Another Motivation for First Matter

Abstract: Aristotelians traditionally motivate the doctrine of first ('prime') matter by claiming that substantial change requires a subject. Without gainsaying that motivation, I propose another: first matter is a necessary postulate for the sort of unity proper to a substance. This motivation arises if one examines a claim that Patrick Toner and Robert Koons share: (TM´) the possession of emergent causal powers (ECPs) is necessary for substancehood. I first explain how TM´ represents the application of 'Merricks's Dictum' ("For a macrophysical object to exist is to have causal powers") to an Aristotelian framework. Next, I argue that, as Toner's and Koons's respective theories use TM´, it is incompatible with the denial that substances have substances as proper parts. In Toner's hylomorphism, TM´ entails that an entity's matter and form are independent substances. As part of Koons's theory, TM´ implies that an entity's elementary parts are substances. Happily, a hylomorphist need not accept TM´. For example, Aquinas rejects TM´ as incompatible with the doctrine of first matter. An ontology like Aquinas's that includes first matter navigates the dialectical straight between the dualism and atomism. If she commits to first matter, the hylomorphist can deny that substances have substances as proper parts.

Keywords: Matter; Form; Powers Ontology; Emergentism

1. INTRODUCTION

Aristotelians have traditionally motivated the doctrine of first ('prime') matter by claiming that substantial change requires a subject. For example, Aristotle claims that the primary bodies (fire, air, earth, and water) are the most basic varieties of physical matter. Each of them can change into any of the others.[1] In the event that, e.g., water changes into fire, what is the change's subject? Not any of the primary bodies, since all of them are equally physically basic. Therefore, matter which is more basic than physical matter is the subject of elemental transformation. David Oderberg translates the same insight into the idiom of contemporary physics. Supposing there are elementary particles and that quarks are among them, he notes that quarks are not the ultimate subject of substantial change, "since they too are capable of substantial transformation."[2] Therefore, matter which is more basic than physical matter is the subject of substantial transformation. Without gainsaying first matter's traditional motivation, in this paper I mean to propose another.

The Eleatic Principle (EP), dubbed by Jaegwon Kim 'Alexander's Dictum', states that "to be is to have causal powers." Trenton Merricks proposes a version of EP restricted to macrophysical objects, which Patrick Toner calls 'Merricks's Dictum':

[1] Asked "whether every one [of the primary bodies] can come to be from every other one", Aristotle says, "It is in fact clear that all are by nature able to change into each other"–Aristotle, *De Generatione et Corruptione*, II, 4, 331a11.

[2] David S. Oderberg, *Real Essentialism* (New York: Routledge, 2007), 72. A bit earlier Oderberg explains, "According to current physical theory, even quarks can be substantially transformed into other quarks: for example, a quark trip of [bottom, top, top] can, by virtue of the strong nuclear force, be changed into a triplet of [down, top, top]; indeed, the bottom quark could also have been changed into a strange or charmed quark[…]Hence, even if the atomist could, *per impossible*, demonstrate that all apparent substantial change at the macro level was an illusion generated by the recombination of elementary particles, he would still have to account for substantial transformation among the particles – and pure potency would still be needed"–Oderberg, *Real Essentialism*, 64.

TM For a macrophysical object to exist is (at least in part) to have causal powers.[3]

In addition to endorsing TM, hylomorphists like Toner[4] and Rob Koons[5] have relied on a version of TM restricted to substances:

TM´ To be a substance is (at least in part) to have emergent causal powers, where a causal power *P* is emergent *iff P* is not grounded in any atomic-level causal powers (and the atoms' mutual spatial relations).[6]

As Aristotelians, Toner and Koons distinguish two ways concrete beings exist: one way characteristic of substances, and another characteristic of accidental unities. The distinction amounts to this: accidental unities have substances as proper parts, while substances do not.[7]

According to TM, possessing causal powers is connected to concrete existence. For Aristotelians like Toner and Koons, accidental unities and substances bear causal powers correspondingly to their diverse ways of existing.[8] An accidental unity's existence is grounded in the existence of its substantial parts (and their mutual relations). Therefore, each of an accidental unity's causal powers is grounded in causal powers of its substantial parts as these are mutually related. An accidental unity cannot do anything its parts cannot do. In contrast, a substance's existence is not grounded in the existence of its parts. Therefore, neither are a substance's powers grounded in the powers of its parts. A substance can do things that its parts cannot do. For suppose the causal powers of a substance *y* were grounded in the powers of *y*'s parts. In that case, *y*'s substancehood would be otiose: *y*'s causal powers would be no different than if *y* were an accidental unity, and commitment to *y*'s substancehood would be unmotivated. To motivate

