Atomos: A Neo-Aristotelian Approach

Abstract: Historically, Hylomorphism—the Aristotelian doctrine according to which objects are composed of form and matter—was the substance theory of choice. In contemporary analytic metaphysics, Neo-Aristotelians have deployed the theory to answer Peter van Inwagen’s Special Composition Question, which asks: What are the necessary and sufficient conditions for two or more objects to compose another object? Yet, an equally important question in contemporary metaphysics, the Simple Question—which asks for the necessary and sufficient conditions for an object to be partless—has received scant attention from hylomorphists. This paper is the first hylomorphic effort to answer the Simple Question. I first discuss competing answers to the Simple Question, and show how one such answer is congenial to Hylomorphism. I then show its compatibility with Aristotelianism. I conclude by sketching a hylomorphic theory of simples in some detail, and discussing some of its implications.

1. Introduction

Hylomorphism is the Aristotelian theory according to which objects are composites of form and matter. Form is the metaphysical principle responsible for an object belonging to the kind it does. Traditionally, form is conceived of as an inherent, constitutive property. Matter is what form inheres in. So, for example, a brazen statue of Hermes is a composite of form, the shape of Hermes, and matter, the lump of bronze the form inheres in.

Hylomorphism is on the rise in contemporary analytic metaphysics. It is called upon most frequently in debates about the composition of objects. It purports to answer van Inwagen’s Special Composition Question, which asks: What are the necessary and sufficient conditions for some objects to compose another object? Hylomorphism is a promising theory of objects, and does a fine job of answering the Special Composition Question.¹ But the Special Composition Question isn’t the only question in debates about composition. There is also the Simple Question, which asks: What are the necessary and sufficient conditions for some object to be mereologically simple, i.e. partless?

The literature is replete with answers to the Simple Question. Yet, there is a dearth of hylomorphic responses to the Simple Question. One reason for this may be that Aristotle explicitly denied the existence of simples. So, perhaps contemporary Aristotelians feel no need to address the Simple Question. I feel otherwise. In fact, I think (i) Aristotelians should admit of simples and (ii) a theory of simples congenial to Hylomorphism already exists in the literature. The trouble is just to get hylomorphists to see things this way. This paper attempts to do just that.

First, I discuss the view of simples hylomorphists ought to endorse, and why it’s preferable to other views of simples and an ontology of gunk. Next, I show how endorsing this

¹ The hylomorphist answers that only when some objects become enformed (i.e., come under the visage of a form) do they compose some further object. See Fine (1999), Johnston (2006), Koslicki (2008), Toner (2008), Rea (2011), Jaworski (2014), and Koons (2014) for variations on this response to the Special Composition Question.
view of simples needn’t go against the Aristotelian tenet of infinite divisibility. Thirdly, I show how one may arrive at said view of simples within an Aristotelian framework, even if arguments in the previous sections fail to convince. Lastly, I sketch in greater detail a hylomorphic theory of simples and consider some of its implications.  

2. Simples

Mereological simples are objects which lack proper parts. There are three views of simples: (i) the MaxCon View; (ii) the Pointy View; and (iii) the Indivisible View. I believe hylomorphists should endorse the Indivisible View. Before discussing it more, let me briefly touch on the first two views, some reasons to be dissatisfied with them, and why I prefer the third.

The MaxCon View takes a mereological simple to be a maximally continuous object. In short, an object is maximally continuous if it ‘occupies the largest matter-filled regions of space around’ (Markosian 1998, 222). So, for example, if the constituent atoms in a lump of iron are pressed tightly such that all their boundaries touch, the lump is maximally continuous. On this view, any object, however large, could be simple. Its mereological simplicity is just a matter of its parts’ spatio-temporal relations to each other.

I’m disinclined to adopt the MaxCon View because it has the odd consequence of countenancing extremely large objects as simple. For example, on the MaxCon View, if a star is somehow compressed such that all its constituent parts touch, it is simple—without parts. This is odd precisely because we know the object, prior to compression, has billions and billions of parts. But how might the mere compression of an object result in the annihilation of billions of objects? It seems implausible it could.  

The Pointy View takes simples to be non-voluminous point particles, much like the points on a Cartesian coordinate system. On this view, simples must be non-voluminous because having volume—being extended—entails divisibility. And if an object is divisible, it has parts and so cannot be simple. So, on the Pointy View, the ultimate constituents of the material realm are point particles, simple inasmuch as they cannot, mathematically (and so metaphysically), be divided.

