplicity of terms in both the genus and specific difference, somehow the specific difference must entail the genus and in this way exhibit what I was calling logical dependence. Finally, the explanatorily efficient model of an essence as opposed to the logically efficient model

is what is to set the limitations on all that is included and all that is not included in an essence for Aristotle.

The desiderata that I claim the above three requirements will enable us to satisfy are explanatory unity/complexity, definitional unity, and the isomorphism between the ontological parts in the substance (form and matter) and the terminological parts in the essence of the substance (difference and genus). These desiderata are not atomic with respect to one another; rather, there is a way in which the satisfaction of some appears to be a precondition to satisfying others. Since what differentiates explanations of interactions between two or more substances from explanations about a single substance is the unity of the definition that is present in the case of one substance, whereas in the case of two or more the two definitions needed do not constitute such a unity, then we must first clarify how a definition is a unity in order to understand why there can be several explanations about the multiple features of a single substance. But since the general strategy Aristotle uses to account for the unity of definition invokes the isomorphism between the structure of the substance and structure of the essence, we must first get clear on this isomorphism. In particular, we have to see what this isomorphism looks like when we have terminological multiplicity in both the genus and specific difference.

Thus, in this chapter and the next, I am going to look at two key places that attempt to solve the problem of definitional unity and invoke, albeit vaguely, some notion of an isomorphism between the substance and its definition. In this chapter we will consider book Eta. To help do this, I will first consider some other places in the

metaphysics that will prepare us to approach Eta. I will then read passages from the *Parts of Animals* as filling in crucial details of the Eta account of definitional unity.

2.1 A Clue from *Metaphysics* Beta

Book Beta is surely, among other things, a warm-up for dealing with the rest of the issues in the *Metaphysics*. Though my task is not anywhere as extensive as dealing with all the issues of the *Metaphysics*, it would seem appropriate to begin by warming-up for my own small problem by touching base with Beta. This problem is whether the principles are genera or elements. In that spirit, consider this section a preliminary pass over a problem the answer to which is central for my account of Aristotelian essences. Being only a preliminary pass over the issue, keep in mind, the problem will be revisited again.

Beta is a dialectical book of the *Metaphysics* in which Aristotle lays out several of the difficulties that we must resolve in studying first philosophy. Aristotle is not merely listing problems, but he is working through the reasons for and against answers to these problems. Though we cannot take Aristotle's dialectical exercises from Beta as simply indicative of Aristotle's final say on a matter, we can get a feel for what sorts of issues must be resolved by a proper solution to the problems under consideration. Since we are concerned with the nature of the essences of substances, and such essences are first principles for Aristotle, it makes sense that we would sharpen our eye for Aristotle's later discussions about essence in the *Metaphysics* by familiarizing ourselves with the discussion from Beta about the difficulties in determining what the nature of first principles is. Let us then consider Beta's dialectical discussion of first principles. Aristotle is going back and forth between two options, and I think his answer somehow

incorporates both options. However, in my following analysis, I will play along with Aristotle's own dialectical exercise.

At *Met* B.3 Aristotle says:

[I]t is hard to say, with regard to the first principles, whether it is the genera that should be taken as elements and principles, or rather the primary constituents of a thing; e.g. it is the primary parts of which all articulate sounds consist that are thought to be elements and principles of articulate sound, not the common genus – articulate sound⁵⁸

The options here are between two versions of what a first principle could be like. Either the first principles for a given thing are the appropriate genera, or the first principles are the primary constituents of each thing. Aristotle says that we look to the constituent parts of a thing and manner of composition when we determine its nature (*tên phusin*); his example is a bed.⁵⁹ Since first principles pertain to the nature of a thing, the first principles would be constituent parts of things. However, he also observes that since we know things by their definitions and genera are principles in definitions, it would seem that first principles would have to be genera of things.⁶⁰

Notice Aristotle must not only be thinking about the primary material stuffs here, whatever these are, when he considers the constituent parts of a thing to be first

⁵⁸ *Met* 998 a20-24

⁵⁹ "Moreover in the case of other things too, if a man wishes to examine their nature he observes, e.g., of what parts a bed consists and how they are put together; and then he comprehends its nature. Thus to judge from these arguments the first principles will not be the genera of things." *Met* 998a32-b1

⁶⁰ "But from the point of view that it is through definitions that we get to know each particular thing, and that the genera are the first principles of definitions, the genera must also be the first principles of the things defined. And if to gain scientific knowledge of things is to gain it of the species after which things are named, the genera are first principles of the species." *Met* 998b3-9

principles. Certainly in understanding how a bed, in the material sense, can be the sort of thing it is we need to know something about its compositional matter, and it seems obvious that for Aristotle this cannot be sufficiently accounted for in terms of the elements, the simplest material stuffs.⁶¹ Instead, he must be thinking of a higher order kind of matter than the elements. So holding constituent parts to be first principles of substances is a plausible suggestion.

The problem with this plausible option in the current context is that the compositional parts of a thing do not seem to be what we grasp when knowing something. We grasp the definition of a thing when we know it, and genera are the principles of definitions. Thus, provided the compositional parts of a thing were the first principles for that thing, it appears we would not grasp the first principles in knowing a thing. Clearly this is problematic since knowledge in the strictest sense for Aristotle must eventually be made to rest on first principles.

But why is it that the constituent parts of a thing should be understood as excluded from definitions? One possibility is that by the constituent parts of a thing Aristotle understands the particular individual stuffs in that thing. Granted the idea that matter is what individuates substances, this might work. However, setting aside any problems with the view that matter is the ontological component responsible for individuation, this does not seem to be what Aristotle could have in mind in this passage. Take his example of the bed. Presumably a bed needs to be composed of something that can support a person's weight. This sets limitations on the sort of constituent parts a bed can have. The constituent parts of a bed must be the *type* of material stuff that can support

⁶¹ Aristotle affirms just this at the outset of *Met* H.4

the weight of a person. This is one way to understand Aristotle's suggestion here that the constituent parts of a thing reveal its nature. However, this means that the contrast between constituent parts and genera is not the contrast between tokens and types. The constituent parts are appealing as possible first principles of things because they identify the *types* of stuff out of which certain natures are realized.

Granted that the constituent parts Aristotle is considering are types of parts and not tokens, we still have to wonder, at this course in the dialectical exercise, why it would seem that they should be excluded from a definition? What advantage is it that genera would have over such types of compositional parts? Consider the generic class that Aristotle gives us: articulate sounds. On my reading, Aristotle gives a genus that restates, in a singular universal form, what is common to a host of particulars – the several phonemes – because he wants us to consider how definitions reveal for us that single look or form⁶² that we recognize in all the particulars; it is that in virtue of which we would group the items together as a group in the first place. The definition picks out the reality we were focused on in the particulars. Take the example of a bed. The definition here would tell us what it is that makes a thing be a bed; constituent parts alone would not be enough for such a definition. Constituent parts reveal something about the nature of a bed because they tell us of what sort of things a bed must be composed, but this requires a preexisting notion of what is to be realized through the parts that make up a bed. The definition must be what makes this plain to us.

⁶² "Look" is one plausible rendering of the Greek *eidos*; however, it can also be rendered as "species" or "form." "Look" brings out the phenomenological significance of *eidos* and *form* or *species* seem more ontological or explanatory. In the 6th chapter I will be in part looking at how these two dimensions relate in the experience of the *kalon* concerning animals for Aristotle.

Taking up the option of genera as first principles, Aristotle says that if genera are first principle, one might then suppose that the most universal of all things, being or unity, are first principles. He abandons this suggestion due to problems peculiar to these transcendentals. In short, such things cannot be genera.⁶³ However, this alone would not refute the notion that we should seek the most universal of *genera* as candidates for first principles. Aristotle does seem to reject this directly, however, when he states that the *differentiae* are principles more than the genera. The *diaphorai* are more principles than the *genê*. We should not understand him as introducing a third primary option into the mix. He still is considering the option where the classes of things that pick out their looks are the principles, but now *genê* by being used with *diaphorai* is made to have a comparative sense of greater universality.

By affirming that the *diaphorai* are more principles than the *genê* he is being explicit that universality is not an essential feature of what makes such classes be principles. If universality as such were the important sense of the option to be contrasted with constituent parts, then one would expect the genus to be more a first principle than the *differentia* due to the greater universality of the genus. The fact that *differentiae* are held to be principles more than genera might be seen as being explained when Aristotle says that, “genera are divisible into species (for man is not the genus of individual men),

⁶³ Assuming being and unity were genera, then it follows that there would be *differentiae* for them that specified them and so yielded the multitude of beings. However, a genus cannot be predicated directly of the difference. As stated earlier, one reason why this might be held is due to the predication being unnatural. Another reason could be the notion that whatever the *differentiae* would be that would be responsible for yielding multiple beings from being, it would have to be something other than being itself. Whichever reading, the point is that we would not be able to predicate being of any difference for being. But then, it would seem that there is no difference for being since what cannot be said to be is not. Hence, we would get a harsh monism. Since this is absurd, then clearly being, and unity for similar reasons, cannot be a genus.

that which is predicated directly of the individuals will have more unity.”⁶⁴ Supposing we read the understanding of differentiae akin to *Met Z.12* into this passage, the final specific difference will implicitly contain all the other essential information about the species. Thus the species term, what is directly predicated of a given individual, will be defined by the final specific difference. So if the species term is more of a unity than the genus, the specific difference will be more of a unity than the genus as well. This might make sense given that a genus will be divided into several differing species by several differences; granted that the specific difference defines the species, there will be no further essential division possible of the specific difference.

However, there must be another reason why the specific difference is more of a first principle than merely the fact that it is a unity in the above sense of its being indivisible by further cuts. Consider how there are indivisible classes of accidents, yet such classes are not first principles. Suppose, for instance, that there is some fully determinate shade of the color red. Since it is fully determinate, one could not further specify this shade. Because it cannot be specified into more particular shades of red, then it is indivisible. However, colors are certainly not first principles for Aristotle, and the same will go with any such qualitative accident or other sort of accident. We could talk about some fully determinate quantity of mass, but again, the massiveness by itself will not account for the being of any object.

There is a more directly relevant sense of unity suggested by the contrast of compositional parts here. One way in which things are unified is by nature. In discussing the sense of nature in *Metaphysics* Delta, Aristotle says:

⁶⁴ *Met* 999a4-5

Organic unity differs from contact; for in the latter case there need not be anything besides the contact, but in organic unities there is something identical in both parts, which makes them grow together instead of merely touching, and be one in respect of continuity and quantity, though not of quality.⁶⁵

Though the passage being considered from Beta here is dialectical, it is suggestive given the mention of organic unity from Delta. Recall that Aristotle said in our passage from Beta that we had to consider the compositional parts when considering what the nature of a thing was. If a difference is to be considered more of a unity than a genus, and the simple indivisibility of the class defined by the species is not enough to account for why this is not, by itself, a sense of unity that is relevant to recommend the difference as a greater first principle than a genus, then we need another sense in which to interpret this unity. Perhaps this point about organic unity would be a better way to understand the sense of unity intended here. The nature of a thing is certainly a first principle for Aristotle. As pointed out, it seems that the nature of something is more evidently invoked in the Beta passage when we are considering the compositional parts, but at the same time, given the dialectical nature of the passage, it would not be implausible that Aristotle represents as mutually exclusive two options of solving an aporia, when in reality he takes the solution to somehow combine both of these options together. I actually think this is in fact Aristotle's view. How would this look in the present case?

Speculating for the moment, there has to be something in the several compositional parts that is identical and is responsible for parts being unified as an organic whole. By contrast, in an artificial whole of parts like the bed mentioned in Beta,

⁶⁵ *Met* 1014b20-23

there is no such identity among all the compositional parts, and this is just because they do not exist as a whole bed by nature.⁶⁶ We might be tempted at first to suppose that there is literally some other kind of thing in each material part, and it is this that accounts for the several parts being unified. This would just postpone the question again. For how would each of the several material parts be unified to that material part in each of them that is identical?⁶⁷ Another option would be that what is “in” each part and so to this extent makes each part identical with every other is the form. However, this form is not present in each part like some stuff added onto all the other material parts and is thus responsible for the identity among the several material parts. Rather, looking ahead to what we will find in *Parts of Animals*, the form would be the working relationship the organic parts have to one another, and this is meant in one sense as the body is merely living and, in another, when the body is fully at work. Thus, given that the form of a thing is its nature in the most fundamental sense, we would have a way to understand what the solution to the dialectical puzzles about first principles out of Beta would look like.

Let us speculate some more. Granted that the form amounts to the working interrelation shared among all the parts in the organic whole that only have their being within such a whole, then giving the account of the form of the thing would involve giving an account of the compositional parts: an account that would involve each part’s own function and the functional relationships among the parts. Again, form is the primary sense of nature, and as Beta says, brining up the compositional parts is to be concerned with the nature of the thing. This makes sense given that the account of the form of an

⁶⁶ See *Met* 1015b36-1015a9

⁶⁷ This seems to be part of the argument in Zeta 17. When we account for the unity of a collection of parts in terms of some new part, this raises the question of how the group containing the new part taken together with the first collection of parts is a unity.

animal involves the account of its matter: its parts and their functions. If somehow we derive our terms for definitions from the animal's several parts and the form that is realized through those parts, then the apparently exclusive disjunction between the first principles being classes or being parts might be resolved. Our definitions, the foundation for our understanding things through demonstrations, would exhibit the form and matter of animal substances. In this way, our knowledge of substances could be traced back to the first principles as Aristotle desires. The definition would be the intelligible version of the reality of the animals we know. At the moment this is just speculation, but I now will turn to developing this account. First, I want to look at some passages from Zeta 10-11 along with. What I hope to find here is support for my view that the account of the form of an animal requires an account of the matter: its parts and their functions. Then, having gotten some support from these texts, I want to turn to Eta. It will not be until the third chapter when we consider the problem of a definition's unity that the full vindication for the present speculative suggestion will be given.

2.2 Metaphysics Zeta 10-11

The puzzle that is of concern for us in Zeta 10-11 is the extent to which formula of parts are included, if at all, in the formula of the substance, the essence, and what these parts can be. At *Met* 1134b28-31 Aristotle considers if the parts could be definitionally prior to the whole; his examples are an acute angle being a part of the right angle and a finger being part of a man. However, he counters that both such parts are posterior in definition and in independent existence. Just focusing on the finger to man relationship, the point about independent existence is clear. A finger apart from the man would be a

finger in name only. It cannot do what a finger does apart from the whole, and ultimately it will rot detached from the whole. However, the point about definitional priority is particularly suggestive. If a man is a whole of parts, how might it be that the whole is something not just defined by listing the parts but instead what is required to even defined the parts?

Leaving that question aside for a moment, consider the following points Aristotle raises:

Similarly, the bronze is a part of the statue as a combined whole, but not of the statue spoken of as form...It is for this reason that the formula of a circle does not contain that of its segments, while the formula of a syllable does contain that of its letters. For the letters are parts of the formula of the form, and are not the matter of the syllable, whereas the two segments are parts only in the way that the matter on which the form supervenes is a part...(Yet in a sense the formula of the syllable will not contain *all* its letter; for example it will not contain these on the paper here or those in the air. For they too are parts of the syllable only by being its perceptible matter.)⁶⁸

The formula of some things, like statues, do not include the material parts of which the statue is made. Bronze *is* a part of the particular statue as it could not be without bronze; however, that is not going to need to be mentioned when giving the account of the statue's form. Imagine going to an elementary school art display where the children all had to make sculptures from clay. When one puzzled onlooker might ask another of a

⁶⁸ *Met* 1035a5-17, Frede would emphasize such passages in his reading that sees the formula of the form of the substance as not explicitly referring to matter. However, matter is in some way internal to such forms insofar as their existence presupposes matter. See Frede 1990.

given work of art “What *is* that?”, “That is clay.” would not be an answer. What he wants to know is, for instance, that the sculpture is of a dog. The material parts do not enter consideration here. To try to show why a certain portion of the sculpture is a dog’s tail, it won’t be worth mentioning that it is clay. Rather, one would point to certain structure features realized in the clay. This point is not particular to perceptible objects either; it holds for mathematical parts and wholes like semi-circles and circles too.

However, there are cases where the formula has to include certain parts.

Aristotle’s example here is the syllable in relation to its letters. To give the account of a syllable we must refer to the syllable’s letters; one cannot give the account of the syllable otherwise. Likewise, if one were to try to give the formula for a given chess opening, say the hyper accelerated dragon, we would have to give the chess notation that would detail the moves. The same thing would hold if one wants the formula for certain rules of integration in calculus, one would have to use appropriate symbolic parts to be able to express the formula. As Aristotle helpfully clarifies here, not every sense of part is included. For example, the letters comprising the syllables on this page do not count as parts of the formula of the syllables. One is not referring to particular letters, spoken or written, when one gives the formula of a particular syllable.

So, some formulas’ accounts involve their parts. Does this apply to animals, and if so, in what way? After mentioning the matter, form, and the compound of the two earlier at *Met* 1035a1 Aristotle says, “For instance, flesh is not a part of concavity, for it is the matter in which concavity occurs; but it is a part of snubness. Similarly the bronze is a part of the statue as a combined whole, but not of the statue spoken of as form.”⁶⁹ From

⁶⁹ *Met* 1035a4-7

the previous case, bronze was understood not to be part of the *formula* of the statue; here, bronze is said to be part of the statue. Bronze is then a part of the artificial, combined whole of form and matter, the composite. In this way, flesh will be part of snubness but not a part of concavity. Thus, he must mean that snubness is like the statue and so refers to a combined whole; filling in the rest of the comparison's details, flesh is like the bronze and whatever shape the statue has is like concavity. If this example is Aristotle's final thought about relations between formula and material parts in organic things, it would seem that the account of the form would not involve the matter. For it seems here that the form in the case of snubness is concavity, and concavity need not be understood in relation to flesh. The form here is fairly indifferent to its substrate, just like a spherical shape is indifferent to bronze.⁷⁰ The account of the form, concavity in this case, would not involve reference to the material parts, flesh. So, again, if this generalized to other organic cases and was Aristotle's final thought about the subject, the forms of animals would not refer to their material parts.

Further evidence for this might be gathered shortly thereafter when Aristotle says: Indeed, even though a line is destroyed when it is divided into halves, or a man when he is dispersed into bones, sinews, and flesh, it does not follow from this that they are composed of these parts as parts of their substance. These are rather their matter, and are parts of the combined whole, but not parts of the form or of what has the formula. Hence they do not occur in the formula.⁷¹

⁷⁰ Snubness is an example used often by Aristotle. Lennox, commenting on its limitations as an example says, "There are an indefinite number of concave things that are not noses, and a variety of noses that are not concave. It seems that 'the snub' refers to a contingent relationship between a certain geometric shape and certain materials." See Lennox 2008: 173.

⁷¹ *Met* 1035a17-22

Aristotle is making an initial point that is not very telling for the question of whether or not material parts are included in the account of the form of an animal. He wants to point out that merely because a given substance is destroyed into certain parts, we cannot infer that what that thing is in terms of its substance includes such parts. This by itself would *not* entail that Aristotle think bones and sinews fail to be included in the substance of a man. It would only entail that Aristotle thinks a thing's being in the set of parts into which a substance is dispersed is not sufficient for that thing's being a part of the substance. However, he continues and declares such things as bones and sinews not to be part of the form, the substance.

Though it might seem this by itself rules out any animal parts from being included in the form and essence of the animal, it does not and for several reasons. First, not all parts are the same *kind* of parts in the animal. There are of course uniform and non-uniform parts. The two parts mentioned are uniform, so the passage by itself gives no basis to reject non-uniform as being part of the substance and essence of the animal. However, does it not provide a basis to reject that uniform parts are included in the substance and essence of an animal? No, it does not. We have to keep in mind that there is a difference for Aristotle between an organic part as present in a living animal and that same part as outside the living animal. We have already seen that a dead finger is a finger in name only. Why was this? Aristotle says:

Now in animals the soul – which is the substance of any living thing – is the substance given by the formula, i.e. the form and what being is for bodies of this

sort. (At least, no part of such a body can be properly defined without reference to its function, which it could not have in the absence of perception.)⁷²

A dead finger is not ensouled. A dead finger cannot perform its function. Looking ahead to Zeta 11⁷³ only the hand that can do its work that is really a hand. A similar point is made in *De Anima* concerning the eye.⁷⁴ After a living thing is dispersed, it is dead and not ensouled. So whatever stuff remains that we might pick out with part-names like “finger,” “eye,” or “hand,” that stuff is not identical to the parts that were functioning in the living animal. One might protest that the points made only mention the non-uniform parts; however, the point still holds for the uniform provided that the crucial distinction is function. Just like the non-uniform parts, the uniform parts also have a function that they only discharge within the context of the living animal.

We should consider Aristotle’s Socrates the Younger remark in full. He says:

It is therefore useless to reduce everything in this way, and to eliminate the matter. For some things presumably are one thing in another, or certain things in a certain state. And the comparison which Socrates the Younger used to draw between an animal and a circle is not sound; it misleads one into supposing that there might be a man without his parts, as there can be a circle without its bronze. But the cases are not the same. For an animal is a perceptible object, and cannot be defined without reference to change, nor therefore without reference to the state of its parts. (For it is not a hand in any and every state that is a part of a man,

⁷² *Met* 1035b14-18

⁷³ *Met* 1036b30-32

⁷⁴ *An* 412b10-24

but only a living hand, which can fulfil its function. A hand which is not living is not a part of a man.)⁷⁵

When Aristotle says it is useless to reduce everything in this way, it is evident from context he is talking about those who want to reduce every definition to form. The sort of things that animals are, are the sorts of things which involve *change*. Unlike purely mathematical objects, animals act and action involve change, and so they cannot be defined without a reference to change in some sense. This is supposed to get us the inference that they cannot be defined without reference to their parts either.⁷⁶

Michail Peramatzis makes a helpful point in showing the connection a form's being defined with reference to change and a form's being defined by reference to perceptible parts. He says:

There is a striking similarity between mathematical form and intelligible matter. Both are necessarily dependent upon the existence of some physical object or other for their existence within the perceptible, physical world. However, just as mathematical form, intelligible matter too does not essentially involve any perceptible types of matter. Nor does it include any essential parts that explain or support the changeability of any objects. For mathematical objects completely lack any capacities for causing or undergoing change. If so, their essence, which

⁷⁵ *Met* 1036b21-31

⁷⁶ Lennox discussion of *Physics* II.2 provides a nice contrast between the way the mathematician and the natural philosopher for Aristotle look at the same natural objects. He says, "The cognitive isolation involved in mathematical concept formation is an isolation of certain attributes of physical objects from change, while change is at the very heart of the science of nature. Thus in framing a definition of unit or odd in arithmetic, or line or triangle in geometry, it is as if they are eternal and immutable. But the objects investigated by natural science are essentially material bodies with their own capacities for change. To leave that out of account would be to fail to understand them at all." See Lennox 2008: 169.

is made up from mathematical form plus intelligible matter, should not contain any features that explain any capacity for change. This is precisely the difference between the perceptible, ‘change-related’ material features, which are parts of the essence of natural forms, and intelligible matter, which essentially belongs to mathematical form. Perceptible types of material feature are integral parts of the essence of natural form as they, together with the relevant formal parts, ground the capacity of physical compounds for various types of change.⁷⁷

For Aristotle, natural substances must have their principle of change within themselves. This is why giving a definition of them requires accounting for this source of change. Thus, since form is more fully the principle of a natural substance, we cannot give the account of a natural form without thereby speaking to how the substance with the form is able to change. Mathematical things just do not change. So even if Aristotle admits to a sense in which purely mathematical objects could have matter too, this will not be the kind of matter that Aristotle is here arguing must be found in perceptible substances. Only the perceptible sort of matter, the parts we see in animals, will fulfill the vital function of helping to account for how acts and undergoes change.

With this understanding that the definitions of animals needs to refer to the animals’ perceptible parts in some way, I will turn to book Eta. We will see how Eta’s account of definition unity is a sort of vague sketch of what it might look like to follow the advice from the Socrates the Younger passage. Eta 6 leaves us with problems that it does not resolve. In short, we will need a more detailed account of how the animal’s parts, its matter, relate to its form in such a way as to constitute a unity, and this more

⁷⁷ See Peramatzis 2011: 95.

detailed account is a prerequisite to attempt to use Eta 6's answer to solve the question of the definition's unity insofar as Eta 6 purports to ground the unity of the definition upon the unity of the substance.

2.3 *Metaphysics* Eta: Whole of Parts and Hylomorphism

2.3.1 Combination of Parts as Differences and Some Puzzles Raised

At the outset of Eta Aristotle announces once again what is being sought. After mentioning principles, causes, and elements as substances, he prefaces what is to come by saying that, "But now we must proceed to the agreed substances, which are those that are perceptible; and all perceptible substances have matter."⁷⁸ Aristotle then talks about in what sense matter is substance in connection to how substance is what underlies. The form and the compound of form and matter are brought up here as well. At the start of chapter two of Eta Aristotle goes on connecting the account of substance as what underlies and as matter to what is potential; he says it remains to talk about "the nature of that which is the substance of perceptible things as actuality."⁷⁹

He follows up immediately by discussing differentiae and at first in connection to Democritus' one underlying substrate that yield various things through the differentiae of "shape," "position," and "arrangement." Aristotle observes there are more differentiae than these three. Some things are differentiated by the way the underlying substrate is combined. His examples are "being blended, tied, glued, or nailed"⁸⁰ Others are

⁷⁸ *Met* 1042a22-25

⁷⁹ *Met* 1042b9-10

⁸⁰ *Met* 1042b15-17 We can note here that Democritus would not be able to allow these kinds of differentiae as his atoms are not the kinds of things that admit of the qualitatively rich differences; the kinds of substrates Aristotle is considering do. For example, it makes sense to talk about gluing together the parts of a box, but it would not make sense on the face of it to talk about gluing

differentiated by their “position.” Examples are a “threshold” and a “lintel.” Then he lists times such as “dinner and breakfast” and places such as “the winds.” Then he lists several perceptible attributes that can serve to differentiate beings. He gives a few pairs of contraries: “hardness and softness,” “density and rarity,” and “dryness and wetness.” Finally he notes that other things can be differentiated by all of these taken together, other by only a few, and some things are differentiated by “excess and defect.”

As though he were drawing a conclusion based upon the observation of all these differences he says:

So it is clear that “is” is said in just as many ways. A threshold is because it is situated so, and [in this case] being signifies its being so situated. (The being of some things is defined by all of these at once. i.e. by their being partly mixed, partly blended, partly tied, partly solidified, and so on. Examples would be a hand or a foot.)⁸¹

Democritus’ atoms together or nailing them. This of course in itself does not count in favor for Aristotle or Democritus. I suppose the question comes down to whether or not Democritus’ simpler substrate and fewer number of differentiae would be able to account for the varieties of midsized objects that interest Aristotle.

⁸¹ *Met* 1042b25-30 In his commentary, Bostock observes that this harkens back to Zeta 1’s reference to being’s being said in many ways. However, this multiplicity of ways to say being in Zeta 1 is referring to the sense of the categories as mentioned in Delta 7. I am not convinced there is any ambiguity in Aristotle’s explanation of what he now means in the current context of Eta 2. If Aristotle is going on to lay out the various senses of principles to explain beings, and these principles will in each case be a part of the nature of the being to be explained, which in its particulars will vary from being to being at the level of the difference, then we should not be surprised to see that this sense of being will be said in many ways. It would seem that it should be said in as many ways as there are species of beings. Moreover, recall that the current discussion at 1042b25 comes after Aristotle had stated we should talk about being in the sense of actuality and not potentiality. Looking ahead to Eta 6’s identification of the form of a thing with its difference, and granting that the form of a given species is peculiar to that species, then the differences of beings will be wholly peculiar in each class of species, wholly determinate. Of course, Aristotle gives genera of such differences here, but that does not rule out that the real differences involved in the definitions of beings will be unique to each of the species being defined.

I think Bostock also introduces difficulties that are foreign to the text by importing an existential sense of “to be” into Aristotle’s point here. When Aristotle will say, for instance, that “οὐδὸς γὰρ ἔστιν ὅτι οὕτως κείται” Bostock translates this as “A threshold is because it is situated so”. Another plausible way of translating Aristotle here is “Something is a threshold because it is

If we remember that Aristotle is beginning to treat of the actuality of perceptible substances, it should be no surprise that these several ways of being different entail several ways of talking about how things are with respect to their being. This presupposes of course that the actuality and form of substances is given by their differences. Let us be sure to observe what Aristotle will himself observe momentarily in the text, namely that none of the above are taken by him to be substances.⁸² Nonetheless, the point he is making with these items and their differences is to be indicative of what we should expect when we get to substances and their differences. That is to say, the difference of a thing will correspond to its form in some way.

Also of importance here, notice that such differences as “partly mixed,” “partly blended,” “partly tied,” and “partly solidified” all refer to certain states of parts.⁸³ So granted that differences must show something here about the form and actuality of substances, and these differences given by Aristotle are differences concerning the state

arranged in this way.” Notice that this way of translating makes no mistake about importing a backwards E sense of existence into what it is to be a threshold. However, Bostock’s rendering makes this confusion more attributable to Aristotle. As Bostock goes on to observe, it seems that Aristotle is making the mistake of saying that a threshold exists because it is arranged in such and such a way. Figuring out why any threshold actually exists will not be answered only by knowing what a threshold is. As Bostock puts it, the confusion seems to conflating “that X is” with “what X is.” See pg. Bostock 1994: 254-257.

⁸² *Met* 1043a4-5

⁸³ Perhaps some take such mentions of combinations of parts to be indicative that the initial discussion concerns a unity of composites and not the forms of composites. For instance, see Halper 1989: 179. Some like Harte see Eta giving us a discussion both of the unity of the composite (form in matter) and the unity of the form of the composite. Harte sees the solution to the unity of the composite as grounded on the unity of form. See Harte 1996: 294. As far as readings of Eta 6 go that do not incorporate much of the biological details into the story, I agree with Keeling (see Keeling 2012). As he sees it, the problem of the unity of the composite and the unity of the form are one and the same. The previous detour into Z.10-11 helped back that point up, not to mention the above remarks from Lennox on *Physics* II.2. However, something I think is lacking from all such accounts is an account of form that is rich enough to map onto and work with the explanatory aims of Aristotle’s biology. The problems I raise below concerning the unity of composite like bronze spheres are sufficient to show we cannot just resort to a vague invocation of potency and actuality to solve the question of the unity of forms or composites. I think Lennox’s point on *Physics* is on track to the answer here, and I will develop that below as I enrich the account of Eta 6 with a reading of passages from *Parts of Animals*.

of combination of the parts, this would suggest that the form and actuality of substances involves certain kinds of combinations of parts. This would seem to fit with the point of the Socrates the Younger passage in that Aristotle, in speaking about the differences of things and their form, is talking about the parts of things insofar as certain kinds of combinations implicitly invokes the existence of parts in those combinations.

Aristotle says the being of some things will be defined in terms of *all* of these sorts of differences. His examples are a foot and a hand.⁸⁴ Here in Eta Aristotle seems to be allowing for a single organic part to admit of several differences, and several of these differences are differences of the combinations of parts.⁸⁵ So if the several differences are all required for the definition, somehow they must be unified if the definition is to be a unity. It will only be this plurality of differences taken together that gives the account of

⁸⁴ Bostock observes that it is odd that the notion of a hand's function is not brought up in connection to the being of a hand, but he does suggest that the later statement of a house's being the sort of thing that can be differentiated by reference to purpose might be read backwards into the being of the hand. There might be another reason as to why the being of a whole artifact like a house can be referred to its purpose, whereas the being of an isolated part of an organic whole cannot refer to purpose. It might be that it is only at the level of the whole, whether artificial or organic, that the purpose of a part of that whole can be grasped. This would be because the function of the several parts is fully intelligible only in the context of the total function of the organism. One might protest that "grasping" is the function of the hand, and this can be known independently of any further specification of the organism in which such grasping takes place. However, I take it that we think of a hand as such having a function only because we immediately complement this function in our mind with something that the grasping is for in the context of the life of a particular organism. We do not necessarily have such particular organism in mind, but we are considering the hand as though it does have such role to play in the life of an organism. Supposing a hand could grasp independently of its being connected to a given organism, would "grasping" count any longer as a satisfying account of the *telos* of the hand?

⁸⁵ Pierre Pellegrin observes how in *Parts of Animals* Aristotle rejects the bipartite method of division and with it the account of a definition having a single difference. "Thus arises a problem that occupied Aristotle's attention in *Metaphysics* Zeta 12: if one divides according to several differences in order to construct a definition, why is the unity of the object defined not damaged?...In our passage in the *Parts of Animals*, Aristotle builds upon a comparison with a sentence that remains one, despite the articulation of its various parts, through the subterfuge of "conjunction." See Pellegrin 1986: 32. But now we can see that even in the context of the *Metaphysics* itself Aristotle already has in mind a multiplicity of differences when it comes to the account of the being of substances. Thus, either Zeta 12 is wrong, or it is just an oversimplification of a more elaborate theory of the unity of definition. We will talk about this more later.

the being of the hand, and if the whole of differences cannot be taken as a working unity, then it seems the unity of definition will be lost. On the ontological side, we might also worry about the unity of the parts making up the combinations the differences pick out. Given the point about the hand from Zeta 11, we might guess the combination could be a type of functional unity. Whatever the answer for the hand and foot, we can see a larger issue here too. A hand or a foot, is only one part of an entire organism. There will be several more parts to an animal than its hand. Might there be several differences for the whole body given in terms of types of combinations of parts like hands and feet? Given our previous considerations of Zeta 10-11, we might expect such parts as hands to go into the account of the being of an organism. Aristotle also says, at the outset of Eta, that both plants and their parts and animals and their parts are agreed by all to be cases of substances. We might worry that if parts are substances and so is an animal, an animal would be some kind of second-rate substance being posterior to the substances of which it is combined.⁸⁶

We have to wonder how Aristotle will be able to maintain a tight unity between the forms of the underlying stuff, the matter, as described by the differences, and that stuff itself. That is to say, it seems like the being of the underlying stuff is only accidentally related to those compositional forms it takes. In fact, Aristotle's own examples help to bring this worry to light. Examples such as houses, windlessness, calm, harmony, etc.⁸⁷ all seem to be cases where the differences given could be applied to other

⁸⁶ Granted that Aristotle will refer to animal parts in his definition of the animal, this question of how the whole animal will remain prior in being to its parts is one to keep in mind.

⁸⁷ *Met* 1043a14-25 These examples come up with mention of Archytas; we are told here that he used to give compound definitions. He'd say something of the matter and the form. For instance, "calm" is "smoothness of the sea." With such terms as calm the express such a contingent relationship between a feature like "smoothness" and a stuff like "sea," it is little wonder why both parts of this compound

sorts of underlying stuffs and so different formulae would result once such an application is made.

When Aristotle points out⁸⁸ that some define by way of the “matter” or the “actuality” or give what is “compounded” out of these other two, it is initially left open whether or not the definition by way of “actuality” will entail something about the definition by “matter.” Granted that Aristotle’s definitions will refer both to form (actuality) and matter, then the definitions by form had better entail something about the definitions by matter. If, as Aristotle’s examples suggest, there could be two identical definitions by form for two different substances due to a difference in types of matter of the substances, then this would only be so because of the inherent contingency of the form being realized in one type of matter or another. This contingency would then infect the kind of definition Aristotle wants to offer that involves both the form and the matter in some way.

Aristotle says that differences in matter will determine differences in formula. He talks of ice in terms of congealed or solidified water, and harmony in terms of such-and-such a mixture of high and low (notes).⁸⁹ His point here, I take it, is that different types of material stuff allow for certain kinds of states to be realized and definitely exclude others. This point seems true enough, but it does not by itself decide whether or not the forms that are realized in material stuffs will demand at some level of composition *only* a

must be defined. Neither of the parts of the definition have any kind of necessary connection to one another. We should keep this in mind for Aristotle’s own account of definition. As I will argue, he too will see both an account of the form and an account of some kind of matter as crucial for the definitions. What we will have to see is how he can do this without allowing his definition to become as accidental of a unity as Archytas’.

