

FORM AS STRUCTURE: IT'S NOT SO SIMPLE

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Abstract

Hylomorphism is the theory that objects are composites of form and matter. Recently it has been argued that form is structure, or the arrangement of an object's parts. This paper shows that the principle of form cannot be ontologically exhausted by structure. That is, I deny form should be understood just as the arrangement of an object's parts. I do so by showing that structure cannot play the role form is supposed to in a certain domain of objects, specifically, in mereological simples. Thus, I show that Hylomorphism does not reduce to Structuralism. I also draw out some important consequences from my argument for Hylomorphism in general.

1. Introduction

Hylomorphism is the Aristotelian theory which takes objects to be composites of form and matter. Form is the principle which makes some object an actual member of its kind. That is, form is metaphysically responsible for an object's having the nature, and so, powers and capacities it does. So, for instance, an instance of sodium has the atomic number 11, explodes in water, and refracts light waves of the frequency it does, et cetera all because of the presence of the form 'Sodium' in some matter. Matter just is whatever form inheres in.¹

Although the functional roles form is supposed to play are uncontroversial, the precise ontological status of form is not agreed on. Recently, it has been argued that form is structure. More precisely: if Hylomorphism is to be a viable theory of objects, form should be thought of as the arrangement of an object's parts (see, e.g. Rea 2011 and Jaworski 2014). So, to consider our example of sodium again, on the form-as-structure conception, form is the specific kind and number of bonds between the various subatomic components of a sodium atom. If such an arrangement is

¹ There is, of course, controversy over what exactly matter is for Aristotle and his followers. See Ainsworth (2016, §2) for discussion. I will do my best to avoid discussion of matter, as my focus is form.

not instantiated by the appropriate parts, then there will be no sodium atom, and hence no object with the various powers and capacities characteristic of sodium. Call this view—that objects fall under the kinds to which they belong and so have the powers they have in virtue of their parts instantiating some structure—*Structuralism*.²

Recently, Structuralism has emerged in debates about composition, specifically as a version of Restricted Composition (the view that only under *some* conditions does composition occur). That is, Structuralism purports to answer van Inwagen's (1990) Special Composition Question, which asks: What are the necessary and sufficient conditions for some objects to compose a further object? Structuralism answers that only when some parts instantiate the right kind of structure do they compose some further object. So, Structuralism has recently developed as a theory about *composite* objects. And this is a perfectly respectable conception of form; in fact, Aristotle himself (*Metaphysics* VII.16-7, esp. 1041b12-1042a) conceives of form as that principle responsible for *uniting* some parts into a single substance. But there is a domain of objects not burdened with worries about composition. This is the domain of mereological simples, i.e. objects lacking proper parts. Although this domain is discussed most explicitly in debates about the ultimate nature of matter, it has important implications for debates about form, the natures and powers of objects more broadly, and Structuralism in particular. Let me briefly show why this is so and why it is important.

Recall that according to Hylomorphism, an object falls under the kind to which it belongs and has the powers it does in virtue of its form. And, according to Structuralism, form just is structure. It quickly then follows that, according to Structuralism, structure is the metaphysical principle which explains why objects belong to the kinds they do and why they have the powers they have. Now consider mereological simples—objects without proper parts. For the sake of argument, imagine that simples are indivisible, extended natural bodies. That is, simples are the smallest bits or units in which material reality comes. Imagine that electrons so qualify as simples. Electrons clearly belong to a kind and possess a set of very specific powers in virtue of belonging to that kind.

² Advocates I have in mind include primarily Koslicki (2008) and Jaworski (2014), but also include Fine (1999), Johnston (2006) and possibly also Rea (2011). See Toner (2012) for more on Structuralism.

For instance, electrons have a charge of -1.602×10^{-19} coulombs, a spin of one half and specific dispositions allowing for their transfer between atoms and larger molecules. In short, electrons have a nature—and presumably so in virtue of their form. But, as simple, electrons cannot in any clear sense be the result of a structure structuring some parts. For, structure is the kind of entity that configures parts, not just *a* part. That is, because simples lack parts, they cannot belong to the kinds they do and have the powers they have in virtue of some parts instantiating a structure. So, if Hylomorphism is a complete theory of objects, simples suggest that something besides structure plays the role of form in a certain domain of objects. My goal here is to show that even if Structuralism is true, by failing to account for the natures and powers of all material objects, structure alone cannot ontologically exhaust the principle of form. That is, form cannot be just structure, and so, Hylomorphism cannot reduce to Structuralism.