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2 Let me be clear: it is not my intention to show the historical Aristotle, or any in the tradition following him, endorsed the view I propound here. In fact, it is emphatically clear that historical Aristotelians deny the view I argue for. That is, in fact, part of the motivation for this paper. My aim is just to show that hylomorphists may in fact endorse a theory of simples, and to consider some of the implications of such an endorsement for Hylomorphism in general.

3 The view our world is composed of simples is opposed to the view our world is gunky. A gunky world is one in which all objects have proper parts, i.e. where every part of an object itself has parts, and so on ad infinitum. For more on simples and gunk, see Markosian (1998, 2004), Braddon-Mitchell and Miller (2006), Hudson (2007), Zimmerman (1996), Sider (1993), and McDaniel (2006, 2007a, 2007b). For the view our world contains neither simples nor gunk, see Cowling (2014).

4 For more on problems with the MaxCon View and responses available to the MaxConner, see McDaniel (2003) and Markosian (2004), respectively.
I do not endorse the Pointy View because it is committed to a material reality without extension. Since simples on this view are unextended, and simples compose all other objects, the Pointy View is forced to adopt a world without voluminous objects. For, not even an infinite number of non-voluminous objects can add up to a single object with volume. But our world clearly is composed of objects with volume. So the Pointy View must be mistaken.\

According to the Indivisible View, simples are extended objects that are metaphysically impossible to divide. That is, simples are objects which do not, in any world, admit of division into some further objects. In other words, simples are the remnants of exhaustive mereological decomposition. They are what populate lowest level of composition.

So why prefer the Indivisible View over the others? Why prefer it over gunk? For one, it is intuitive the division of objects into their constituent parts must terminate in some first level beyond which division is no longer possible. If we split a lump of iron in half, and its halves in half, and so on, it is implausible we could go on indefinitely without hitting ‘rock bottom’. The MaxCon View does not guarantee us this result. Moreover, a first level of composition populated by simples as described by the Indivisible View provides a framework for a satisfyingly grounded theory of objects. If matter is infinitely divisible, and every object is composed of some further objects, then the mereological structure of the world is inexhaustible, and so, it seems composite objects like you and I cannot be adequately grounded. But a first level of composition has partless constituents out of which all mereologically complex objects may be constructed. Inasmuch as these ‘first parts’ do not depend on any parts for their existence, the composite objects built up out of them do not depend on an infinite regress of parts. Both the Pointy and Indivisible Views give us this result, but the former does so only by introducing problems of its own. The Indivisible View promises these results, and does so without the odd consequences of the MaxCon and Pointy Views. For these reasons, I suggest hylomorphists seriously consider the Indivisible View of simples.

Before moving on, let me consider two objections. (1) One might respond that hylomorphists have inherited a view of mereological simplicity from Aristotle, what some call ‘Substantial Holism,’ according to which an object, inasmuch as it has a (substantial) form, is partless. This is because form ontologically ‘reorganizes’ the parts of an object, subverting them

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5 See Dumsday (2015) for other odd consequences of the Pointy View.
7 For opposing views on this, see Marksian (2005) and Schaffer (2003).
8 This is especially so for Aristotelians, who generally require both explanations and physical and metaphysical structures to be finite, bottoming out in first principles or primitives. For instance, even though the world is temporally infinite for Aristotle, time and the motion it arises from must be grounded in some first unmoved mover. So for Aristotle, and, again, Aristotelians and hylomorphists in general, structures of dependence, i.e. grounding, must have first levels. But, see Ross (2008).
9 I make the caveat, “inasmuch as it has a (substantial) form” because not all objects are on ontological par for Aristotelians. For example, artifacts such as axes and hammers are composed of form and matter, but their forms are ‘accidental’ and not ‘substantial’. Because of this, artifacts and other ‘accidental unities’ aren’t mereologically simple as understood by the Substantial Holist.
and their powers to the new whole they compose. So if hylomorphists have this view on hand, is there room for the Indivisible View too?

In short, yes. Hylomorphists can endorse both the Substantial Holist and Indivisible Views—but not as two different views of mereological simplicity. Instead of being a view about mereological simplicity, the Indivisible View may be a view about the ultimate nature of matter. That is, it rebuts a gunky view of matter, but doesn’t describe the concept of simplicity. So the hylomorphist could hold the Indivisible View in regards the nature of matter, and Substantial Holism in regards mereological simplicity. So, for example, such a hylomorphist could say that when two atoms (indivisible simples) are reorganized by a form, the object they compose is mereologically simple.

(2) According to the Substantial Holist view, with parts and their powers subverted to the whole, parts are said to exist only potentially, not actually, in a composite object. So, according to hylomorphists, a whole does not depend on its parts because those parts don’t exist (in actuality). If this is so, do hylomorphists need to worry about composite objects being grounded in their parts? That is, if the parts of an object cease to exist (in actuality) when they compose a whole, isn’t the whole fully grounded inasmuch as it is simple?