⁸⁸ *Met*1043a14-21

⁸⁹ *Met* 1043a10-12

unique sort of matter relative to that form. For instance, though a hammer cannot be made from water, there are several kinds of material we could use to make a hammer, not one unique kind. For Aristotle there is a proximate matter relative to the substance in question; there are not only four elements when it comes to the matter of things. Aristotle says at the beginning of Eta 4 that there is a different matter appropriate to each being even if there are underlying elements for everything that comes into being.⁹⁰ And he also says that some things can be made from the same material; his examples are a box and a bed. The material here is wood. Now, clearly these two beings are artifacts and so we should not expect them to have the stronger sense of continuity among their parts that organic unities show. However, we still need a textual account of this strong, organic type of unity.

2.3.2 The Beginnings of an Answer to the Unity Worries

It is in Eta 6 that we see that Aristotle wants the matter and form of a substance to count as a unity in a strong sense; however, the earlier, explicit mereological dimension to differences (form) and matter that were present in the earlier discussion in Eta is now dropped. This is why I chose to go through the first chapters of Eta as a prefatory step to getting into Eta 6. Though admittedly Eta 6 does not explicitly draw the connection between itself and the earlier points from Eta about the several parts of things being the matter and further determined by the actuality which is given by the difference, I do not find it a stretch to think that this connection is nonetheless implied by having Eta 6 be the terminating chapter of the book in which these earlier points were raised. There are

⁹⁰ *Met* 1044a15-20

some chapters in Eta that do not seem to form any tight knit theme with the first two chapters.⁹¹ But the connection between the first chapters of Eta and Eta 6 strikes me as obvious.

Aristotle begins by saying:

Whenever anything which has several parts is such that the whole is something over and above its parts, and not just the sum of them all, like a heap, then it always has some cause. Indeed, even in the case of bodies there is a cause of their unity – sometime contact, sometimes stickiness, or some other attribute of this sort. A definition, however, is a unitary formula, not by being bond together (as the *Iliad* is) but because it is the formula of a unity.⁹²

Initially we do have the mention of parts, but as we will see there is not going to be any explicit parallels drawn between material parts in the substances and terminological parts in a definition. For now, the point is just that something that does not come to be through an accidental heaping of parts together, but is in itself something more than the mere sum of such parts, must be accounted for by a cause. Aristotle mentions how this even happens with bodies that are bound together by contact or stickiness. However, those things that are one by mere means of “contact” or “stickiness” exhibit a much lower grade sense of unity than the parts in a single animal. Aristotle’s key strategy in solving the difficulty of definitional unity will be by grounding the definitional unity in this stronger sense of unity that obtains in substances. A definition is a unitary formula because it is the formula of a unity: the substance being defined.

⁹¹ Bostock thinks that Eta 4 and 5 in particular do not move us forward with the main problem. See Bostock 1994: 259-260.

⁹² *Met* 1045a8-14

So we have that a whole of parts is a unity and not a heap when there is some cause of that unity, and now we are told that the cause of the definition's unity is to be traced back to the unity of that thing of which the definition is a formula. So how is the substance a unity? "What is it, then, that makes man a unity rather than a plurality – for instance animal and two-footed."⁹³ Aristotle first observes how those who treat "animal" and "two-footed" as though they were subsisting entities in their own right make the problem very acute. It would seem to be irresolvable. How could two independent things ever be one except in the sense of an ontological heap?

However, Aristotle invokes his doctrine of matter and form (*morphê*)⁹⁴ and potentiality and actuality to explain away the acute problem. He says:

However if, as we say, there is on the one hand matter and on the other hand shape, and the one is potentially while the other is actually, the question no longer seem a difficulty. For this problem is the same as would arise if the definition of a cloak were a round bronze. The word would then be a sign of the formula, and the question would be: what is the cause of the roundness and the bronze being one? The difficulty has then disappeared, since the one is matter and the other form. What, then, is the cause of what is potentially being in actuality (discounting, in the case of a created thing, whatever produces it)? There is no further cause of the potential sphere being actually a sphere; this is precisely what is for each of them.⁹⁵

⁹³ *Met* 1045a14-15

⁹⁴ Bostock will render μορφή as "shape." See the following quote.

⁹⁵ *Met* 1045a22-32

Here seems to be the point. Definitions are formulae of beings which can be analyzed ontologically speaking into form and matter. To talk about a thing just as it is matter is to always leave out some further determination that the thing must have in order to be at all. For example, any given hunk of bronze must be some kind of shape, even if it is one for which we do not have a ready name. Matter as such is potentially a being, whereas a form picks out that state that some matter is actually in. Bronze in itself is already actually something; however, bronze as matter, is potentially some shape that is not determined just by bronze being itself. At the same time, “roundness” is not realized independently of stuff that can be shaped to be round.

The point is then that bronze would not be related to its roundness as a hunk of bronze would be related to a wooden handle. The handle can be taken apart or joined to the bronze. Both are something in their own right independently from one another. However, the round realized in a hunk of bronze cannot be taken apart from the bronze and be itself. Roundness only is through some stuff that is round. Nor can the bronze fail to be some determinate shape or other. Thus there do not seem to be two things given the pair “round bronze.” The only sense of cause of unity that can be given here is the efficient cause. This would answer the question of how the bronze was made round.

2.3.3 Problems for Eta 6’s Account of Hylomorphic Unity

If we took Aristotle’s example of round bronze as literally indicative of his understanding of the relation between form and matter or potentiality and actuality in all

cases of substance, we would lose the strong sense of unity in substances.⁹⁶ Granted, the bronze must be some kind of shape in actuality to be at all, and the roundness in a particular piece of bronze is not some separable stuff like a wooden handle would be. However, “roundness” can easily be realized in several other types of material than bronze, and though bronze must be some shape, it need not be round. Aristotle’s own point about an efficient cause in the artificial cases here is telling. If we consider it for a moment we realize there must be something other than an individual case of round bronze that is the cause of any individual round bronze, and this is just because there is no substance which is by nature round bronze.⁹⁷ The unity of “round” with “bronze” is an artificial unity, not an organic one. It is contingent that any particular bronze item should ever be made round.

Recall that in Eta 4 Aristotle said that one must give the matter “peculiar to the thing in question.”⁹⁸ Though this is not enough in itself to warrant that the matter of which he speaks here is wholly unique to the thing in question, his example of the menstrual fluid in human beings as the matter peculiar to us at the start of the process of

⁹⁶ Bostock himself realizes the issues with the example of a bronze sphere. This seems to be a very accidental conglomeration. However, I think he missed the sense in which any given bronze must still be some kind of shape. Moreover, as will be shown, I will disagree with his view of Eta 6 as a distinct project from what Aristotle undertook in Zeta 12. See Bostock 1994: 280-284.

⁹⁷ Bostock thinks that Aristotle should have just allowed that round bronze could be a unity. See Bostock 1994: 284. This seems wrong. The question is not whether we can treat round bronze as one thing; it is one thing. It is a given kind of matter in one possible accidental state. But we must have a principled way to distinguish this sort of accidental unity from those unities that are organic if there is to be the distinction between these things. Aristotle does endorse, in Delta and elsewhere, such a distinction between accidental unities and organic unities. Bostock himself had mentioned how the soul might be the way to account for the unity in a substance. However, if the soul is not just to be a linguistic cover for our inability to offer a real explanation, there has to be an account of the soul’s relation to the body that will differentiate itself from the relation of artificial forms to their matter. Otherwise all we are doing in using a term like soul is marking off those things we intuitively take to be organic unities from those things we intuitively take to be accidental unities, but we lack any reason for the distinction.

⁹⁸ *Met* 1044b2

generation suggests that he is thinking of such a unique matter. If the matter Aristotle had in mind in Eta 6 is the sort that is wholly unique to the form of the substance in question, and the form could not be realized without its matter, this would get the strong sense of unity that seems to be hinted at in Delta 6.

Unfortunately the chosen example does not help point us in the right direction. Moreover, we might wonder what priority form or actuality has over matter or potentiality if both are dependent upon one another. It is possible that Aristotle is dealing with matter here in a difference sense than that which is included in the being of a substance. Aristotle might be talking about the stuff that preexists the existence of the substance. That is, Aristotle might be thinking of the inorganic elements out of which the living substance is formed. However, if this were so, it is not clear why this would help out in accounting for the unity of the definition of a substance. For if such inorganic stuffs were to be included in the being of living substances, all living things would be as contingent of unities as are artifacts. Just like artificial forms, the form of a living substance does not need to be realized in a collection of inorganic stuffs for those stuffs to be what they are.

It is when we take the initial parts of Eta that mention the agreed upon substantial status of animals or plants and their parts that we might have some grounds to back up the strong sense of unity that Aristotle apparently wants a definition to get from reflecting the unity of the substances. Aristotle had used a hand and foot as a kind of whole of parts that is defined by several varieties of differences. He neither went into the different materials in the hand that are specified by these differences nor the extent to which the hand itself might be a matter for the whole human being. Still, what we might conjecture

is that we can fit the earlier talk from Eta 2 with the shape of Aristotle's solution to the problem of the unity of definition in Eta 6. We already have Eta 2 that treats the actuality and form of a substance as the difference; thus we might treat the genus as indicative of the potentiality in some sense.⁹⁹ We would look to the substance's unity to explain the unity of the definition. Thus if the parts from Eta 2 should be taken as the matter, as seems natural, we would have some kind of ordering¹⁰⁰ that the various parts of an animal must possess to be the form of the substance in question. It is still not clear how the several differences as determinates altogether constitute a unity, and it is not clear how the genera exactly relate to the substance. Turning to the *Parts of Animals* will help to fill in the details of this account from Eta.¹⁰¹

2.4 Enriching Eta 6's Hylomorphism with *Parts of Animals*

At *Parts of Animals* (PA) 640b17 Aristotle is considering how animals and their parts exist by nature. He speaks of how one needs not only investigate the elements out of which everything else is constituted, but that one must go on to consider the sorts of parts appropriate to animals. He says:

Air and water are matter for bodies; that is, it is from such things that all the
ancients constitute the nature of bodies. But if human beings, animals, and their

⁹⁹ As representatives of this view see Balme 1962, Grene 1974, Furth 1988: 246, and Irwin 1988: 568.

¹⁰⁰ It is not clear what the nature of this ordering is. The biological works will help us to get clear on this point.

¹⁰¹ *Physics* II.2 is another place we could go to get more details about the relationship between matter and form in natural beings. Lennox's discussion of it (see Lennox 2008) illuminates the relationship between the form and proximate matter of a substance in teleological terms. The natural scientist for Aristotle must investigate certain matter with an eye to how it realizes certain ends determined by the form of the thing comprised of that matter. For my purposes here, I find *Parts of Animals* to be the more developed account of this point. So, though I want to flag that the points considered here are supported elsewhere in Aristotle's works, I will not delve into it much further.

parts exist by nature, one should speak about flesh, bone, blood, and all the uniform parts. Likewise too, about the non-uniform parts such as face, hand, and foot, one should say in virtue of what each of them is such as it is, and in respect of what sort of potential. For it is not enough to say from what things they are constituted, e.g. from fire or earth. It is just as if we were speaking about a bed or any other such thing; we would attempt to define its form rather than its matter, e.g. the bronze or the wood.¹⁰²

In the previous paragraph Aristotle spoke of how the ancients would attempt to derive the whole process of generation of animals from interactions among the elements along with some force that would move the process (strife, friendship, reason, or spontaneity). At the start of the quoted passage, Aristotle goes on admitting that such elements are a type of matter for bodies. However, he continues under the supposition that such inanimate things are not all that exists by nature. Supposing that animals and their parts exist by nature, we must speak about a matter that constitutes them that is compositionally speaking higher than the elements. That such parts of animals can be considered matter seems evident from the context. Since water and air are both matter for bodies because they are that out of which bodies are composed, and animal parts are that out of which animals are composed, it seems fair to infer here that animal parts are the matter for animals. Granted, such parts as bone, blood, skin, etc. are not the only kind of matter, but they must still be considered a kind of matter as it is out of these that the animal is composed.¹⁰³

¹⁰² PA 640b17-26

¹⁰³ At the beginning of *Generation of Animals* 715a8-715a17 we get an explicit confirmation that the matter for an animal is its several parts. One might challenge whether or not this applies to other

Returning to the supposition that animals and their parts exist by nature, we have to ask how it is that this differentiates Aristotle's way of understanding animals from the ancient philosophers to whom he refers. In the previous paragraph we see that the ancient philosophers understood the cosmos and all that was in it in terms of the basic inanimate elements and some primitive forces (love, strife, reason, spontaneity, etc.). Higher order compositions that we would consider to be animate are nothing more than contingent results whose possibility is defined by the constitution of elements according to whatever forces we happen to posit. To put it in terms of nature, for such ancient natural philosophers the elements and primitive force(s) seem to be all that exists by nature. Animals and their parts come about through the contingent interactions of these natural things.

Aristotle supposes otherwise. He says that if animals and their parts also exist by nature, then we have to identify material parts out of which the animal is comprised that are already animate parts. By saying "already animate parts" what I mean is that unlike water and air that may or may not be compositionally present in a living being, already animate parts are those parts that can only be realized in a living being. You can find water or air in living beings, but the beings you find them in need not be living beings. However, flesh or bones are only found in living beings.¹⁰⁴

works, but in the case of *Parts of Animals* the point seems to hold. The beginning of *Generation of Animals* strongly parallels the opening of *Parts of Animals* 2 as we shall see.

¹⁰⁴ Flesh or bones left over from a dead animal would not be properly speaking "flesh" or "bones" any longer. They cannot perform their function, and this is what is crucial in the identity of an animate part. As an easier way to respond to this point too, we might add the only reason why such homonymously named parts exist (i.e. the corpse's flesh or bones) is because they were present in the living animal at one time.

In the passage we also get a distinction between the non-uniform and uniform parts of animals. For the moment, we need only observe that non-uniform parts such as a hand are more complex than the uniform parts. Bones and skin are both compositionally present in a hand. To put it generally, any non-uniform part is comprised of uniform parts. So the point about needing to consider already animate parts obviously follows for the non-uniform as well. That is, in order to understand animals we will need to consider their non-uniform parts as well as the uniform parts, for these are both organic parts.

What might Aristotle mean here when he goes on to point out that we should understand the “potential” or power in virtue of which each such part is as it is? In his commentary on the passage James Lennox points out what potential means in terms of the elements.¹⁰⁵ Earth has “cold/dry” as its potentials, water “cold/wet”, air “hot/wet”, and fire has “hot/dry” as its potentials. If one asks what it is that earth is like, one answers by saying what it has the potential or power to do and have done to it. Now if we take the case of animal parts, what Aristotle is saying is that explaining an animal in terms of the powers of elements is not sufficient.¹⁰⁶ Rather, one has to talk about the powers that those parts have as the parts they are. So, if we were talking about a hand, we would say something about what powers a hand has *qua* hand. Presumably, such a power would be something like grasping.

¹⁰⁵ See Lennox 2001: 137.

¹⁰⁶ Allan Gotthelf’s discussion about the question of final causality for Aristotle sets up the question in terms of the reducibility of living things to what he calls “element potentials.” He initially observes a finer distinction between the potentials of an element and its nature. The potentials of an element are its qualitative powers to interact with other things. The nature of the element describes it in locomotive terms. However, he says it is fine for the purposes of the discussion to wash over these finer distinctions. Gotthelf’s emphasis more concerns the developmental dimension of the reduction question, though any answer on the feasibility of reducing the development of an organism to the interaction among elements according to their potentials would seem to already stake a claim concerning the reduction of the activity of the fully developed animal. See Gotthelf 2012: 3-44.

One could think that what Aristotle meant here was that we had to consider the organic parts that were the potential out of which a non-uniform part like the hand was derived. But he goes on to observe that we want to define the form of a thing and not its matter when understanding what it is. Thus, I take it that this means the potential he is speaking about in the quoted passage is meant in the sense of the power an organic part has as just as the organic part it is and not some kind of material potential.

In the next paragraph Aristotle brings up Democritus. He attributes to him a view that an animal and its parts are what they are in virtue of configuration and color. Whether or not this is Democritus' real view, is irrelevant to my present purposes here. It is how Aristotle argues against this view that matters. This cannot be right, he thinks because even if a corpse will look like a human being and have the same configuration, nonetheless, a corpse is not a human being. Even more instructive is what he says about a hand.

It is impossible for something in any condition whatsoever, such as bronze or wooden, to be a hand, except homonymously (like a doctor in a picture). For such a hand will not be able to do its *work* [my emphasis], just as stone flutes will not be able to do theirs and the doctor in the picture his. Likewise none of the parts of a corpse is any longer such – I mean, for example, any longer an eye or a hand.¹⁰⁷

This helps to bring out more fully why the appropriate powers relative to a given animal part are necessary in understanding it. The identity of such a part is bound up with its function, being able to do its work. Of course, it will be because of the powers that a part has that it will be able to do its work. Certainly the hand of a well-crafted mannequin will

¹⁰⁷ PA 640b33-641a4

look like a real human hand, but the mannequin's hand cannot do the work of a human hand; it does not have the power of grasping. Moreover, there is no being for which the work of the hand would be done in the case of the mannequin. A human hand performs a function for the entire human being of which it is a part.

What is also interesting here is that the matter of a part and so the matter of the whole organism as well, must be of a certain type. Only that matter which is capable of allowing a given part to do its work will do. A wooden or bronze hand is not possibly the matter of a hand, since such matter will not allow a hand to do its work. In view of such a point alone, the relation between organic form and matter must be more of a unity than bronze sphere. There is not a point about how the sphere needs bronze to be sculpted; moreover, there is no point about the work a sphere has to accomplish.

Nonetheless, in terms of the desired unity of form and matter of Eta 6, this is not yet enough to get us that the matter for the part of a given animal can only be of a certain kind of stuff. It might be that several different materials are equally good when it comes to allowing a part to discharge its function. However, there is something Aristotle says about the seed of animals that suggests there is a uniqueness to what the matter is of a given animal. Aristotle says, "Surely it is not any chance thing that comes to be from each seed, nor a chance seed which comes from a chance body; rather, *this* one comes from *that* one."¹⁰⁸ Whatever material a given seed is, it already is such that it can only realize one species of animal. However, it might be that the total form of the animal is determined uniquely by the seed and yet there will be identical parts from animal to animal. So even if the seed and what it produces is unique from species to species, there

¹⁰⁸ PA 641b26-28

might be non-unique parts of which such unique seeds are productive. Granted that parts are the matter of an animal, then there would be some non-uniqueness to the matter of some animals.

We find later that the parts of a given species that are in their “substantial being” must be unique to that species. Aristotle brings this point up while discussing problems for definitions obtained by way of bipartite division. He says:

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.¹⁰⁹

Given the apparent identification between animal parts and matter that has been made throughout Eta and here in *Parts of Animals* 1, then for Aristotle to say that when one kind of part is realized in two different species it is required that the part as it is realized in the two different species either be unique or not part of the substantial being of the species, it means that the matter that is part of the substantial being of an animal must be unique to that animal.

Let’s pause here to see what we have so far in terms of the unity of substance that was set out in Eta 6. The unity of a substance from Eta 6 was understood to be a unity of form and matter. Matter was understood as a potentiality, and form was the actuality. Eta

¹⁰⁹ PA 643a1-5 Lennox in his commentary backs up the point expressed in the antecedent of the above conditional. He says “Minimally, Aristotle is insisting that, if a feature is shared by, or common to, things different in form, and cannot be further differentiated, then it does not belong in the being of either one. If the two-footedness of birds and human were not capable of differentiation, this feature would not specify the being of either.” See Lennox 2001: 157.

began with an account of form's (the difference's) relation to matter that was expressed in mereological terms. However, in Eta 6 the mereological dimension was dropped. Moreover, the example that Aristotle chose seemed to be poor for illustrating the sense of unity between form and matter that he envisioned. But the preceding passages from *Parts of Animals* helps to straighten out these difficulties. On the one hand, it seems clear here that the matter of an animal includes at least its organic parts. These are the parts that have a work to perform that is intelligible only in the context of the whole animal. Moreover, such parts as belong in the being of the animal species are unique to that animal species. It seems that such parts must be things like feet, hands, etc., as these would all occur in unique ways. But why is it that such parts *must* be unique?

Aristotle says:

Since every instrument is for the sake of something, and each of the parts of the body is for the sake of something, and what they are for the sake of is 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 sawing; for sawing is a certain use. So the body too is in a way for the sake of the soul, and the parts for the sake of the functions in relation to which each of them has naturally developed.¹¹⁰

¹¹⁰ PA 645b15-20, Aristotle often uses the tool model for conceiving of natural teleology. As will be seen below, there are adjustments that have to be made when transitioning from the teleological relationship between the tool and its use and that of the substance and its good. One possible worry I will not consider in detail is that Aristotle's conception of teleology depends upon thinking of natural substances in terms that require the type of intentional activity of the craftsman. All I will say is that I think Broadie is correct to emphasize that the point of the comparison is between the idealized relation of the relevant cognitive skills of the craftsman and the product of his activity. In such an abstraction, we are supposed to think of a perfect activity of production that is like second nature to the craftsperson, busy away producing with no express intention about doing what he is doing for some end. Qua human being, the person who is an expert craftsman could be thinking about some reason for the tool and be deliberating further about how to put it to use. But the abstraction of the

What we get here is a sort of teleological hierarchy in an animal body. Each animal part is for the sake of some action, and the entire animal body is for the sake of some complete action. If we look at Aristotle's analogy of the saw, we will see what he has in mind here more clearly.

Let us suppose a saw is made up of a wooden handle and a metal serrated blade. The blade is made a certain length and with a proper serration for the sake of cutting through wood. The handle is made so that it can be easily grasped and pushed forwards and backwards across the wood so that the blade can cut through the wood. In one sense, we can see that the action of the handle of the saw is distinct from the action of the blade of the saw. However, in another sense, we can see that they need to be understood together. This is because the full understanding of that for the sake of which the two parts are, is only available in relation to the complete action of the saw, and it takes both parts together to understand how either one by itself contributes to that complete action. How is it that the blade of the saw will be able to be moved across the wood? The blade will be moved by the hand that grips the handle to which the blade is fixed. How is it that gripping the handle and moving it will contribute to cutting the wood? There is a blade attached to the handle. Both of these questions of the individual functions of the parts are made intelligible in their interrelation by reference to the complete action of the saw.

In the case of animals and their parts the relation must be similar. Each animal part would have an action, and this action would contribute to the complete action of the

perfect craftsman is just capturing that non-deliberative state wherein the craftsman would produce like second nature. This seems to give us a model from which to start thinking about the teleology of natural substances that does not presuppose the kind of deliberative (and so calculative and desirous) relationship to the end that is implausible concerning most natural substances. See Broadie 1987.

whole animal body. All animal parts taken together are the animal body, and this body has a complete action comprised of all the actions of the parts of the animal.¹¹¹ Given that the body as a whole possesses a complete action and it is not a heap of actions that are contingently assembled, then like the saw, we should understand that all the functions of the particular bodily parts will work together in a complementary way. Each part would then have an action and so contribute to the complete action of the animal body, and yet each part would be supported for its existence by the actions of all the other bodily parts. Where this analogy would have to break down is in terms of the telos of the whole action of the animal. Unlike a saw, there is not a work independent of the animal in question towards which the animal is directed as a telos. An animal's end is to live in the way peculiar to the species in question.

One could wonder in which of the following two ways a complete action is meant. 1) A complete action could mean that all the parts are interdependently functioning, and this functioning of all the parts together is *all* we mean by complete action. 2) A complete action could mean that there is some function that is realized *in addition* to and *as* the interdependent functioning of the parts, and this is the whole animal as it is in act. I understand Aristotle to be saying something like 2 here. When the entire animal is in act, there is an account that can be given of this act just in terms of the interdependent functioning of the parts. However, these interdependent functional relationships in act are also the entire animal acting. This is not to deny that the description focusing on the whole is privileged. As we see from the saw analogy, it is

¹¹¹ This agrees with the reading of Jason A. Tipton in his *Philosophical Biology in Aristotle's Parts of Animals*. He identifies the bodily members as altogether constituting a whole of parts, and he sees the functions of those parts constituting another functional whole of parts. See Tipton 2014: 71.

only at the level of the whole that we get the telos that explains complete action of the whole animal.

Take a mock example. Suppose we are considering some parts of a tiger. It has to have a certain power of smell in its nose, a power of sight in its eyes, a power for locomotion in its limbs and other parts, a certain kind of teeth, etc. When a tiger hunts and eats, all of these various parts and functions come together in the unique way that is the tiger's hunting and eating. Minimally, these parts and functions have to be fairly well suited for each other to come together as one action of hunting. A hodgepodge of parts with non-complementary functions will not be able to come together in such a single action. The hunting as an action of the whole tiger just is, materially speaking, the interdependent functioning of the parts.

The parts of a given animal must be suited to one another to work together and so be one body. Since the matter of the animal is its parts, and the activity of the whole animal will be the act of its form, then the material of a given animal is fixed according to its form. But why can the matter not be different and yet realize the same complete action? Is there not some gap between the function of a part and the part itself? Think of how wildly different the parts of an artifact like a saw could be. Surely several different sorts of parts could be used to achieve the same function. Moreover, the same parts of a saw could be used in ways that are not even for the sake of sawing. For example, a person can use a saw as a musical instrument.

Once again, the worries about the contingent relation between the matter and form creep in. This time it is worse too. Before it seemed that contingency infected the relation between matter and form because we included the elements in the substantial being of

substances. The current worry is that there is some contingency between the function of a part and the part that realizes the function. Thus, granted that the matter of an animal is its parts and the function of the part is part of the activity of the form of the whole animal, then once again contingency enters into the relation between the form and matter.

The crucial difference here is that in the case of artifacts, the telos of the function is external to the artifact itself, but with animals, the telos is internal to the animal. The purpose of an organic body is to maintain itself in the peculiar manner appropriate to it. For Aristotle, the identity of a complex whole such as an artifact and an animal is found in the telos, and it is just because the telos of an artifact is external to the artifact itself that we can have wildly different looking tools be the same tool in functional terms, or have one and the same tool take on wildly different functions. However, because an animal's telos is intrinsic to it, we cannot change parts that an animal *ought to have* without changing the animal itself. Whereas the action of an artifact is, roughly speaking, completed by doing something beyond itself, the action of an animal is completed by the animal's whole body doing something, full stop.¹¹²

Even if not grammatically, ontologically speaking it seems that the verbs that go with artifacts are transitive, and in two ways. On the one hand, the end of the artifact is realized beyond itself. On the other hand, the artifact is moved by something exterior to

¹¹² There might still be some contingency that enters into the picture here. Aristotle will allow that some animal parts will develop from the excess of nutrients in an animal's diet. Such excess nutrients are made available to the animal from its environment; thus a part like a horn may be considered not to be a part of the form of the animal. But for all this, the horn is still not present in the animal due to factors that are completely independent of the form of the animal. However, as I will consider later in chapter 5, there is a deep worry here given the mysterious discussion of deer horns in *PA* 663a8-10. Aristotle declares such not only useless but in fact detrimental. My use of "ought to have" in the above anticipates that solution. In short, my view is that the horns are parts that are beneficial up to a point, but then become detrimental. Thus, the animal ought to have the parts prior to their becoming detrimental, but not after. Hence, the shedding occurs.

itself and for an end apprehended by the one using the artifact. This is why, within some limits, one and the same artifact can be put to uses that are wildly different. The person or persons using the tool determines its end. Though also within limits, several different looking tools can be used to accomplish the same end. With an animal, its actions should be understood in an intransitive sense ontologically speaking, and in two ways. The function of the parts is realized in and among the several parts themselves, and a complete action of the animal is an action of the entire animal. When a predator like a lion hunts and consumes, this certainly affects beings that are beyond itself. But in terms of the lion's telos, all that matters is the lion. The parts that are the lion find their end in maintaining themselves and being at work in the complete work of the whole lion, and the telos of the lion is achieved in living as a lion lives.¹¹³

To put the preceding point next to Aristotle's critique of "Democritus," though it is true that the identity of an animal part is bound up in being able to perform its function so that a severed foot is only homonymously a foot, this function cannot be so generically characterized that any range of morphological variations on a given part that a

¹¹³ We might consider problematic cases involving either 1) non-human production of object such as nest building by birds or a beaver making a dam or 2) humans making artifacts. Concerning 1, I think the answer to such difficulties lies in considering the end goal. Yes, there is an end achieved in the nest or dam, but the end is not for the nest or the dam. The end is for the bird or beaver. There is contingency between fit of part to function that enters here, but the contingency is between the parts and function of the nest, the parts of the dam and its function. However, on the side of the bird or beaver, it would not be the same actualization of its building capacity were the parts of the animals in question to change. This is because it is the activity of just those parts together as the whole animal that is the end of that animal: bird or beaver. If one brings up case 2, I must confess that I do not think it's possible to defend the view that the human act requires one specific kind of body. The rational capacities that we have and are definitory of our function are not the act of a body, though of course the body is involved as a necessary consequence for all our acts but contemplation. Still, it is plausible that a practically rational being like ourselves should have a body that works well to achieve the sort of practical activities unique to us in virtue of our rationality. A hand as the tool of tools is one such part that works well with our rational soul. However, it seems that there is nothing functionally necessary about our particular kind of hand or any other of the exact bodily features we have for the sake of realizing our practical rationality.

given species possesses can still count as a properly formed part of that species.¹¹⁴ On the one hand, the part must be suited to work with the other parts of the animal so that a complete action of the animal's entire body emerges. This itself limits the range of morphological variations. On the other, the complete action of the animal is realized through and *as* the work of the entire animal body. The realization of the complete action is not outside the animal or beyond its parts. Thus, the particular morphological features of the animal parts go into what counts as the complete action of the animal. A change in the set of parts for an animal would mean that the form that is being realized is different.

In *PA 2* we get a very nice summation of the stages of compositions in an animal. It goes well with the preceding to show how the various parts of animals come together to become a body and so have a complete action. Aristotle says:

Since there are three compositions, one might put first composition from what some people call the elements, e.g. earth, air, water, and fire. And yet, perhaps it is better to speak of composition from the potentials, and not from *all* of them, but as stated previously in other works. That is, moist, dry, hot, and cold are matter of the composite bodies, while the other differences, e.g. heaviness and lightness, density and rarity, roughness and smoothness, and the other bodily affections of this sort, follow these. Second is the composition of the nature of the uniform parts within animals – e.g. of bone, flesh, and the other things of this sort – out of the primary things. Third and last in the series is the composition of the nature of the non-uniform parts – e.g. of face, hand, and such parts.¹¹⁵

¹¹⁴ There has to be some degree of range that is allowed here. Otherwise the only distinction between healthy, adult animals of the same sex would be that they occupied different positions in space.

¹¹⁵ *PA* 646a12-23

Notice the parallel with the opening of *Generation of Animals*. Aristotle says:

We have then already discussed the other three causes, for the definition and the final cause are the same, and the material of animals is their parts—of the whole animal the non-homogeneous parts, of these again the homogeneous, and of these last the so-called elements of bodies.¹¹⁶

The first stage of composition appears to be the composition of the elements from primary contraries or perhaps the composition of other inorganic stuffs from these elements. Though there might not ever be a developmental stage where the inorganic elements are combined to form the uniform (homogeneous) parts, nonetheless, the inorganic elements are present in the uniform parts.¹¹⁷ This marks the second stage of composition. The third stage listed here is the composition of the non-uniform parts out of the uniform. Aristotle does not mention the fourth stage, which would be the composition of the whole animal from the non-uniform parts, but it is obvious. So when Aristotle next makes the point that in generation what is posterior in time is prior in nature, we know that it is the whole animal and its action that is prior in nature even if the menses of the animal in question is what is prior in time. As his analogy with the case of the house shows, it is only the notion of the final whole by which we can come to understand the nature of the parts. This is because we need to understand the function of the parts, and it is only in the context of the whole animal at work that we can get a grasp on these parts' functions.

¹¹⁶ *GA* 715a8-12

¹¹⁷ In his commentary on the *Parts of Animals*, Lennox notes that the inorganic elements are never composed into the uniform parts during biological development. Instead, the developmental process begins with "blood or its analogue." See Lennox 2001: 180-181.

2.5 Eta 6's Substantial Unity in the Light of the *Parts of Animals*

In Eta it seemed that a mereological dimension to the form/matter relation was made explicit at the start of the book but later dropped once Aristotle went on to consider how the form and matter are a unity. Now we can appreciate how it is that there is a mereological dimension to substances, and why substances are a unity in a strong sense. Not only are animal substances the result of a composition of material parts, they are the result of an iterated series of such compositions. Recalling what Aristotle says, we ought not to consider the compositional parts that would be the same across various animals as part of the substantial being of any animal. Evidently the elements are not to be considered part of the essence of animals. However, since the uniform parts of a given species of animal are unique to that species, we would start there. It seems clear that the non-uniform parts would be unique.

Since the parts of the animals are their matter, then the ordering of these parts together must constitute the form of the animal. Since there is an iteration of compositions, there will be partial forms that themselves are composed together to result in a higher form. I will reserve the term substantial form for the final composition of the non-uniform parts; this substantial form is also a composition of the uniform parts insofar as the composition of the uniform parts is the non-uniform parts. We could also call the non-uniform parts, partial forms; such partial forms are matter for the substantial form. Perhaps the uniform parts are could also be considered partial forms; however, unlike the non-uniform they are immediately combinations of material that is not in the substantial being of the animal in question. This is not to exclude uniform parts themselves from the substantial being however. The uniform parts are included in the substantial being

because unlike the elements they only exist within the species of the animal possessing them.¹¹⁸

Let us remind ourselves how the substantial form and its matter, in the sense of non-uniform and uniform parts, are a unity in a very strong sense. It is the complete action of the whole animal body to which all teleological explanations must eventually return. Thus the complete action of the substantial form has explanatory priority in teleological terms. The several powers of the various non-uniform parts are at work together in various ways, and this mutually supporting work among the several non-uniform parts is what realizes the activity of the substantial form. Recalling what we found from *Parts of Animals* these several non-uniform parts have their identity in part through their function. This function of the several non-uniform parts is for the sake of the complete action of the substantial form. Thus the identity of any non-uniform part is found in the substantial form to which its own action contributes. Since the parts of the animal are its matter, then we see here that with respect to the non-uniform parts, the matter and substantial form of the animal is a unity. There is not an independent existence and activity for a non-uniform part apart from the work it does for the sake of the complete action of the substantial form. Any one non-uniform part's work is part of the complete action of the substantial form of the animal. A similar story holds for the relation between the uniform parts of a non-uniform part and the non-uniform part itself; that is, the collection of uniform parts that working together makeup some non-uniform

¹¹⁸ For a more details laying out of these iterations of the matter/form relationship see Furth 1987: 30-37. Kosman puts the point nicely, "But in each of these cases, the relation of matter to that of which it is the matter will be the same as that of an animal's body to the animal; it will be one of natural instrumentality, in which matter and that of which it is the matter share the same nature." See Kosman 1987: 389.

part is another case where the identify of any uniform part is found only in the whole work to which its own function contributes. The uniform parts' several functions would be for the sake of the non-uniform parts, and since the non-uniform parts functions are for the sake of the complete action of the substantial form, then the functions of uniform parts are ultimately for the sake of the complete action of the substantial form too. In this way, there is no irreducible multiplicity of forms in a living substance. All partial forms have reality only in virtue of the part they play in the substantial form and its actions.

The unity of substantial form does, however, cease in its relation to the inorganic elements. Though the elemental powers contribute to the work of the uniform parts, the identity of the elements is not bound up in this contribution. The elements would be what they are independently of their contribution to the life of any animal. This final point provides us with two ways to read what Aristotle is talking about in Eta 6. Recall the analogy of round bronze that Aristotle uses to describe the unity of a substance. As said earlier, the apparent contingency of bronze having a round shape made it seem like this was at best a loose analogy. However, perhaps we should understand the bronze as being like the elements, and then understand the round as being like the tight knit unity of the uniform parts, non-uniform parts, and substantial form. The contingency of the bronze being round would then parallel the contingency of some collection of inorganic elements being taken up into the composition of an animal. Call this the first reading. On a second reading, we would see the round bronze as being a rough way to indicate that the uniform and non-uniform parts in relation to the substantial form are not two different independent things; rather, all animal parts are parts of the unity of the substantial form.

The first reading has a big problem. The point of Eta 6 was to ground the unity of the definition in the unity of the substance. If we took the bronze to be representative of the inorganic elements, how would a definition amount to a unity at all? If the elements themselves are to be a part of the substantial being of a composite substance like an animal, then composite substances like animals hardly amount to unities. This is because such inorganic parts as the elements are what they are independently of their presence in a living being. Thus a definition whose unity is only as strong as the substance it describes must not be a unity when describing substances that would follow this reading of Eta 6 in which the inorganic elements are taken as part of the substantial being of substances.