To accomplish my goal, I proceed as follows. First, I set the stage for my challenge to Structuralism with a few preliminaries and a terse discussion of mereological simples. Next, I present in more detail the problem I laconically sketched above, what I call the Problem of Simples. In the fourth section I consider ways in which the Structuralist might respond to my challenge, and conclude the best response is to admit structure is, at best, just one species of form. In the final section, I draw out some important metaphysical consequences from my argument about the ontological status of form: if Hylomorphism is an account of all objects, both composite and simple, it brings with it greater metaphysical commitment than Structuralists might expect.

But, before I begin, let me be up front about my aims. It is *not* my intent to suggest that structure cannot be form. Such a task goes beyond the scope of a single paper and is antithetical to my broader metaphysical goals. Nor is it my goal to argue against Structuralism as an answer to the Special Composition Question. My humble aim here is just to show that form is a genus in which structure is, at best, only a single species.

2. Some Preliminaries

Before presenting my challenge to Structuralism in more detail, I should clarify a few things: (i) my appeal to simples within an

Aristotelian framework, (ii) my account of form, and (iii) my specific conception of simples.³

(2.1) *Aristotelian simples*

Aristotle and his followers in general denied the existence of simples, specifically both point particles (*Physics* VI.1-4; *On the Heavens* III.1) and Democritean atoms (*On the Heavens* III.2-8; see also Sorabji 1983, chs. 23-4). So one might wonder whether and how simples can fit into an Aristotelian discussion at all. First, note that mereological simplicity is not a settled notion. So, just because some Aristotelians deny the reality of some conceptions of simples, it does not immediately follow that Aristotelians cannot admit of simples *simpliciter*. (Shortly, I will discuss my preferred view of simples and show why Aristotelians can easily admit of such entities.) Note further that not all Aristotelians dismiss simples in such a clearly partisan way. One of Aristotle's earliest commenters, Alexander of Aphrodisias, appears to admit of simples of a sort:

Natural bodies differ, in that some of them are *simple*, others *composite*. The matter which functions as substrate for composite bodies is itself a natural body made up of matter and form; for every natural body is composed of these. *But the substrate in simple bodies is not composed of these principles; if it were, it would be composite*. And if this substrate is not composite, then neither is it "body," since every body is composed of matter and form. Therefore, the matter that is substrate of simple bodies will be some simple nature without form, so formless indeed that considered in its own essence it is utterly bereft of any shape or configuration. (*De Anima*, 3, 21-4, in Fotinis (1979, 3) [emphases mine])

That is, as objects mereologically break down, we eventually arrive at a level at which objects no longer divide into natural bodies. In other words, natural bodies come in some smallest

³ I am not the first to criticize the notion of form as structure. Sclatsas (1994, ch. 4), Marmodoro (2013) and Koons (2014) have challenged a variety of recent versions of Hylomorphism based on structure (although it is unclear if they wholly do away with structure). David Oderberg (2014) has also recently challenged Structuralism in a more head-on way. (One can, in fact, find Oderberg's critique in its nascence in Aristotle. See *De Anima*, 1.4 (408a10-18)). My challenge here contributes a new line of argument in these recent debates against form as structure.

unit, below which, if somehow divided, would leave us with propertyless prime matter and a subsistent form, i.e. metaphysical *principles*, not *objects*. Or, so says this particular Aristotelian. What this shows is that it is perfectly consistent for an Aristotelian to admit of simples of a sort. Specifically: simples understood as natural bodies (material objects) at the lowest level of mereological composition.⁴

(2.2) *The status of form*

I have said that form is the principle metaphysically responsible for some object falling under the kind to which it belongs, conferring on it the powers and capacities characteristic of its kind. This tells us what form does, but not what it is. Form might play the same role across a variety of cases, but it might be a different entity in itself across those cases. That is, form might be best considered functionally, i.e. by what it *does*, not what it *is* (see Brower 2014, 66-9). If this is so, one might wonder if my argument against structure as form has any teeth. In other words, if form is identified simply by what it does, and not what it is, what if anything is wrong if structure plays the role of form in some cases but not others?