Firstly, not all hylomorphists accept the doctrine of Substantial Holism. So, inasmuch as these hylomorphists take the parts of objects to be actual, they cannot escape the pressure to ground wholes in their parts. Secondly, it isn’t clear the potentiality of parts obviates the need to ground wholes in their material constituents. Consider a molecule of sodium chloride. It is composed of two parts: an atom of sodium and an atom of chlorine. According to the Substantial Holist, these atoms cease to exist when they instantiate the form of sodium chloride. Even so, to my lights, the molecule of sodium chloride still depends ontologically on the atoms of sodium and chlorine. For, if they did not exist, the molecule of sodium chloride surely couldn’t. And for the molecule to ontologically (and not just temporally) depend on those atoms sounds a lot like it being grounded in them. In short, the existential cessation of parts does not clearly show that a whole is not grounded (in some important way) in those parts. If this is right, even Substantial Holists should be drawn to the Indivisible View.

3. Infinite Divisibility

Aristotle denied the existence of simples as described by the Indivisible View (in his day, the atoms of Democritus). He did so primarily because he held all continua, including objects, to be infinitely divisible. So, despite its virtues, hylomorphists may feel they cannot endorse the Indivisible View. In this section, I show how the Aristotelian tenet of infinite divisibility needn’t exclude simples as described by the Indivisible View from the hylomorphist’s ontology.

10 For more on the potential parts view, see Holden (2004, 91-131).
Aristotle’s argument for the infinite divisibility of objects runs as follows. Consider, for example, a line—a continuum of a single dimension. A line may be either infinitely divisible or composed of atoms. If a line were composed of atoms, those atoms could be either un-extended or extended. If the former, the atoms would ultimately coincide because, to compose the line, their boundaries would need to touch. This is because, as un-extended, there is no difference between the entire atom and its boundary. So, in short, un-extended atoms cannot add up to compose an entity with extension. If atoms were extended, then they would be susceptible to division, and so, not truly atomic. (In short, extension entails divisibility.) Thus, continua—material objects included—must be infinitely divisible.

This recapitulation does not do justice to Aristotle’s argument, or the many other reasons he has to deny simples. But let it suffice to show that Aristotle, and so, many hylomorphists, are committed to the infinite divisibility of objects. Does this prevent the hylomorphist from endorsing the Indivisible View?

I do not think so. Consider, for example, a cat. A cat is divisible in at least two ways. In one way, a cat may be divided along whatever axes one imagines. It may be divided in top and bottom halves, front and back halves, quadrants, or what have you. In another way, a cat is divisible into the naturally occurring parts that compose it, like portions of water, minerals, and flesh. In this first way, a cat is infinitely divisible. The cat may be divided however many times one envisions; inasmuch as the cat is extended, it is divisible. In the second way, however, the cat is not infinitely divisible. Imagine you divide the cat to the quantum level. Before you is an electron. Inasmuch as the electron is extended, it may be divided in the first way without limit: there are electron right and left halves, top and bottom halves, etc. But the electron is not divisible in the second way. The electron does not decompose into any further kinds of natural objects. And material reality does not come in electron halves. In short, electrons are indivisible objects.

Call this the distinction between mathematical divisibility and natural object divisibility. What does it suggest? It suggests that hylomorphists can uphold both the Aristotelian tenant of infinite divisibility and the Indivisible View of simples. Specifically, the

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12 This brief negative argument is Aristotle’s most famous against atomism (Physics VI.1). But, throughout the physical treatises, he develops a number of different arguments against atomism. See White (2013) for a terse discussion of these other arguments. A sampling of excerpts helps convey Aristotle’s distaste for atoms: ‘…nothing that is continuous can be composed of indivisibles’ (Physics, 231a24-5); ‘But, as we saw, no continuous thing is divisible into things without parts’ (Ibid., 231b12); ‘…every magnitude is divisible into magnitudes…’ (Ibid., 232a23); ‘Besides, a view which asserts atomic bodies must needs come into conflict with the mathematical sciences, in addition to invalidating many common opinions and apparent data of sense perception’ (On the Heavens, 303a20-3); ‘But every body is divisible and therefore…no body…can be divided into its ‘least’ parts’ (On Generation and Corruption, 328a3-6).