As for the second reading that I am endorsing, admittedly, and as Bostock observes, the relation between “bronze” and “round” is ultimately contingent. That is, a thing’s being bronze does not entail its being round or vice versa. Aristotle often gives odd examples, and the contingency might just be a consequence of such an odd artificial example being used to illustrate a naturally organic relation between form and matter. Even if the example is not great, at least on this second reading the point of the apparently poor example would not sacrifice the unity of the substance and the unity of definition. The point is to show how the organic parts of the substance and the substantial form taken together are a unity, and so the definition that reflects this will also be a unity. So I take it that it is more sensible to read the bronze as representing the uniform and non-uniform parts, and the roundness of the bronze as representing the substantial form. We just must admit that the example is misleading.

One way that the definition can reflect the unity of the several parts in the substance is if the parts of the definition pick out the parts of the substance. Since, then, genera and differences are the parts to be found in the definition, we would expect our genera and differences to refer to the parts of the substance, though of course in more and less generic ways.¹¹⁹

With that in mind, consider the following:

Of the uniform parts present in animals, some are soft and moist, while others are hard and solid. Those that are moist are either generally so or are so while in their natural setting, e.g. blood, serum, soft fat, and fat, marrow, semen, bile, milk (in those that have it), flesh, and the parts analogous to these; for not all the animals are made of these parts, but rather some made from analogues to certain of these parts.¹²⁰

Blood and other such uniform parts are the focus, and Aristotle mentions that not all animals have all of these but rather some animals are made out of analogues. This would suggest that we could already classify some animals based upon the possession of such parts, full stop. That is to say, we might have the sanguineous animals, the non-sanguineous would be comprised of those animals having whatever parts are analogues for blood. Aristotle says later:

¹¹⁹ Bostock (see Bostock 1994: 287-289) thinks that Eta 6 shows Aristotle abandoning the notion of a definition's being comprised of genera and differences. He sees it as at odds with the strategy to account for the unity of definition that we find in a place like *Metaphysics* Zeta 12. In the next chapter I am going to consider Zeta 12 fully in the light of the present results. There I will argue that Zeta 12 focuses more on the terminological dimension of the account for the unity of definition; Eta 6 makes the ontology behind that account explicit. However, it is only after we have brought out the importance of animal parts for understanding substances that we can get the complete account.

¹²⁰ PA 647b10-19

The relative differences between things of the same kind are for the sake of the better – that is, the differences both of other parts and of blood from blood. One sort of blood is thinner, another thicker, one purer, another more turbid, and again one colder, another hotter, both in the parts of one animal (for the upper parts of one animal are distinguished from the lower parts by these differences), and between one animal and another. And in general some animals are blooded, while some have, in place of blood, another such part. Thicker and hotter blood is more productive of strength, while thinner and cooler blood is more perceptive and intelligent. And the same difference obtains among the attributes analogous to blood. This is why both bees and other such animals are more discerning in their nature than many blooded animals, and why among blooded animals those having cold and thin blood are more discerning than their opposites. But those with hot, thin, and pure blood are best; for such animals are at once in a good state relative to both courage and discernment.¹²¹

Notice how there will be several differences to describe the particular type of blood. The blood can differ from part to part within the same species, and it can differ across species. Moreover, we get that there are analogous parts to blood in other animals. This suggests that we have a specification of blood at the level of species and perhaps even types of blood within the same animal. But more importantly for the moment, it shows Aristotle operating in divisions that obtain from separating animals according to classes that are defined by reference to their parts.

¹²¹ PA 647b29 648a11

That the definition of an animal will need to refer to whether or not it is blooded is confirmed by Aristotle when he says, “[For] that some animals are blooded while some are bloodless will belong in the account defining their substantial being.”¹²² Clearly, the account defining the substantial being of a thing will be comprised of terms. What we see then is that Aristotle must derive at least some of these classes by consideration of the parts of the animal. What is more, notice how a kind like “blooded” is a determinable.¹²³ Any actual animal will have blood of a given sort. Though the passage above does not confirm or disconfirm that every species has unique blood, it does confirm that there are varieties of determinate types of blood. Thus, here is a clear case where one of the kinds of parts of animals is used in the definition of an animal, and this kind of part illustrates a determination relationship.

Though we will consider concrete passages later, this is not an isolated case. Aristotle does think of animal classes largely in terms of their parts.¹²⁴ At the beginning of *History of Animals* Aristotle repeats the division between uniform and non-uniform parts. Then he goes on to state how kinds can be derived from a comparison among such parts. He first observes that individuals of the same species will have identical parts.¹²⁵ He says:

In other cases the parts are identical, save only for a difference in the way of excess or defect, as is the case in such animals as are of one and the same genus.

¹²² PA 678 a34-35

¹²³ Much more on this follows in the next two chapters. For the moment, the relation between determinable and determinate can be understood the same as generic to specific.

¹²⁴ Aristotle will also think of classifications for animals in terms of habits and habitats as well.

¹²⁵ Clearly, “identical” here does not mean absolutely identical as my nose is identical to itself. Rather, the point is that my nose and another person do not differ the way a lion’s nose would with mine. Both myself and another have an identical *type* of nose: human.

By ‘genus’ I mean, for instance, Bird or Fish; for each of these is subject to difference in respect of its genus, and there are many species of fishes and of birds. Among them, most of the parts as a rule exhibit differences through contrariety of properties, such as colour and shape, in that some are more and some in a less degree the subject of the same property; and also in the way of multitude or fewness, magnitude or smallness, in short in the way of excess or defect. Thus in some the texture of the flesh is soft, in others firm; some have a long bill, others a short one; some have abundance of feathers, others have only a small quantity.¹²⁶

Aristotle now gives two cases of a kind, a determinable, in which several determinate differences can be located. The example of fish and bird is suggestive. There are surely several sorts of differences that be found among fishes’ several parts, and perhaps other differences too. If “bird” is to be a genus, how will it be the determinable for multiple types of determinate differences? Some birds have longer bills, others shorter ones. Some have an abundance of feathers, others less. A natural answer from what has preceded is that the genus “bird” will be the determinable for these various determinate features by being complex. “Bird” is really an abbreviation for those host of determinable features with respect to which particular species of birds present the determinate features. So, going off of the above, perhaps being feathered is taken by Aristotle to be part of what it means to be a bird, and likewise with possessing some kind of beak. However, no actual species of bird merely has feathers, full stop. Any actual species of bird possesses a

¹²⁶ HA 486b17

determinate kind of feather and to a determinate extent. The same goes for all of its other determinable, birdlike features.

2.6 A Remaining Problem

Expanding on the above, we should expect that the determination relation for an animal species will involve several determinable kinds, genera. Several of these will be taken by considering the parts of animals. In this way, the genus of an animal species will be comprised of a variety of determinable features. The difference for an animal species will have to describe, among potentially other things, how it is that these several determinable parts look in a determinate form. The difference will contain all of these determinates. The difference will be describing the organic features in the animal species that are unique to the animal in question. The difference immediately maps onto the animate aspects of the ontology of animal substances. The substantial being of species is unique to those species; the difference will contain all the descriptions of such unique traits. The genus, on the other hand, does not immediately correspond to the ontology of animal substances. There is no such thing as a proper part in a bird that is just “feathered” full stop. Rather, the determinable features in species only become visible when we are comparing the features of certain different species.¹²⁷ Still, such generic and determinable features correspond to the substance in some way. They correspond to the substance in the same way that being colored corresponds to something that is red. Identifying generic

¹²⁷ In chapter 5 we will consider that there are Aristotelian examples of determinable classes that arise by considering how certain types of parts work together in a kind to solve a problem specific to that kind. To be precise, there are parts of birds that work together to make up for the digestive problem caused by only having a beak and no teeth and jaws with which to grind their food.

traits is not useless. As we will see later, certain kinds of explanation require us to consider animal substance only at a generic level.

For now, we still have a pressing problem left concerning definitional unity. It can be put in terms of Eta 6. Supposing that the concept of telos and the complete function of an animal body is sufficient to explain why the substance is a unity in terms of form and matter, we still have to see how the promise of Eta 6 is made good. That is, Eta 6 said that if the definition is a formula of a unity, then the definition too is a unity. My position is that we have to pay attention to the terminological side of the question of a definition's unity that Zeta 12 emphasizes in order to understand why Eta 6 is a successful account of a definition's unity for Aristotle. I intend to do this in the next chapter.

3. Aristotelian Determination Relation and Animal Parts

In chapter 2 we saw how the unity of the form and matter in a substance should be understood along mereological lines. The matter of an animal substance is those parts in the substance that are unique to the substance in question. The form is the working relationship that all those material parts have together. However, we also saw that this relationship was iterated. First, the uniform parts are comprised of inorganic elements. Since these inorganic elements are not unique to any one living substance, then they are not part of the being of any living substance. Still, the composition of inorganic parts present in the uniform parts is required for there to be uniform parts at all. Such inorganic parts are matter for the substance, but they are not part of the substance's being. The next level up is the composition of uniform parts into the non-uniform parts. Thus, uniform parts such as skin, bones, blood, etc. are combined as a hand. A hand can be understood as a form in relation to the uniform parts that are present in it, and these non-uniform parts are the matter of the hand. The uniform parts in the hand work together in such a way as to allow the function of a hand to be possible. Finally, the collection of non-uniform parts all working together is the living substance. It is this final, functional composition of non-uniform parts that is the substantial form; the non-uniform parts are matter for the substantial form.

In this story the matter and form of a substance are unified.¹²⁸ It is not possible for uniform parts to be independently of non-uniform parts, and non-uniform parts cannot be

¹²⁸ There is another obvious sense of matter according to which the matter and form would not at all be a unity. If we think of the inorganic stuffs that are not part of the substantial being of the animal as a kind of matter, it is clear that this kind of inorganic matter would not be in unity with the form. Such inorganic stuffs can be what they are independently of their presence in a living thing. With organic matter

independently of their presence in the appropriate living substance having such parts. On the one hand, the only reason why any such parts, whether uniform or non-uniform, exist is because of the generative process of living substances. Bones, hands, etc. do not come into being unless it is through the generation of a living substance. On the other hand, even when such parts are removed from some living substance, the removed parts lose their identity as the parts they were in the living substance. This is because the being of the part is wound up in discharging its proper function for the whole of which it is a part, and parts cannot discharge their proper functions when separated from the whole animal. So, in terms of dependency, the parts depend upon the whole: the matter cannot be independently of the form.

The dependency does, however, go the other direction. The total function that is achieved by the several parts of an animal working together is impossible without parts. For example, there cannot be a dog that is without any of the parts appropriate to a dog. Now, it is true that some parts that are included in the being of a substance can be lost, and yet the substance is not altogether destroyed by such a loss. So, if a dog were to lose a limb, the dog would not necessarily perish, but the entire *ergon* of the dog would necessarily be impaired just by losing a limb. Supposing, for instance, that running is supposed to be involved in the *ergon* of a dog, the loss of a limb will be detrimental to the *ergon* of the dog.

The form and matter of a living substance are in different ways both dependent upon one another. The form of the animal is the functional whole and so requires the proper parts in order for it to be realized, and the matter of the animal are its several parts which cannot be independently of the whole animal. According to Eta 6, it is because of

this unity of form and matter that the definition is a unity as well. There must then be some kind of a connection between the definition and substance such that the unity of the matter and form on the side of substance allows us to see the parts of the definition as unified as well. However, what this connection is does not become transparent in the context of Eta 6. We are only promised that somehow the unity of form and matter is like the problem of the unity of definition, and we get some grounds to think the form might be like the difference.

To make some progress toward solving the problem of the unity of definition, I will first consider Salmieri's account of the determination relation in Aristotle. Then, I want to turn briefly to Zeta 12 where we get one of the most sustained accounts of why a definition is a unity. Next, we will consider how there is an inherent tension between Zeta 12's proposal and that which is apparently hinted at in Eta 6. *PA* I.2-3 explicitly states problems that will plague an account of definitional unity like we find in Zeta 12. These problems arise due to assumptions about the necessity of defining an animal in terms of its parts. So *PA* I.2-3 makes explicit what is at issue between the conception of a definition's unity that we find in Zeta 12 and the one that is hinted at in Eta 6. From here, I will then offer what I take to be the solution to the issue, and this will involve completing my account of what I take to be the implicit determination relation in Aristotle's thought. It is this rich version of determination that allows us to see Eta 6 and Zeta 12 as working in harmony.¹²⁹ I think they are focusing on different aspects of one

¹²⁹ I am not alone in thinking Z.12 and H.6 work together somehow. In Owens (see Owens 1978) says of Z.12 that it has a doublet "in which the relation of the elements in the physical composite is brought into the treatment and explained on the same principles." As I will point out later, Gill (see Gill 2010), though differing in my interpretation, sees the two as working together in that Z.12 gives the key to understanding H.6 Salmieri (see Salmieri 2008) sees both passages as solving the problem of a definition's unity by relying on the assimilation of the notion of matter to that of determinable

and the same determination relationship. I will sum up my account of this determination three stages. First, I will introduce a more streamlined and basic account of the relation so that the way in which the desiderata are satisfied is made more evident. Then, I will introduce some complications for this basic account and comment on how the complications, though admittedly not covered by the basic account, could be accommodated without compromising desiderata satisfaction.

3.1 The Basic Determination Relation

3.1.1 Salmieri's Interpretation of *Metaphysics Iota*

In his dissertation *Aristotle and the Problem of Concepts*¹³⁰ Greg Salmieri shows that Aristotle made use of the determination relation. He commences by citing W. E. Johnson as the more or less contemporary touchstone for what it means for two things to be in a determination relation. Salmieri isolates three important points made by Johnson about the determination relation. He labels these J1-J3. He says:

“J1. Certain things are not merely other than one another—as blue is other than both loud and inflation—but are different from, or “opponent to” one another, as blue is different from red.

J2. Things that differ from one another in this way can, on the basis of this difference, be grouped together as alternative determinates of a single determinable.

kind. Thus H.6's apparent shift to a consideration of form and matter for solving the problem of a definition's unity is just a further elaboration of the solution presented in Z.12. Though I think Salmieri is correct that the determination relation plays a role throughout all of Aristotle's accounts for the unity of a definition, I think that H.6 brings up a different aspect of that relation than Z.12. Whereas Z.12 is looking at determination as it occurs along one generic class all the way to the final determinate version of that class, I think H.6 brings out the mereological dimension of a complicated determination relation. This mereological dimension alludes to the sort of functional relationship the animal parts, under a fully specific description, have to one another. Edward Halper (see Halper 1989) sees this same emphasis on the functional unity of the material parts that constitutes form in H.6 too. However, I think that all of these aspects of the determination relation and consequently the full account of a definition's unity, most fully emerge in *Parts of Animals* book I.

¹³⁰ See Salmieri 2008

J3. The grouping of determinates of a single determinable together is not based on any qualitatively identical characteristic that is shared by each determinate and revealed by an analysis of it.”¹³¹

Some things are merely *other* than one another. One thing X’s being other than something else Y is a particular way of X not-being Y. Some things, however, are different from one another. One thing X’s being different from Y is also a particular way of X not-being Y. Consider the contrast between the pair “blue and loud” and the pair “blue and red.” With the second pair, it is true that blue is not red, and we can nest this “not-being” within an underlying sameness. Blue is not the same *color* as red; color is the underlying sameness in terms of which blue is said not to be red. Though blue is not loud, we cannot as readily nest this “not-being” within an underlying sameness.¹³² So when we have one thing X’s not-being another thing Y as obtains with cases like blue and red, we say that X is different from Y, and this means the way in which X is not Y is according to some underlying sameness. When we have one thing X’s not-being another thing Y as obtains with cases like blue and loud, we say that X is other than Y, and this means the way in which X is not Y is not nested within some underlying sameness or, at any rate, is not as readily nested within some underlying sameness. I take this to be the point of J1.

The point of J2 is easily grasped after J1. The underlying sameness in terms of which some things X and Y differ is called a determinable. In such a case, X and Y

¹³¹ Salmieri 78

¹³² I would disagree with those who say that blue and loud are simply other than each other and that there exists no underlying sameness in terms of which blue and loud are to be distinguished from one another. Granted, red and blue more obviously manifest the sameness in which their difference is nested. However, it seems there is an underlying sameness for blue and loud as well, albeit a more remote sameness by comparison. Both blue and loud are sensible qualities, and though this sameness might be quite abstract, it still seems to be a kind of sameness. So though I admit that when we compare the pair red and blue to the pair blue and loud, red and blue are more akin to difference and blue and loud to otherness, I would not want to say that absolutely speaking blue is other than loud. As we will see, Aristotle may want to affirm this absolute sense of otherness in some cases.

would be called the determinates of this determinable. So, for instance, blue and red are two determinates of the determinable “color.” Scarlet, crimson, and maroon would be determinates of the determinable red. So it is possible, as the case with red here illustrates, for one and the same thing Y to be both determinate in relation to some more determinable property X, and also be determinable in relation to some more determinate property Z.¹³³

The point of J3 takes some unpacking. On the surface it may sound odd. After all, the underlying sameness in terms of which different things are not each other seems to be a qualitatively speaking identical characteristic. Johnson says:

But can the same reason be given for grouping red, yellow and green (say) in one class under the name colour? What is most prominently notable about red, green, and yellow is that they are different, and even, as we may say, opponent to one another; is there any (secondary) adjective which analysis would reveal as characterizing these different (primary) adjectives? In my view, there is no such (secondary) adjective; in fact, the several colours are put into the same group and given the same name colour, not on the ground of any partial agreement, but on

¹³³ I take it as obvious that the determination relation is transitive, and it is partially with a view to transitivity that I softened the above point about the distinction between otherness and difference. For instance, granted that blue is a determinate way of being colored, and colored is a determinate of being a quality, then “blue” is a determinate way of being a quality by transitivity. It seems easy to follow such links via transitivity to “quality” starting from “loud.” Hence “loud” and “blue” would become determinates of one and the same determinable. It seems natural to accept transitivity when it comes to determination, thus it seems several more things can be related via a determination relation than we would normally expect. However, the point still stands that several more invocations of transitivity are needed for some things to be made to stand under one and the same determinable than others, and likely some things are immediately determinate in relation to an other thing. Thus, as I stated earlier, we talk about pairs of items that are more akin to a relation of sheer otherness than other pairs of items that more obviously manifest their underlying sameness. I do not believe that there are any two items that are merely other than one another, though for my use of determination with Aristotle, I do not think anything hinges upon there being or not being two items that are merely other than one another.

the ground of the special kind of difference which distinguishes one colour from another; whereas no such difference exists between a colour and a shape¹³⁴

There is not, as Johnson sees it, some common thing in several different particular colors that we could arrive at through analyzing out all the other differentiating factors. Thus, the determinable “color” which is the underlying sameness is not some atomic, ontological feature present in every particular color. Color is present in the several different determinate colors only as those colors. To help make the point by way of contrast, suppose we had a clock, a bell, and a statue that are all made of bronze among other components. We can have all the non-bronze components of the artifacts without necessarily having the bronze. The bell’s having a wooden handle, for instance, does not entail that any other part of it be made of bronze. In the case of such artifacts, we could literally remove the bronze and show that in virtue of which the clock, the bell, and the statue were said to be the same. This is just not possible when it comes to an underlying sameness like “color.” Surely we can conceptually distinguish color from particular colors, but we cannot have a real color except as a particular color. A determinable feature, as the case of color illustrates, is not compositionally present with other features and together makes the determinate feature.

Salmieri shows how Aristotle affirms J1-J3¹³⁵ in the *Metaphysics* Iota. Aristotle says:

But difference is not the same as otherness. For the other and that which it is other than need not be other in some definite respect (for everything that exists

¹³⁴ Johnson 174

¹³⁵ Salmieri shows that Aristotle holds to J1 and J2. However, he believes that J3 is entailed by J1 and J2.

is either other or the same), but that which is different from anything is different in some respect, so that there must be something identical whereby they differ. And this identical thing is genus or species; for all things that differ differ either in genus or in species, in genus if the things have not their matter in common and are not generated out of each other (i.e. if they belong to different figures of predication), and in species if they have the same genus (the genus is that same thing which both the different things are said to be in respect of their substance). And contraries are different, and contrariety is a kind of difference. That we are right in this supposition is shown by induction. For they are all seen to be different; they are not merely other, but some are other in genus, and others are in the same line of predication, and therefore in the same genus, and the same in genus. We have distinguished elsewhere what sort of things are the same or other in genus. Since things which differ may differ from one another more or less, there is also a greatest difference, and this I call contrariety. That contrariety is the greatest difference is made clear by induction. For things which differ in genus have no way to one another, but are too far distant and are not comparable; and for things that differ in species the extremes from which generation takes place are the contraries; and the distance between extremes—and therefore that between the contraries—is the greatest.¹³⁶

So we get the same distinction between otherness (ἑτερότης) and difference (διαφορά).

Two things can be said to be other without this being nested in terms of some underlying sameness. However, two things are different only in some definite respect, some

¹³⁶ *Met* 1055a3-18

underlying sameness. Aristotle says they must differ either in kind/genus (γένει) or in form/species (εἶδει). As Salmieri helpfully flags here, there is some confusion it seems in the way that Aristotle is using his terms.¹³⁷ However, the main point of passage is evident: some things differ according to an underlying sameness while things that are other need not be referred to any definite respect in which they are other. Thus we have an endorsement of J1 here.

Salimieri next turns to Iota 8, where Aristotle says:

That which is other in species is other than something in something, and this must belong to both; e.g. if it is an animal other in species, both are animals. The things, then, which are other in species must be in the same genus. For by genus I mean that one identical thing which is predicated of both and is differentiated in no merely accidental way, whether conceived as matter or otherwise. For not only must the common nature attach to the different things, e.g. not only must both be animals, but this very animal must also be different for each (e.g. in the one case horse, in the other man), and therefore this common nature is specifically different for the two things. One then will be in virtue of its own nature one sort of animal, and the other another, e.g. one a horse and the other a man. This difference then must be an otherness of the genus. For I give the name

¹³⁷ When we say that two things X and Y differ in genus, this could mean that X is of a distinct genus from the one containing Y. However, just as we say two different kinds of color differ in their color, it could also mean that X and Y differ in being two different species of the same genus. As long as Aristotle uses the expression consistently, it would be fine. But, as the above passage shows, he appears to use the expression in two different ways. When he says “in genus if the things have not their matter in common and are not generated out of each other” he would appear to be using “differ in genus” in the sense that we have to different species of the same genus. Thus, when he gives us an example of things differing in species, we would expect to get different individuals of the same species. However, he goes on to say that things differing in species have the genus in common.

of ‘difference in the genus’ to an otherness which makes the genus itself other.¹³⁸

Here Aristotle affirms J2. Notice that the differing species are grouped according to the determinable “animal.” Moreover, it seems J3 is also endorsed with Aristotle’s “this very animal must also be different for each (i.e. in the one case horse, in the other man).” The point here is that there is not some common property called “animal” existing independently of the differentiating features which, when added to it, yield horse in the one case and man in the other. Rather, animal is only present in the one case as horse and in the other as man.¹³⁹ As Salmieri says:

For Aristotle, the forms of a kind aren’t disparate phenomena but variations on a theme, alternative versions of the same thing. But the sameness they share isn’t something that exists identically in each of them that can be contrasted to their differing forms as the control in a scientific experiment can be contrasted with the variables. Rather the thing that is the same, the kind, is the very thing in which the different forms are other than one another—it is the respect in which the various forms of the kind vary.¹⁴⁰

3.1.2 Shortcoming of the Basic Determination Relation and Hint of a Possible Solution from W. E. Johnson

In what follows Salmieri goes on to showcase how this attribution of the

¹³⁸ *Met* 1058a8-16

¹³⁹ This does not prevent us from considering in its own right that underlying sameness in virtue of which we recognize things as types of animals. Surely, we are able to consider a class such as bird or animal regardless of the fact that it is impossible for any substance to simply be an animal or bird with no further determination. This must be required of any Aristotelian account of determination insofar as Aristotelian explanations will require generic and so determinable classes for explanatory purposes.

¹⁴⁰ Salmieri 82

determinable relation to Aristotle helps to explain how Aristotle is able to save the unity of definition. He looks at this in the context of Zeta 12 and Eta 6.¹⁴¹ However, though I agree with what Salmieri has said as far as it goes, I believe there is more to be said about the full account of a determination relation in Aristotle. In particular, there is a mereological dimension for which an account must be given. Recall that real definitions of animals must refer to animal parts. Thus, even if Salmieri is correct, as I believe he is, that Aristotle does use the determination relation as the means by which to account for a definition's unity, this must be shown to be possible given definitions that are complex enough to describe the parts of the animal.

Interestingly, in W.E. Johnson's original work on the determination relation, we can find something that is highly suggestive as to how we might start incorporating a mereological dimension into the determination relation. As just stated above, animals have several parts, so the definitions of animals will be terminologically speaking a whole of parts provided definitions refer to such animal parts. Given that there will be more and less generic terms in the definition of an animal, then we should expect to find more determinate descriptions of the animal's parts and correspondingly more determinable descriptions of the animal's parts. As we will momentarily see, Johnson shows just how this could look in the case of a plant.

Johnson begins by observing how "increase of intension is accompanied by decrease of extension."¹⁴² The initial idea is that given three adjectives¹⁴³ P, Q, and R, if we characterize a set as being all those members of which the conjunction "PQR" holds,

¹⁴¹ *ibid*

¹⁴² Johnson 178

¹⁴³ Johnson slides occasionally between terms that denote linguistic items and terms that denote ontological items. As far as I can tell, these "use" and "mention" slips are harmless.

then we will have an increase in intension in comparison to a set of which the membership criteria is only one of these conjuncts; however, we will have an extension that is equal or narrower given the conjunction of the three adjectives in contrast to a set of which the membership criteria is only of those adjectives. For example, the set whose members are “blue and square” is larger in terms of intension than the set whose members are “blue.” At the same time, the set whose members are “blue and square” is extensionally speaking equal or smaller than the set whose members are “blue.”

Obviously, membership in the set of all blue and square things is sufficient for membership in the set of all blue things. Thus the set of all blue and square things will be a proper subset of the set of all blue things, provided some blue things are not square.

Only if every blue thing is also square will the two sets be equal. However, clearly there is no way that the set of all blue things could ever be a proper subset of the set of all blue and square things. These points can clearly be generalized, and this generalization would just be to state that there is an inverse proportion between the sizes of the extension and intension of a class.

Johnson observes how there is another way than conjunction of predicates to increase the intension of a class and so decrease its extension. Suppose we have the above conjunction “PQR” as the set membership criteria for some class. Using Johnson’s own notation, let us denote a determinate of P by p' . Thus the new set whose membership criterion is “ $p'QR$ ” is greater in intension and possibly less¹⁴⁴ in extension than the set

¹⁴⁴ It is a fine point of detail here whether or not classes defined by a given determinable are of necessity broader in extension than the classes defined by their respective determinates. For Aristotle, the answer would be yes. But I qualify the point above only in terms of “possibly” in order to allow for some who might think that in the actual world the class defined by some determinable is co-extensive with a class defined by one of its determinates. This may seem odd. It would be like if

whose membership criterion was “PQR.” As Johnson observes here:

“Thus there is a genuine difference between that process of increased determination which conjunctively introduces foreign adjectives, and that other process by which without increasing, so to speak, the number of adjectives, we define them more determinately.”¹⁴⁵

This point alone is already intriguing. Recalling the notion of a definition by division and that such divisions *can* be terms signifying determinates of more determinable classes, we can see how what Johnson is observing here has deep roots. But one of the examples he uses to showcase this point has to make us pause a bit as Aristotelians. Before we go to this example, a few clarifying remarks on Johnson’s terminology are needed. Johnson proposes that we signify a determinable by a capital letter, say P for example. Next, assume P has two determinates; he says we should signify these as follows: p’ and p’’. Assume we have a summum genus given by the conjunction: PQ, where P is a determinable and Q is a determinable. For the sake of brevity, suppose each of these determinables has only two determinates. Thus we would have the broadest class, defined by conjunction of the determinable P and Q: PQ. Then we would have the following intensionally greater and extensionally lesser classes defined by: p’Q, p’’Q, Pq’, and Pq’’. To clarify, the class defined by Pq’ would be all those things that are the determinable P and the determinate q’. Finally, there would be the most determinate classes or the infima species. These would be the classes defined by: p’q’, p’q’’, p’’q’, and p’’q’’.

the only color in the actual world were red. Red is a determinate of color, but in this odd world where all is red, the class of all red things is co-extensive with the class of all colored things.

¹⁴⁵ Johnson 178

Now we come to what is very suggestive for the current focus on Aristotle and the definitions of animals. Johnson says:

To illustrate these symbols from a botanical classification of plants: let the determinable P stand for the number of cotyledons, Q for the disposition of the stamens, R for the form of the corolla, S for the attachment of the petals and sepals, and T for the divisibility of the calyx. Then PQRST represents the summum genus '*plants*' as describable under these five heads, but otherwise undetermined in character.¹⁴⁶

Notice that what we are getting is a mereological dimension incorporated into the determinable relation. There are several determinable classes conjoined together that make up summum genus '*plants*.' The term "plant" is itself singular, but this is really a shorthand for a terminologically multiple genus. Moreover, the multiple genus for which "plant" is a shorthand involves an explicit reference to the parts of the plant in the descriptions of the determinable classes. Q is the disposition of the *stamens*. R is the form of the *corolla*, and so on and so forth. Notice, then, how the mereological complexity in the terminological sense derives from the mereological complexity in the ontological sense.

One may still rightly worry about the unity of the several determinate axes. That is, even if the determinate p' is not some foreign content tacked on to P, is not p' a foreign content in relation to say q' and not to mention the other axes of determination concerning the summum genus of plants? We will have ample time to consider this problem and others. But for the moment, let me just declare that it is my position that

¹⁴⁶ Johnson 179-180

Aristotle not only had in mind what Johnson neatly formalizes in the above, but Aristotle also had an added wrinkle to the determination relation here that has not been noticed in any other analysis of the relation of which I am aware. That is to say, Aristotle has a way to account for why the several determinate features of the determinable axes are a unity. In all other accounts of the determination relation the relation is understood only in a vertical way. For example, red is the determinate of color; using Johnson's notation, p' is the determinate of P . Johnson sets out how objects can be understood as falling under genera defined by conjunctions of determinables. However, Johnson does not investigate the possible horizontal relationship that obtains between determinables like P and Q that factor into the genera of some object, and, most importantly, the horizontal relationship between the most determinate levels of the determinable axes, say p' and q' . This is not to suggest that Johnson would be opposed to such a horizontal relationship; it is just that he does not say anything about it explicitly from what I know.

Now I will turn to Zeta 12 to develop how determination is at work in its strategy to account for definitional unity. After this, I will go on to problematize this more simplistic account by contrasting it with my reading of Eta 6 from the previous chapter. Then, I will go onto how passages from *PA* I.2-3 will give us a way to resolve the issues between Zeta 12 and Eta 6.

3.2 Relating Zeta 12 to Eta 6

3.2.1 Determination and Definitional Unity in *Metaphysics* Zeta 12

Aristotle says:

The problem I mean is why a thing whose formula we call a definition is a unity.

For instance, let the definition of man be ‘two-footed animal’; then why is it that this is a unity and not a plurality consisting of ‘two-footed’ and ‘animal’?¹⁴⁷

The mock example used is where a man is defined to be a two-footed animal. Why are these terms a single thing? Aristotle considers a somewhat similar case:¹⁴⁸ the terms “man” and “pale.” These form a unity, when they do, because there is a man that happens to be pale; a given man “has pallor as an attribute.”¹⁴⁹ So if we were to use this as a model for the solution to the problem of definitional unity, we might think that either “animal” had “two-footed” as an attribute or vice versa. Presumably, “animal” would play the role of subject here and “two-footed” would be the attribute. The present definitional case appears to be different because “the one does not participate in the other.”¹⁵⁰ He elaborates saying, “For the genus seems not to participate in its differentiae, since if it did the same thing would participate in opposites at the same time (for the differentiae which differentiate the genus are opposites).”¹⁵¹

We might think this is an odd reason to give in support that the genus could not participate in its differentiae. After all, men are sometimes pale and also not pale, but there is an important difference between the case of individuals that are accidentally pale or accidentally not pale. “Man” is not wound up in the account of what it is to be pale. Also, the account of what it is to be a man is not in part constituted by his being pale or not; individual men can become pale or not while remaining men. “Pale” is thus an

¹⁴⁷ *Met* 1037b9-13

¹⁴⁸ *Met* 1037b14

¹⁴⁹ *Met* 1037b15

¹⁵⁰ *Met* 1037b17-18

¹⁵¹ *Met* 1037b19-21

accident that some individual men possess. However, with genera we are not dealing with concrete substances that admit of possessing one accident or another at different times. Thus, if we were to think of a single genus timelessly participating in its differentiae in the way that a concrete substance like a given man participates in opposite attributes at different times, we would be led into an evident impossibility. One subject “animal” would end up simultaneously being both “two-footed” and not “two-footed.” There also seems to be another problem here that Aristotle does not bring up. Even if a genus and differentiae could come together in an accidental way akin to that of “man” and “pale,” the problem would be that such an accidental unity is not sufficiently robust for a definition that is supposed to give the account of a primary substance.¹⁵²

We will return to solving the above problems, but Aristotle drops it to introduce another problem. Even assuming that a genus could participate in all of its differentiae, there will still be another issue left to resolve. As long as there are several differentiae needed all at once to obtain a definition, we will also have to account for why all of these together with the initial genus make a unity.¹⁵³ Aristotle’s examples are “going on foot,” “two-footed,” and “wingless.” If we supposed, as Aristotle considers and then rejects,¹⁵⁴ that there were some genus in which all of these differentiae were found, and that this fact alone made all of the differentiae in the genus be a unity, we would get big problems. I take it that the issue here is that unities should not only bind together certain groups of features but that unities should also set apart some groups of features from others. So the problematic solution would end up creating unities out of groups that should clearly be

¹⁵² Aristotle does bring this up in his discussion in *Metaphysics* H.6 where he rejects that a definition could be one in the way that *Illiad* is one.

¹⁵³ *Met* 1037b21-23

¹⁵⁴ *Met* 1037b23-24

set apart from one another. For example, given that the quadrupeds and bipeds are in one genus, then they would constitute a unity in a definitional sense, and that just cannot be sensibly allowed.

As Aristotle begins to make headway here notice how he restricts the scope of the definitions that are being investigated. He says:

We must first consider definitions obtained by division, for here the definition consists only of what is called the primary genus and the differentiae, the other genera being the primary genus taken with certain differentiae.¹⁵⁵

This restriction suggests that what follows is not the final word Aristotle has to say about definitions. Perhaps it would help to think of this restriction as relevant for dealing with the problems initially considered in Zeta 12 that could not be solved with the above failed solutions. In this way limitations for the account of Zeta 12 need not be read as damning for a potentially richer account of definitions that Aristotle could offer that would incorporate the insights of Zeta 12's story. But we still have to figure out the account that is advanced in Zeta 12.

Aristotle says:

If, then, the genus does not, in an unqualified sense, exist apart from the forms of the genus, or if it exists, but only as matter – for voiced sound is the genus and the matter, and the differentiae make from this the forms of sound and the phonetic elements – then it is clear that the definition is just the formula composed of the differentiae.¹⁵⁶

¹⁵⁵ *Met* 1037b27-31

¹⁵⁶ *Met* 1038a5-8 In her essay "Unity of Definition in Metaphysics H.6 and Z.12" Mary Louise Gill makes a lot out of this passage's understanding of a genus. As she sees it, the genus "voiced sound" can be understood as really being a covering of a conjunction of genera that are determinable in

The point seems to be this. Granted that the genus is not existent in an unqualified sense apart from its differentiae, then there will be no trouble in explaining how such a dependent class is a unity with the differentiae upon which it depends to be real at all.

The trouble would only arise were it the case that we had two independent classes, the incidental conjunction of which needed explaining. Notice Aristotle's example here.