Two points help to clarify this worry. First is that the functional conception of form arises primarily with regards to different *sorts* of forms. That is, because Aristotelians generally recognize both (i) substantial and (ii) accidental forms, different entities can play the role of form *simpliciter*.⁵ For instance, when considering accidental forms, the hylomorphic compound 'musical Socrates' can be analyzed in terms of the accidental form 'musicality' and the matter Socrates, a concrete particular human. But Socrates himself, a material object (or substance), is analyzed in terms of the substantial form 'Humanity' (or 'Socrates' if you prefer tropes) and some portion of matter (however that is ultimately to be understood). The hylomorphic result in the latter is a material object though, and not an accidental unity or modified object. The two forms play very different roles in such a hylomorphic

⁴ More than just this is needed to show that Aristotelians can admit of such entities. I discuss this more below.

⁵ Substantial and accidental forms roughly correlate to essential and contingent properties, respectively. But see Oderberg (2007, ch. 1) for more on this. Note too, that some Aristotelians take matter and form to simply be whatever is in potentiality and actuality, respectively, in an entity. So, in this latter way especially, the ontological status of 'form' can be rather diverse. Again, see Brower (2014, 66-9).

framework. Accidental forms like ‘musicality’ are not my focus here. Only so-called substantial forms, responsible for the actual reality of material objects, are my focus.

More importantly, recall that my aim here is not to show that structure *cannot* be form. My aim is to show that even if structure plays the role of form in one domain of objects, it does not in all domains. That is, my goal is to show that Structuralism is, at best, an incomplete story about material objects, and so, that there is more to form than just structure. So, to repeat: structure might be form in some cases, but structure cannot *ontologically exhaust* the principle of form.

(2.3) *My kind of simples*

As mentioned above, what it means for an object to be mereologically simple is not a settled matter. There are three competing theories of mereological simplicity: (i) the Pointy View; (ii) the MaxCon View; and (iii) the Indivisible View (see Markosian 1998, the *locus classicus*). My preferred view is the Indivisible View. I will first say why the first two views are unsatisfactory and then explain the Indivisible View and my preference for it in more detail.⁶

The Pointy View takes simples to be unextended, non-voluminous point particles. So, proponents of the Pointy View take material reality to be composed of space-time points. I have two conceptual issues with this view. First, it is unclear what it would actually mean for a point particle to be an object. An unextended point on a coordinate system, essentially what a point particle is, is simply far too much of an abstraction to qualify as a real material object. Second, it is unclear how point particles could ever compose an object with volume. If point particles are the fundamental constituents of our world, and our world is composed of voluminous objects, how can even an infinite number of the former add up to a single of the latter (see Simons 2004, 371-6)? I do not think they can. And besides these worries, history is replete with issues surrounding the physics of point particles, and no recapitulation of these is necessary here.⁷

According to the MaxCon view, simples are maximally continuous objects (See Markosian 1998, 221-7; 2004). To be maximally continuous is, roughly, for an object to ‘occupy the largest

⁶ See Dumsday (2015a, 1023-6) for a clear, terse summary of some of the following views.

⁷ See Dumsday (2015b) for a recent discussion.

matter-filled, continuous regions of space around' (Markosian 1998, 222). So, for example, if a sphere of iron is compressed to the point at which all of its constituent atoms' boundaries touch, i.e. become continuous, the sphere is mereologically simple. Some problems for the MaxCon View are well-rehearsed (see McDaniel 2003), but here I will mention just one I find particularly troublesome. Modify the previous example such that *two* distinct, maximally continuous spheres of iron touch such that their boundaries become one, i.e. become continuous. In this case, if MaxCon is true, then the moment the spheres touch, they are annihilated and give rise to a new object. (Or, perhaps, one is annihilated and one survives. See Markosian 1998, 225-6.) So, MaxCon denies the *Preservation Thesis*: the idea that parts, when they compose a whole, continue to exist. For example, if a table is a whole composed of several pieces of wood, according to the *Preservation Thesis*, the pieces of wood continue to exist as such even while they compose the table (see Koslicki 2008, 177). The *Preservation Thesis* is incredibly plausible and the MaxCon view has other odd consequences.⁸ That MaxCon denies this thesis is a serious strike against it.