13 St. Thomas Aquinas makes this distinction in his commentary on Aristotle’s Physics: “But it must be pointed out that although a body, considered mathematically, is divisible to infinity, the natural body is not divisible to infinity. For in a mathematical body nothing but quantity is considered. And in this there is nothing repugnant to division to infinity. But in a natural body the form also is considered, which form requires a determinate quantity and also other accidents.” (In Phys. I.9.66).
hylomorphist may claim any object, inasmuch as it is extended, may be mathematically divided indefinitely. But, this needn’t prevent the hylomorphist from endorsing a view according to which natural objects (and not mathematical units) comes in some smallest, indivisible bits. The electron may be divided mathematically without end into minuscule electron slices, but the material order bottoms out in electrons, not electron slices.\textsuperscript{14}

4. An Aristotelian Avenue to Atoms

So far, I have presented a view of mereological simples, some reasons hylomorphists should endorse it, and shown how such an endorsement needn’t conflict with the Aristotelian tenet of infinite divisibility. Before sketching in greater detail a hylomorphic version of the Indivisible View, I would like to briefly show how, from a classically Aristotelian incipience, one may arrive at the Indivisible View independently of what has been argued thus far.

Aristotle’s theory of matter is stratified. In short, this means any single object may have a number of different entities playing the role of matter; exactly what plays the role of matter depends just on the level at which we analyze the object. For example, the matter in a brazen statue of Hermes is the portion of bronze the shape of Hermes configures. But, when we consider the lump of bronze itself, the portions of copper and tin composing the lump are its matter. And an atom of copper has various protons, neutrons, and electrons serving as matter. And protons have triads of quarks serving as matter, and so on.

Aristotle thinks that, if we go down far enough, all (sublunary) material objects are composed of the same kinds of matter. Ultimately, he thinks, objects are composed of the four elements: earth, air, fire, and water. In the lexicon of the \textit{Metaphysics} (1014a26-35), Aristotle defines an element as:

\begin{quote}
[T]he primary component immanent in a thing, and \textit{indivisible in kind into other kinds}; e.g. the elements of speech are the parts of which speech consists and \textit{into which it is ultimately divided, while they are no longer divided into other forms} of speech different in kind from them. If they are divided, their parts are of the same kind, as a part of water is water (while a part of the syllable is not a syllable). Similarly those who speak of the elements of bodies mean \textit{the things into which bodies are ultimately divided, while they are no longer divided into other things differing in kind} and whether the things of this sort are one or more, they call these elements. (trans. Ross, italics original, bold-face mine)
\end{quote}

In short, Aristotle thinks there are some lowest level kinds into which all other kinds (Oaks, Humans, Tuna, etc) ultimately decompose.\textsuperscript{15}

\textsuperscript{14} For reasons to endorse this distinction, and the distinction between the kinds of parts such divisions result in, see Simons (2004).

\textsuperscript{15} You might now ask, “What serves as matter in the elements?” Aristotle has a fascinating answer to this question, which I address in the next section.
Now consider form. In a famous passage of the *Physics* (I.4, 187b14-22), Aristotle addresses the view that “everything is in everything.” He answers the view must be false, because it would mean, for example, that an elephant could be contained in a grain of sand. Let me quote his response in full.

Further if the parts of a whole may be of any size in the direction either of greatness or of smallness (by ‘parts’ I mean components into which a whole can be divided and which are actually present in it), it is necessary that the whole thing itself may be of any size. Clearly, therefore, since it is impossible for an animal or plant to be indefinitely big or small, neither can its parts be such, or the whole will be the same. But flesh, bone, and the like are the parts of animals, and the fruits are the parts of plants. Hence it is obvious that neither their flesh, bone, nor any such thing can be of indefinite size in the direction of the greater or of the less. (trans. Hardie and Gaye, my emphases)

In short, Aristotle claims that forms cannot exist beyond certain limits. That is, there cannot be star-sized tomatoes or electron-sized kitties. And if this is so, it must be false that “everything is in everything.”

The theory that “everything is in everything” is not of interest to us here. What is of interest is the idea that forms have minimums below which they cannot exist. The commentary tradition develops this idea into the *theory of natural minimums*. To repeat, it claims just that certain forms cannot exist below certain levels.

Now, if forms have natural minimums, and the elements have forms, it follows that elements themselves will have minimum limits below which they cannot exist. And for the lowest level kinds which compose all material objects to have minimums is for the material order to bottom out in some smallest units. But that is just to say that objects are ultimately composed of entities incapable of division—*atomos*. More explicitly: if there are no further kinds into which the elements may be divided, and elemental forms have minimums, the minimums of the elements will be the smallest, indivisible units in which material reality comes. In short, elemental minimums are very much like simples as described by the Indivisible View.