Voiced sound as such is a determinable that has no reality unless it appears as a determinate voiced sound. Likewise, the genus has reality only through its differentiae.¹⁵⁷

Let us consider how what we have so far solves the first set of issues we considered above at the outset of Zeta 12. The first problem was that if the genus and the differentiae are a unity, then the genus would appear to be contraries simultaneously. But this problem resulted from thinking that the genus would be like a subject that possessed its several differentiae as though they were attributes. If we follow Aristotle's suggestion,

relation to the more determinate genera. So for instance, pitch would be one example of one of the several determinable genera that are present in the genus "voiced sound." As she sees it in Z.12, when one further determines the genera, one chooses one of these determinable genera, and follows the process of division. The primary genus in a process of division is going to be different from the intermediate genera that result before one makes the final cut; the primary genus is a plurality of determinable genera and so presents us with several possible axes which we are able to further specify via division. Though this is a very interesting and clever reading of the passage, I'm not sure the text at this place gives any explicit indication that Aristotle had this in mind here. Be that as it may, we might wonder how the primary genus taken together with the final cut will actually be a unity on Gill's reading. Certainly, a given final cut, call it F, will be a determinate of one determinable axis in the primary genus, call that one determinable axis G, and so F would be a unity with G. However, the primary genus on the whole is comprised of several other axes, and these are logically independent of F and G. Gill's suggest that the whole animal might need to be defined by such a plurality of axes; she suggests that they could be unified in relation to the *bios* of the animal. I think Gill is absolutely right here; however, there is a question if the several animal parts will relate to the characteristic life they make possible as an artifact does to its parts. In short, I think the answer is no. Gill's suggestion can be defended against this charge and shown good once we try to work some of *Parts of Animals* back into the *Metaphysics*. See Gill 2010.

¹⁵⁷ Notice that this stipulation of the genus not having an unqualified existence apart from the difference here harkens back to point J3 that Salmieri identified in Johnson's account of determination. This might also involve J1 and J2, since differences are taken from within the same genus. However, the fact that the differences resulting from bipartite division always include one privative difference complicates matters. The opponent differences involved in J1 and J2 for Johnson were not privative. Recall, his examples were colors.

we realize that it is rather the several determinate differentiae that each possesses the genus. Thus, in this way, the unity of the genus with each differentia does not entail the simultaneity of contraries in one class. This is because it is the differentiae as opposed to the genus that is more like the subject. The differentiae are independent whereas the genus is dependent upon the differentiae for whatever reality it has. Notice that the contingency that obtains in the relation between a man and his paleness will not obtain in the relationship between a genus and any one of its differentiae. There are more pale things than men, and there are more men than just pale ones. However, if Aristotle's suggestion holds, the genus will only ever be found in one of its differentiae, and any of its differentiae cannot be without being its genus in a determinate way. Any one of the differentiae will entail the genus.

From Aristotle's initial supposition that the genus not have existence apart from the difference, we can also see a solution to the second problem that Aristotle introduces. Aristotle himself provides it. He says:

But moreover, the division should be continued by taking the differentia of the differentia. Thus footed is a differentia of animal, and the differentia of footed animal must again be a differentia of it *qua* footed. So one should not properly say that of footed things some are winged and some wingless – though we do say this, because of our inability – but only that some are cloven-footed and some are not cloven-footed. And one should try to proceed always in this way until one reaches things with no further differentiae. Then there will be as many forms of

foot as there are differentiae, and the footed animals will be equal in number to the differentiae.¹⁵⁸

The problem this passage is intended to address is how we will have a unity in the definition when the definition is comprised of one genus and several differentiae. As we will see, this solution does solve the problem, but only for those definitions that can be obtained by bipartite division. First off, we know that the immediate difference that divides the genus, when taken with that same genus, will make a unity. We know this because of Aristotle's previous suggestion that a genus could not exist apart from its differences. However, if we then went on to take several coordinate differentiae we would lose the unity of our definition. The reason why is that coordinate differentiae like footed and winged do not have any necessary connection. True, there are things that are both winged and footed. However, there are footed things that are not winged, and there are winged things that are not footed (flying fish for instance). So there is no entailment relationship among these features in either direction.

What Aristotle recommends is that we take the differentia of the differentia that was used to divide our initial genus, and by the example he chooses, we notice an important fact. Anything that is cloven-footed will necessarily be footed as well. Thus, just as the first differentia entailed the genus, so too, the second differentia will entail the first differentia. And so the second differentia will entail the genus.

To put the point a bit more generally, suppose we have a list of differentiae $D_1, \dots, D_n$, and a genus G . Assume that the subscript of a given D represents the division taken of the genus G . Thus D_1 is the first division of G , and D_2 would be the second.

¹⁵⁸ *Met* 1038 a9-15

What Aristotle is recommending that for any D_{i+1} , we must choose it so that it is a division of D_i , and that D_{i+1} entails D_i . Hence, we will have a series of entailment relations such that D_n entails D_{n-1} entails entails D_1 entails G . The point is that any definition that would satisfy this series of entailment relations would be a unity in a very strong sense. There is no differentia of the definition that is merely conjoined to another and logically independent of the other differentia.

Aristotle says, “Now, if this is so, it is clear that the last differentia will be the definition and the substance.”¹⁵⁹ We can see if we are proceeding by definitions that involve bipartite division how the final division will be a differentia that entails all the information that preceded it. In that sense, the final differentia really is the definition. Moreover, if at least some definitions (essences) are to be the account of substances, then Aristotle’s additional claim holds to an extent as well. Notice as well that something like a determination relation is at play here in Zeta 12. We have the final cut that will, purportedly, be the substance, and all the other more generic classes are entailed by this final differentia. All of these more generic classes will not exist by themselves, or, at any rate, they will exist as matter. This clearly seems to be at least a version of the determination relation we have seen above. The denial of the unqualified existence of the genus apart from the difference reflects point J3. However, so far it is not clear how Zeta 12 stands with respect to J1 and J2. That bipartite division results in one difference that is a privative poses problems for reading J1 and J2 into Zeta 12.

It is good to recall that Aristotle bracketed off his current investigation in Zeta 12 from definitions in general; he also reiterates the preliminary and limited scope of Zeta 12

¹⁵⁹ *Met* 1038 a18-19

in its concluding sentence. “So much, then, as a first statement of the nature of those definitions that are obtained by division.”¹⁶⁰ How much of this account in Zeta 12 is supposed to stick to the fuller understanding of definitions is not clear. Once we turn back to consider Eta 6 again, we will have a better handle on why Zeta 12 cannot be the final word on definitions.¹⁶¹

3.2.2 Tensions Between Eta 6 and Zeta 12

As I understand Eta 6, and as argued in the last chapter, there is an implicit focus on the mereological dimensions at work in the matter/form distinction. The parts of an animal are its matter, and it is the functional relationship that such parts have to one another that is the form. The promise of Eta 6 was that we could obtain an account for the unity of definition by observing the unity of matter and form, potency and act. If we can assume that definitions will still be comprised of genera and differentiae, then there must be some kind of a connection between the parts of the substance (matter and form) to the parts of the definition (genera and differentiae). Given such a mapping, we should expect that the way in which matter and form are a unity will be reflected in some kind of a relationship among the genera and differentiae; however, it does not seem like the simple account offered in Zeta 12 can be the final word on this relationship.

¹⁶⁰ *Met* 1038 a34 I am in agreement with Bostock’s emphasis that we treat Z.12 as a preliminary discussion about the issue of a definition’s unity. However, I think he goes too far by failing to realize that division of some sort will still be preserved in Aristotle’s considered views on a definition’s unity.

¹⁶¹ In his essay “An Aristotelian Puzzle about Definition” Allan Code understands Z.12’s account of a definition’s unity to turn upon the genus not being anything apart from its species and he also sees the method here as wedded with the process of division. As he observes this will grind down the *ousia* of a thing to one feature: something Codes observes to be clearly at odds with *Parts of Animals* critique of the method of division. Code sees H.6 as taking an entirely different approach to the issue, one that he thinks does not rely on division. See Code 2010.

As we saw, the winged and the footed would be two distinct differentiae. Two distinct differentiae can end up in one and the same definition only if one entails the other (either immediately or mediately through other differentiae). However, the winged and the footed are logically independent of one another. So no single definition that abided by the Zeta 12 strategy for the unity of definitions would have “winged” and “footed” as differentiae. Nonetheless there are clearly species of animals that are both winged and footed; we can pick whatever bird we like to illustrate the point. Granted that animal parts are the matter of animals, then a definition that involved reference to the matter and form of animals (as Eta 6’s definitions do on my reading) would have to involve a reference to animal parts. And so, in the case of birds, we would have a reference to the “winged” and the “footed.” But as just shown, Zeta 12 could not be used to give an account for the unity of a definition involving the differentiae of “winged” and “footed” simultaneously. Obviously this problem generalizes to every animal, given that every animal has parts. Aristotle himself has commented on these very problems elsewhere. If we turn to *Parts of Animals* I.2-3, we find him explicitly pointing out the preceding difficulty and more.

3.3 A Plurality of Classes for Animal Kinds in *PA* I.2-3 and A New Role for Division

I do not believe that Aristotle simply rejects everything that he lays out in places like Zeta 12 concerning bipartite definitions and their unity. In particular, I believe that Aristotle’s final account of a definition’s unity will incorporate Zeta 12’s insights while modifying them within the context of a greater account that will involve division. However, when looking at *Parts of Animals* I.2-3, it can be very easy to think Aristotle has simply rejected the view on definitions that he appears to espouse in Zeta 12. By

looking carefully at the several criticisms Aristotle is making, we will get a better idea about the relationship between Zeta 12 and Eta 6, and we will also see what there is about Zeta 12 that might still plausibly be maintained, assuming it has any work left to do for the account of a definition's unity.

3.3.1 Problems with Bipartite Division

Aristotle says, "Some people attempt to grasp the particular by dividing the kind into two differences. But this is in one respect not easy, and in another impossible."¹⁶² Apparently Aristotle is talking about bipartite division as a method for getting to the indivisible species. There are difficulties of different degrees for this proposal. The first problem Aristotle raises is that "For of some things there will be only one difference, the others being superfluous."¹⁶³ Aristotle does not say here why this is problematic, but we can see the issue he has with this consequence of bipartite division later on. He says:

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

¹⁶² PA 642b5-6 The word "particular" is translating *to kath' hekaston*. It does not mean the numerically distinct individual; it rather means the indivisible kind.

¹⁶³ PA 642 b6-7

according to one such division. So it is impossible for those who divide in two to grasp any of the particular animals.¹⁶⁴

As we saw in Zeta 12, a dichotomous (bipartite) division will end with a single term, and all the other terms are strictly entailed by that final term. To illustrate this, Aristotle gives us a feature of human beings: split-footedness. Assuming that this was the final point in a continuous series of bipartite divisions that began from a kind to which human beings belonged, then this would have to be the definition of the human being, if such a process of division could yield a definition. But as Aristotle observes, the problem here is that human beings are much more than that one feature. Notice that Aristotle goes on to generalize this problem for all other animals as well. Just as we saw in our comparison of Zeta 12 and Eta 6, bipartite division will never be able to give the entire definition of any animal, and this is just because the essence of any animal cannot be ground down to a single feature.¹⁶⁵

To reiterate, I do not take it that Aristotle is giving up on division as such. It is worth thinking about the fact that Aristotle does not only make the previously quoted critique of bipartite division. That critique *does* show, I think, that it cannot be a self-sufficient method to get a definition for animals. The problem is not merely that it is difficult to come up with the divisions, but that the output of even a successful process of bipartite division will never get the definition of any animal. However, this critique does *not* show that division cannot play a role in real definitions. What I think we see in the rest of *PA* I.2-3 is Aristotle's improving upon the notion of division. We know that he

¹⁶⁴ *PA* 644 a2-11

¹⁶⁵ The very fact that animals have parts in their substantial being is enough to explain why this holds.

cannot be doing this because he believes that the method of division alone will enable us to define animals, but if we can see him refining the account of division, then we might be led to conjecture that there is a limited role that such a method of division could play in the final account of definition for Aristotle. With that in mind, let us look at the remainder of his points from these two chapters.

3.3.2 Tearing apart Kinds

Aristotle makes a point about not breaking up certain kinds. He says:

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-dweller, while some are among the water-dwellers.¹⁶⁶

In his commentary on the passage Lennox gives a helpful illustration citing the *Statesman* and *Sophist* by Plato.¹⁶⁷ In the *Sophist* water-dwellers are divided between swimmers and fliers. As a result, birds will end up under the class of water-dwellers. In the *Statesman*, the land-dwelling walkers are divided into the two-footed and four-footed. The two-

¹⁶⁶ PA 642 b10-19

¹⁶⁷ See Lennox 2001: 154

footed are then divided into the winged and wingless. So some birds will end up under the land-dwellers and other birds will end up under the water-dwellers.

Lennox's illustration helps to drive home Aristotle's point, but it is still not evident why such a tearing apart of the class of birds is undesirable. It is true that common usage is sometimes a rule for us, and common usage observes that "birds" is a kind. But as Aristotle shows with his examples of the blooded and bloodless animals, not all of the important kinds are found by the terms of common usage. Can we at least say that if there is a class of animals established by common usage, then this class must not be torn apart? This does not seem right either, and Aristotle says as much later on when he rejects dividing animals in terms of their being tame or not.¹⁶⁸ Aristotle will say that when it comes to birds, we should take the lead of the many,¹⁶⁹ but that is not to say that it is *because* the many distinguish birds as a group that we should do so. Granted common usage is not why birds are not to be torn apart from one another, we must find a different reason.

It is worth noticing that a classification where some birds are set apart from others is a possible way to divide things. It is logically possible after all to have a variety of divisions available where the logical territory of the various classes intersects in some cases. For instance, I could divide human beings into male/female, fast/slow, old/young, tall/short, etc.; the classes here will intersect with one another. However, this logical possibility cannot be allowed provided one's classes are to be carving the subject matter being classified at its joints. To allow a classificatory system where water-dwellers and

¹⁶⁸ PA 643b3-8

¹⁶⁹ PA 643b10-11

land-dwellers is as natural as a distinction as that between fish and birds makes it seem that nature has no joints; it is rather our perspective that makes the joints appear.

The previous paragraph speaks to one of the underlying weaknesses of the method of division when used as a self-sufficient method. How do we know from which class we ought to begin when making our divisions? If we began from water-dwellers, notice how this includes a variety of species that are quite different from one another. In contrast to this, the class of birds seems to have a much greater family resemblance shared among all its members. I see Aristotle as putting his finger on the underlying cause of this family resemblance¹⁷⁰ that obtain in the case of a class like birds when he says:

[O]ne ought to divide by features in a thing's substantial being, and not by its proper 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.¹⁷¹

Choosing to begin our process of division on the class of land-dwellers is a failure to pick a feature of any animal's substantial being. What is it that will count as the animal's substantial being? If the previous chapter's interpretations of *Eta* and *PA I* are correct, we know this will include the parts of the animal. But this means we would have to start from a plurality of classes when we started to divide a class like birds, and this might

¹⁷⁰ I do not mean to suggest that Wittgenstein's family resemblance is all there is to the distinctions among Aristotelian natural kinds. I am only using the term to emphasize the way in which, without any further reasons obtained from detailed study, certain groupings of animals appear to us as belonging together.

¹⁷¹ *PA* 643 a26-30

seem troublesome. Is not the kind “birds” a single class? Also, we might worry that there will be nothing left to divide if we begin from the substantial being.

Aristotle says, “Rather, one should try to take 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.”¹⁷² Here Aristotle explicitly confirms that the kind “bird” is defined by several differences at once. So the name “bird” is a terminological covering for several other terms.¹⁷³ Moreover, we can see that Aristotle must also think that birds can still be further specified even though the kind “bird” contains features that are of the substantial being of the animals included therein. So if my point from Eta 6 holds that sees animal parts as included in the definition of animals, this means that a kind like “bird” is at least a conjunction of several generic descriptions of the parts that are shared by all birds. To put it generally, for a genus of animals X , we can find a conjunction of terms in X $x_1, \dots, x_n$ that are all generic descriptions of the parts of the animals contained in the genus. The various species of a given genus would then be defined, at least in part, by way of specification of these various terms.

One big step has been made toward our coming to Aristotle’s fuller account of definition. Recall, in Eta 6 it was supposed to be that the unity of definition was

¹⁷² *PA* 643 b10-13

¹⁷³ This agrees with Gill’s point concerning Z.12, where she holds that the kind of genus Aristotle is considering actually is comprised of several determinable genera. We now see thanks to the explicitly biological context why all the several genera in that genus count as a kind of unity. This would be because all the genera that taken together makeup the genus bird are descriptions of parts that are at work in things that are birds. So a generically described functional unity among parts common to birds is the basis for the genus’ being a unity. But such a unity will only be fully cashed out in the light of the particular ways that the bird parts function. Our functional story would not be complete until we descended to the level of particular species, and so the unity of the genus is in a way anticipatory of the strong unity that will obtain at the level of the specific difference.

established through a reference to the unity of matter and form in the substance, the animal. It was not immediately clear there how the terminological parts were to map onto the structure of the substance. Through the previous passages, what we have seen is the first connection made between the various parts in the substance and the parts in the definition. Animal genera will be conjunctions of the generic description of the parts of the animal species. We are not yet ready to see how the unity of the substance in terms of matter and form allows us to ground the unity of the definition, but at least we have found a bridge between some of the terminological parts of the genus and the parts in the substantial being of animals. To figure out how we get a unity of definition here we must first show how Zeta 12 still plays an important part in Aristotle's account.

3.3.3 Non-Bipartite Method of Division

3.3.3.1 Privative Terms that Produce a Difference

Even after making all the points against division as a stand-alone method for obtaining definitions, Aristotle goes on to do some fine-tuning work concerning division in *PA* I.3. He says:

If one does *not* take the 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.¹⁷⁴

We should hear echoes of Zeta 12's point about taking the difference of the difference. If we do not do this and instead divide up a class like winged into a relatively speaking incidental set of classes like pale and dark, then the unity that emerges is one of brute conjunction. The classes are really just logically independent of one another. So Aristotle still appears to be concerned about preserving the unifying work that was done by only taking the differences of differences. Given the complexity of the initial class from which we start in cases like birds or fish, we might wonder why he still aimed to hold on to this sense of unity.

Something new emerges here that is absent in Zeta 12. What does Aristotle mean by dividing the "one kind straight away into many"? He cannot be referring to the way that we divide "bird" into its several generic terms the conjunction of which is signified by "bird." These are not divisions into different birds; all birds have these differences. What Aristotle is getting at emerges when we contrast dividing something into many right away with dividing something by the bipartite method. With the bipartite method, we had one positive feature that further specified the class it was cutting, and we had a negative indeterminate feature. For example, if we were dividing the class "winged" a bipartite division might produce "feathered" and "non-feathered" as its next two specifications. There are problems that Aristotle had raised for this method just insofar as it produced such negative and indeterminate classes. For one, a negative itself is not

¹⁷⁴ PA 643 b17-25

something that Aristotle sees as capable of further specification.¹⁷⁵ How could there be different kinds of nothing? So, if we were to cut a generic class by the method of bipartite division, we would have a positive difference that was really different from nothing else under the generic class since the corresponding negative difference is not something at all. Consequently, there would be no distinction really drawn among the members of the generic class by the bipartite division, and so it would really produce no specification of the generic class. Recall, this issue was why we could not neatly read J1 and J2 into Zeta 12.

Aristotle claims that if we divide the more generic class by several differences all at once, then the aforesaid problem will vanish: the negations will make a difference. But how is this? Suppose we had at least three positive differences A, B, and C for some generic class. We could then see that the non-A under the generic class really meant something quite positive and meaningful in its own right. In other words, the expression “non-A” is indeterminate *only* in a terminological way. Though the sense of non-A is negative, provided we are following Aristotle’s new recommendation to divide by many positive differences at once, non-A refers to “B or C.” Both B and C are determinate and something in their own right.¹⁷⁶ Notice too, that with this adjustment added to the story of Zeta 12, J1 and J2 can now apply to it. To put Aristotle’s point here in terms of color like Johnson used, we are not dividing a more generic determinable color kind like “red” into “crimson” and “non-crimson”; rather, we are dividing it up into things like “crimson,” “maroon,” “scarlet,” etc. The differences here are opponent in the sense of J1, and they

¹⁷⁵ PA 642b20-25

¹⁷⁶ Balme says “If we purport to divide the footless into snakes and fishes, what we are really dividing is not footless but those animals that are footless.” I am just adding the point that the negative class, “footless” for instance, can refer “those animals that are footless.” See Balme 1987: 75.

are all opponent to each other in terms of “red.” Aristotle’s point about the privations producing a difference here is evident too. “Non-crimson” here refers to “maroon” or “scarlet” or etc.

3.3.3.2 Differences Defined by Opposites

Now, even if this shows how introducing several positive differences at once will avoid the problems of vacuous classes referred to in terms of negations, how is it that we are supposed to come up with these more complex lists of differences? What was nice about the bipartite method of division is that one really only needed to come up with a single division; the other class was just a negation of the positive one. Aristotle says, “Again, one should divide by opposites. For opposites are different from one another, e.g. paleness and darkness, straightness and curvature.”¹⁷⁷ With opposites like this we have a range of ways in which the generic class can be further determined. The class “color” can fall within the ranges laid out by the opposites “white” and “black.” If the generic classes that make up a genus like “bird” are determined by differences in the way that “color” is determined by the several colors that fall between the range defined by the opposites black and white, then the differences of generically described animal parts that appear in a genus like “bird” will be related to those generically described animal parts as a determinate to a determinable. So, in the very same way that places like *Apo* 2.13 and *Zeta* 12 hint at a determination relation between differences and genera, we now have a

¹⁷⁷ *PA* 643a31-33 In connection to this point see Lennox’s “Aristotle on Genera, Species and ‘The More and the Less’”

fuller version of determination in place for the account of definition we have so far developed out of *PA* I.2-3.

We will have to wait to see Aristotle's explanatory practices in action, but for the moment, we can conjecture that such differences might involve a range of values of more and less for the kinds of parts of the genus in question. So, for instance, the beaks of birds can be longer or wider, more or less solid, more or less curved, etc. Relying on the relationship between the shape of an animal part and its function that we saw in chapter two, these differences in morphology are going to correspond to a difference in physiology.

Recall, that the genus of a given animal species is supposed to be comprised of generic descriptions of the animal parts of the several species falling under the said genus. What seems very plausible is that the several differences that fall within a range defined by opposites of more and less could be used to specify those generic descriptions of the animal parts so that what we get are several accounts of the way those parts look in all the species belonging to the genus. This would then be yet another bridge between the terminological dimension and the substantial dimension.

3.4 New Dimension to Determination and the Unity of Definition

Now I will move to a consideration of a new complexity concerning the determination relation in Aristotle. I will first develop this complexity, and then turn to how the definition's unity will be obtained by relying upon it. In commenting on the definition's unity, I will also remark on how the account satisfies the other

desiderata identified in chapter 1. I will give a simplified sketch of how the definition is a unity, and then introduce some complications.

3.4.1 Vertical and Horizontal Aspects to the Determination Relation

To make this emerging picture of definition a bit easier to follow, here is an over simplified symbolization of what we have found so far. Suppose we have a given genus of animals, G . We know this contains a conjunction of generic differences. So $G = g_1 \& \dots \& g_n$ where any g_i stands for some generic description of a part that is of the substantial being of all the species falling under G . Let X_G be a union of sets of terms as follows: $X_G = X_1 \cup \dots \cup X_n$, where any $X_i = \{ \text{all } x \mid x \text{ is a determinate way of realizing } g_i \}$.¹⁷⁸ For example, suppose G is “bird,” g_i is “animal with a beak,” and X_i contains conjunctions of the determinate ways of having a beak (length, width, density, etc.). Obviously, we could situate lengths between “longer” and “shorter”, widths of beaks between “wider” and “narrower”, density between “denser” and “less dense.” In short, X_G contains all the determinate ways every bird part from G can be realized,¹⁷⁹ and a

¹⁷⁸ A given determinate way of being an animal part might in fact be very complex, and though I’ve tried to devise a symbolic way to capture in general how this occurs, I have not been able to do it and I am not sure it’s worth the trouble ultimately. Suffice it to say that if, as Aristotle maintains, we find differences with respect to the more and less, and there are generally several such differences present at once in any determinate animal part, then a determinate animal part will itself be determinate in multiple respects all at once. There should be no reason to worry about the loss of unity even if the ways of being determinate for a part are themselves complexes of several determinates defined on values of more and less. I think here too we can invoke the notion of function. For example, it’s because there is a certain work that a hawk’s beak must do that it has a certain curvature, length, density, etc.

¹⁷⁹ As I will be discussing Funkhouser’s theory of kinds in the next chapter, I should mention that I am not making now or later any fine distinction between the realization and determination relationship that Funkhouser would. To layout Funkhouser’s distinction in brief, there are determinate types of pain and determinate types of neurological states. Let’s say we have a determinable type of pain P and a determinate type of pain p' , and say we have a determinate neurological state d' of the determinable neurological state D . Suppose p' and d' are necessary and

given X_i contains all the determinate ways the bird part generically described by g_i can be realized.

Suppose we have a given species of bird S that falls under G . What will the definition of S look like? Granted that the definition must involve the genus, we must have G as part of the definition. Next, we will need a difference for each of the generic descriptions of parts that makeup G . Thus, we will get a total difference D , where $D = d_1 \& \dots \& d_n$, such that each d_i belongs to X_i , and d_i is a difference for g_i . Because every element of X_i is a determinate of the determinable g_i , then d_i is a determinate of g_i . So, it follows that d_1 entails g_1 and...and d_n entails g_n .

The conjunction of paths of entailment that are traced from each d_i to each g_i correspond to a conjunction of determinations of G . G on the whole is determinable along each of its n -many determination axes, and D , on the whole, is one unique way that G can be determined along all its axes. Along any one given determination axis, notice that an account of a definition's unity like that from Zeta 12 will apply. Call this the vertical sense of the determination relation. However, if this is the end of the story, we do not have a satisfactory answer to the question of why the definition of a substance is a unity. Though the vertical sense of the determination relation explains the unity of each d_i taken with each g_i , it does nothing to account for the unity of the several components of D itself. Let us remind ourselves that there is no need to account for the unity of G by itself, since G only exists through its several species. Thus, the question of the unity of G really comes down to the unity of the several differences that are in D . What we need at this

sufficient for another. Funkhouser denies that d' is a determinate of P . Instead, Funkhouser says d' *realizes* P . I do not use realize in such a fine-grained way in this dissertation.

point is an account of the horizontal sense of determination. That is to say, we have to explain why $d_1 \& \dots \& d_n$ are more than just a brute conjunction.

As I understand it, entailment is a mark¹⁸⁰ of determination. So if there is a horizontal sense to the determination relation, this can be explored in terms of the entailment relations obtaining among the members of D (to use our current case in point). But what could this be? In the case of the relation between a given g_i and d_i the entailment seemed to be analytic. The entailment associated with vertical sense of determination concerns a relation between terms where at least one term, the more generic term, does not describe an animal part as it fully and determinately exists. In the case of the horizontal sense of entailment (assuming there is one), we have to look for a relation among terms that *apparently* describe animal parts as they fully and determinately exist.

I want to deny that such a determinate description of a single part, isolated from the other parts in the animal, captures that part as it fully and determinately is. Let us remember the point of the Socrates the Younger passage and the points obtained by reading *Parts of Animals*' functional accounts of the animal essence back into Eta 6. A single animal part conceived in isolation from its place in the entire functional relationship of other animal parts does not capture the unique work that part does, and the part's work, its activity, is intrinsic to its identity as the part it is. Cashing out this activity does not require becoming anymore determinate in a vertical sense. That is, we will not figure out the activity of the long legs of a heron by more determinately describing its

¹⁸⁰ I take it that a determinate's entailing its determinable is a necessary condition of the vertical aspect of the determination relation though not sufficient. We can have several sorts of entailment relations that are not cases of determination relations.

long legs. Rather, it must be related to its other parts and its unique way of life (*bios*).¹⁸¹ This functional relationship among the fully determinate parts that realizes the *bios* is the horizontal sense of determination. The mind, just as it contemplates the act of a given animal, will itself be in act rehearsing the causal relations that are deployed among the animal's parts in realizing its way of life. This is an understanding of the explanatory relations among the animal parts that reflects the causal relations.

These organic parts are present in the numerically distinct individuals of a species in a way wholly unique to the species in question. Each one of these organic parts is then identical to one of the d_i that we have in the above account of D , and this shows how we can understand the relationships among all the terminological parts of D . What we will be doing in following out the explanatory transition from a given d_i to a given d_j is to be following a functional relationship that obtains between the two and seeing this in the light of the complete action that is realized. Aristotle accounted for the long-leggedness of certain birds was connected to the unique life they have as marsh-dwellers. So the complete action of what such a bird does with those long legs is invoked, but at the same time, the nature of its feet had to be brought up in connection, as the legs by themselves are not enough to realize this action.¹⁸²

The way this appears in the concrete cases of the functioning of an entire animal would be very complicated, but in order to give the sense of what I have in mind here, consider this mock example. We consider the determinate way in which a woodpecker's

¹⁸¹ *PA* 694b12-25 Aristotle explains the long-leggedness of some birds in relation to their marsh-dwelling way of life. He then goes on to comment about other parts such as their feet and toes. The function of the whole animal as its *bios* holds the privileged spot, but full explanations of how one part helps to realize the *bios* inevitably calls up other such parts that work together. In connection to the *bios* and explanatory unity, see Lennox 2010.

¹⁸² *ibid*

feet are constructed. We ask why the feet are so constructed. Our answer is found by showing how the construction of the feet is suited to a peculiar function. Let us say that the feet are peculiarly suited to grasping on to the sides of trees. But why should there have to be such a function at all for the woodpecker? We find our answer by considering what end is served by the woodpecker's being able to cling on to the bark of a tree without branches. We see that the woodpecker can then drive its beak through the tree's bark at a variety of locations. Of course, this function also requires a skull and beak of peculiar design. Eventually we will get that this all must be done to keep the woodpecker eating the sort of food that is appropriate for it. And it eats these things to keep all the rest of its body fit to do the things a woodpecker does. Such as clinging on to the sides of trees... This is why "doctor doctoring itself" is such a helpful analogy for nature. Imagine a doctor in act as a doctor upon himself. By healing himself, he keeps himself alive to keep doctoring. The analogy breaks down of course, because "doctor" is not a substance; the essence of a person who happens to be a doctor is not given by giving the account of what it is to be a doctor. Rather we would give the account of what it is to be a person. In the case of the woodpecker,

Each of the several parts has a work to do, but this work has its end achieved by facilitating another part's work, and the sum total realize the complete actions in the animal's way of life. Of course, as this is a kind of closed system, each part's own work benefits itself as it contributes to the whole work of the animal. Just as each part's function was for the sake of working with another part in the animal and ultimately a complete action, so too our understanding of each part's function requires this relating of a single part to the functions of the other parts that the part in focus helps facilitates.

When we consider a single part in isolation, we are not considering something that can exist by itself. On the one hand, each part is sustained by other parts. On the other, the purpose of the function of each part requires other parts for its intelligibility. It is only in the whole animal where any one part achieves its purpose and is sustained to achieve its purpose. The whole of the animal's organic parts is a functional network that blends together the explanations that invoke the principles of necessity and teleology. Each part achieves its telos by contributing to the function of other parts in the whole, and it is necessary that each part be supported by the work of all the other parts. Such a blend of the necessary and teleological would be nonsensical, unless this whole of parts were a unity. It is the complete action of the whole woodpecker in the above that we are considering when seeing how the several parts explain one another. This was highlighted last chapter with Aristotle's analogy between the saw and its parts, and the animal and its parts. There is a certain complete action(s) realized by them. At the same time, this complete action is all those several parts functioning in their own interdependent but unique ways.

Recall that one of the key features of a determination relation is that the determinable features cannot exist apart from their determinates. There is nothing that is just a color unless it is red, or blue, or etc. This same story holds for the vertical sense of determination that obtains along each of the n -many determination axes in G . If beak, for example, is the determinable description of a part, we know it has to exist in some more determinate way. However, notice that the several determinate parts $d_1, \dots, d_n$ are such that their very being is to be in the context of the entire whole. Just as considering beak absent

any further determination is a kind of abstraction, so too it is abstract to only consider the woodpecker's beak apart from the rest of the woodpecker.

We can expound the genus "bird" into several genera that involves several more generic descriptions of bird parts than "beak". Each of the genera is itself a determinable, but the determinate way each of these genera can be only occurs when all the other genera have been determined in a proper way so as to achieve a total functional network among all the parts of a single species of bird. Thus even though it makes sense to break up the simple unity of the genus "bird" into its several genera (whatever these all are), there is equal sense to maintaining the simple term "bird". For it is really "bird" that is the determinable, the several axes of determination are clarifying what kind of a determinable "bird" is. "Bird" is a functional mereological determinable; it is only when we reach the full determinateness of the parts of a bird found at the level of particular species that the functioning of the several parts "interlock" in full detail as it were. Until then, there is only a generic sense of how a beak, feet, feather, etc. all work together. Only with the determinate description of the bird's parts do we see the full determination: the way in which the several parts of a given species of bird functionally fit together to achieve a single work.

3.4.2 The Unity of Definition, Explanatory Complexity and Unity, and Isomorphism

So, we will have a genus G that is really a conjunction of several genera that generically describe the parts of the animals that belong to G in virtue of belonging to G . Thus $G = g_1 \& \dots \& g_n$. Each g_i is a determinable. Let X be a union of sets such $X = X_1 \cup \dots \cup X_n$, and where every $X_i = \{\text{all } x \mid x \text{ is a determinate of } g_i \text{ and } x \text{ falls within a}$

given range defined by some term and its opposite}. A given member z of a given X_i can be determinate in several ways at once. So if the g_i in question were “beak”, and X_i is to be the set of determinate ways in which birds beaks are realized, then the way a given species’ beak will look can be determinate with respect to several features. It will have a given length, width, shape, solidity, color, etc.¹⁸³

Now, any given species belonging to G will be a collection of parts that are determinates of the various determinables conjoined in G . Thus a given species D can really be expressed as $d_1 \dots d_n$, where each d_i belong to X_i and so is a determinate of the determinable g_i . So we know that each such d_i and g_i taken together are a unity, for the determinable g_i cannot be apart from its determinate forms. Zeta 12’s account is consequently vital for solving this vertical sense of a definition’s unity; Zeta 12 solves this just by relying upon the vertical sense of determination.

There is the horizontal sense of a definition’s unity that is left unaccounted for by Zeta 12, and it is here that we must bring in Eta 6. What we must see is that the being of the several parts described by the terms $d_1, \dots, d_n$ is only possible in their the functional network of the whole animal. Each of these parts finds the fulfillment of its telos in contributing, in its own unique way, towards the functioning of other parts in the whole animal, and each part in turn has its own work be supported by functions carried out for it

¹⁸³ It would nice to be able to say in advance how many different dimensions of determination will factor into the determination of a given type of animal part. However, that this cannot be done is evident when we consider that we are talking about determination up to explanatory power for species and that is not always evident what aspects of animal parts are vital for their functions and what aspects are either merely accidental or necessary consequences of the aspects of the animal parts that are vital for their function. True, every *individual* of a species will have a determinate color, weight, height, etc. at a given moment, but these will not be scientifically interesting to the Aristotelian biologist unless the determinateness in the individual reflects deep down fact about the essence of the animal species in question. I take it as obvious that there are such determinate aspects of the individual that are merely accidental so far as the essence of the individual’s species goes.

by other parts in the whole animal. So the several parts $d_1, \dots, d_n$ are really a unity. What the completed definition of species S would do in giving the account of D is to lay out all the causal relations among the several d_i in D . These sets of causal explanations among the several parts of D would terminologically manifest the substantial unity. We would never reach a d_i the telos of which was intelligible only in relation to itself, and we would never have a d_i for which there was no dependence upon other members of D in order to do what d_i does: just as the existence of each part of the animal is supported by the whole animal, so too the significance of the function of each part is only to be grasped in the context of the whole animal.

There is another thing we have to stipulate if the account is to get us the unity of the definition in the horizontal sense. It cannot be that there are closed functional pockets within the animal independently of other such closed functional pockets. This would mean that we had some sets of terms from D that taken together counted as a unity by reflecting one such closed functional pocket in the whole animal, and then we had another distinct set of terms from D that taken together counted as a distinct unity by reflecting another closed functional pocket in the whole animal. If this were to obtain, it is not clear why the animal should be called a whole in the first place. The animal would really just be an accidental conjunction of two living things: the two closed functional pockets.