The third view of simples, the Indivisible View, avoids denying this thesis and fits more squarely with intuitions about simples. The Indivisible View holds that simples are objects that are metaphysically impossible to divide. That is, it takes simples to be objects at the lowest level of composition, the smallest bits in which material reality comes. Or, in yet another way: simples are what remain after exhaustive mereological decomposition (see Zimmerman 1995). So, on this view, simples are extended natural bodies. They are just the smallest natural bodies around, and the ones that compose all other objects. So why prefer the Indivisible View? Firstly, it avoids the problems besetting the other two accounts of simples. Secondly, it is exactly what most philosophers intuitively think about the ultimate nature of matter (see Markosian 2005). For, the Indivisible View represents a satisfying and *grounded* account of reality's smallest constituents (cf. Cameron 2008). That is, it best accords with the idea that material reality bottoms out at some fundamental layer, upon which all higher levels depend in some way. There is also good scientific reason

⁸ Such as: if you observe (however) many maximally continuous objects converge and come to compose a whole, you must deny the new object has any parts. This is odd precisely because composition is just about *parts* and wholes.

to endorse an indivisible, extended view of simples (see Braddon-Mitchell and Miller 2006, McDaniel 2007; and Schaffer 2003 for an opposing view).

I will refrain from speculating on whether or not the historical Aristotle would admit of simples so understood.⁹ But I do think simples conceived as indivisible, extended natural bodies can fit into a perfectly respectable Aristotelian ontology.¹⁰ They are just the lowest-level hylomorphic compounds that exist.¹¹ And there is nothing anti-Aristotelian about a hylomorphic analysis of objects. So, I will assume the Indivisible View of simples so described henceforth. But note: I do not take myself to have shown the Indivisible View to be correct, but only to have established it plausible enough to consider whether Structuralism can make sense of simples so understood.

3. The Problem of Simples (for Structuralism)

Imagine that O is an object composed of the parts x , y and z and has the power to Φ . According to Hylomorphism, O exists and has the power to Φ in virtue of O 's form inhering in some matter. Structuralism holds that O 's form is the configuration of its parts. Say O 's parts instantiate a structure represented as $x-y-z$. So, according to Structuralism, O exists as an actual member of its kind and has the power to Φ because x , y and z instantiate the $x-y-z$ structure. And, as a version of Hylomorphism, Structuralism purports to be a theory of all material objects. But, it is unclear if Structuralism can really account for the kind-membership and powers and

⁹ Although I do think some ancient and medieval Aristotelians might understand such simples as 'Nature's *minima naturalia*'. See McGinnis (2015, 3-8) for a fine historical discussion of *minima naturalia*.

¹⁰ Note that simples as I have described them, as extended and material, admit of a sort of infinite divisibility. This is because matter is continuous. But just because matter is infinitely divisible does not mean natural bodies are infinitely divisible into further natural bodies. We can imagine cutting an electron in half *ad infinitum*, but that does not mean electrons actually admit of such division. So, although simples as I have described them are indivisible in one way, they are infinitely divisible in another way: conceptually or considered quantitatively, one can infinitely divide any material object. See Thomas Aquinas, *In Phys.*, I.9.66.

¹¹ Such simples would not be *metaphysically simple* though, inasmuch as they are composed of form *and* matter. But, within the domain of material objects at least, neither form nor matter is ever found, i.e. actually instantiated, by itself. That is because form and matter are both metaphysical principles, not actual natural bodies, according to Aristotelians. So, this metaphysical compositeness does not threaten the *mereological simplicity* of indivisible simples.

capacities of all material objects. That is, it is unclear if structure really is form as the Aristotelian understands it. That is because simples provide a clear counterexample to structure as form: as simple, simples have no parts capable of instantiating a structure. For structure is the kind of entity that configures parts; it is at least a *dyadic* relation. So, simples belong to the kind(s) they do and have the powers and capacities they have in virtue of something besides structure. And if Hylomorphism is true, this means that form cannot be just structure.

Let me put the challenge a bit more formally.

The Problem of Simples:

1. *Hylomorphism.* All material objects fall under the kinds to which they belong and have the powers and capacities they do in virtue of some form *F* inhering in some matter *M*.
2. *Structuralism.* Form just is structure, so: an object *O* exists as an actual member of kind *K* and has the power to Φ in virtue of *O*'s part instantiating the *K*-producing structure *S*.
3. *Simples:* Mereological simples exist (or are at least possible and/or conceivable).
4. *Simple Natures:* Simples belong to kinds and have the powers and capacities they have in virtue of belonging to those kinds, i.e. simples have a nature.
5. *Simple Simples:* Mereological simples lack parts capable of instantiating a structure.
6. *No Structure.* Simples belong to the kinds they do and have the powers and capacities they have in virtue of something besides structure. (2-5)
7. *More Than Structure.* Some material objects belong to the kinds they do and have the powers and capacities they have in virtue of something besides structure. (6)
8. *Form \neq Structure.* In at least one domain of material objects, form cannot be structure. (1-2, 7)

So, to unpack and illustrate the main idea a bit, imagine two objects, one simple and one composite. Both are instances of some substantial kind, i.e. both objects are the result of some form inhering in some matter. And as hylomorphic compounds, both objects have a nature and so powers and capacities in virtue of their forms. Structuralism says form, what makes these two objects actual instances of some substantial kind, is structure. But the simple object cannot have some structure as its form: structures must be instantiated by *two or more* objects (i.e. parts).