None of this is meant to suggest Aristotle or any in the tradition following him deployed this argument or were unknowingly committed to it. In fact, although a number of Aristotelians in the modern era had corpuscular tendencies, none seem to have noticed this argument. Nevertheless, my aim in outlining it here is just to show that from uncontroversial Aristotelian physical principles, one can arrive at a view much like the one contemporary metaphysicians know as the Indivisible View. Let me now provide some detail on how the Indivisible View may be outfitted by hylomorphists.

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16 For more on the theory as it is developed by the commentary tradition, see McGinnis (2015) and Murdoch (2001).
17 Some (e.g. Sokolowski (1971)) have denied the elements have forms, and so, may object to my move here. But this is an extreme minority position; nearly all contemporary and historical commenters of Aristotle take him to posit elemental forms.
5. **Hylomorphic Atoms**

Up to this point, I have argued an *extant* theory of simples is congenial to Hylomorphism. But I have said little about how that view is, or might be, *hylomorphic* in any interesting way. In concluding, I will do just that, and consider some implications of the view for Hylomorphism in general.

Recall that Hylomorphism is the view that objects are composites of form and matter. Aristotle introduced the principles of form and matter to explain change, but broadly, form and matter explain why objects belong to the kinds they do, and so why they have the properties and powers they have. So, simples must be composites of form and matter. But, if ‘form’ and ‘matter’ are to be more than heuristics of no ontological import, what *entities* play the role of form and matter in simples?

Let’s start with matter. We know that matter in ordinary, ‘medium-sized dry goods’ like cats, toasters, and humans is some (grouping of) other object(s), like water, minerals, sheets of steel, etc. Now, simples are objects at the lowest level of composition, and so, cannot in any clear sense be composed of *other* objects. For, if simples were composed of some other objects they wouldn’t truly be simple. But if pre-existing objects cannot play the role of matter in simples, what can? The answer, I think, is provided by Aristotle. To explain how the elements (earth, air, fire, and water) could transform into one another, Aristotle posited a propertyless substratum of change. He suggested some basic or ‘prime’ matter underlies the change of, say, fire into air, because no other natural object could underlie such transformations. I think a similar matter must be posited to account for the hylomorphic composition of simples. One of Aristotle’s earliest commenters, Alexander of Aphrodisias, suggests this much.

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, trans. Fotinis (1979, 3) [emphases mine])

In short, if an *object* cannot serve as matter in simples, perhaps a *principle* like Aristotle’s prime matter can. ¹⁹

And what about form? Many contemporary hylomorphists think form is the structure of an object, or the arrangement of its parts. So, for example, on this structuralist conception of form, the number and kinds of bonds configuring sodium and chlorine atoms into a molecule of sodium chloride is form. But simples have no parts, and so, cannot be arranged or structured in

¹⁹ See Ainsworth (2016, §2) for more on prime matter.
any clear way. For, structure is (at least) a dyadic relation; it requires parts, not just a part, to be instantiated.\textsuperscript{20} If not structure, what might play the role of form in simples? Again, I think the answer is in Aristotle.

As mentioned at the outset, form is traditionally understood to be an inherent (universal) kind property. I short, on this view, a tuna is a tuna and not something else because the form ‘Tuna’ ontologically inheres in some matter. We needn’t worry about the nature of ontological relations, such as inheritance, here.\textsuperscript{21} The point to stress is just that form cannot be something ontologically innocuous like structure. If simples are to be composites of form and matter, form, at least in simples, must be something ontologically capable of linking up with a portion of propertyless prime matter to produce an object of familiar experience. To my mind (and Aristotle’s), an inherent kind property, conceived as either a universal or trope, is the up for the task.

So, the existence of hylomorphic simples has two interesting consequences: (1) something like Aristotle’s prime matter exists, and (2) form cannot be understood just as a structure or an arrangement of parts. This paper has no intentions of counseling a rejection of Hylomorphism based on these results. In fact, although prime matter is a mysterious principle and inheritance may seem odd, I think Hylomorphism is a compelling theory of objects. A decision to reject or accept Hylomorphism must be based on whether or not its philosophical utility outweighs its costs. The ontological commitments implied by hylomorphic simples are a central part of that evaluation; all I hope to have done here is explore and clarify those commitments.

References


Cameron, Ross (2008). “Turtles All the Way Down: Regress, Priority and Fundamentality” Philosophical Quarterly 58, 1-14


\textsuperscript{20} For an in-depth discussion of this problem and responses to it, see Renz (forthcoming).

\textsuperscript{21} For discussion on ontological relations such as inheritance, and a defense of a view much like the one I am sketching here, see Lowe (2006, 34-49 & 87-98).


Renz, Graham (forthcoming). “Form as Structure: It’s Not so Simple” Ratio