This stipulation does not mean that an animal cannot continue to live without the loss of some parts that are part of the substantial being of the animal, but does require that no such part or groups of parts can be cut off from the whole animal and still maintain themselves. Moreover, it also requires that the work of the whole animal will be

significantly impaired when it loses any one part that is part of its substantial being. If a woodpecker lost a foot, it would not die immediately, but the impairment to its total function might likely result in its eventual death.

Returning to the main point, the several determinates $d_1, \dots, d_n$ will manifest the unity of the substance as we lay out the various interdependent functional relationships that obtain among all the animal parts that are picked out by the several determinates. In this sense, the several determinates when taken together and used to explain one another are expounding the complex way that D is a unity. D is a unity precisely by relying on what I was calling the horizontal dimension of determination. As we will see, there are other varieties of such a horizontal relationship among determinates, but not all such cases' horizontality is cashed out in terms of functional interdependence.¹⁸⁴

So for a given species S , the definition will be comprised of genus G and a difference D . Both G and D are shorthand for a manifold of various descriptions of animal parts. G describes these parts quite generically. G is really comprised of several determinables: $G = g_1 \& \dots \& g_n$. When stated as a bare conjunction, D is really a corresponding manifold of various specific descriptions of animal parts; that is, $D = d_1 \& \dots \& d_n$. D is comprised of several descriptions that are determinates relative to each class in G . G taken together with D count as a unity as far as the two go because of the vertical sense of determination that obtains between each g_i and d_i . Finally, the reason why D is itself a unity is due to the horizontal sense of determination that obtains through

¹⁸⁴ If we take generic classes of mathematical objects (triangles for instance), we can see that there are various dimensions of determination (length of sides and angles). However, given a particular triangle that is fully determinate along these dimensions, it still is not true that the relationship between these dimensions is functional. However, considering functions like the sin, cosine, and tangent, there are necessary relationships between these two dimensions.

the explanatory relations among all the several d_i ; these explanations trace out functional relations that exist among the several parts of the animal. The functional relations taken together makeup up the unity that is the animal; the determinate descriptions when linked altogether by means of explanations mirror the substantial unity at work in the living being.

Laying out how the preceding definition will be a unity also highlights how explanatory unity and complexity are satisfied. The complexity of the definition on my account is built in by the way the genus and difference of the definition contain a plurality of class corresponding to more and less determinate descriptions of the animal's parts. The unity of the several explanations, what makes them all be about some *one* substance, is satisfied by the closure of the several explanatory relations among the classes corresponding to the animal's organic parts that track the causal relations among those parts. Finally, the isomorphism between definition and substance appears insofar as the determinate descriptions of parts and the corresponding explanatory relations parallel the causal relations among the parts in substance.

3.4.3 Some Complications

3.4.3.1 More kinds of genera in the definitional genus than ones describing singular parts

The picture I have painted above relies on a tidy one-to-correspondence between a generic description of a part and a specific description of that part. It seems clear, however, that there are more kinds of genera than this. For example, at *PA* 674b19-675a¹⁸⁵ Aristotle is considering a number of conjunctions of parts of birds. The class into

¹⁸⁵ In chapter 5 will revisit in this passage in detail.

which the conjunctions all fall are not named, but they are unified as a single class in functional terms. For ease of reference call this genus Q. The birds, having a beak and no jaws or teeth, cannot break down their food as well. The several conjunctions Aristotle considers are all ways of solving this issue. For some of these bird species there is no single part that is a determinate of this class. This is different from the tidy one-to-one correspondence between genus and difference I describe in the above basic account.

Though genera that are conjunctions of parts are different, I do not think this will jeopardize my account. At the generic level of explanation which recognizes that all birds have beaks and the limitations of beaks for breaking down several types of foods, we can recognize a general need that needs to be fulfilled. This work is still carried in a determinate way at the level of this or that species of bird via a complementary relationship among certain of the species parts. This is really not much different from a case of the relation between “wing” and “hawk’s wing.” Birds have a certain kind of part, “wings” that are to perform a certain kind of function “flight.” A hawk has a particular kind of wing for this that works within the context of its own complete activity and way of life. This wing is also a conjunction of several fully determinate parts. What might make this seem so different is that we have natural language name for the latter part whereas we lack this for the former part.

What might worry us here too is that some of the parts in functional conjunctions belonging to genus Q, are parts that are themselves determinates of another genera than Q. For instance, the stomach of some birds would belong to Q. This is no issue, though of course it escapes my basic representation. So long as both of the genera are determinables

of the determinate part, the strategy for definitional unity that my account proposes will still work.

3.4.3.2 What really is the genus of a definition?

As the preceding example of Q might suggest, it would seem very unlikely that most of the standard sorts of generic kinds like “birds,” “fish,” etc. would come ready made with all the variety of explanatorily speaking relevant genera packed into them. Is there really going to be some uniquely special conjunction of genera possessing a name which we christen *the* genus of the definition that is comprised of several coordinate genera? I doubt there is such a genus for Aristotle, but I do not know. Fortunately for my account, all the desiderata I identified will be met regardless. Consider an oddity like the Libyan ostrich. Aristotle sees it as being somewhat like the birds but also somewhat like the four-footed animals.¹⁸⁶ If definitions had to work within a rigid classificatory system for Aristotle, this would be a maddening case to consider for his reader. On my view, as long as there is an interdependent function among the parts of the Libyan ostrich that can be described by the differences and explanatory relations, there will be no problems. For whatever genera we might have, provided they are determinable kinds of which the Libyan ostrich’s parts are determinates, my strategy for accounting for definitional unity will hold. Where $G = g_1 \& \dots \& g_n$ we could let n be any arbitrarily finite number, and so

¹⁸⁶ PA 697b13-15 Henry Devin gives an interesting discussion about Aristotle as a pluralistic realistic about natural kinds. With regard to such oddities as the Libyan ostrich, Henry holds that there is no real worry here provided the essence of an animal need not belong to one kind only but is instead defined by the intersection of kinds as laid out in *Apo* II.13 96a24-b1. See Devin 2011.

long as for every determinable g_i there was a determinate d_i my story would appear to work.

3.4.3.3 What about the relation between uniform and non-uniform parts?

Recall that the full difference on my view will include the entire set of fully determinate¹⁸⁷ descriptions of the animal's parts. In laying out my above basic representation, I did nothing to try to capture the relation between the uniform and non-uniform parts, yet both of these are present in different ways relative to the species. Recall, the several fully determinate descriptions of parts in the specific different must exhibit the closure of explanation that mirrors the interdependent functioning of the several corresponding parts. Serving as matter for a non-uniform part is one way of functioning, and this is one of the main ways uniform parts function. For instance, a hand is composed of flesh, bone, tendons, etc. So then, even if I have not explicitly shown the compositional relation between the uniform and non-uniform parts, such a compositional relation is how the uniform parts function, and should be understood as part of the interdependent relation among the animal's parts.

Something that is worth mentioning here is that I do not understand the elemental materials as being part of the being of the animal. Though surely, as we can gather from the discussion at *PA* 646a12-24, the elements or at least elemental powers play a role in the reality of animal substances, such elements have the reality they do independently of their presence in the animal substance. We might imagine the relationship between the uniquely organic causal powers and the elemental causal powers in an animal substance

¹⁸⁷ By "fully determinate" I mean as picking out the parts as they uniquely occur within the species.

as that between the rules of a basketball game and physical laws during a basketball game. Though the playing of the game must abide by the physical laws and in fact presupposes them, this is not stipulated by any of the rules of the basketball game. So too, the inorganic causal powers, though not identical to any of the elemental powers, must presuppose them for their possibility. As one might suspect then, things can become in tricky accounting for the interplay of these organic powers and the elemental.¹⁸⁸

¹⁸⁸ This issue will come up in chapter 5 concerning parts like horns.

4. More Considerations on Determination

The account I have offered up to this point has several features that recommend it. Recalling the three desiderata of unity of definition, explanatory unity in the light of a complexity of explananda, and the isomorphism between substance and essence we can see how the account has its advantages. First, let's remind ourselves of what these desiderata were.

When it comes to unity of definition, recall that there had to be a particular version of logical dependence that obtained between the specific difference and the genus. Stated quickly, the specific difference had to entail its genus. If this did not obtain, then we would lose the unity of definition¹⁸⁹ given that a definition includes both a genus and a specific difference. However, with a view to explanatory power, we also wanted our definitions to be complex enough so that they could get us explanations of the features of animals. In other words, the more metaphysically driven ambition of the unity of definition cannot be purchased at the price of making our definitions useless for giving explanations for animals. This is one reason, among others, why Aristotle rules out bipartite definitions for biology. Though the story of unity for a bipartite definition is fairly straightforward, such definitions are not rich enough terminologically to be of much use in accounting for all the variety of features that a given animal possesses. Our definitions have to be comprised of several terms to be adequate in explaining the manifold features of actual animal species. At the same, the explanations we give must somehow show that they are explanations of a single substance. For instance, the

¹⁸⁹ Again, here and elsewhere I am concerned with the definitions of substances for Aristotle.

explanations for why a tiger has the teeth it does and the paws it does must somehow show that these explanations derive from some unity; for instance, the reason why a tiger has such paws must ultimately be connected to the reason why the tiger has the teeth it does. Finally, whatever story it is that would satisfy all of these desiderata must also maintain the isomorphism between the definition and the substance. The several terms in the essence that explain the variety of animal features must not just be devised by us to meet intellectual goals of explanation but must really in some way be derived from the substances in question.

My account will preserve both the unity of definition and explanatory power. The specific difference is a plurality of terms that describe the uniform and non-uniform parts of the animal as they occur uniquely within that species. In this way, the parts that go into the account of the form are being identified by the specific difference. Each of these parts entails several generic descriptions of those parts that would also be predicable of other species. It is possible in this way to satisfy explanatory complexity in view of such a plurality of classes derived from the parts of the animal. We see how definitional unity is maintained by first focusing on the relationship of the several terms involved in the specific difference. The non-uniform parts all have functions to discharge in the life of the species in question, and each of these several functions is possible within and is for the sake of the whole animal. There is not some part of the animal that has a priority over the others; it is the whole animal at work that has the priority. The descriptions of the non-uniform parts of an animal will then exhibit this same teleological unity at work in the substance by the explanations that link those descriptions of parts to one another. We will explain why the work of one such part is required in relation to another part's work,

and so on and so forth. Thus, the specific difference, though terminologically complex, will still be a unity in virtue of the sort of closure of explanations that will obtain among the terms involved in the specific difference. The uniform parts are brought into this unity insofar as they take part in such a function too.¹⁹⁰ Moreover, given that each generic term involved in the essence is entailed by some term(s) in the specific difference, then the genus taken with the specific difference is a unity as well. Finally, the isomorphism here between the substance and the essence is maintained insofar as the form of the substance is the working together of all the non-uniform parts of the substance, and the specific difference is just a description of all these parts taken together with the explanations that show how they all require each other. The generic classes in the essence are real only through the specific differences that corresponds to the actual ontology of the animal.

So, as said, there are some things to consider that recommend the preceding account. However, there are still some challenges this account faces. In this chapter I want to consider some possible objections to this account and offer responses. Some of these objections can be grouped together whereas others are fairly miscellaneous in nature. One pressing issue that I will not address in this chapter is whether or not Aristotle's actual biological explanations are consistent with the account I have offered. I will devote much of the next chapter to this issue. For the moment, I want to consider challenges centered about the version of determination that I have offered. I do not pretend to have exhausted all possible objections, but I hope by answering the problems I do consider that I will indirectly lend more support to my account of essences for Aristotle.

¹⁹⁰ Most, though not all, uniform parts take part in this interdependent functioning of the non-uniform parts by serving as matter for the several non-uniform parts.

4.1 A Possible Objection to my Account of Determination

4.1.1 The Horizontal Dimension

I have given an account of the determination relation in the process of working on the problems associated with Aristotle's account of essences. Some of what I have said is nothing novel in terms of discussions that have taken place about the relation itself, and in terms of Aristotle I take myself to be building upon some of Salmieri's own work. However, there are novelties about my treatment of determination both as a relation and as it factors into an interpretation of Aristotle.

In terms of Aristotle, I believe that my introducing the mereological dimensions to determinates and determinables is new. Because I have introduced the mereological dimension into determination for Aristotle, the horizontal explanatory dimensions among the several determinable dimensions in a genus and horizontal explanatory dimensions among the several determinate non-uniform parts of a species is in some sense new. It is not new *simpliciter* concerning an interpretation of Aristotle insofar as others have understood that the several parts of the animal under more or less determinate descriptions are functionally and ontologically interdependent. However, my consideration of this interdependence is new insofar as I see this as intimately a part of determination for Aristotle and wound up with the structure of an essence.

In terms of the determination relation itself, my introduction of the mereological dimension to determination is not at all new. W. E. Johnson had already seen this mereological dimension in his treatment of determination. Much more recently, Eric Funkhouser in his *The Logical Structure of Kinds* has proposed a theory of kinds in which, among other details to be considered shortly, he sees that most kinds will be

comprised of a plurality of determination dimensions. He also observes how the several dimensions of determination of a single kind can have mutually necessitating relations¹⁹¹ among one another; however, he does not make this a core feature of his treatment of determination. For instance, there may be good reasons that explain why the determination dimensions of a kind like triangle necessitate one another. That is, there may be good reasons that explain why it is impossible for a triangle to have some lengths of sides along with certain angles. However, Funkhouser thinks investigating such necessitation relations is up to the expert associated with the kind in question. Funkhouser is concerned with a more general picture of determination that will not delve into the particular sorts of necessitations among determination dimensions of this or that particular kind. So what I have called the horizontal dimension of determination is recognized by Funkhouser but left out of his general theory of kinds.

If Funkhouser is right in separating the treatment of necessitation relations among determination dimensions from his theory of kinds, what can be said for my treatment in which I have made such necessitation relations, or, as I call it, the horizontal dimension of determination, a central feature of determination? I think there are two possible responses here that I can give. The first would be to concede to Funkhouser that, in general, the horizontal dimension of determination of a given kind is best considered by the expert of that kind. Because I am primarily working on Aristotle's treatment of living

¹⁹¹ Determination, realization, and even identity are all kinds of necessitation relations for Funkhouser. A necessitation relation obtains between two kinds whenever an object's being one of those kinds guarantees it be the other kind as well. Funkhouser's examples are the following pairs: crimson and red, a certain neuroscientific state and a conscious experience, and H₂O and water. These illustrate determination, realization, and identity necessitation relations respectively. See Funkhouser pg. 6-7. For my treatment, I am more concerned about the necessitation relations that will obtain among the different dimensions of determination. I use "necessitation relation" to refer to these.

kinds, and the sort of account at which Aristotle's treatment aims is intended to result from his expertise concerning such living kinds, then Aristotle ought to have something to tell us about this horizontal dimension of determination when it comes to living kinds. Thus, as opposed to my consideration of the Aristotelian determination relation offering us insights into determination as such, it would be better to consider Aristotle as primarily concerned with determination in a limited context: the context of living kinds. I think this response is right in some respects. Funkhouser is offering a more general account of determination than that which is restricted to living kinds. So the particular kind of horizontal relationship among animal parts of a kind under more or less determinate descriptions does not have to be Funkhouser's particular concern. However, there are reasons to be concerned about this horizontal dimension of determination, reasons that transcend interests in living kinds as such.

I want to claim that such necessitation relationships are part of the determination relationship in at least some kinds. Kinds of living substances, for Aristotle, are ones where the determination relationship includes these necessitation relationships. To see why this horizontal dimension (the necessitation relationship) is so intrinsic to determination in living kinds, I need first to consider two preliminary points. One such preliminary is a difference between Aristotle's notion of some very generic kinds and Funkhouser's. Another preliminary is the very strong sense of necessitation that is at work among the determination dimensions of animal kinds. Let us first look at the idea of varying degrees of strength in necessitation relations, and then look at the difference between Aristotle's notion of some very generic kinds and Funkhouser's.

4.1.2 Necessitation Relations

Consider a case that both Johnson and Funkhouser use: the kind “color.” For the sake of discussion, we will stipulate that colors are determined along three dimensions: hue, saturation, and brightness. Funkhouser quotes Johnson saying:

Our familiar example of colour will explain the point: a colour may vary according to its hue, brightness, and saturation; so that the precise determination of a colour requires us to define three variables which are more or less independent of one another in their capacity for co-variation; but in one important sense they are not independent of one another, since they could not be manifested in separation.¹⁹²

I want to emphasize two points from this quotation of Johnson by Funkhouser. The first is that color is the sort of kind with multiple determination dimensions where the precise way in which one dimension is determinate does not necessitate that another dimension be determinate in some other precise way. To make this point clearer I will take Funkhouser’s lead and employ a mathematical model.

Take a coordinate system for three-dimensional space. In it we have an x-axis, y-axis, and z-axis; thus the space would be all ordered triples (x,y,z) . We can represent the kind “color” and its subkinds with this coordinate system.¹⁹³ Let’s stipulate that the x-axis

¹⁹² Funkhouser 35

¹⁹³ The analogy is not meant to be taken too strictly. For example, I purposely failed to specify whether or not our three dimensional space is defined by the set of rational numbers, real numbers, etc. The reason is that I’m not sure that the fine distinctions there are between such sets apply to the determination dimensions of color. For instance, is the set of all colors infinite or finite? If infinite, is it countably infinite or is it uncountably infinite? I’m not sure what the answers to such questions would be, but, fortunately, the inability to answer such questions does not detract from the general usefulness of the analogy when taken loosely.

is to correspond to brightness, the y-axis to hue, and the z-axis to saturation.¹⁹⁴ A completely determinate color on this graph will correspond to some ordered triple, a point. At least some¹⁹⁵ of the sets of points on the graph will correspond to terms that denote natural subkinds of color; for instance, there will be a set of points on the graph that correspond to all the determinate shades of red. The shades of red will be all those points falling within certain ranges on the x, y, and z axes.

What Johnson is claiming in the above quote concerning the greater or lesser independence of the co-variation of the determination dimensions for color can be represented with our graph. He says that the variation of colors across the dimensions of brightness, hue, and saturation are independent of one another. So, assuming that 7 picks out a determinate brightness on the x-axis, we would say that the set of points $\{(x,y,z) \mid x=7\}$ are defined for whatever values of y and z are on our graph. On the graph, this would look like a plane that sliced three-dimensional space at point 7 on the x-axis; all the points within that plane correspond to a determinate color. Johnson's point is realized by this graph insofar as setting $x=7$ does nothing to affect the variation of the variables y and z. If what Johnson had claimed about the independence of the variation of color's determination dimensions were false, then there would be certain combinations on the graph that were undefined. For example, assuming that the relationship between brightness and hue were fixed by some kind of necessitation relationship definable by the function $F(x)=x$ (where x is some hue and $F(x)$ is some brightness), then there would be

¹⁹⁴ I assume that unlike a three-dimensional coordinate system, there is a maximum value for each dimension of color. So to be very accurate, it would probably be better to say that we are dealing with a continuous subset of the three-dimensional coordinate system.

¹⁹⁵ I only say some because if we were to select an arbitrary set it would be possible to take collections of points for which we don't have a color-kind term.

no determinate color corresponding to the point (9,1,3), since $9 \neq 1$. I do not mean to claim that Johnson is wrong here; I only want to clarify what his claim means by also showing what it would mean for it to be false.

The second point I want to emphasize from Johnson's quote is that even if the variation of values on color's three axes of determination is not fixed by some kind of necessitation relationship, it still holds that any determinate color will necessarily have *some* value with respect to all three axes. In other words, there is no color that lacks a hue, or a brightness, or a saturation. Any determinate color must possess a specific hue, brightness, and saturation.

Thus, if something *p* is described as a color, there would be nothing more we could say about it than that it is something with a hue, brightness, and saturation. If it was further specified that *p* is red, then we could presumably define certain minimum and maximum values for *p* in terms of hue, brightness, and saturation. However, within the maximums and minimums, it would seem that there is still no fixity of the variation of the relation among hue, brightness, and saturation that would obtain for *p* in virtue of *p*'s being red. Not all kinds are like colors concerning this independence of co-variation among determination dimensions; consider the kind "shape." If we specify we are in the subkind "triangle," then there is a definite fixity concerning relations among angles and sides. The Pythagorean theorem is one such famous fixity and so are the trigonometric functions.

To the extent that at least two determination dimensions of a kind can vary quite independently of one another, such a kind exhibits a looseness of fit concerning these two determination dimensions. Again, just because the kind exhibits such looseness of fit

between two dimensions does not entail that subkinds must also exhibit such looseness of fit. On the other hand, when the variation of the determination dimensions between two kinds is fixed according to some rule, the kind exhibits tightness of fit between these two determination dimensions. The kind “color” appears to exhibit a rather loose fit among all of its determinations dimensions whereas triangles exhibit a tighter fit concerning the ratios of their sides, for instance. However, notice that even in triangles, a line segment that happened to be one side of a given triangle is not itself defined by relation to the other sides and the angles of the triangle. That this is so becomes obvious by considering how we can construct triangles in geometry out of primitives. Once it is specified that we have a side *of* a triangle, it does entail that there are two other sides. Moreover, with only a few more specific details such as length of a side and an angle, we can derive the rest of the details about the triangle as a triangle. But just given the description of a line segment, it would not be possible to infer whether or not that segment was part of a triangle or not.

Are there any examples of kinds where not only will the description of one determination dimension, at greater and lesser degrees of specificity, allow us to infer the descriptions of other dimensions, but the very description of one such dimension is only intelligible in relation to the other dimensions? For example, if this held for triangles it would be impossible for a possible line segment that can be a part of a triangle to be or be understood independently of the appropriate triangle. If my interpretation of the relationship among animal parts for Aristotle is accurate, then Aristotelian animal kinds are the sort where the very intelligibility of one determination dimension requires the other determination dimensions. This is because animal kinds are derived from a more or

less specific description of the parts of animals of the kind, and the very identity of animal parts for Aristotle involves their *interdependent* functioning. Since the function of one part of an animal is understood in relation to what it does for other parts' functions, and so, ultimately, what one part does for the entire system of the animal, then all of the animal's parts that are essential would be included in the very intelligibility of one part. Recall, this is just why a hand separated from the body is a hand in name only.

Since an animal's parts under more and less specific descriptions are the determinates and determinables that make up the difference and the genus of the animal respectively, then even understanding one determination dimension requires all the others as well. I will refer to this feature that Aristotelian¹⁹⁶ animal kinds exhibit where the understanding of one determination dimension requires all the others as well as maximal tightness of fit. Perhaps there is even a tighter fit among determination dimensions of some kind, but for my context now, I will not come up with a kind that exhibits any tighter fit.

What I want to say is that this maximal tightness of fit for animal kinds is part of the determination relation for animal kinds. I think Funkhouser would disagree with this. As stated earlier, Funkhouser sees the investigation of the various necessitation relations that exist among the determination dimensions of a given kind as the business of the expert of the given kind. To make my case for why the necessitation relations among determination dimensions for Aristotelian animal kinds is part of the determination relation itself, I need to explain the second preliminary that concerns the difference in Funkhouser's and Aristotle's conception of very generic kinds.

¹⁹⁶ I say "Aristotelian" because, again, it is another question beyond my current scope to show that animal kinds in reality do or do not agree with Aristotle's view of them.

4.1.3 Generic Kinds that Lack Its Subkinds' Determination Dimensions

Funkhouser considers a generic kind¹⁹⁷ to consist of several dimensions of determination along with non-determinable necessities. For instance, a non-determinable necessity of the kind “rectangles” is that any rectangle has four ninety-degree angles. This feature does not come in varying degrees of specificity, and so Funkhouser considers it to be non-determinable. Since every rectangle must have four, ninety-degree angles, it makes sense to call it a necessity. Rectangles admit of two determination dimensions: the length and width of their two pairs of sides. A particular rectangle would then have a determinate length and width. Particular colors would have a determinate hue, brightness, and saturation. Notice that in all of these cases, the kind has a number of determination dimensions, and every particular falling under such a kind is fully determinate with respect to each of these dimensions.

On Funkhouser’s theory there are some kinds for which subkinds of the kind have no value on one or more of the dimensions of determination for that kind. Funkhouser’s example is the kind “shape.” As just said, every rectangle must have a determinate width and length. Thus the kind “rectangles” will be determinable along two dimensions. Five sided shapes can be determined along even more dimensions. And other kinds of shapes with many more sides can be determined along many more dimensions in terms of lengths of their sides or values of their angles. Some shapes, circles for instance, will not even have sides. So Funkhouser proposes that the kind “shape” has infinitely many

¹⁹⁷ These very generic kinds are dubbed “property spaces” by Funkhouser.

determination dimensions.¹⁹⁸ Rectangles are kinds of shapes, and any rectangle only has two determination dimensions. So every determinate rectangle will be an instance of the kind “shape” wherein infinitely many determination dimensions have null values.

I think Funkhouser must hold very generic kinds like “shape” to possess infinitely many determination dimensions because he does not consider the possibility of very generic determinable kinds that are not conjunctions of the determinable dimensions of all the subkinds belonging to it. When we are *only* thinking about a kind like “color” this seems natural. We can explain why “red” is a kind of color by observing that “red” has a hue, brightness, and saturation; the same will of course be true for any color. So, when we are looking to identify a general kind for a group of supposed subkinds we might also think that all we need to do is figure out the dimensions of determination of each of the subkinds and then conjoin these together.

If we are going to allow that subkinds of shapes have null values along infinitely many determination dimensions, we might well ask why we do not include determination dimensions such as saturation, hue, or brightness along with a dimension like radius when talking about the kind “shape” underneath which a particular triangle falls. Just as a particular triangle, qua triangle, does not have a determinate radius, so too it does not have a particular brightness. But why then do we include “radius” as one of the dimensions of the kind underneath which triangles fall and not “brightness”? If a very general kind like “shape” is nothing more than the sum of all determination dimensions found in all particular shapes, then understanding the kind itself will not enable us to

¹⁹⁸ Funkhouser 41

answer why some determinations are present in the kind whereas others are not. Hence saying that “brightness” is not a feature of shapes qua shapes just begs the question.

I think there is another way to understand a very general kind like shape that does enable us to explain why some determination dimensions are excluded from shape and others are included. It would seem more plausible to let such a determinable kind as shape not be reduced to all the determination dimensions of its subkinds. It is correct as far as I can tell to say that being a shape is being closed and continuous¹⁹⁹ in two dimensions, if we are talking about planar shapes, or being closed and continuous in three dimensions, if we are talking about solids. This seems to be a fine candidate for the account of the kind “shape.”

However, why is it that we will be justified in claiming that rectangles or triangles are shapes on my view? For Funkhouser, we can explain why triangles are shapes by observing that they have determination dimensions found in the kind “shape.” My view does not enable us to explain the inclusion of triangles under the kind “shape” in the same way. On my view we would explain why triangles are shapes by showing that they must have the property of being closed and continuous. Moreover, once we have such an account of the kind “shape” that does not reduce to a conjunction of dimensions of determination, we can explain why some determination dimensions ought to be excluded from and others included in subkinds, which is something we could not do on Funkhouser’s account. For instance, “hue” is not included in the determination dimensions of any subkind of “shape” because “hue” is not a way of being closed and continuous. However, notice how things like the angles of the triangle and lengths of its

¹⁹⁹ For whatever it is worth here, both closure and continuity can be given a very precise meaning; however, it would take us into some topology that would take some time to recollect.

sides are involved in explaining the closure and continuity of the involved shape.

Supposing it were meaningful to talk about line segments possessing a hue, notice that the hue would play no part in three line segments forming or failing to form a triangle and so something that is closed and continuous. However, we clearly must have certain angles and line segments in order to form a closed and continuous shape that is a triangle.

We might say that all the dimensions of determination that Funkhouser packs into the generic kind “shape” are implicitly present in “shape” on my account. All of these dimensions are implicitly present insofar as closure and continuity is ever only realized in determinate ways of being closed and continuous.²⁰⁰ However, the further structural details that are found in particular shapes like triangles, rectangles, etc. only emerge as we descend to subkinds of shapes. After we get to a particular subkind of shape like “triangle” my story matches Funkhouser’s. That is, any fully determinate triangle will have all and only as many determination dimensions as the kind “triangle” itself. However, the kind “shape” itself is, comparatively speaking, structurally amorphous when looking at the subkinds that fall under it; again, this is just to say that the several dimensions of determination that are part of the subkinds of “shape” are not explicitly present in the account of shape itself.

²⁰⁰ To confess my source of inspiration for this point, Aquinas says in the *De Ente et Essentia*, “This designation which is in the species with respect to the genus is not through something in the essence of the species which is in no way in the essence of the genus; rather, whatever is in the species is also in the genus, but as undetermined. For, if animal were not the whole that man is, but a part of man, it would not be predicated of man, since no integral part may be predicated of its whole.” See Mauer 26.

4.1.4 Necessitation Relations as Part of Determination for Animal Kinds

For my treatment of Aristotle, the kind “animal” would be more amorphous structurally speaking.²⁰¹ For instance, we could say that all animals have parts and that these parts must have an internal teleological relationship to one another, but any more detailed remarks that reveal structure in terms of particular determination dimensions would likely be confined to this or that genus or species of animal.²⁰² Be that as it may, we could still affirm that any living thing must have such an internal teleological relationship among its parts, just as we could affirm that any shape must be closed and continuous. With this remark, I can now make my case for why the necessitation relations among the determination dimensions of Aristotelian animals kinds must be considered part of the kind that is determined.

A subkind falls under its kind in virtue of its being a determinate of the more determinable kind. The determinate is a particular way of being the determinable kind. The kind “animal” is a very general kind. Granted the Aristotelian understanding of the kind “animal,”²⁰³ we know that in order for a thing to be an animal it must be comprised of parts and these parts must have a particular relationship to one another. This

²⁰¹ This might further explain why Aristotle is led to think of the genus as a kind of matter in some places and the difference as being like form. In some contexts like *Metaphysics* Z.12 where precise biological explanations are not at issue, Aristotle could be considering the animal as the relevant highest genus. In the context of biology, we would want to restrict our genus further because not many if any rich biological explanations would be forthcoming about this or that species insofar as the species is an animal. My point here is that Aristotle could be shifting his focus from one genus to another for the same individuals in different explanatory contexts. Thus in *PA* the more particular genus would be the relevant one to consider. In *De Anima* we would want the more structurally amorphous genus of “living substance.” The metaphysical context would presumably get us the most generic ontological categories possible.

²⁰² Surely other things about animal could be said as well. We could say that animals are substances that perceive.

²⁰³ I am bracketing any living beings there might be that transcend the sublunary realm for Aristotle.

relationship is given by the internally closed teleological story concerning the parts. So in order for a kind to be a subkind of “animal,” the individuals of the kind must have parts that are related to one another in a teleological way. Just as we would say that red is a kind of color in virtue of its being a certain kind of hue, saturation, and brightness, so too we would say that dog is a kind of animal in virtue of its being a certain kind of teleological relationship among its parts. So a subkind of animal is a more determinate kind of the determinable “animal” because it is a kind of teleological relationship among its parts. Thus, for animal kinds, the teleological relationship among an animal’s parts is itself part of what is determined. But the determination dimensions of animal kinds are their types of parts, and the teleological relationship among those parts corresponds to the functionally interdependent necessitation relations among those parts. Thus for living kinds, the necessitation relations among determination dimensions is part of what is determined.²⁰⁴

Again, I am prepared to allow that there are some kinds for which the necessitation relations among its determination dimensions are *not* part of the determination relation of those kinds. My guess, for the moment, is that such kinds will be ones constructed from more primitive objects; thus I would guess that most mathematical/logical objects fall within such kinds where the necessitation relations are

²⁰⁴ What is interesting is that such an account of the class of animals that would characterize it by the kind of relationship its determination dimensions have to one another, is the kind that is in the neighborhood of the remarks Aristotle makes in places like *Physics* II.2, Zeta 10-11, and much of the first book of *Parts of Animals*. More determinate, though still generic, and standalone classes are what occupy most of Aristotle’s attention in actually explaining animal parts.

not part of determination for those kinds.²⁰⁵ With the case of scientific kinds, more broadly understood, I am not so sure.

What exactly counts as the determinate version of the teleological relationship among such part is something like the complete action or way of life of the animal that will of course involve all its parts functioning interdependently. It is tempting to conjecture that some of the great kinds like birds and fish are a more determinate version of this general teleological relationship yet still generic. There seems to be some kind of way of life or complete action common to birds²⁰⁶ for example. Flying seems part of that life for birds. From this we might say that birds must have certain sorts of parts like feathers for the sake of flying. Aristotle does treat being feathered as a kind of unexplained explainer for birds.²⁰⁷

4.2 Worries about Relations and Substance

Let me take a moment here to point out what is so remarkable about the necessitation relations among the determination dimensions of an animal kind being part of the determination relation itself for that animal kind and answer an objection. Keeping in view that a theory of kinds will not be concerning itself with all the details of this or that kinds explains why Funkhouser is correct, on the whole at least, to leave the

²⁰⁵ Consider the triad of *Apo* 96a35-36. As Barnes says in his commentary, "Since the only numbers prime in this latter way are 2 and 3, *number*, *odd*, and *prime in this sense* are sufficient to define *three*. If we read "and" in "prime and prime in *this sense*" (96a38) as "i.e.", we get precisely these three notions as definitive of *three*; 96a36 then has to be taken as listing attributes that hold, but may not be definitive, of *three*." See Barnes 241.

²⁰⁶ Of course, there are outliers here that make these kinds of statements shaky. What of something like the Libyan ostrich?

²⁰⁷ *PA* 692b9-15 tells us how all birds have wings, and *PA* 693b9-11 declares that capacity for flight is in their substantial being.

investigation of necessitation relations among kinds to the experts of those kinds.

However, in view of the preceding, it seems animal kinds are somewhat unique in that the sort of necessitation relations that go on among their determination dimensions are part of the very reason why animal kinds are kinds of animal at all. It could seem that there is some kind of a conflation I am making between the kind itself and necessitation relations occurring in that kind. My account is that it is essential to a subkind's belonging to the animal kind to have this peculiar teleologically explanatory necessity relation among its determination dimensions. This necessity relation might be thought of as a sort of second order dimension of determination that supervenes on the various first order determination dimensions, the several kinds of parts.²⁰⁸

Necessitation relationships, whether teleological or otherwise, are relations. One could hold that relations are always posterior to their relata, and one might think this is Aristotle's view on the matter as well given that relation is a category of accident. If this is true, then my view is absurd. I am claiming that the functional relationships among animal parts is the form of the animal, and so the essence of any animal must always lay out these functional relationships as the essence must describe the form of the animal, along with the matter, the several animal parts. But granted that the form is a functional relationship among the parts, it might seem inevitable that the matter would have to become prior to the form.

In the *Categories* itself where relation is identified as an accident, Aristotle declares that an individual horse or an individual man are examples of primary

²⁰⁸ Though with respect to the identified determination dimensions the teleological style necessitation relation is supervenient, ontologically, the several causal relations among the substance's parts corresponding to that necessitation relation is prior to any one single part.

substances.²⁰⁹ So if these two animals are primary substances, and yet they are both relations of functioning parts, then it might seem that Aristotle is fine with this kind of biological relation among animal parts being included in substance. However, even though such relationships are present in a declared to be primary substance, it does not follow from that alone that such relationships are part of what makes such primary substances primary substances. Moreover, though Aristotle is not definitive here, the weight of evidence in the *Categories* is on the side of not even calling things like “being a head,” “being a foot,” etc. relatives. He says:

But as for a head or a hand or any such substance, it is possible to know it – what it itself is – definitely, without necessarily knowing definitely that in relation to which it is spoken of. For whose this head is, or whose the hand, it is not necessary to know definitely. So they would not be relatives. And if they are not relatives it would be true to say that no substance is a relative. It is perhaps hard to make firm statements on such questions without having examined them many times. Still, to have gone through the various difficulties is not unprofitable.²¹⁰

In *Metaphysics* Delta 15²¹¹ Aristotle makes a distinction between three kinds of relations. First, he distinguishes the sort involved with numerical cases such as the relation of “double” and “half” and the “greater than” and “less than.” Then he distinguishes the kind of relations between agents and patients; an example is the relation of “that which can heat” to “that which can be heated.” Finally, he considers another sort of relation that exists between such cases as “the knowable” and “the known.”

²⁰⁹ *Cat* 2a13-2a18

²¹⁰ *Cat* 8b15-24. Fabio Morales does hold that Aristotle’s denial of animal parts as relatives is Aristotle’s final position. See Morales 1994.