The composite object, having parts, can be the result of a structure inasmuch as its components may be arranged and configured. But if our simple has no proper parts, only an improper part, viz. itself, it cannot be arranged. It just is what it is, regardless of any configuring or arranging.

So, if Structuralism purports to be about all material objects, as does Hylomorphism, it leaves unexplained the natures and powers of simples. But explaining the natures and powers of objects is just what Hylomorphism is supposed to do! So even if Structuralism is the correct theory of *composite* objects, it must be confined to *that* domain. And if Structuralism does not explain the natures and powers of all material objects, then another story about form is yet to be told, i.e. Hylomorphism does not reduce to Structuralism. So, at best, Structuralists have confused a species (structure) with its genus (form).

4. Responding to the Problem

Let me now consider responses to my argument.

(4.1) *The ‘So What?’ Response*

One might respond that Structuralism is a theory about the relations between a whole and its parts, and so, is not troubled by the Problem of Simples. Kathrin Koslicki (2008, 174) says roughly this much when discussing simples in passing:

Content or matter. . . is best viewed as consisting of a domain of objects that are themselves already structured; this conception breaks down only when applied to a “first” level of composition (if there is such a thing), made up of entities that are not further composed of anything; however, since these ground-level entities are presumably not also mereologically complex, a theory which concerns the relation between wholes and their parts [i.e. a structural theory of composition] does not apply to them and is hence not violated by their non-dichotomous nature.

Koslicki is right; the Problem of Simples does not invalidate Structuralism. But it is not my aim to invalidate Structuralism. My aim is to show that Structuralism cannot be the correct account of all material objects, and so, that form is not exhausted by structure. She is also right to conceive of simples as ‘already

structured'. But that is just to recognize a phenomenon—that simples belong to kinds, et cetera—and fail to provide an explanation for it. But, again, Hylomorphism is in the business of explaining the natures and powers of all objects. So this response just admits that structure does not exhaust form and that Structuralism is an incomplete theory of objects. And that just is to admit my conclusion.

(4.2) *No Simples, No Problems*

If simples did not exist, there would be no Problem of Simples. That is, if our ontology did not countenance simples, my argument would have no teeth: talk of simples would be meaningless. And one might deny the existence of simples by appealing to an ontology of gunk: one where every object has proper parts, *ad infinitum*. So, in a gunky world, there is no first level of composition; every part of an object has parts, and those parts have parts, and on and on. So, in a gunky world, structure can explain the natures and powers of all objects. That is because every object will have parts capable of being configured, no matter how far down the mereological chain of composition one goes.

First, it is not clear that gunk and simples are mutually exclusive categories (McDaniel 2006). So, positing gunk does not immediately obviate my challenge. More importantly though, whether or not our world is gunky or bottoms out in simples is an empirical question for physicists to answer. But, prior to a complete physical theory, it seems most satisfying to posit the existence of simples. Why? Because a gunky world, where composition never bottoms out and objects are not finitely grounded, just does not fit with intuition. And this is especially so amongst Aristotelians, who generally require explanations to bottom out in first principles or primitives. Moreover, even if our world is gunky, a possible world in which simples exist and Hylomorphism is true is conceivable. So, there would still be a possible world in which my argument poses a genuine challenge to Structuralism. But, overall, without a complete physics, we ought to cautiously assume that composition bottoms out in simples and avoid positing actual infinities. And so, my challenge should still stand.

(4.3) *Inexplicable Simples*

One might respond to my challenge by denying we can explain why *all* material objects belong to the kinds they do and why they

have the powers and capacities they have. That is, one can deny an explanation needs to be given (or can be) for why simples belong to the kind(s) they do and have the powers and capacities they have. In other words, take the natures of simples to be brute and so avoid the need to make form anything besides structure.