²¹¹ *Met* 1020b26-1021b2

Aristotle says

Things able-to-act and affectible [are relative] in respect of their capacity to act and be affected and the actual functioning of these capacities; as for instance the able-to-heat is relative to the heatable because it is capable, and in turn the heating is relative to the being-heated and the cutting to the being-cut in that they are actually functioning. Numerical relatives do not have actual functionings except in a sense described elsewhere; actual functionings involving change do not hold good of them. With some relatives in respect of capacity a temporal reference is included in the statement of the relation, as for instance what *has* produced relative to what has been produced and what *will* produce relative to what will be produced. For a father is called father of his son in this way; for one of them is a thing that has produced and the other a thing that has been affected is in a certain way.²¹²

This point fits well with the earlier remark about capacities in Delta 12 1019a15-18. “We call a capacity what originates a change or alteration either in another thing or *qua* other, as for instance housebuilding is a capacity which is not a constituent of the thing being built, but doctoring, which is a capacity, might be a constituent of the thing being doctored, but not of it *qua* being doctored.” All of an animal’s part have a work to do for the whole animal, and an important dimension of this this work involves the causal interactions among the several parts of the animal. Insofar as the parts’ capacities work on each other in various ways, then when speaking about those kinds of capacities a relative predicate is invoked. Consider the omentum and mesentery. Aristotle speaks

²¹² *Met* 1021a27-1021b2

about the omentum as covering the remainder of the stomach and main body of the intestines. The mesentery transports nutriment from the stomach to the blood vessels, and this ultimately nourishes the other parts. In both cases, the parts considered have actions which are realized in other parts. That functional capacity is part of those parts' identity. Following the points from Delta 15 about capacity, then insofar as these kinds of animal part is said to have a given capacity, the part is being spoken of relatively.

Fabio Morales has an interesting take on this issue of relatives in Aristotle. He holds that Aristotle held relational attributes to have a "peculiar *indefiniteness*."²¹³ Consider a numerical relational statement like "That stick is larger." The obvious question is "Larger than what?" We get a definite subject from the claim "that stick," and "larger" gives us the criterion of comparison between the stick and something else. However, we are not given that something else in relation to which the stick is claimed to be larger; it is in this sense that relatives are indefinite. Applying this to animal parts, Morales holds that they should not be considered relatives because they in fact *lack* this indefiniteness. Due to Aristotle's functional understanding of animal parts, a part like "hand" already contains within its definition that it fulfills a certain function within a living whole. The term "hand" contains within its definition that it is the hand of a living body.

The problem with asking if living parts are relational in the context of the *Categories* is that it has no real mention of such complexities as form and matter. Consider how Aristotle frames the issue there. He talks of how it is not necessary to determine *whose* hand a given hand is in order to know that it is a hand. The way it is

²¹³ Morales. 261

posed brings nothing up about the functional nature of the hand. Once we do bring up that distinction between form and matter, it changes the possibilities for what kinds of relatives there can be. The functional relationships among animal parts is essential to their very being; it is not accidental. With relatives like “older,” “equal,” etc. we can see how there is no intrinsic feature of the subject picked out by the relatives. As Morales points out, Aristotle says in *Metaphysics* N.1 1088a29-b1, a substance can change its status in terms of relational predicates without there even being a change in the substance itself. If this is Aristotle’s thought still in the *Metaphysics*, then though we might be thinking of the causal network of animal parts as relational, Aristotle is clearly not. An animal cannot, for instance, lose a foot without change to itself in the way that it could become smaller insofar as that to which we compared it became larger while it remained the same.

As Morales puts it, “For since one must appeal to the whole in order to define them [animal parts], this reference is *contained* within the definition (and the meaning!) of the respective terms.”²¹⁴ To illustrate Morales’ point, we do not know what a hand is unless we see how it is a part that grasps, for instance, for the man. Now, if I am right in what has preceded, we can say more. It is not only the structurally speaking simpler whole called “man” in relation to which we understand the meaning of “hand”; rather, it is the functional relationship with the other parts of the man and the man’s complete action in relation to which we understand the meaning of “hand.” This is clearly not to say that for Aristotle every person using the term “hand” must understand the complex functional story involving the other animal parts in order to follow the ordinary use of the

²¹⁴ Morales 264

word “hand.” However, for the Aristotelian biologist, it would seem that understanding what a hand is would require this full understanding. This point reiterates an earlier one made in previous chapters. For animal kinds, the functionally explanatory relations (their necessitation relations) among their parts must be included; such functions are required to grasp the meaning of the parts. Animal kinds exhibit maximal tightness of fit.

One qualification here needs to be made. Even though the organic animal parts’ causal relations with one another are not accidental to them but an intrinsic part of their being, there is an inorganic level of composition in the animal in relation to which all such animal parts’ causal relations are accidental. In view of this, any particular animal that comes to be is always contingent, as there is a level of its composition that has no intrinsic tendency to realize any animal or animal part at all. The elements need not be organized in such a way to realize an animal. Fire, earth, water, and air and their natural powers are what they are independently of a presence in living things. However, for Aristotle, in the context of a living thing, the causal relations at work among animal parts are *not* reducible to the interactions among the compositions of elements, an interaction which would be merely contingent in relation to the inorganic level itself.

An explanatory reductionist could counter by claiming that such causal relations among animal parts are merely accidental situations that are possible in virtue of the capacities of the inorganic parts out of which animals are realized. To such an objector, treating the various capacities of animal parts as irreducible natural causes would be as silly as claiming that the capacities of a clock’s parts were irreducible natural causes. This is not to say that the functioning of the parts in the animal or the clock is random, but we do not identify the proper cause according to which the animal or clock operates

until we redescribe the two objects' functions in terms of the causal powers of the primitive elements out of which the clock or animal is composed. Such primitive elements are not properly characterized in a way that would involve either descriptions about a clock or a living thing.

Inevitably, as such a reductionistic story has it, there will have to be some kind of contingency that cannot be accounted for on such a view when it comes to an animal. Since inorganic components have no natural tendency to be in this or that organic composition, and the natures of these inorganic components are the only options for explaining animals, then that organic compounds were realized can only be accounted for by the fact that a particular previous historical state of the inorganic components obtained.²¹⁵ This particular previous historical state was the one where, once it was realized, would result in organic compounds out of the inorganic components, but that such a historical state was realized is contingent relative to the causal powers of the inorganic stuffs themselves. Aristotle simply does not accept that animals or their parts are not by nature. Even though he does allow that the inorganic elements have a role to play in the composition of animals, it is only from preexisting individuals of the same species that new individuals of the same species come. There are no conjunctions that are by nature contingent and result in animal kinds for Aristotle.

There are admittedly positions that could be taken between complete explanatory reductionism of the sort I sketched and Aristotle's view. One might hold that the number of primary things there are by nature is not fixed. In other words, more complex items can develop from the more simple elements, and, once they do, there are new causal

²¹⁵ One can imagine some materialistic Presocratics accounting for animals along these lines.

powers introduced into the world.²¹⁶ Moreover, even if one is tempted to opt for ontological reductionism concerning animals, one need not thereby be committed to explanatory reductionism. It is at this point that issues get murkier too. For Aristotle, it does seem that the issue of ontological reduction and explanatory reduction go hand in hand. However, these days it seems at least a respectable position to accept the ontological thesis while rejecting the explanatory thesis concerning reductionism. So even if some might want to be ontological reductionists concerning animals, there are still several who would reject the explanatory reductionistic thesis. Assuming such a case can still be made for the rejection of the explanatory reductionism, then my points on determination about animal kinds would still be relevant. For, granted explanatory reductionism for animal kinds fails, then the explanatory relations among animal parts are, explanatorily speaking, non-accidental.

Finally, even if there are no such things that exhibit what I called maximally tight fit among their determination dimensions (as do Aristotelian animal kinds), the notion of generic kinds that are not conjunctions of all the determination dimensions of their subkinds is still important to a project like Funkhouser's. The conception of such generic kinds gives us a principled reason for excluding some determination dimensions from our generic kinds. Also of interest for Funkhouser's account is the possibility that for some kinds the necessitation relations among the determination dimensions could themselves be determinable. As I put it earlier, this would be a kind of second order determination dimension supervening on the first order dimensions.

²¹⁶ For example, James Kreines lays out such an account from a Hegelian standpoint. See Kreines 2008.

4.3 Worries about Artifacts and Determination

It seems possible that some kinds of artifacts will exhibit some degree of analogous tightness of fit to that of Aristotelian animal kinds. Something as simple as a hammer serves as a good enough example here. If even a hammer shows a similar tightness of fit among its determination dimensions, then it seems that I am incorrect in thinking that a mark of animal kinds is this maximal tightness of fit. So it would be wrong to use that as the membership criteria for animal kinds. If we consider this a bit, we will see the worry is unfounded.

A hammer must have a certain head in order to work. It must be made of a sufficiently denser material than the nails it is to drive so that it can main its shape in order to convey enough force on the nail to drive it. However, the head also must be formed so it can be secured to the end of a rigid body of a given length. It has to be secured to this body in order for the source of the energy to be able to efficiently convey energy to the head of the hammer that will in turn convey that energy to the nail; this is the handle of the hammer. The handle must be of an adequate density so it can transfer the energy to the hammer and not lose it by bending upon contact. Also, in view of the source of the energy of the motion, the handle must be made with a view to its being used by a human hand; the handle must be ergonomically constructed to suit our hands.

The above, though technically simple, is enough to make the philosophical point I have in mind. The head and the handle of a hammer might be considered the two determination dimensions of the kind “hammer.” The above seems to suggest a necessitation relationship that obtains between the head and handle of the hammer. A sledgehammer’s head cannot be put upon the handle of a hammer used to drive nails, for

instance. Why is it that both an artifact like a hammer and a substance like a tiger appear to exhibit this tightness of fit among its determination dimensions? In these cases, the reason is that both kinds are ones in which individuals belonging to the kinds have a work to do in virtue of belonging to that kind. The sledgehammer head cannot be placed upon the handle of the carpenter's hammer because such a combination would fail to do the work of either kind of hammer. An individual of the kind "hammer" must drive something to a sufficient degree of efficiency. Only certain combinations of parts of hammers yield sufficiently efficient work outputs. So too, a tiger that would have non-tiger parts swapped for tiger parts will not achieve its work as well. A tiger with deer eyes is not one suited to the specific type of preying that is part of the total work of the tiger.

Seeing this close analogy between artifacts and animals might make one wonder why we should not take kinds of artifacts to exhibit the determination relation I have sketched out so far. I think it is important to realize that in the case of animal substances, the term "work" in the above can be replaced with the term "life." Such a replacement is not possible with artifacts. This terminological difference points to an ontological difference that spells out a difference in determination between artifacts and animals.

For an animal, the beginning of the motion that is the work of the individual animal starts within the species of which it is a part; it comes from its parents. Also, the work of the individual animal is completed within the species of which it is a part. A tiger's foot working well while hunting is defined in terms of an end attained for the tiger. Why a tiger reproducing successfully counts as the tiger doing its work can be answered by viewing the end of individual tiger and perhaps the species at large. When it comes to tools like the hammer, the beginning of the motion that initiates its work does

not come from another hammer but from the human being who made it. The work of the hammer is not done for itself or its kind; it is done for the benefit of the person using it or the kind “human beings.”

This ontological difference between artifacts and animals translates into a difference concerning the necessitation relationships among the determination dimensions for artifacts and animals. Unlike animals where the determinate details of the parts of the animal explain one another in the way that they each contribute to sustaining the life of the animal and therefore the very existence of the parts in question, the hammer’s parts in their determinate details explain one another but only by reference to an external factor: the work that the hammer does for the person using it. The existence of each of the parts of an artifact does not depend upon its contributing to the work of the artifact, but when it comes to organic parts, the existence of each of the parts is dependent upon the work of the whole animal. The being of the parts of an animal are wound up with the work of the whole animal. Because the work of the whole animal is the interdependent functioning of its parts, then the interdependent functioning of the animal parts is not something extrinsic to each of the animal parts.

The upshot for the necessitation relationship among artifacts is that they can have a very tight degree of fit among their dimensions of determination, but such tightness of fit is not intrinsic to the stuff that is the artifact. It is only *if* we intend to consider the collection of parts before us as organized for a work that this tightness of fit pertains to the parts before us. The parts themselves are intrinsically “indifferent” to one another, but because such an arrangement of parts in a given artifact is not indifferent to our interests, we intend the several parts as parts of a whole with a view to the work that this whole

does for us. With an animal this is not the case; the being of each of the parts of the animal depends upon the interdependent functioning of the all the parts. The work that these several parts do is for themselves as a self-sustaining whole. Since the determination dimensions of animals are taken from the animal's parts, then the tightness of fit among the determination dimensions for animal kinds is intrinsic to the those determination dimensions. With artifacts, since the determination dimensions are also taken from the parts, the determination dimensions have no intrinsic connection to one another until we intend to view them as ordered to a work we want the artifact possessing those determination dimensions to do.²¹⁷

4.4 Final Thoughts on Animal Kinds and Determination

Even if it is true there is a clear difference between Aristotelian animal kinds and artifacts, is it true, given what we know about the emergence of new species over the course of evolutionary time, to affirm such a difference? Because it is possible for new parts of animals to evolve over time, it seems that the tightness of fit in determination dimensions of animal kinds cannot possibly be as tight as it should be if they were Aristotelian animal kinds. On an Aristotelian view, it looks like mutations for an animal would not be beneficial as it would disrupt the fine-tuned functional relationship among the animal's parts. That there do emerge new species that are better able to survive in

²¹⁷ What would we say of artifacts that have no parts due to human influence in forming them? Consider a single crystal that was put to some use or other by people. The story, I take it, is still the same for the crystal as it would be for a compositionally more complex tool. The particular work the crystal would perform in virtue of being used as a tool is indifferent to the crystal itself. Yes, there are natural capacities that the crystal has in virtue of being itself, but these capacities of themselves do not put themselves to work in accordance with the end that people desire to achieve, and the crystal can be what it is independently of being put to work for such a human end.

virtue of changes to the parts of the species speaks against the notion that the interdependent functional relationship among an animal's parts is ever as tight as it would be if they were in fact Aristotelian animal kinds. Perhaps this is mitigated somewhat due to the flux of environmental factors, something Aristotle did not hold.

Granted that it is true that there is more of a looseness of fit among the determination dimensions for real animal kinds than there are for Aristotelian animal kinds, there is still a marked difference between the way in which the determination dimensions of artifacts entail each other and the way in which those for animal kinds do. The necessitation relations among the determination dimensions for animals and artifacts are both "generated" with a view to the functional unity of the whole artifact or animal; that is, there is a work that both wholes are to do in virtue of being an artifact or animal. In the case of artifacts, there is no intrinsic interdependence among the several parts that go into the artifact; the work that the whole tool is to perform is a matter of indifference to the being of the natural stuff that goes into the tool. With animals, the work of the whole animal must be achieved for the animal parts to maintain their being; there is an intrinsic interdependence among the animal's parts.

There are two final points, however, that I will not further consider here as I think it touches on topics that would require much more treatment than I can give. To the first, if it is true that the organic world entirely developed out of the inorganic, we might suppose that there is no novel causal power that emerges with the organic. If there is no novel causal power that emerges with the organic, then the distinction between artifacts and animals seems to be only one of degree and not of kind. Just as the work an artifact does is reducible to the way in which the non-artificial parts are put together so as to

interplay in a particular way, so too the way that an animal would live and reproduce would be reducible, ultimately, to the way the inorganic parts happened to interplay with one another. We might want to say that there is a difference in that our creations do not yet reproduce, but, still, in either case the point would hold that the only causal powers at work are the inorganic. What appears to be an ontologically primitive whole, the animal or the artifact, is nothing more than an accidental interaction of inorganic stuffs. In such a case, the real determination dimensions at work in animal kinds would be given by the compositional possibilities of whatever the base inorganic elements would be. As said, the issues such a consideration raises require much more attention than I can give here.

Secondly, once we consider the mutability of animal kinds over evolutionary time, the issue of the causal interaction between the environment of animals and the animals' natures themselves must suggest itself. What is significant about this for the sake of what I take to be my Aristotelian account of determination? Recall, my account was supposed to provide a principled reason as to why we would exclude certain sorts of determination dimensions from our generic kind. In the case of animals, we would not include the sorts of determination dimensions that did not factor into explaining how it was that the animal in question was a kind of interdependent functional unity. However, granted that the features of animal kinds are, at least in part, determined by the peculiar sorts of challenges for survival that the environment poses them, then it seems that a larger story for the determination dimensions of animal kinds may be in order. Not only will some traits be selected due to the inorganic aspects of the environment, some will be adopted due to the advantage it yields its possessor in terms of working with the other organic members of the environment. Of course, the possessor having these traits in turn

shapes the nature of the environment for all other organic members, and itself. It seems as though the Aristotelian story I have told about the internal functional relationship among animal parts is maintained but integrated into a larger working relationship among all the other factors in the environment. Just as one part in an animal has a work to do that supports the life of the whole animal and so in turn supports itself, it could seem that each animal, with all its traits, presents a unique factor in the environment that shapes conditions that determine what other kinds of forms of life could be successful and so in turn affects its own chance at survival. If this sort of more general application of Aristotle's thought were to be possible, it raises several questions. Are individual animals substantial? What are the primitive kinds we would use in biological explanations? Etc. Such questions must be left for another time.

5. Some More Objections and Responses

5.1 Introduction to the Objections

In the previous chapter I aimed to strengthen my account of Aristotle's doctrine of essence; I did this mainly by considering and answering objections that could be raised against the view of the determination relation my account presupposes. Now I want to consider and address a few miscellaneous objections that can be raised against my account. There are three main objections I want to consider.

5.1.1 Extrinsic Determination of Animal Parts

Several animal parts seem to be explained by the way they can function in relation to their environment. On my account, each part of an animal does something for the whole animal in virtue of the way it specifically works with the other parts in that animal; the working of some of the other parts than part *x* are the condition to which we look to explain why a given part *x* is as it is. It is the functional relationship of the whole animal that is unconditioned or explanatorily basic insofar as teleological explanations of any of the animal parts are to be obtained only by reference to features within the whole animal. However, given that so many animal parts must successfully interact with the environment to function properly, we might wonder how the environment is not yielding us conditions that explain at least some of the animal's parts.

For instance, how could the teeth of a polar bear be explained in terms of what it does for the bear absent some reference to the type of prey it has? The work the bear's teeth do makes sense in relation to the flesh, bones, etc. of the seal, for instance. But this makes it seem like the whole animal, the polar bear in this case, is no longer the

unconditioned. Insofar as there are parts like the polar bear's teeth that are teleologically explained by a condition external to the animal in question, the animal is to that extent explained by relation to something external to it. Thus, if this issue cannot be addressed, an animal essence on my story would lose the unity so crucial to it at the horizontal level of determination. Without the unity that obtains from the horizontal level of determination, an essence is no longer a unity. This concern is a pressing one and would apply to any animal possessing parts for the sake of interacting with other substances in its environment for food.²¹⁸

5.1.2 The Ontological Status of Auxiliary Parts

Another concern arises when we think of the way in which some animal parts seem to be primarily determined according to Aristotle by the presence of beneficial matter in the environment. Consider the case of horns in *Parts of Animals* 663b20. In this passage Aristotle indicates he is going on to consider horns not by the "nature of the account" but instead in terms of the "necessary nature." He says, "We must say how the nature according to the account makes use of things present of necessity for the sake of something."²¹⁹ In what follows, Aristotle identifies how horns come from earthen matter, and that in certain large animals (the ones that for the most part have horns), there is a surplus of earthen matter in the body. Thus, given that horns are beneficial to the animal

²¹⁸ To a lesser extent, we might also worry about parts of the bear that help interact with non-substantial factors of its environment. For example, the polar bear needs to have a coat and layer of fat suitable for withstanding the bitter cold. These features would then seem to be understood functionally in relation to something beyond the polar bear. Thus, it would seem the polar bear is in some respects determined by factors external to it. As will be shown below, the solution I offer to cases of external determination of the animal parts by other substances will also apply to non-substantial cases such as climate.

²¹⁹ *PA* 663 b20-25

possessing them, the production of horns from this excess of earthen matter will be beneficial to the animal.

Lennox in his commentary observes that it is the form that is being picked out by the “nature of the account” and material that is picked out by the “necessary nature.” By “material” Lennox is thinking of the foodstuffs coming into the animal through its diet that are not initially in the proper condition to contribute, materially, to the animal’s being and so must be concocted through digestion. He observes this might suggest something like indirect teleology. The form of an animal can make use of material in its environment in a way that is useful to the animal by developing an auxiliary part. We would then be explaining the auxiliary part by reference to the good it does for the animal, but unlike the case of primary teleology, this auxiliary part itself is strictly speaking not integral to the form of the animal.²²⁰ It is almost as though the form of the animal uses the material of the environment to produce an auxiliary part in the way a craftsman makes use of materials to produce artifacts.

Such auxiliary parts would present difficulties independent of any relation to my account of essences for Aristotle. For example, the ready comparison that can be made to a craftsperson should give us some concern. It would seem impossible that the form of a non-rational animal is able to act as a craftsman in relation to material in its environment. In terms of my account however, the problem is that if such a part plays a significant role in the life of the animal, then such a part must factor into the account of the horizontal level of determination. But recall that on my story, the total form (substantial form) of the animal is the interdependent functional relationships realized among the specific types of

²²⁰ See Leunissen 2010: 25

parts that makeup the animal, and these interdependent functional relationships are the horizontal level of determination. It is not the case that the specific activity of a bald eagle could be realized through any other parts. The particular makeup of the parts is integral to the particular function they realize. However, if such auxiliary parts do factor into the horizontal level of determination, a contradiction may seem to follow. Such parts are not supposed to be included in the being of the animal, the form of the animal, but that is just what it seems must follow given that these auxiliary parts play a significant role in the function of the entire animal.

5.1.3 Aristotle Does not Explicitly Layout the Causal Interdependence of Animal Parts

One might wonder why there are no cases of Aristotle explaining an entire animal in terms of the kind of account I offer. He never does lay out a series of explanations of the parts of a given animal such that the causal interdependence and so unity of the animal is exhibited. Is not the absence of such explanations evidence that my story is wrong? There are several things to say here, but, surprisingly, I think this issue will take us somewhat into the question of the relation between metaphysics and natural philosophy for Aristotle.

5.2 Apparent Cases of Extrinsic Determination of the Parts of Animals

5.2.1 Camels and Their Foodstuffs

There are a number of passages in *Parts of Animals* that suggest extrinsic determination. One such passage involves a discussion of some of the parts of blooded

and live-bearing animals that are involved in the intake and concoction of food.²²¹ In general, blooded and live-bearing animals will have either a complete set of teeth and a single stomach or an incomplete set of teeth and multiple stomachs. The reason why for Aristotle is that, when it comes to blooded and live-bearing animals, the whole job of breaking down the food must either take place between a complete set of teeth and one stomach, or an incomplete set of teeth and several stomachs. Apparently, the work that would be done by a complete set of teeth must be made up for by an additional number of stomachs, or, to state it the other way, lacking multiple stomachs requires a complete set of teeth in order to break the food down. There is another feature that Aristotle is interested in here as well: the possession of horns. In almost all cases, an incomplete set of teeth is correlated with horns. The reason is that the material cause of both teeth and horns is surplus of earthen matter in the nutrition, and if the surplus is used to develop one such part, there is not enough left over to develop the other.²²² Thus we would expect that since those animals with horns must have incomplete teeth, then animals with horns will have multiple stomachs. Moreover, since multiple stomachs come to be in an animal to make up for the lack of teeth, then there should be some excess earthen matter left over in those animals with multiple stomachs. Hence, we would expect that animals with multiple stomachs have horns. Contrary to such expectations, camels have multiple stomachs, incomplete teeth, and no horns.²²³

We can explain why the camel does not have horns by going back earlier to book three. At *PA* 663a1-a7 we see that in some of the animals that have excess of earthen

²²¹ *PA* III.14

²²² *PA* 663b26-664a2

²²³ See Lennox 2001: 280-281

matter, their sheer size is sufficient to protect them. Protection being the primary purpose of horns, it would be in vain for camels to then have horns, as Aristotle observes. Thus, as nature does nothing in vain, camels do not have horns. However, we are left with another difficulty. Since camels have no horns, they still have an excess of earthen matter. We would expect them to have complete teeth, and yet they do not.

In his commentary Lennox observes this as a place where legitimate worries over *ad hoc* explanation can be entertained.²²⁴ Aristotle patches up the gap by saying that it is more necessary for the camel to have multiple stomachs than front teeth, and that apparently the front teeth (which would make it possess complete teeth) would somehow be useless. It seems that though in some kinds of diet it is possible for the work of multiple stomachs to be accomplished by complete teeth and only a single stomach, in some kinds of diet, like the camel's thorny and woody diet, only the option involving multiple stomachs will be sufficient for the task. Still, there is excess earthen matter as the camel is the sort of animal to have such excess of earthen matter. So we find that the excess earthen matter is used to make the mouth and tongue of the camel suitable for chewing its hard to concoct thorny and woody food.

Though, as alluded to in the above, there are several interesting puzzles to consider in this passage about camels, my focus is the extent to which there is an apparent extrinsic determination of the camel's nature by its food. It is the thorniness and woodiness of the food that determines the necessity of the multiple stomachs and the nature of the camel's mouth. But this thorniness and woodiness are features of the species of plants that the camel eats; they are not features of the camel itself. Thus, apparently,

²²⁴ Lennox 2001: 281, Lennox says that here Aristotle might have been led to rethink his account of horns as opposed to trying to reinterpret the data to fit that account.

two things about the camel, its multiple stomachs and its mouth type, are determined by the nature of another being extrinsic to that of the camel. If this is all there is to be said about this case, then the explanatory closure that we expected to find at the horizontal level of determination cannot be maintained for Aristotle. Moreover, granted my story about the essence of animals, the unity of the being of things like a camel would be lost.

There are two extremes here that we have to avoid as Aristotelians. As just shown, we cannot declare that the camel is to be understood, essentially, in relation to its environment. However, neither can we say that because the nature of the camel is such as to be able to eat thorny and woody stuffs, there are such things for it to eat in the world. This just “solves” the problem by forgetting that it has recreated it in the case of the stuff the camel eats. Now the plants the camel eats are extrinsically determined by the nature of the camel that eats them. Though placing the camel on a teleological pedestal might seem absurd, it is not without a basis in Aristotle, though it is the human being that is teleologically ultimate for the sublunary world according to that story.²²⁵

It is helpful to talk about points of view and interests here in a metaphorical sense.²²⁶ I say “metaphorical” because some might think that only intentional agents can

²²⁵ *Politics* I.8 is the notorious instance of this. Plants are for the sake of animals, some animals would be for the sake of others, and all the other living sublunary beings are for the sake of the human being. For a discussion of anthropocentric external teleology, see Sedley 1991.

²²⁶ What I have to say here is mainly in harmony with Leunissen’s view of secondary teleology. She emphasizes how the use mankind and animals will make of other beings for food is to look at things from the point of view of the predator. The animals and plants that can be used as food have their own unique point of view as well, and from this point of view they are not mere foodstuffs but independent beings with their own good. However, I don’t understand why she claims that the material potentials of the consumed being are causally primary. Granted, when discussing secondary teleology as a whole, Leunissen is also involved in a discussion about auxiliary parts that come to be in the animal that are not part of the form of the animal strictly speaking on her view. Still, her remark is meant to apply both to the case of such auxiliary parts and predator/prey relations. I will have more to say about such auxiliary parts below, but, for the moment, granted that there is some causal role that the material of the foodstuffs has to play when an animal gets nutrition from eating, how can this be primary? The food is going to be converted into nutrition to maintain the form of the

be said to have a point of view or an interest. If we adopt the camel's point of view, we think of things in terms of the camel's interests. If we adopt the point of view of the plant that the camel eats, then we think of things in terms of that plant's interests. From the point of view of the plant, its thorns are beneficial. Presumably such thorns protect the plant from being consumed by herbivores. From the point of view of the camel as an herbivore, the thorns are not beneficial. From the point of view of the camel, its specific mouth and stomachs are beneficial. From the point of view of the plant, the camel's mouth and stomach are detrimental.

The two points of view correspond to two divergent lines of teleological explanation that apply to the camel's eating of the thorny plant. For the camel, the plant is just a food source; the only way it can factor into the teleologically causal relations of the camel's life is by the camel consuming it. For the plant, I suppose the camel is a threat. If we look at things in camel terms, then the plant is around in order to be eaten. In camel terms, the plant is teleologically ordered to consumption by the camel. It is already to be understood in terms of the camel's good.

If we have two different individuals of two distinct species, then this means the two have different essences. On my view of an essence, this means that we will have two distinct stories about the way each individual's parts work together to realize the whole animal. The worry introduced via extrinsic determination is that these two causal stories about how individual A and B's parts function will somehow bleed into one another when some of B's parts must be a certain way for the sake of consuming A. My suggestion using the point of view language escapes this difficulty. When we are looking

animal and all its parts. This itself is a work of the form of the animal and a realization of its final cause. See Leunissen 2010: 40-42.

at the relation between A and B from B's point of view, we do not treat A as a distinct being from B in the sense that A would possess its own unique teleological story. The most A is in its own right is the potential to be consumed by B. Though A is not a part of B insofar as A is only potentially consumed, it is defined, from B's point of view, entirely in terms of what it contributes to B. So, the way in which B's parts involved in consumption must be suited to do so in relation to A does not require us to include A's own teleological story in explaining B's. For B, A just has no teleological story of its own from B's point of view.²²⁷

One could think my story goes too far. Granted the point of view way of resolving the issue of extrinsic determination, we might worry that there becomes no distinction between B and A from B's point of view. However, there are still significant differences between the role A has for B, even from B's point of view, and the role one of B's own parts has for B. Return to the case of the camel and the thorny plant. The plant has no active tendency to become the camel's food. So, more activity on the camel's part is required to consume the plant. Also, the camel's body has done nothing to bring the plant into being; the plant exists independently of the camel. Finally, once the camel eats the plant, that particular plant ceases to be. This is different from any part of the camel. Any part of the camel has an active tendency to perform its function for the sake of the whole came. Any part of the camel cannot come to be independently of the camel. Finally, the camel parts are not destroyed in serving their function; instead they are dependent upon

²²⁷ This solution would also work for other environmental factors like climate. Both food and climate are external environmental factors, neither of which has a *kath' hauto* essence that would be included in the essence of the living being in question.

the whole camel to be. So, my perspectival style solution will not entail that the animal's food stuff must be understood as part of the being of the camel.

5.2.2 Beneficial Features in One Species for Another, and a Form of the Cosmos

There is at least one other type of apparent extrinsic determination in Aristotle that is not explained by my point of view strategy. In *Parts of Animals* IV.13, 696b25–34, we get an account of dolphins' and selachians' eating behavior. The behavior is their turning belly up when they grasp their prey. They must do this because their mouths are on their underside. However, the purpose for which they do this is where the difficulty enters. Their turning over allows other prey to escape them, and this has two consequences that are cited as causes of the turning over to eat (causes in the sense of the telos).²²⁸ On the one hand, this keeps dolphins and selachians from gorging themselves to death, but, on the other, this preserves the kinds of animals that are their prey. Apparently, dolphins and selachians are so gluttonous by nature that without this impediment to their eating, the species they eat would go extinct. He says, "And nature appears to do this not only for the sake of the other animals..."²²⁹ What comes after is the typical Aristotelian explanation of this type of eating in terms of the good it does the dolphins and selachians.

Several things have to be mentioned to clarify what the problem is here. I follow Lennox's reading²³⁰ of what nature means in such places like the previous quote. *Usually,*

²²⁸ There is another cause of the dolphins and selachians turning belly up to eat: their mouths are on their underside. This cause is clearly not teleological as it makes no sense to say that dolphins turn over to eat *for the sake* of having their mouths on their underside.

²²⁹ PA 696b25-27

²³⁰ See Lennox's 1996.

it is a short way to talk about the reason why the form of an animal is as it is. So we might say “Nature places the mouth of the dolphin where it does, so that the dolphin does not gorge itself to death.” All we are indicating by this is that the mouth’s placement is benefitting the animal, and this benefit is why the feature is as it is. It is not that the form somehow made a decision about how it would be in some respect. Evolutionary language often times exhibits merely apparent absurdities wherein adaptations to the environment are spoken of in ways that suggest the individual animals are doing things that cause the adaptation. For instance, we might say that some evolutionary ancestor of ours evolved rationality for the sake of the advantages it gave him.

To return to the problematic passage, the issue with it is that the internal teleological story that almost always accompanies this usage of the term “nature” is missing in part of the passage.²³¹ The mouth’s being on the underside of the dolphin or selachian is explained, in part, in relation to the benefit it yields animals *other* than the dolphin or selachian, namely their prey. This could be a particularly vexing problem for my story. It seems like we have a case of interspecific teleology and yet the solution involving various perspectives I advanced above will fail in this case. The perspective solution, though admitting relations to the external environment into our explanations for animal features, still treats the telos of the animal, the features of which are being explained, as bedrock for the teleological explanations. In the passage involving dolphins and selachians, it is the telos of the prey, the animals other than the dolphins or selachians, that becomes teleological bedrock, for at least one of the explanations offered.

²³¹ Cf *Physics* 2.1193b12-13 “nature is a path towards nature” where the presumption is that the referent of the term is the same in the two instances.

Lennox, in his commentary admits this is an anomaly that cannot ultimately be explained away, though we can lessen how troubling it sounds at first. For one, he points out that Aristotle opens his explanation here with the “unusually tentative phrase ‘nature *appears* to do this.’”²³² Also, this passage still contains the type of internal teleological explanation we expect to find. Leunissen admits that there is cosmic teleology in Aristotle, but cosmic teleology is a case of secondary teleology for her. Secondary teleology can always be brought back to primary teleological terms for its explanation.

The goodness, order, and joint arrangement of the cosmos as a whole emerge from the goal-directed actions of the individual parts of the cosmos towards the same end, the Unmoved Mover. This goal-directedness is usually explained as being steered by the individual natures acting as efficient causes for the sake of something.²³³

Leunissen does not see what kind of explanatory role is left at this point for a nature of the whole cosmos. Yes, there is a cosmic unity, but the driving force of it is still the several individual natures in the cosmos pursuing their own unique *telê*.

I would be glad to agree with Leunissen insofar as it would prevent the dolphin passage from compromising the unity of the essence for my story. I do think that when it comes to the case of the dolphin, she is right that, in biological explanations, even if there is such a benefit rendered to its prey by the dolphin’s having its mouth where it does and so needing to prey as it does, this is still a feature that ultimately is explained by the form

²³² See Lennox 2001: 341.

²³³ Leunissen 47

of the dolphin.²³⁴ My problem though is that there is explanatory work left over for a nature of the whole cosmos to do that is not explained by the forms of the kinds of beings in the cosmos. Assuming for the moment that the various groups of existing animals are living in areas such that they have mutually beneficial relationships, I'd agree that the natures of each of the several animals is all we need to explain the mutually beneficial relationships. Notice though that I said we could assume for the moment that the various groups of existing animals were found in the appropriate areas so as to have a mutually beneficial relationship. If we do not just assume this, then it becomes a question as to how the mutually beneficial arrangement is the one we find.²³⁵

In his answer to this puzzle, István Bodnár like Leunissen thinks that the meshing of an animal's nature with its environment will already be contained in the biological account of the animal's nature. He says, "Accordingly, the description of biological natures already contains the way the animal, in a teleological manner, meshes in with its environment."²³⁶ That we can see a reference to the way an animal meshes with its environment in the biological account of the nature of an animal is true. For instance, the camel's mouth is just one such case and point of this. What Bodnár misses is that the reference of the meshing of the animal with its environment in the animal's nature is no *explanation* of why the animal will in fact mesh with its particular environment. He does have a potential response here that needs to be considered.

²³⁴ Leunissen maintains that the exact positioning of the mouth on the dolphin is a case of secondary teleology. But, again, such secondary teleology is determined by what is better for the animal. And what is better for the animal will be defined by what it is in virtue of its form.

²³⁵ Though I do not consider the possibility much here, a divine being crafting the world like a human artist would be yet another way to attempt to address this issue.

²³⁶ See Bodnár 2005: 27.