But, to deny an explanation exists for why simples belong to the kind(s) they do and have the powers and capacities they have is philosophically unsatisfying. First, the intuition that *there is* something in virtue of which an object belongs to the kind it does and has the powers it has is forceful. To claim that the natures of simples are brute, without explanation, is to leave a hole in one's metaphysical theory. And again, this is especially so for the Aristotelian who employs Hylomorphism to explain why *any* object falls under the kind to which it belongs. Secondly, if there were more than one kind of simple (say, a negatively charged kind and a positively charged kind), anyone who denied an explanation for the nature of simples *per se* would lack a further explanation: why a simple of kind K_1 is different in nature from a simple of kind K_2 . And even if taking a simple of one kind as brute were acceptable, failing to account for the difference between two kinds surely would not be. So, considering metaphysicians (and Aristotelians in particular) want to explain why and how the world's constituents are the way they are, this response is unacceptable.

(4.4) *A Different Kind of Structure*

Perhaps structure as I have discussed it, as the arrangement of an object's parts, is not the only way to conceive of structure. For, there are at least three other conceptions of structure that could plausibly play the role of form in simples: (i) spatial structures, (ii) stuff structures, and (iii) shape structures. If any of these structures can play the role of form in simples, then perhaps Structuralism as I have argued against it is incomplete, but broadly considered, is still a correct account of all material objects. Let me deal with these in turn.¹²

(4.4.1) *Spatial Structures.* A spatial structure is the relation between the spatial sub-regions of an extended object. So, for example, a spatial structure might be the relation between the left and right halves of an electron, or the relation between the four

¹² Thanks to audience members at the University of Illinois at Urbana-Champaign for bringing several of the following responses to my attention.

anatomic quadrants of a human body. Such a structure is not a configuration instantiated by concrete particular objects though, like the x - y - z structure instantiated by the objects x , y and z . But it is a structure nonetheless; it is a relation holding between an object's parts, viz. its spatial sub-regions. And perhaps such a relation can explain why simples have the natures they do.

The spatial conception of structures fails for two reasons. First, it is not clear that spatial sub-regions are genuine mereological parts of objects. Material reality doesn't come in electron top or bottom-halves, and so, such spatial sub-regions do not compose electrons in any straightforward sense. It seems most plausible that spatial sub-regions are conceptual or potential parts of objects, not real parts (see Markosian 1998, 222-5).¹³ And if the "parts" said spatial structures configure aren't genuine, then perhaps neither are the spatial structures themselves.

More importantly, an infinite number of such structures could be instantiated by a single object.¹⁴ This is because the spatial parts such a structure configures are as numerous as the spatial divisions one makes. So, for instance, a simple will have a top and bottom half spatial structure, a left and right half spatial structure, a quadrant spatial structure, *ad infinitum*. But if there are an infinite number of spatial structures instantiated by some object, it is hard to see how they could play the role of form. For, just a single form is needed to explain the nature of an object, so either the nature of an object would be radically over-determined, making nearly all structures impotent, or there would be just as many objects as spatial structures—a sort of infinite coincidence. But these results are unacceptable, so spatial structures are out of consideration.¹⁵

(4.4.2) *Stuff Structures*. Metaphysicians often distinguish between *objects* and *stuff*. Objects are denoted by *count nouns*, such as 'toaster', 'chair', and 'human being'. These terms denote individual instances of some kind, while *mass nouns*, such as 'water', 'wood' and 'gold' pick out portions or masses of some kind of *stuff*. To illustrate the distinction, consider an ounce of water and

¹³ See Simons (2004) for advantages of not treating spatial sub-regions as genuine parts.

¹⁴ Cf. Oderberg (2014), who poses an analogous problem for Structuralists in regards to the matter or 'content' of an object.

¹⁵ See Toner (2008) for other costs of admitting a plurality of forms in a single object.

a single flower.¹⁶ If the water is divided equally in two, the result is two half-ounce portions of what we began with: water. If the flower is similarly divided, the result is not two small flowers, but instead two parts of a dead flower. So, the idea is that stuff is such that one can continuously divide it, up to a point, and end up with portions of the same kind with which you began. Objects however, do not admit of such division.

One might propose that simples are structured by a sort of stuff structure, a structure which imposes some arrangement on some portion of stuff. So, for example, an electron would be the hylomorphic result of electron stuff (or some more basic kind of stuff) being arranged by an electron-producing stuff structure. Might this be a plausible Structuralist analysis of simples?