Let us agree that it is part of the nature of an animal to inhabit a *type* of place. By this fact alone it is true that there is already something in each species' nature that goes some way in accounting for the beneficial arrangement of species. To take the case of the camel and its food, both by their own natures must be found in the same type of place. Call this place a desert. Grating this, it is not possible for a camel and its food to be found outside a desert, and so they must be found in the same place, a desert. There would be nothing special about the case of the camel and its food, so what would hold for this case would hold good for all cases of beneficial arrangement among species. In this way, it would appear that Leunissen and Bodnár are correct; the beneficial arrangement is reducible to the natures of the species involved in the beneficial arrangement. Since each animal's nature entails what type of place is proper to it, then by considering the conjunction of the animal natures we find in a particular beneficial arrangement, we will see that it is entailed that those animals existed in that type of place. However, there is a problem here.

Consider the case of camel and its foodstuff again. There is more than one desert in the world. Suppose for the moment that there are only two deserts, A and B. By the nature of the camel and its foodstuff it is entailed that the two must exist in a desert. But there are four possibilities granted A and B are all the deserts there are. The camel and its foodstuff could both exist in A or they could both exist in B; however, one could exist in A and the other in B. So granted there is more than one instance of a type of place like desert, it is only a possibility that the beneficial arrangement of the camel and its food will be realized. The animal's nature itself does nothing to explain why the beneficial arrangement (where the animal and its foodstuff are found in the same place) is the one

realized. Since that beneficial arrangement is realized, then something else in addition to the natures of the animal substances must explain the beneficial arrangement.

One could attempt a response on behalf of those inclined to see things as Leunissen and Bodnár here. Granted camels must live in deserts, but perhaps it gets even more specific. That is, camels must not only live in deserts, but very particular yet to be discovered empirical type. For example, suppose we see deserts A, B, and C, and only C has the camels and foodstuffs. The current suggestion would be that there are more specific ways of being a desert, and C is that kind that both the camel and its foodstuff by their nature inhabit, whereas A and B are not. Of course, we will suppose this to generalize to all other animal and plant kinds. In this way the natures of the animal and plant substances would be explaining the beneficial cohabitations.

One answer is given by contemporary ecology wedded with evolutionary theory. In this story, it is the pressure of finding a niche to occupy in the ecosystem that determines if the animal kind will make it or not. Thus, the existing animals whose “natures”²³⁷ we can study are not at all atomic with respect to one another. The only reason why there are animal natures we can consider in isolation from one another and abstracted away from the ecological reality is because those individuals we are grouping into one kind as opposed to another fit into the ecosystem. With this story, the problem of how groups of individual animals of different kinds (with different natures) are located in ways that allow them to mutually benefit one another really does not arise. This is because a necessary condition for new animal kinds to come into existence is that they *do* find a way to be benefited by their environment and so the other species therein. There

²³⁷ An Aristotelian nature for living things would not seem possible in this contemporary evolutionary story.

cannot exist an animal nature that is not so integrated, in one way or another, into its environment.

This option is not one Aristotle could adopt. To mention the simplest reason, it implies a dynamic cosmos in terms of the kinds of animals that exist at a given time. Now, though I will not argue the textual justifications for it here, it seems to me that the best Aristotelian answer is to posit some kind of a nature²³⁸ to the whole cosmos itself, but whether or not we posit one or adopt some solution like Leunissen suggests, I can still defend my understanding of the essence of animals wherein we look only to the *telos* of the animal to explain the animal in biology. That my solution is not threatened by Leunissen's explanation of the cosmic teleology as secondary teleology is obvious enough; it is the possibility that there is a form of sorts to the cosmos that seems to spell doom for my understanding of an essence for Aristotle. For if there is a form of the cosmos, then, ultimately, the explanation for why some animals are as they are would seem to come from considerations beyond the animal itself.

The idea of a nature for the whole cosmos will not be as troublesome for my story as it may seem. On my account, the relationship between form and matter occurs several times within one and the same animal. Recall, first we have the elemental powers as matter for the uniform parts, then the non-uniform parts, and finally the functional relationship of all of these together in the entire body of the animal. Each level of composition corresponds to a form of the animal. It is what Aristotle calls the total form of the animal that includes all the other compositions in the concrete animal insofar as the non-uniform parts are its proximate matter. In the animal it is true that the explanation for

²³⁸ See Matthen 2001.

an animal part depends upon what it does for the sake of the whole animal, but it is also true that compositionally-speaking more basic parts are referable to the more complex as a type of teleological cause. If there is a form of the cosmos for Aristotle, we can apply this point to soften the threat to internal teleology. Animals would still be pursuing their own unique *teloi*, and just as it is true that the lower level of composition is necessary to realize the higher level in a single animal, so too the composition of the cosmos would depend upon all the members of the universe pursuing their own *telê*. However, there would be a teleological step further insofar as we were to consider the interdependent functional relation of the cosmos as a whole. What would this form exactly be though? It would at least be the arrangement of all the groups of individuals of the various animal kinds in ways that support one another in their existence.²³⁹ However, the details of this story are not important for my present story. All I want to maintain is that allowing a form of the cosmos does not impinge upon the explanatory work to be done by the internal teleological explanations with which Aristotle is mainly concerned.

5.3 Auxiliary Animal Parts

Following Gotthelf, Mariska Leunissen identifies the primary sense of Aristotelian teleology as an irreducible potential for form. Certain parts in the animal come to be because these parts and their function are included in the being of the animal

²³⁹ There are obviously more questions that could be raised here if I were going to argue for the cosmos having a form. For instance, is the cosmos alive? If not, that seems inconsistent; if it is, then how would we deny that a primary substance such as *this* dog is in something else? Moreover, just as the understanding of a hand requires understanding what it does in the whole human body, would an understanding of any one animal require understanding the entire cosmos? Again, I do not need to be so worried about these questions as I am only aiming to show that my story of an essence for Aristotle is not threatened by possibility of a cosmic form.

itself. “hypothetically speaking, nature could not have “designed” the animal without these features, for without them it would not have been able to live or be the kind of animal it is.”²⁴⁰ However, Leunissen identifies another class of teleological explanations involving animal parts that she believes Aristotle offers that exhibit secondary teleology.

The secondary type of teleology involves a formal nature of a natural being *using* materials that happen to be available (usually residues that have come to be of material necessity and that are not conditionally necessitated) for the production of parts that serve the animal’s well-being. The presence of these parts is not a necessary prerequisite for the realization of the animal’s form; instead, their presence is said to be “for the better.”²⁴¹

She considers the passage from *Parts of Animals* III.2 663 b22-35 that deals with teeth and how they come to be.

We must say what the character of the necessary nature is, and how nature according to the account *has made use* of things present of necessity for the sake of something . . . For the residual surplus of this sort of [earthen] body, being present in the larger of the animals, is *used* by nature *for* protection and advantage, and [the surplus, which] flows of necessity to the upper region, it *distributes* in some animals to *teeth* and tusks, in others to horns.²⁴²

According to Leunissen, in this passage “Aristotle exhibits teeth to be paradigmatic products of secondary teleology.”²⁴³ She sees that the coming to be of teeth, for Aristotle,

²⁴⁰ Leunissen 18

²⁴¹ Leunissen 4-5

²⁴² PA 663b22-35

²⁴³ Leunissen 34

is primarily owing to material necessity; the coming to be of the teeth is driven by the matter. Similar to an Empedoclean account wherein the generation of a part is driven by the material necessity of the stuff out of which the part is composed, so too is the tooth generated from a surplus of the earthen material in the diet of the animal. Relative to the material stuff (earth) involved in the process, the functionally fitting nature of the tooth is incidental. Leunissen does add that the formal nature of the animal is needed here. She says:

However, the *presence* and functionality of teeth must ultimately be explained by reference to the goal-directed actions of the formal nature of animals with teeth. The formal natures of these animals make use of these materials and “assign” a function to them in accordance with the potentials the materials have of necessity.²⁴⁴

Granted, teeth will not come to be without the surplus earthen stuff in the diet of the animal; however, it is *because* of the act of the form of the animal (its consuming food and digestion) that the surplus earthen matter is present in the animal. Moreover, it is because of the form of the animal that the teeth are assigned a function; it is the form and its function that define the use of teeth to be beneficial. Just as rain will fall of necessity, but thanks to people’s crops needing irrigation this rainfall is understood as functioning to achieve some goal, so too the teeth will form of some kind of material necessity, but because of the teeth forming within a whole animal the teeth will function for a goal.

Leunissen will even maintain that on Aristotle’s account teeth are not really needed in the animals that have them.

²⁴⁴ *ibid*

So even though the coming to be of teeth is not primarily driven by form (Aristotle never suggests that there is a preexisting potential for form that is being realized by the production of teeth; strictly speaking, he believes animals could nourish and defend themselves without teeth), Aristotle does not deny that natural, materially necessitated processes can have beneficial outcomes.²⁴⁵

In contrast to such non-essential parts as teeth or horns, Leunissen later brings up parts such as fins for fish. These are what she calls vital or essential parts because they are, according to Leunissen, necessary for the act of the form of the kind of thing which has them. Such essential parts are made out of the best nutriment during the embryonic state of the animal. Teeth, horns, kidneys are both non-essential. Teeth and horns are luxury parts that are concocted from residual stuffs in the diet. Kidneys are subsidiary parts developed in the embryo from inferior nutriment.

Leunissen's account of secondary teleology applied to animal parts is possibly at odds with my account. I hold that the animal functions as a whole of its parts, and it is this functional relationship that sustains itself that is the total form. The organic parts (whether uniform or non-uniform) are the matter of the animal. The descriptions of this organic type of matter, not the elements, and the total form are together the essence of the animal. If I hold that all the animal parts are essential to the animal, then my account will be at odds with Leunissen's. If I hold that only some of the animal parts are essential, then my account can work with Leunissen's. I am not in general convinced that we are forced to read Aristotle as holding to non-essential parts. For the reasons I shall offer, I would prefer to maintain the position that all of the organic parts of the animal (all parts

²⁴⁵ *ibid*

but the elemental level of composition) are essential for the animal. However, there is one problematic case involving animal horns I will momentarily consider.

There are some reasons not to accept this account of secondary teleology applied to animal parts. It is hard to believe that Aristotle would consider teeth not to be needed for toothed animals to live. If the idea is that species like the ox, camel, tigers, etc. could survive without their teeth, then this is just false. I do not know why one would think Aristotle would not have been able to see this. However, there is another suggestion that is not as absurd, and perhaps it is this that Leunissen intends. Maybe the idea is that the currently existing species that have developed teeth as luxury parts could have developed some other luxury part, and, though the specific luxury part is not necessary, the function provided by the luxury part is necessary for the life of the animal.

This suggestion has problems too. If the teeth of an animal are a sort of ad hoc addition resulting from the presence of certain surplus matter in the animal's diet, why would other purportedly essential, animal parts be organized in such a way as to work only with the presupposition of teeth? Consider *PA* III.1 662a18-30. Aristotle is explaining why even though a part like a mouth is in common with several animals, it nonetheless has a distinctive function as realized in specific animal kinds. "For nature, in virtue of itself...puts the parts common to all animals to many distinctive uses"²⁴⁶ and he elaborates this by observing how some animals have strength in the mouth while others speech.

But nature has collected all these uses together in one, producing a differentiation of this part for the differences of its operation. That is why some mouths are

²⁴⁶ *PA* 662a18-19

narrower, some wider: those which are for the sake of nourishment, respiration, and speech are narrower, while of mouths that are for the sake of protection, all that are sawtoothed open wide. For since their strength lies in their biting, it is useful for the opening of the mouth to be large; for the mouth bites with more teeth and over a larger area to the extent that it opens more widely.²⁴⁷

It is nature in virtue of itself that differentiates the types of mouth according to differences of function. I read this as stating it is according to the form that an animal has such and such a mouth; it develops this for the sake of the unique function enabled by that mouth. Notice in particular the case of the wide mouth. The very function of such wide mouthed creatures is biting, which presupposes teeth. The parts integral to the acts of an animal that are according to its form must be, if anything is, essential to the animal. Thus, being integral to the function of having a wide mouth, teeth are essential parts. This will not only work in the case of animals that defend themselves, but we can combine the point about a wide mouth for biting with the point about nourishment to understand why a tiger's mouth, for instance, is so constituted.

It is true that Aristotle does emphasize the distinction between the formal nature (nature of the account) and the material when Aristotle considers horns and teeth. Such parts do come to be after some animals have been alive for a time. Humans are not born with teeth. We might then be tempted to introduce the distinction between essential and non-essential, thinking that what was essential had to be present from birth. However, we are not forced to conclude that such parts are inessential merely because they are developed after birth, and the fact that Aristotle chooses to emphasize an equally

²⁴⁷ *PA* 662a23-30

important material dimension to the development of a part need not mean that the part's development is primarily driven by the matter, as Leunissen holds concerning these parts. Her contention is that in cases of parts like teeth and horns it is the nature of the matter that is primarily directive in the generative process whereas in cases like fins it is the formal nature that is directive of the process.

I see no reason to think that there is any distinction between the directive role of the formal nature or material nature in the processes of horns' coming to be and a heart's, to use to cases. Consider the point about horns in which the earthen material flows of *necessity* upwards. Whatever power earthen material has insofar as it is earthen, it will maintain this power when present in other animal parts. Earthen stuff will be "doing" the same things it always does. The form of the animal must always realize itself through the elemental compositional bedrock, as this is what all other parts are made of. This includes parts that develop after birth such as horns and teeth, and the parts developed in the embryo. Yes, such parts in the embryo are realized through other organic materials, as Leunissen points out, but such materials still at bottom are made up of the elemental powers. There will be just as much of an elemental causal story to tell for the development of obviously essential parts during the embryonic stage as there will be for horns and teeth.

It would make a difference if parts like horns and teeth developed in an animal independently of any causal input from the animal's form. If the generative process realizing parts like horns and teeth was taking place in the body solely in virtue of material powers different from the form of the animal, then it seems there would be a real difference between such parts and those that require the causal power of the form of the

animal. However, if the point is just that there is a role the material plays in the generation of horns that is irreducible to that of the animal's form, this is not different from all other cases of animal parts. That Aristotle chooses to emphasize how the material stuff of the horn has its own causal power does not suggest that it is even the primary driver of the growth of horns, let alone the only.

There is a perplexing passage that might be more easily handled if we hold that the horns come about primarily due to material causal powers and are not part of the essence of the animal. At *PA* III.2 663a8-10 Aristotle makes the startling claim that in some animals that have horns and for whom these horns are useless, nature has provided other means for defense. Aristotle goes even further. He says, "for the size and extensive branching of their horns harms them more than it helps."²⁴⁸ If something arises in an animal in virtue of its form, it would make no sense to call such a part harmful. The horns in deer are said to be harmful to them. This seems to require that their presence is contrary to the realization of the form of the animal. In such a case, it seems we have only the material nature left over in the animal to account for the horns. The seemingly impossible alternative would be to hold that something can come to be by the form of the animal, and yet that thing be frustrating of the end of the animal.

As odd as it seems, this seemingly impossible alternative is exactly what Aristotle says. He speaks of deer as being horned by nature.²⁴⁹ In the context of the discussion of alleged non-essential parts, this seems helpful for my preferred understanding that all parts are essential as even a part as useless and even detrimental as deer horns is said to

²⁴⁸ *PA* 663a10

²⁴⁹ *PA* 664a5-8

be part of the nature of the deer. However, at the same time, this is itself problematic as it violates the teleological principle of animal parts in an extreme way. Moreover, this statement of the uselessness and harmfulness nature of horns for deer occurs shortly after the claim that live-bearing animals have horns for the sake of protection and strength.²⁵⁰ As Lennox observes, there wouldn't be as much of a difficulty if the part were a consequences of another part that was of the nature of deer. The problem is the part is a part of the deer's nature.²⁵¹

I am not sure Aristotle's remark here allows a completely satisfactory interpretive answer. Leunissen's marking off horns as mere luxury parts does have the advantage of keeping the harmful presence of horns from being ascribed to the nature of the deer; of course, we might still wonder if the term "luxury" is applicable. She can account for the "culprit" concerning the growth of the horns in relation to the material causes in the deer's diet. At the same time, she would face the trouble of accounting for why Aristotle says deer are horned by nature. For my preferred reading that maintains all animal parts as essential, the difficulty is that Aristotle calls this part detrimental and part of the deer's nature. My reading sees every animal part as essential. The activity of each part is itself integral to what it means to say the animal is living, and each part promotes the life of the whole animal. Thus, an essential part working against the life of the whole animal, is inconsistent with my account. Still, Aristotle does seem to back my preferred reading insofar as he will explicitly state that deer are horned by nature.

²⁵⁰ *PA* 662b27-30

²⁵¹ See Lennox 1985: 264-265.

My best suggestion for this passage would be to read Aristotle as not speaking absolutely. That is, perhaps such parts are not always disadvantageous for deer according to Aristotle. When he explains what it is about them that is disadvantageous, it is their extensive branching, size, and presumably their weight (though this is not explicitly identified when listing their problem causing features). Deer horns are unique in being solid throughout and not hollow. Hence, they become quite heavy and cumbersome as they grow, and it is understandable how this could become a disadvantage after a point. However, within certain limits, horns are not always a disadvantage. Deer can defend themselves with their horns, and this is something that Aristotle said horns can do for all the live-bearing animals, apparently deer included.

Perhaps Aristotle is just focusing on what makes the case of horns in deer particularly odd: a case where a part is naturally shed in an adult. If this happens naturally, then in accordance with Aristotle's teleological outlook, the change has to be for the better. The end of the change, the loss of the horns, must be better than the start. Thus, the horns must be detrimental, and this is problematic as stated. Why would nature produce something that is not merely in vain but an outright obstacle to the good of the deer? However, to deny that the horn is a detriment would make the natural casting of the horns unexplained teleologically. Why would nature get rid of what is advantageous for the animal? My suggestion would be to see that there is a middle ground possible here. We can say that the horns are advantageous *up to a point*. Once they become too heavy and cumbersome, that point is reached. At this stage then, the deer casts its horns. Thus, both the horn and the casting are understandable in teleological terms.

Two issues remain with the suggestion I would like to make. First, there is nothing in the text to suggest it. All we get is that the horns are useless or detrimental. Second, Aristotle repeats the uselessness of horns for deer later in his affirmation that deer are horned by nature. Worse, he even uses the useless or harmful nature of horns to explain why only male get them. Males being stronger, the weight of the horns are not as detrimental to them as they would be to the female.

Returning to the main point, I think the possibility of inessential parts can still work with my understanding of Aristotle, though I think rejecting the idea of inessential parts is the better option. If we held to inessential parts, we would just have to say that, in general, such parts aided the activity of the total form of the animal. The essential parts would have to illustrate the functional unity that I have spoken of earlier. The inessential, with the exception of oddities like deer horns, would aid that activity but not in a way that would be indispensable to the activity of all the essential parts. We would have to think of the inessential parts like tools humans use to improve an activity. Though they help the activity, we would still have human activity without the tools. Trying to draw this distinction between which parts the animal could or could not do without would seem to be very difficult. Some animals can survive with lost or deformed parts, yet that does not mean that the presence of such parts or their proper formation is inessential. Moreover, as an exegetical point as stated above, we are not compelled to draw the distinction.

5.4 Aristotle Does not Explicitly Layout the Causal Interdependence of Animal Parts

My account requires that all of an animal's parts work together to constitute a functional unity. It is a fair question to ask why Aristotle never offers a complete set of

explanations that highlight the functional unity among the parts of a species he considers. What we see in the *Parts of Animals* are what could be termed partial explanations. I call them “partial” in relation to such a complete set of explanations that would show the functional unity of all the parts of a given species. If Aristotle really held that an animal’s parts form such a tight knit whole that the function of any one part requires the function of the other parts, one might expect that somewhere Aristotle would go through all the functional relationships among an animal’s parts such that the interdependence of the parts and unity of the total form would be shown. Since we do not find attempts at such complete explanations, it might appear that my account is reading too much into Aristotle.

To answer this worry, I will look at several of the remarks Aristotle makes about the class of birds in *Parts of Animals*. What I aim to show is how Aristotle’s explanations vary between levels of determination. At some points Aristotle is on the more determinable and thus more generic level of explanation, whereas other times he is at the more determinate the thus more specific level of explanation. Though the explanations, when connected together, at the generic level suggest a kind of one-way explanatory relation from primitive features of the genus “bird,” the explanations at the more specific level show a kind of explanatory interdependence of animals parts as they are coordinated to some one function in the way of the life of the animal. So, even though it is not highlighted or laid out explicitly, the unified, interdependent functioning of animal’s part at the determinate level of the species is something indicated by piecing together remarks in *Parts of Animals*. This having been shown, I will comment on why for methodological reasons Aristotle would not be interested in laying out his book to

focus on this interdependent function at the level of the species but instead focus on the more generic level.

Consider Aristotle's explanation for why birds do not have a nose. He says:

[T]he *bird*, at any rate, has nothing one would call a nose. This is a consequence of the fact that instead of jaws it has what is called a beak. And these things are so because nature has constituted the birds in this way. That is, they are both two-footed and winged, so that it is necessary that their head and neck have little weight, just as it is also necessary that the chest be narrow. In order, then, that it may be useful for both physical strength and nourishment, the beak they have is *bony*; while it is *narrow* on account of the smallness of their head. And in the beak they have channels for smell, but are unable to have nostrils.²⁵²

This account is found after Aristotle explains the presence of noses in other sorts of animals: the live-bearing and four-footed animals. He then brings up birds along with snakes and blooded four-footed egg layers. In comparison to animals like pigs, deer, and elephants it must stand out that birds have nothing like a nose;²⁵³ Aristotle explains why it is that birds cannot have a nose.

The first point is that birds have beaks instead of jaws; this beak seems to occupy the space of possibility not only for jaws but also for nose. Since no one would call a beak a nose, birds do not have noses. This part of the explanation seems clear enough.²⁵⁴ However, why is it that birds cannot have jaws, and why is it that a beak is the alternative

²⁵² PA 659b4-13

²⁵³ "Nose" is not defined in purely functional terms. If it were, then because birds do have "channels for smell," the birds would surely have a nose too. This speaks again to my earlier point that for Aristotle the material part and its function are equally important. See Lennox 2001: 237.

²⁵⁴ We might also wonder why possessing jaws is a necessary condition for noses.

to jaws? The rest of what Aristotle says helps explain these two facets of his main explanation. I take “these things” in “these things are so because nature has constituted the birds in this way” to refer to absence of jaws and presence of beak.

In response to the question of why birds cannot have jaws, he identifies that birds are two-footed and winged. Being two-footed and winged apparently requires that the birds be lighter on the head and neck. This explains the absence of jaws because having jaws would put too much weight on the head and neck. But what determines that jaws would require “too much” weight on the head and neck here? It is locomotion generally and the capacity for flight in particular in relation to which the amount of weight is determined to be excessive; the two feet enable the bird to stand, walk about, and are used in tandem with the wings for flight. That it is a bird’s capacity for flight that Aristotle has in mind here is suggested when he compares the weight limitation to the narrowness of the chest with “just as it is also necessary that the chest be narrow.” At *PA* 693b15-17 he explains the function of the narrowness of the chest in terms of its aerodynamic advantage for flight. The presence of jaws would then require too much weight in the head and neck for the sake of working with the bird’s two footed and winged nature that are for the sake of locomotion in general and flying in particular.

We still have left the question of why birds are winged and two-footed, but this is answered elsewhere.²⁵⁵ Let’s consider the remaining question concerning beaks that is answered in this passage. Granted that birds cannot have jaws for the above reason, still, why would they have anything at all on the head? To explain why jaws cannot be

²⁵⁵ Aristotle explains the bipedal nature of birds at 693b5-14. Of particular interest here is that a defining trait is itself explainable. See Lennox 2001: 237. “Winged” as such appears to be a primitive of the genus “bird.” That is, to be winged is part of what it means to be a bird.

possessed is still not to explain why a beak must be possessed. The answer is given in the rest of the section. Though birds cannot have jaws and the rest of the “equipment” that would accompany and enable the jaws to function usefully, birds still need some part to accomplish functions analogous to those that jaws enable; however, what kind of part is possible here is constrained by the rest of the bird’s nature: its other parts. The beak is the answer to this problem. The beak helps to facilitate the requisite functions of “physical strength” and “nourishment” in a way that is consistent with the presence of the other parts of the bird. For the sake of facilitating the above two functions the beak is bony; this material will aid it as a tool and help to intake nourishment and begin to break it down to some extent.²⁵⁶ Because the bird has a smaller head for the sake of its flying, the beak must be narrow since, it must fit on the bird’s small head.

To review, a bird is two-footed and winged, and this is primarily for the sake of flight. Thus, a bird’s head and neck must be light enough not to interfere with flight. So, a bird cannot admit the weight of a jaw and the apparatus that goes with a jaw to achieve the function a jaw and such apparatus would achieve. Since a bird still needs this function achieved, it has a beak. We see a few determinations of some parts by others here. Feet and wings are determining parts like head and neck, and this in turn determines the beak. What about the beak and the feet and wings? These are at the two opposite ends of our explanation here; the beak seems to be the most explained and the feet and wings unexplained. It turns out, however, that the beak does explain other things about birds.

The part of birds that is the receptacle of nourishment is explained in part because of the nature of the beak. Aristotle says:

²⁵⁶ The extent to which different bird species break down their food with the beak will vary and looking at concrete cases makes it more evident how the boniness of the beak is used.

For since they do not fully perform the work of the mouth (for they lack teeth) – that is, they have nothing either to cut or to grind nourishment – because of this some birds have, in front of the stomach, what is called the crop in place of the operation of the mouth.²⁵⁷

The nature of the beak requires that some other kind of modification in parts be present in birds to make up for the extent to which a beak cannot fully do the work of a mouth with teeth and jaws. Aristotle goes on to mention a number of such possible digestive modifications. He observes how some birds have a broad esophagus and either a bulky part that stores up food in front of the stomach or some a swollen part of the stomach itself. Some have a strong and fleshy stomach to store up the nourishment for a long time and concoct it.

Of particular interest is that of the birds with long necks. He says these all have a “rather long crop, owing to the moistness of their nourishment.”²⁵⁸ Notice how this particular feature, the longer crop, is a possibility thanks to the long neck of such birds and the kind of nutrition they intake. That long neck itself is suited to the activity that intakes such nourishment.²⁵⁹ This is relevant because it shows that the way the digestive problem is solved, a problem that emerges at the more generic and determinable level of bird, is constrained by the more specific and determinate level of more particular kinds of birds. Aristotle says:

And in some cases the beak of such animals is also long, as is the neck, for taking nourishment from the depths. And most of those with such beaks and either

²⁵⁷ *PA* 674b19-23

²⁵⁸ *PA* 674b30-32

²⁵⁹ *PA* 693a7-23

entirely or partially webbed feet live by preying on some of the small water-dwelling animals; and for such birds the neck is just like a fishing rod, while the beak is like a line and hook.²⁶⁰

This complicates the story further. The presence of beaks created a digestive difficulty for which other parts were needed. Thus, the class formed by the conjunction of types of parts like crops, long crops, fleshy stomachs, etc. can be explained in relation to the digestive difficulty that beaks create. Notice this class, for which there is no name Aristotle gives, emerges as a class because of the digestive need that explains it.²⁶¹ Call this class *D*, where $D = \{x \mid x \text{ is a part or conjunction of parts such that } x \text{ addresses the digestive deficiency created by beaks}\}$. *D* is explained in relation to being beaked, which is explained in relation to being two-footed and winged. These individual conjuncts that Aristotle mentions are all more determinate than the level we were at when considering *D*, being beaked, and being winged or being footed. Once we consider the long crop which is only possible in conjunction with being long-necked, we enter into the more determinate level.

This more determinate level introduces other factors that were absent at the more determinable level. Before we had a tidy one-way progression of explanations that moved

²⁶⁰ PA 693a16-23

²⁶¹ This speaks to my earlier point from chapter 1 as to the non-superfluity of having generic classes even granting the determination understanding of the relation between the genus and difference. Recall, the determinate contains all the information given by the determinable via entailment relations. However, it is still not superfluous to have the determinable class because it gets us explanation that are not possible at the more determinable level. A genus like class *D* really emphasizes how vital the genus can be for explanatory goals. Unlike the genus “beak” where there is one determinate part in a species to which it corresponds, there can be more than one part taken together that constitute the determinate of *D* in a given species. For instance, it is having a broad esophagus and a swollen part of the stomach together that is the determinate of *D*. If we remained at the most determinate level only, it is not clear why we would consider grouping the determinate part “wide esophagus” with the determinate part “swollen part of stomach” to recognize the joint work that these two parts have in the life of the species of bird possessing them.

from being winged and two-footed, to being beaked, and finally to belonging to D. Being beaked has explanatory priority in relation to belonging to D. However, once we get into the determinate ways to be D, the applicability of the one-way ordering starts to break down. What are we to say of the long beak's relation to the long neck? The long crop, which was one way of being D, requires a long neck, but this long neck seems to be equal in terms of priority of explanation with its complementary long beak. Moreover, if we think about the long crop itself that helps to digest the particular moist kind of food its possessor will catch, is this explanatorily prior or posterior to the long beak or long neck? To put this in question form, does this waterfowl have a long neck and beak for the sake of the long crop, or long crop for the sake of the long neck and beak? The main activity to which these things are ordered is of course nourishment, but there seems no significant way to introduce an order of priority or posteriority concerning the ordering of these three parts to that activity. Rather, it seems they all coordinate in realizing the activity of obtaining nutrition.

There is an even more glaring example that the more determinate level of descriptions of animal parts does not maintain the one-way order of explanations that obtained on the generic level. Aristotle says:

Further, some of the birds are able to fly and have large, strong wing, e.g. those with talons, and the flesh-eaters; it is a necessity for them to be able to fly on account of their way of life, so for the sake of this they have both many feathers and large wing. It is not, however only the taloned birds, but other kinds of birds as well, that are able to fly, namely all those for whom self-preservation lies in the quickness of their fight or that are migratory. But some birds are not able to fly,

but are heavy – those whose way of life is earthbound and that are fruit-eaters or are swimmers and spend their life around water.²⁶²

Though capacity for flight and being winged can be taken as a primitive for the genus “bird” (being “winged” is just part of what it means to be “bird”), here we see that at the more determinate level the peculiar nature of the wing is not primitive but explainable.²⁶³ The way of life of raptors accounts for why their wing is large and many feathered; they need to be able to fly a certain way in order to be able to hunt as they do. Notice that this will be a coordinated activity involving several parts. Aristotle alludes to this by indicating them by their “talons,” but clearly other parts will be involved in this activity of hunting. Recall Aristotle’s remark that the beak of birds is “useful for its way of life.”²⁶⁴ So the particular kinds of beaks, talons, and wings of the raptors are coordinately explained in relation to the function realized by the way they function together. This would include the points Aristotle makes about their eyes needing to see clearly when they “soar to the heights.”²⁶⁵

To generalize from the case of birds, when Aristotle is focused on the generic descriptions of animal parts, there appears to be a one-way ordering in the explanations. Some parts appear to be primitive as it is never explained why the animals of the genus

²⁶² PA 693b27-694a8 See Lennox 2001: 332-333. The point is not that only such birds as the migratory and predatory can fly, but only they are excellent at flight. Conversely, those said not to be capable of flight, are, on the whole, merely poor fliers.

²⁶³ I can to an extent agree with Gotthelf, in that not all explanations of animals are “circular, animal features being ultimately explained in terms of each other”; however, I agree insofar as we are looking at generic style explanation. When it comes closer to the level of what is ontologically basic, the species, it seems what is treated as an unexplained explainer can become explained. Thus, it would seem such “circular” explanations might have been allowed at the level of the ontologically basic. See Gotthelf 1987: 169-170.

²⁶⁴ PA 662b5

²⁶⁵ PA 657b26

have them whereas other parts are not primitive and are explained in relation to the parts that appear to be primitive. A treatment of such generic classes is required for the sake of explanation. To prove that the isosceles has 180 degrees is not a proper Aristotelian explanation insofar as the trait belongs to triangle as such, not isosceles. So too, to prove that a crane must have a beak and not jaws with teeth is not a proper Aristotelian explanation insofar as being beaked belongs to bird as such, not crane. However, such explanations abstract from what is more ontologically basic; the more ontologically basic is revealed by the more determinate description of animal parts. Once we look at the more ontologically basic level, we see the interdependent functional unity of the parts of the animals.

That Aristotle does not ever in one location lay out how all the parts of one species work together to achieve a coordinated function in its way of life is striking; however, from what we have seen, it does not show that Aristotle is not committed to the unified, functional interdependence of animal parts in a species. Concerning *Parts of Animals* itself, it is apparent that such a project was not Aristotle's goal. Instead, it seems that Aristotle is aiming to find the most generic association of traits and explain those. As already said above, such explanations would be lost at a more determinate level.

However, we should also see that such explanation would help one to pick up on the unified functional interdependence at the more determinate level. Because we realize that beaks create a digestive issue needing to be addressed and that some parts address this, we will be looking for the parts in a particular bird that do this in a determinate way. In this way, the sort of explanatory project of *Parts of Animals* that is mainly concerned

with generic and partial explanations can facilitate a later project that attempts complete and specific explanations concerning a given animal.

6. The Role of the *Kalon* in Aristotle's Biology

6.1 Discovering the Principle of Teleology and Necessity

Aristotle's first book and even the initial portion of the second book of *Parts of Animals* can be understood as a kind of philosophy of biological practice. As opposed to dealing with concrete biological questions as he will in the rest of *Parts of Animals*, he is more concerned about laying out some of the things that any proper biological explanation must do. One of the central tenets that emerges is that biological explanations must proceed along two distinct but related lines. There are explanations of things in terms of the "for the sake of which," and in terms of "necessity."²⁶⁶ Of course the first of these two types of explanations is teleological. Put generally, to explain a feature of an animal teleologically is to show how the feature functions in achieving the life of the animal. The other is what Aristotle will call hypothetical necessity. In order for certain functions to be realized, there must be certain kinds of parts present. Aristotle's example is of an axe.²⁶⁷ An axe must split wood, so it must be sufficiently hard. Consequently, it must be made of bronze or iron, for instance. A tiger's claw must be capable of tearing the skin of its prey, so it must be made of a material that can serve this function.

Aristotle goes on to observe how his predecessors failed to discover this dual type of explanation. Some like Democritus landed only on a material cause. A significant question arises here. How is Aristotle, or anyone for that matter, successful in discovering these two types of causal accounts that are so central to Aristotelian biological practice? Was it merely luck that led Aristotle to find these two types of explanations? Aristotle

²⁶⁶ PA 642 a1

²⁶⁷ PA 642 a9

himself says that Empedocles “stumbles” upon the correct way of explanation, being “led by the truth itself.”²⁶⁸ Aristotle offers one reason for their failure. He says they had no doctrine of essence or definition of substantial nature.²⁶⁹ Though this is in part explanatory of their failure, it raises the new question of how one would be led to this doctrine of essence and definition of the substantial nature of animals.

Posterior Analytics 2.19 addresses how we acquire the principles and by what faculty we apprehend them. Though itself an interpretive task to work out in full, the story of 2.19 holds we must have several perceptions of a thing to move to the principle. A natural way to think of this is as follows: we see many dogs, we remember the perceptions, and eventually we get a universal concept of dog. The story so understood would account for our knowledge of cats, trees, men, etc. However, there is another kind of principle that would not be like these sorts at all. Consider the distinction between types like “triangles,” “180 degrees possessing shapes,” etc. and things like “demonstrative proofs” and “inductive generalizations.” The first types are studied in geometry. The distinction between the second two things must be understood if one is to deal with the former types in a geometrically appropriate way. Geometry proceeds by demonstrations, not inductive generalizations. Getting a type like “triangle” would seem to be a case of principle acquisition that fits with the above story of 2.19 that commences with perception, but how would this story work with a type like “demonstrative proofs”? As anyone knows who has tried to teach such proofs to students, there is no perception of them. Yes, there are constructive proofs that make use of diagrams, but those diagrams

²⁶⁸ *PA* 642 a16-7

²⁶⁹ *PA* 642 a25

themselves just as they are perceived are not proofs. So, it might seem hard to understand how perception will actually lead us to general methodological principles for this or that science.