No, because this response assumes the very object we have set out to explain. To see why, imagine we have a large portion of electron stuff, i.e. a large number of electrons. Now divide this portion of stuff until we are left with a single electron. Proponents of the current strategy suggest that this electron is the result of some electron stuff being structured by a stuff structure. But electron stuff just is a plurality of electrons (i.e. objects), so appealing to *electron* stuff is just to appeal to the very thing we are trying to explain.¹⁷ Nor is it clear an electron can be the result of some basic, primordial stuff structured by a certain electron-producing structure. For one, electrons as I have discussed them are simple and do not decompose into any further objects. Secondly, if electrons do not decompose into further objects, any sort of primordial stuff composing them is best described as a metaphysical principle, like the Aristotelian's prime matter, and not some natural body like an object or portion of stuff. And this would no longer be a 'Stuff Structuralism' but rather a full-blown immanentist, constitutive Hylomorphism.

(4.4.3) *Shape Structures*. One final conception of structure is that it is something like shape. I mean by 'shape' the ordinary way in which we classify objects as *spherical*, *cuboid* or *pyramidal*. So perhaps a simple is structured, and so falls under the kind to which it belongs, et cetera in virtue of some shape. So, for example, in virtue of instantiating a cuboid shape, a simple belongs to the kind K_{Cube} and has various powers characteristic of that kind, say

¹⁶ The example is borrowed from Burge (1977).

¹⁷ See Zimmerman (1995, 60-6) for more.

positive charge. And in virtue of instantiating a spherical shape, simples belong to kind K_{Sphere} and have the negative charge characteristic of that kind. So, it seems shape structures can both explain why simples have the natures they do *and* explain the difference between distinct kinds of simples.

First, it is unclear if it even makes sense to speak of shape at the level of simples. But, granting that it does, this version of Structuralism still fails to adequately play the role of form. That is because shape is a property that ontologically depends on some antecedent object. That is, shape is a way in which an already actual object is modified. But if some object ontologically predates a property like shape, there is no clear way in which that shape can be responsible for the object falling under the kind to which it belongs. And this is especially so for the Aristotelian, who takes form to be that principle which concrete particulars depend on for their existence.¹⁸ Now, I think it is plausible to say shape endows objects with some powers and capacities, as the roundness of a ball grants it the power to roll. But the existence of a ball is ontologically prior to any particular shape, and so, the ball *qua* material object of some kind must be the result of some other form inhering in some matter. In other words, shape cannot be (substantial) form.

5. Implications

To recap, I have argued that mereological simples—extended natural bodies at the lowest level of composition—cannot be the result of some structure configuring some parts. I did so to show that the Aristotelian principle of form cannot be ontologically exhausted by structure. My motivation for doing so was to show that Hylomorphism cannot be reduced to what I have called Structuralism, which holds that form just is structure. But what does it mean for form to be more than just structure? What does all this entail for Hylomorphism?

There are several reasonable conclusions to draw from the foregoing. (i) One might think structure is the most viable candidate for form, and so, showing it cannot play the role of form in some domain is all the worse for Hylomorphism. (ii) Or one might admit that Hylomorphism is not intended to be a theory about all

¹⁸ See Loux (2005) for more on the ontological relations between an object and its form.

objects, but only composite ones, and so the foregoing is no trouble to it. (iii) Or lastly, one might think this shows new work on Hylomorphism and the ontological status of form is needed. Given the intuitive appeal and philosophical utility of Hylomorphism, I think the last conclusion is the correct one. Although here I lack the space for a proper discussion of this conclusion (and my preference for it), I can briefly mention one of its important implications. And this is that Hylomorphism as a complete theory of objects brings with it greater metaphysical commitment than Structuralists might think. Why? Because I think the most plausible candidate for form in simples is an inherent constitutive property. That is, I think simples fall under the kinds to which they belong, et cetera because some constituting property (conceived of as a trope or universal) inheres in some matter. And moreover, this matter cannot be some pre-existing natural body, as it plausibly can in composite objects, because there are no natural bodies ‘below’ simples. I think the best candidate for matter in simples is, as the quote in section 2.1 suggests, something like propertyless prime matter. So, if Hylomorphism is an account of all material objects, both composite and simple, it requires substantially greater metaphysical machinery than Structuralism might indicate. But with that metaphysical commitment comes greater explanatory power—or, so says this Aristotelian.¹⁹

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