My solution to this puzzle is that perception actually does serve as a basis for acquiring the two principles of teleology and hypothetical necessity. However, it is not because of our perceiving this or that particular kind of animal that we are led to discover these principles. Rather, it is because for certain kinds of people there is an experience of beauty (*to kalon*)²⁷⁰ concerning perception of animals, whatever the kind. What I want to say is that in perceiving animals and experiencing the type of beauty Aristotle identifies, we are oriented to the animal in a way that is harmonious with Aristotle's teleological principle and principle of hypothetical necessity, and this perception of beauty can lead us to the second order awareness of the principles we use in doing Aristotelian biology. So, ultimately, I do think that perceiving in a certain way, given enough time to think about the experience, can significantly contribute to discovering the method Aristotle endorses for biology.

To make this case I will first look at *Parts of Animals* I.5. Then I want to bring remarks from *Poetics* I.7 into the discussion. When these are combined with my preceding account of what an essence is for Aristotle, it will become clear how perceiving animals as beautiful is a gateway to the principles of Aristotelian biology.

²⁷⁰ As will become apparent, I am not supposing there is one univocal sense of *to kalon*. Aristotle at *Topics* 106a20-22 points out the homonymy of *kalon* by observe as applied to animals its contrary is *aischron* but applied to houses its contrary is *mochthêron*. Now this in itself does not exclude the possibility of some unified sense of *kalon* that stretches over such case, but I will not presuppose one here.

6.2 Perceptual and Ontological Aspects of the *Kalon*

6.2.1 Parts of Animals 1.5

Aristotle provides a defense of the study of biology as he understands it in this chapter. He begins by distinguishing between two kinds of “substantial beings constituted by nature.”²⁷¹ Some of these are “ungenerated and imperishable throughout all eternity, while others partake of generation and perishing.”²⁷² Concerning those things that are ungenerated and imperishable, we have very little “perceptual phenomena”²⁷³ on the basis of which we can investigate the questions we would like to answer. The generated and perishable substances are much more easily studied since “we live among them.”²⁷⁴ However, Aristotle is aware that gathering the relevant evidence requires one who is “wishing to labor sufficiently.”²⁷⁵ Presumably the point here is that even though evidence is available to perception, it does require a concentrated effort. It is not as though we just open our eyes and the relevant descriptions of animal kinds pour into our soul. There is more to it. Perhaps this is an allusion to the type of labor that led to the *History of Animals*.

The contrast is then made between the reasons why the study of the eternal substances is valuable and the reason why the study of perishable things is valuable. Aristotle compares the slight glimpse we have of the eternal substances and the higher

²⁷¹ PA 644b23

²⁷² PA 644b24

²⁷³ PA 644b27

²⁷⁴ PA 644b28

²⁷⁵ PA 644b30

value we place on them to the chance glimpse of a loved one.²⁷⁶ Just as we love the quick sight of a loved one more than a sustained look at less beloved objects, so too we love the small sight we have of the eternal more than the manifold looks the perishable world offers us. However, there is another kind of value to the study of the perishable and generable beings. We have much more perceptual evidence concerning them, and so we can have a better understanding of them.

Lennox in his commentary flags the potential oddity of this passage for our contemporary ears.²⁷⁷ Even granting that the celestial bodies are eternal, we would likely question why this entails a higher degree of value. Lennox explains this by reminding us that Aristotle is within the Parmenidean tradition wherein that which cannot fail to be is of a higher value than that which can fail to be. In Aristotelian explanatory terms, the higher theoretical value is tied to the cosmic causal priority of eternal being over transient being, as Lennox observes.

Aristotle proceeds saying that it remains for us to discuss animal nature, since we have discussed how things appear to us concerning the divine. He adds that we should not leave anything out of our consideration of animal nature, no matter how little it may be esteemed.²⁷⁸ He goes on to give more reasons for studying biology. Those who are “by nature philosophers” and can understand causes are claimed to get extraordinary

²⁷⁶ PA 644b31-35, This might sound somewhat puzzling given the context of the remark. Since it will turn out that the terrestrial objects of understanding are more near to us, one might think that this metaphor is unfortunately chosen. Wouldn't we feel more like viewing a loved one when looking at that which is nearer to us, the terrestrial animals, than that which is more remote, the celestial bodies? Perhaps the point is that the eternality of the *individual* approached in the celestial case is more akin to the nature of that which is the proper object of our intellect: eternal science. Though there is something eternal about terrestrial animals, it is not the animals themselves.

²⁷⁷ Lennox 2001: 172.

²⁷⁸ PA 645a3-6

pleasure from studying animals.²⁷⁹ This seems to cover most of the same territory as the preceding remarks that trotted out the two different types of value that the study of animals and study of the celestial bodies embody. However, notice the important additional remark of pleasure. Pleasure is not a value that we can ascribe to the study itself without relation to the person who does the studying. By contrast, both primacy of the kinds of causes and the degree of evidence for conclusions in a study are features of the study itself. Though of course the pleasure is occasioned by the causes of animals, that pleasure is not a part of the object of study itself.

Aristotle brings up that those who enjoy looking at the likeness of animals because they are studying the art that produced those likeness, cannot disagree with his point about studying actual animals so as to enjoy the pleasure of understanding the nature that caused them. In fact he says such people ought to enjoy the study of the actual animals *constituted* by nature more.²⁸⁰ Let's consider the weaker point first, namely that people who enjoy studying likenesses of animal for the sake of understanding the art that produced those likenesses should also recognize the enjoyment of studying actual animals for the sake of understanding the nature that caused them. People who enjoy looking at a likeness of an animal because it is charming or appealing to the senses are not the type of person Aristotle is addressing. He is addressing those who like to study the likeness of animals for the sake of understanding the art that gave rise to them. The art is the formal cause of the statue. So those people he has in mind enjoy studying a form when they look at animal likenesses: the *technē* that was in the mind of the artist. Though

²⁷⁹ PA 645a7-11

²⁸⁰ PA 64511-15 The word Lennox translates as "constituted" here is *sunestôtôn*. This emphasizes the part/whole relationship and being constructed in an organized way. We should keep in mind this part/whole relationship as it will turn out to be integral to the experience of the *kalon* in animals.

not artificial, those who study animals for the sake of understanding the nature that produced them are also studying a form. Maybe the biologist will be studying more too, but if the analogy holds up, then they should primarily be studying form. Aristotle confirms this later at *PA* 645a30-36. So if we admit that it is fine and enjoyable to study animal likeness because this is a means to contemplate a form, then for the same reason we must admit it is fine and enjoyable to study actual animals, since this is how we come to understand the nature that is their form.

Why, though, would Aristotle claim that studying the natural form should be even more enjoyable? I think there are at least two possible explanations for Aristotle's saying this. Recall that the structure of the form of a thing is suited to realize the final cause of the thing. Assuming that the artist who produces an animal likeness intends to make as accurate a representation of the actual animal as possible, then, when he succeeds, a form very similar in appearance to the appearance of the actual animal will come to be in his medium. Thus, given the kind of people we are considering, those who study the animal likeness will be liking something, the artificial form, that is derivative upon the natural animal form ultimately. So, if they enjoy the derivative, then they ought more greatly to enjoy the original.

Though perhaps initially tempting, I think there is a flaw in this account of why Aristotle says those who like to study the likeness of animals for the sake of understanding the art that gave rise to them will more greatly enjoy studying actual animals. For one, we do not know if Aristotle thinks the goal of the artist in producing an animal likeness is representation. More importantly, if one is enjoying understanding the *art* in studying animal likenesses, one is not so much preoccupied with the particular

animal likeness in the statue, rather, one is preoccupied with the sorts of techniques used in the art to *cause* the said likeness.²⁸¹ The principles of an art like sculpting or painting are far broader in scope than this or that sculpture or painting, even though they can be used to generate a given animal likeness. Thus such principles are not going to be derivative on the natural form of the animal corresponding to the animal likeness. If Aristotle had addressed those who look on animal likenesses for the sake of appreciating the likenesses, then this account might work, but he addressed those who look on animal likenesses for the sake of appreciating the art that gave rise to them.

The other account, which I think is the more plausible, is that people who consider artifacts to enjoy studying the form responsible for them, are enjoying the ordering and lack of being haphazard (*tuchontos*) that they see in such things.²⁸² Aristotle says, “For what is not haphazard but rather for the sake of something is present most of all in the works of nature”²⁸³ Granted that not being haphazard and being for the sake of something is the basis for the enjoyment of studying both artifacts and animals, and these

²⁸¹ See also *Poetics* I.4 where Aristotle maintains the true pleasure in people seeing likenesses and imitations is connected to learning. He says, “Thus the reason why men enjoy seeing a likeness is, that in contemplating it they find themselves learning or inferring...For if you happen not to have seen the original, the pleasure will be due not to the imitation as such, but to the execution, the colouring, or some such other cause.”

²⁸² Irwin agrees with this reading of the passage. He thinks this enjoyment here has to do with our understanding of the teleological ordering in the animal; however, and in contrast to my view, he thinks this enjoyment does *not* pertain to the visual experience of the animal. As I will argue, the experience of this enjoyment is both of the understanding and perception. Irwin also tries to read the teleological delight entering in at the stage of parts that he sees as not being of the essence or necessary. One example is from *PA* 661b7-8. I cannot see how he gathers from the passage that teeth are not part of the *ousia* of the man. Moreover, I think it is the delight in the form itself that we experience for Aristotle in the case of biological beauty. Irwin himself, after attributing to Aristotle the view that only those parts that are neither necessary nor essential are the kind in relation to which we experience beauty, finds it difficult to account for why we should not also experience beauty concerning the teleological judgments of the other parts that are necessary or essential. See Irwin 2010 381-96.

²⁸³ *PA* 645a 22-23

traits are most present in animals, then we can explain why Aristotle thinks those who enjoy studying artifacts should even more greatly enjoy the studying of animals.

Recall the point from earlier chapters concerning the substantial matter of an animal and its substantial form. In something by nature, like a dog, the substantial material cannot be independently of being the material of its substantial form. A dog's paw will not even be if it is separated from the dog. Of course, there is also an inorganic material substrate to the animal that can be what it is independently of its presence in an animal form, but my point is just that there is also the substantial material that cannot be independently of the substantial form. With an artificial form, the only kind of material present is the inorganic substrate. There are no parts in the artifact that depend upon being a part of the artifact to be what they are. In other words, the composite of the artificial form and matter is an accidental unity.

To make a related point, the form of the artifact is determined by the end for which people will use it. The artifact has a work to perform, but this end is outside the artifact. The exact form of the artifact gets determined by balancing at least two factors that are a part of Aristotle's own biological practice in explanation: necessity and teleology. We want a given end result, and the artifact is to yield this. This is the teleological factor. The artifact has to be composed of the kind of parts that allow it to function as a means to the desired end. This is the factor of necessity. We want to break a rock, and so the thing we craft must be of a denser material than that rock we are striking. The sledgehammer occupies this functional niche. It combines the right kind of material components in the right way to provide a means to the end of crushing rocks. Notice that this end goal for which the hammer exists does not matter for the hammer itself. A

hammer does not need to be used to maintain its form. Thus, the end of the hammer, an animal likeness, or any artifact for that matter, is quite contingent to the artifact, both in terms of the matter and in terms of the composite.

So, in multiple ways there is a greater degree of the haphazard in the artifact than in the animal. No material part of the artifact needs to be in the artifact in order to exist, and the artifact need not be achieving its work in order to continue existing. However, in animals, there are material parts that can only exist by being present in the animal; the animal needs to be achieving its work in order to continue existing. This is just to say that both form and the end of the animal are intimately a part of the composite animal. The animal is not an accidental unity whereas the artifact is. So, given that we enjoy studying artifacts insofar as they are means to contemplate the ordering of things to an end, then we ought to more greatly enjoy studying animals as their forms and ends are more present in them than the forms and ends of artifacts are present in particular artifacts.

This greater degree of organization and lack of the haphazard even shows some affinity between things by nature like animals and the eternal celestial bodies. According to Lennox, that transient beings like animals are able to reproduce themselves and so in this way animal kinds are able to always be, is a way in which transient being has “one foot in the eternal realm.”, for Aristotle at any rate.²⁸⁴ So, to the extent that there really is something of the eternal and the divine present in even transient beings like animals, it would seem that we should also be able, though perhaps in a lesser way, to enjoy the theoretical value associated with the study of eternal being while we study animals. Aristotle shows us that we ought to enjoy the study of individual animals because they

²⁸⁴ Lennox 2001: 173.

are especial a lack of the haphazard and are ordered to an end. This can also explain how transient beings like animals still have a foot in the eternal. The form which is also present in all other individuals of the animal kind and is eternal, is part of the being of individual animals. So what is eternal and divine is also present at the level of transient being, though in a lesser way than with celestial bodies. Unlike celestial bodies which can never lose their form, individual animals will lose their form. Still, the consequence of that form being in the animal is, on the whole, the eternal perpetuation of the animal kind through the reproductive process.

We find the famous Heraclitus anecdote between the first point concerning the special theoretical value associated with the study of animals and the second point concerning the haphazard. Aristotle says, “[So] too one should approach research about each of the animals without disgust, since in every one there is something natural and *kalon*.”²⁸⁵ His point about the lack of being haphazard is actually offered in support of this claim that in every animal there is something natural and good/beautiful. So this being ordered as animals are in terms of their parts (their matter), working together to realize the form of the animal (the entire functional relationship of the parts), entails that the animal is something good/beautiful.

²⁸⁵ PA 645a 22-23 I render “*kalon*” in this section as “good/beautiful.” Lennox chooses “good.” This is certainly one very important dimension of *kalon* that is at play here in the text. The next point that observes the lack of what is haphazard makes particular sense when we are thinking of *to kalon* as meaning “good.” However, because the Greek could have the multiple sense of *kalon* in play here, “beauty” is not thereby ruled out. Moreover, as we will see shortly in the context of the *Poetics*, there is reason to think that both the English “beautiful” and “good” should be used to translate *kalon* concerning animals. *Poetics* emphasize the perceptual nature of the *kalon* concerning animals and other wholes of parts, and, it seems to me, that “beauty” calls up the perceptual much more than “good” does. On the perceptual nature of *to kalon*, see Kosman, 2010: 353.

I want to turn to *Poetics* I.7 now. What we see there is another connection between this functionally mereological relationship of animals and *to kalon*. What *Poetics* gets us is an additional emphasis on the perceptual nature of *to kalon*. In connection to what we have seen in *Parts of Animals* I.5, this will show that the functionally mereological relationship that animals are, is, to some extent at least, capable of being grasped by perception.²⁸⁶

6.2.2 Poetics I.7

Aristotle makes the claim that plot is the most important part of tragedy; he says the plot is “the first principle, and, as it were, the soul of a tragedy.”²⁸⁷ Now, at the start of I.7 he goes on to discuss what the proper structure of plot will look like in a general way. After making a few remarks about the beginning, middle, and end of a tragedy’s plot, he concludes “A well-constructed plot, therefore, must neither begin nor end at haphazard (*etuche*), but conform to these principles.”²⁸⁸ The well-constructed plot for tragedy, just like the animal likeness and the animal itself from *Parts of Animals* I.5, will

²⁸⁶ *Top* 146a21-32 should not be read as rejecting perception as something intrinsic to beauty. There Aristotle rejects that the beautiful is what is pleasing to the ears or eyes. His reasoning is that this will allow a thing to be beautiful and not beautiful simultaneously. For, he thinks, if something is pleasing to the eyes but not the ears, then it will be beautiful insofar as it pleases the eyes but not beautiful insofar as it does not please the ears. This point would clearly not work with our own sense of disjunction. To put it logically, Aristotle must be rejecting something like the following proposition: (For all x)(Bx iff Sx) & (For all x)(Bx iff Tx), where Sx = x is pleasing to the eyes, Tx = x is pleasing to the ears, and Bx = x is beautiful. For supposing there is something y such that Sy & ~Ty, then it follows from our above proposition that By & ~By. In short, the point he is making is about problems of contradiction that arise when the account of something B gets defined by one property S and then another the T such that S and T are contingently related. Aristotle’s focus here is not on *to kalon* as such but instead the issues with such disjunctive definitions.

²⁸⁷ *Poetics* 1450a28-39

²⁸⁸ *Poetics* I.7

not be haphazard in its arrangement of parts but accord with the principles Aristotle lays down for the middle, beginning, and the end.

He goes on to expand on what is proper for a plot. “Again: to be beautiful, a living creature, and every *whole made up of parts*, must not only present a certain order in its arrangement of parts, but also be of a certain definite magnitude.”²⁸⁹ We might think that the point here concerns the object itself. That is, independently of any relation to a human observer, an object that is a whole of parts fails to be beautiful without the proper magnitude. The point is different. Aristotle continues:

Beauty is a matter of size and order, and therefore impossible either in a very minute creature, since our perception becomes indistinct as it approaches instantaneity; or in a creature of vast size—one, say, 1,000 miles long—as in that case, instead of the object being seen all at once, the unity and wholeness of it is lost to the beholder.²⁹⁰

The failure for an object that is a whole of parts to be beautiful when it is too large or small has to do with our being unable to perceive it as a whole of parts. Yes, there has to be a certain order to the parts that makeup the whole if that whole is to be beautiful; however, the whole must also be capable of being perceived by us as a whole. Something too small would not allow for us to see all the parts of the whole that make it up, and something too large would not allow us to look at the multiple parts all at once. Aristotle does not say that we cannot recognize the beauty of an object that is too small or too large. He just says it is not beautiful, and this holds for animate bodies. This shows the

²⁸⁹ *Poetics* I.7 Beautiful seems a fitting translation of *kalon* in a discussion about poetics. However, it’s worth repeating that the same term is occurring here that Lennox renders as “good” in *Parts of Animals* I.5.

²⁹⁰ *Poetics* I.7

perceptual nature of beauty for Aristotle here.²⁹¹ The mind can take in a whole of vast or minute sizes, but the eye cannot.

If a thing itself fails to be beautiful because of a fact about our perception of it, then it cannot be that the type of beauty we are considering here is simply a property of objects for Aristotle. I really mean to emphasize the qualification “type of beauty.” It may be that there are instances of what Aristotle calls *kalon* and in the sense of “beautiful” that are features of the things themselves. For example, when Aristotle calls the virtuous action *kalon*, we might want to say that this is a feature of the object here, the act. Thus, granted that *kalon* does mean something like “beauty” in such a case, there would be cases where beauty is a feature of an object.²⁹² But in the *Poetics* passage it seems this is not true for the beauty of a tragedy, painting, or animal.

There are possible objections to this reading. One might say that the denial of such very small or very large objects being beautiful is just an abbreviated way of denying that we can recognize them as beautiful. It would seem odd that Aristotle would leave out such an important qualification here. Moreover, some of the objects Aristotle is considering are paintings and tragedies: artifacts. As such, the end they have is not

²⁹¹ Irwin misses the perceptual dimension of what Aristotle is saying here. He reads it rather as something of a repetition of what he called the *kalon* in nature: what I was considering above in *PA* I.5. Though I do agree that there is a connection between *PA* I.5’s account of *kalon* and *Poetics* I.7 in terms of the teleological ordering of the parts to a whole for the sake of function, the *Poetics* passage adds a qualification highlighting how much the perceptual subject is a part of the *kalon* when it comes to the *kalon* in nature, as Irwin would put it. See Irwin 2010: 388-389.

²⁹² As will be seen, I am going to argue for a relational understanding of animal beauty that obtains between us as perceivers/knowers and the object itself as material and form. It will be because our intellectual and perceptive capacities are put into a certain activity occasioned only by animal life that we experience beauty. Thus the desirous and intellectual soul are going to be acting a certain way in experiencing animal beauty. In the virtuous act, the human soul as desirous and intellectual will be in a certain kind of act. So there is the possibility at least of assimilating the ethical case of *kalon* to the account I will develop here for animals. We call it beautiful in the animal case because our souls are put into a certain kind of act contemplating a given animal; we call it beautiful in the virtuous actions case because our souls are into a certain kind of act performing a given deed.

defined in relation to themselves but instead in relation to human beings. Recalling *PA* I.5's ascription of *kalon* to that which is ordered to an end and not haphazard, the beautiful would be said of things as they fulfill their end.²⁹³ Thus artifacts of fine art like tragedy and paintings would not be beautiful when they do not achieve their ends, and this would be determined by whether or not they achieve the purpose for which we made them. Thus, with the case of the artifacts of painting and tragedy, it cannot be that by saying they are not beautiful when too large or small here Aristotle means only that they are too large or small for us to apprehend their beauty. Given the end these things have, if human spectators cannot take in the whole appropriately, then these artifacts fail to achieve their end and so are themselves not beautiful (again, assuming that beauty gets predicated of something only if it fulfills its end).

One might wonder if my above argument undermines my point. If the beautiful is said of a thing when it fulfills its end, then the beautiful really is a feature of the thing itself. The only reason why the relation to human spectators entails a denial of beauty is because we are talking about certain artifacts, the ends of which have their relation to human spectators. However, Aristotle affirms that this holds of animate bodies as well, and animals, animate bodies, do not have their ends determined in relation to our purposes. Thus, though it may be true that a thing's fulfilling its end is necessary for an

²⁹³ See also Torrente 2019. Though Torrente's focus is on actions (he emphasizes beauty's "intimate connection with teleological achievement." 227), his final account applies to animals as he sees it. "It is not a coincidence that beauty is the end (*telos*) of virtuous action, that is, the fulfilment, the attainment of the best expression of human nature. Therefore the first meaning would be that of "excellence," or perhaps even better, that of "actualized excellence," in the sense of the first act that has attained its full purpose: *entelecheia*....when something has reached its perfect state and has therefore realized its potentialities, it can be said, with good reason, that that certain thing is beautiful, as it has fulfilled its own essence." 227.

ascription of beauty, it cannot be that it is sufficient. Human perception of that end fulfilling thing is also required.

6.2.3 Putting *PA* I.5 and *Poetics* I.7 Together

For animals, we know in a general way what their ends are: to live completely as the kinds of things they are. The ends of animals are not externally defined but internally. Thus, for an animal to be in act according to its form is for the animal to achieve its end. However, according to *Poetics* I.7, this is not said to be beautiful unless humans can perceptually²⁹⁴ intake this whole of parts that is in act. My suggestion to connect these two points (the animal achieving its end and human's perceiving it) is that human beings, insofar as they experience beauty in seeing animals, are perceptually attuned to the individual as it is a realization of its form.²⁹⁵ Though it is clearly false that we can fully perceive the form of the animal at a glance in the sense that the Aristotelian biologist understands it, there is a way to understand how perception of the animal is already attentive to the form when we are experiencing beauty.

Aristotle's point about beauty from *Poetics* I.7 emphasizes beauty as being a perception of a whole of parts. Considering what has preceded in my earlier chapters, the

²⁹⁴ Notice that the point must be that humans need to perceptually intake the whole of parts for there to be beauty. Intelligibly speaking and with no view to perception, a thing that has five parts and is thousands of miles across and a thing with 5 parts that is microscopic are both capable of being objects of intellect, but not perception. So Aristotle's points in *Poetics* I.7 show that our experiencing beauty essentially involves perception, though more too may be involved on our part.

²⁹⁵ One will see this is an Aristotelian, biological version of what Kosman has put his finger upon. He conceives beauty as a kind of relation between the ontological and the phenomenological. It is appearance as revealing the being of what is. He says, "We could say (and here Plotinus is again helpful) that the *kalon* is to the good as "appearance" is to "being."...maybe we should say that it reveals something important about their understanding of the relation between ontology and phenomenology, the relation, in other words, between how things are and how they make their appearance...But for Plato, appearance is not something separate from being, but simply the presentation of what is to a subject: being, as we say, making its appearance." See Kosman 2010: 354.

substantial form of the animal is the functional relationship among all the animal parts. The secondary matter, not the inorganic matter, are those parts that can only be what they are while a part of the animal. Recall, non-uniform parts such as hands, limbs, wings, etc. are all cases of secondary matter. The non-uniform parts taken together form a whole that is the entire animal. These non-uniform parts and this whole are capable of being perceived in the cases Aristotle is considering in *Parts of Animals*. This point is complemented by Aristotle in *PA* I.5 when he emphasizes that we are studying the parts of the animal for the sake of understanding the whole animal primarily, and not for the sake of the parts themselves.²⁹⁶ This reminder occurs very closely to his claim that in all animals there is something natural and beautiful.

So it does not seem much of an interpretive stretch to see the whole of parts in the animal that is perceived as *kalon* by us in *Poetics* as being the substantial form and secondary matter, the ordering of which is said to be *kalon* in *PA* I.5. Of course, it is not strictly entailed that our delight in the animal as a whole of parts should direct us to what is ontologically basic in Aristotelian terms. People who decorate their homes with animal likenesses seem to show a *prima facie* appreciation of the animal shape but no appreciation of the functional relationships obtaining among those parts in the real animal. However, Aristotle claims that the being ordered to an end as animal parts are, is a kind of *kalon*, and *Poetics* adds the whole of animal parts can only be *kalon* if it is perceivable as a whole of parts. Granted that this sense of *kalon* concerning animals is one and the same kind in *Poetics* and *Parts of Animals*, then for Aristotle at least, the

²⁹⁶ *PA* 645a 30-35

form/matter relation is latent in the way we perceive animal wholes and parts when we see them as *kalon* as the Aristotelian biologist does.

6.3 How Animal Beauty Fits with Aristotle's Teleological Understanding of Animals

Aristotle's understanding of *to kalon* concerning our perception of animals might give a kind of phenomenological basis for his objection to philosophers who reduce animals to inorganic parts (more on this in the conclusion). If an animal were to be explained in material terms only, the degree of organization that is being appreciated by the Aristotelian biologist would not be very different from that appreciated by those who enjoy looking at artifacts to understand the art. With the artifact, the art in the soul of the craftsman would be what imposes the order upon the matter to realize the artifact; by nature, there is no such artificial form. With the animal, the interaction of the material parts (earth, fire, water, air) and their natural powers (hot, cold, moist, dry) would be all that produces the animal. Nothing about the animal as such would be essential in the causal powers that brought it to be. In both cases, the resulting organization (the animal) would be a contingent possibility relative to the material parts. The material parts would in themselves have no natural tendency to realize the whole animal. Thus, the peculiar absence of what is haphazard in living beings that Aristotle identifies would not obtain.

Granted it is the veridical perception of this greater absence of the haphazard in the animal that causes the greater pleasure in the natural philosopher, then if the reductionistic natural philosopher were correct about animals, there would not be the greater degree of pleasure in perceiving animals that Aristotle identifies.²⁹⁷ Aristotle's

²⁹⁷ As an analogy, consider the person who enjoys studying artifacts to appreciate the art that gave rise to them. Let's suppose he is looking at a particular rock formation that seemed to be carved by

teleological understanding of animals is required to make sense of the experience of animal beauty as Aristotle does. Assuming the experience of the *kalon* that Aristotle describes, and granted this is not an illusory experience, internal teleological explanations like Aristotle gives are the way to go in order not to undercut this enjoyment of beauty while seeking to understand them theoretically. In this way, the practice of biology could even intensify that initial enjoyment because it can bring a greater apprehension of the way in which the animal is an ordering to an end.

This poses a question concerning the antireductionism in Aristotle's approach to animals. One might speculate that Aristotle remained an antireductionist due to the poverty of the reductionistic explanations offered at his time. This position would have it that for Aristotle the question of holistic explanations concerning an animal versus reductionist stands or falls on what makes better sense of the facts.²⁹⁸ If I'm correct about the experience of animal beauty for Aristotle, it opens up the possibility that Aristotle's antireductionism is founded upon the experience of the kind of beauty he identifies concerning animals. As I said above, granted we experience beauty like Aristotle

some human. He later discovers that this was due not to art but rather chance circumstances. Thus the kind of enjoyment he would have been anticipating or even taken himself to have been initially enjoying when he first perceived the rock formation would be undercut. So too, though of course in a different way, the enjoyment of the beautiful animal would be undercut were it to turn out that it came about by the chance interaction of material parts. In the perception of either the artifact or animal that is an enjoyment of it and desire to further understand, there is taken to be a certain kind of form of the whole responsible for the experience. In the artifact, the form is in the mind of the craftsperson and the artifact is a gateway to contemplating that form: the craft that gave rise to it. In the case of the animal, the form is internal to the animal being perceived, though of course the full account of that form can be given without any mention of this or that particular animal.

²⁹⁸ This sort of account seems strengthened in consideration of such passages as *Physics* II.8. The point is that if we were to abandon the teleological style account for such fact as the sorts of beneficial parts that we find in animals, we would only be able to say it is due to chance. However, things happening by chance are not always or for the most part. The beneficial relations among animals and their parts are always or for the most part. Thus we must remain in the teleological camp. Note that if this is the sort of sole criterion by which Aristotle would hold to his antireductionism, then if we could show there that either there were more options than teleological explanations or mere chance, it would be possible that Aristotle might abandon his teleological view.

describes and this experience is not illusory, then it entails that animals must be understood teleologically as well as materially, for in the perception of beauty we are attuned to the animal as a whole (form) of parts (matter). However, it is a very big question to settle if in fact that experience of beauty, supposing we have it, is in fact veridical or not. Due to this, one could maintain that the shadow of the doubt of illusion is not dispelled for Aristotle except by further consideration about what explanations best make sense of the facts.

The above philosophical worry aside, it is clear that Aristotle *does* think animals must be understood teleologically in part, and so the experience of animal beauty would not be illusory for him. For Aristotle, our perception of animals as beautiful requires an internally teleological approach to understand the animal as it gave rise to that experience in us. Moreover, because it is the perception of the form of the animal organizing its matter that gave rise to this experience in us, coming to understand the object as it gave rise to this experience in us is a coming to understand the being of the thing.

6.4 Beauty's Relation to the Discovery of Teleology and Hypothetical Necessity in Biology

The question of how Aristotle, or anyone, could have come to discover the method of teleological explanations and with it the type of necessity Aristotle has in mind is not quite answered by showing that the experience of the *kalon* Aristotle considers requires his version of teleology and hypothetical necessity. There is still a difference between immediately viewing an animal in a way that presupposes teleology and becoming reflectively aware of it as a methodology. However, granted that the teleological outlook is an implicit part of the experience of animals as *kalon*, this

experience provides a possible genetic starting point for developing the methodology Aristotle endorses. The philosophical person to whom Aristotle alludes in *PA* I.5, is a person who already desires to know things. If the *kalon* to which he is sensitive gives him a perceptual grasp of a high degree of ordering and absence of the haphazard in the animal, this does not yet amount to a full understanding of the animal. However, the *kalon*, as it perceptually attunes him to the animal as a kind of functional whole achieved through its parts, is what raises the animal to his awareness as a potential object of theoretical inquiry. That it would be this initial experience of the animal as *kalon* that draws a person's theoretical attention to it is going to color the way he continues to consider it theoretically thereafter.

Something that requires emphasis here is that it is the experience of the animal as *kalon* that draws *theoretical* attention to the animal. Consider the different claim that in whatever manner a person's attention is initially drawn to an object, that manner will have a lasting effect upon the way the object is studied. This is obviously false. There are several manners in which we could characterize how one initially attended to an object that later was to become an object of theoretical attention, and these manners would have nothing to do with the methods of the ensuing investigation. For instance, one might have been surprised by seeing a new species, but the surprise will not be a crucial element that frames the way that new species is studied. One might have needed to have hiked to see a species, but that has nothing to do with the theoretical methods needed to approach the gathered data. So, unlike these, the *kalon* does not merely account for how we came to notice the animal, but how we came to notice them as something to be studied.

If we can see how the experience of the animal as *kalon* would lead one to ask certain questions, we can see a way in which that experience determines future studies of the animal. The actions of the entire animal are immediately observable to us when we perceive them. Seeing that the actions of the whole animal do not occur in a haphazard way is part of the *kalon* and what attracts the philosophical. Though there would be the immediate perception of this lack of being haphazard, there would not be a fuller understanding of how this ordering is achieved in detail. Aristotle reminds us in *PA* I.5 that the entire investigation really is being made for the sake of understanding the whole, which in the case of animal beings, is an active whole, not passive like a statue.

So, one type of questions that could arise initially concerns the actions we perceive of the whole animal. We might ask, “Why are these animals doing what they do?” Additionally, if we emphasize the mereological dimension of the *kalon* concerning animals, the question can be “How do these parts help it do that?” This could sound odd to some ears, but the way that Aristotle uses a parallel between artifacts and animals in *PA* I.5 suggests an example that might be easier to follow.

Imagine Aristotle seeing a modern blender. As he watched the whisks turning rapidly at least these two questions would come naturally enough to him. “How does it turn like that, and for what does it turn like that?” I take it that it is hardly a stretch to think a person naturally prone to seek explanations would wonder about the answer to both of these questions on seeing a blender work for the first time. Notice that what informs asking such questions are the assumptions that the blender is for something and that the parts have to be a certain way to realize the work of the blender. Recalling my above interpretation of *PA* I.5, these two assumptions are supposed to hold true even

more for the animal than the artifact. The individual animal is more closely wedded to its *telos* than the artifact, and the parts that realize the actions of the animal can only be what they are as partaking in the life of the animal that performs the actions the parts make possible. Granted this is *kalon*, and the *kalon* is perceptible by us, then as one would see the animal as *kalon* these two assumptions would be immediately at play for the perceiver. Thus such questions concerning the animal would not be randomly generated. With the philosopher, her desire to know will show itself by such questions thanks to what is at play in her perception of the animal as *kalon*. She will want to more fully understand how the animal is a special case of the lack of what is haphazard, and so she will want to know why the animal does what it does and how.

If the experience of the *kalon* with the animal does lead to these types of questions in the right kind of person, then the account of how we get to Aristotle's two principles of teleology and hypothetical necessity is easy to see. Once this sort of questioning and attempted answering would happen enough times, one could start thinking about what it is in general one is doing when thinking about animals this way. This is what Aristotle describes himself as doing at the start of *Parts of Animals*.²⁹⁹ He is considering the sorts of standards that the student of nature (animals in this case) ought to use in determining whether or not an explanation about animals is even of the right type. That we have such a capacity to look upon what we have done and describe it generally is not contestable.

²⁹⁹ PA 639a 12-15

6.5 Concluding Remarks

Though there is something beautiful in this account of the *kalon*, it still seems in a way to be a philosophical stretch. One may want to ask, “Do we really have a perception of animals like this? And, even if we do, how do we ever get the second order confirmation that our methodology we’ve extracted from several such perceptions is right?”

Concerning the first question, it’s not obvious how Aristotle could respond. What could we say to blind people who denied the existence of colors? Perhaps we could orchestrate some scenario involving the blind color deniers that would persuade them. Suppose there were ten small boxes, each of a different color, and only one had a coin in it. We gave each such color denier one chance to pick the box, and we told them it was the box that was colored red. After each of them would (likely) fail, we’d let a person who could see pick the red box, and each time he’d give that coin to the blind person. Afterwards we’d let them review the success rates. This might convince some of the color deniers that there is something to the reality of colors, since those who claim there are got the coin.

On the biological side, those who do think animals are the sorts of internally teleological beings that Aristotle claims might try to point out to the skeptics that several explanations were found concerning animals when the method presupposing teleology was used. Unlike the case above involving the coin, we have to ask what a non-question begging criterion for a good explanation would be here. After all, Aristotle offers teleology and hypothetical necessity as part of the standard that any satisfactory explanation about animals should obey. Perhaps today we might suggest something like predictability as a criterion to decide between the skeptic concerning teleology and the

Aristotelian who endorses teleology. However well that might work, it seems it would be unlikely to matter much for the Aristotelian biologist or the skeptic. For the Aristotelian, he just perceives the unique kind of *kalon* associated with animals; the skeptic just doesn't. Assuming teleology did yield accurate predictions, one response from the skeptic could be to make the distinction between explanatory and ontological reduction here. That is to say, we need teleology as a method for explanations, but in reality the animal is not a primary substance. That such an option would even seem a plausible alternative to us and so be one that requires argument to be rejected might just signal that we have lost the experience of animals as *kalon* that Aristotle identifies. To use a somewhat analogous case from Aristotelian ethics, the scoundrel who does not see that some actions are just *kakos* and other are *kalon* will not be able to be meaningfully persuaded by Aristotle's ethics.

To answer the second question I raised above, the experience of the *kalon* might provide a way to reject other accounts and vindicate Aristotelian teleology. As said earlier, the teleologically explanatory approach does not undercut the experience of the animal as *kalon* in the very unique way that the Aristotelian biologist experiences it. Granted other such methods will undercut this experience by reducing it to something illusory, then the manifestedness of the *kalon* will serve as evidence against reductionistic stories.

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