[3] Patrick Toner, "On Merricks's Dictum", *Journal of Philosophical Research* 33 (2008): 293.
[4] Patrick Toner, "Emergent Substance", *Philosophical Studies* 141/3 (2008): 281-297.
[5] Robert Koons, "Staunch vs. Faint-hearted Hylomorphism: Toward an Aristotelian Account of Composition", *Res Philosophica* 91/2 (2014): 151-177.
[6] I intend 'emergent' just as Koons does. For Koons, a major task of hylomorphism is to explain the relation between a substance's powers and those of its parts. One proposal is that "all of the powers of the whole are wholly grounded in the powers of its parts, together with their extrinsic (spatial) relations to each other." According to this "wholly grounded" view of wholes, "no composite thing can have any fundamental powers." Since this is incompatible with the hylomorphist's commitment to the fundamentality of composite substances, hylomorphists "should reject the wholly grounded conception of wholes and should instead embrace *emergent* powers of composite substances" –Koons, "Staunch vs. Faint-hearted Hylomorphism", 157. My use of "emergent," also covers Toner's "non-redundant," which he borrows from Merricks. For Merricks, "a composite object causes an effect *E* non-redundantly only if *E* is not caused by that object's parts working in concert"–Trenton Merricks, "Vagueness and Composition", *Mind* 114/3 (2005): 631-632.
[7] Toner endorses "strong anti-atomism, according to which no substance has a substance as a *proper* part […] Whenever an atom becomes part of a substance, it is not merely changed into another atom, it actually ceases to be a substance at all" –Toner, "Emergent Substance", 287. Koons's view is the same: "[*X*] is a substance iff *x* is unencompassed (i.e., not a proper part of anything)"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 173.
[8] Toner claims accidental unities exist only in an attenuated way. In his view, since the chair in which I sit is a "pseudo-object" with "pseudo-parts," *it* cannot bear weight. Instead, there is a chair only inasmuch as some atoms arranged chair-wise plurally instantiate the functional property *chair*. Moreover, the chair-function "can be, and, in our world, always is, performed by objects standing in a certain multigrade relation"–Patrick Toner, "Meta-ontology and Accidental Unity", *The Philosophical Quarterly* 56 (2006), 555-556. Therefore, a chair can bear weight only inasmuch as some atoms plurally instantiating *chair* can plurally perform the chair-function.

their commitment to the unity and mode of existence proper to substances, Toner and Koons each assert that having emergent causal powers (ECPs) is necessary for substancehood.

I reply that although some substances have ECPs, TM´ is incompatible with there being composite substances. As I argue, however, this incompatibility points to a metaphysical principle upon which the unity proper to a substance depends, i.e., first matter (pure potentiality). The paper proceeds as follows: section 2 gives the historical background behind Toner's and Koons's endorsement of TM´. Section 3 analyzes and criticizes Toner's and Koons's respective endorsements of TM´, identifying two respects in which TM´ can threaten a substance's intrinsic (*per se*) unity. First, 3.1 argues that TM´ collapses Toner's hylomorphism into a version of dualism with respect to form and matter. Second, 3.2 argues that as a feature of Koons's view, TM´ entails that a substance's elementary parts are substances, i.e., that composite "substances" are mere accidental unities. Section 4 then motivates first matter by arguing that the sort of unity proper to a substance depends on there being first matter. To this end, 4 proposes Thomas Aquinas's hylomorphism as illustrative of why substance ontology and TM´ are incompatible. After 4.1 briefly notes Aquinas's rejection of TM´, 4.2 and 4.3 explain that he rejects TM´ because it is incompatible with the doctrine of first matter, which he accepts. Finally, 4.4 argues that, whereas TM´ collapses hylomorphism into either dualism (Toner) or atomism (Koons), first matter ensures a substance's intrinsic (*per se*) unity. In that case, substance ontologists like Toner and Koons have ample reason to renounce their commitment to TM´ and endorse the doctrine of first matter.

2. EMERGENT CAUSAL POWERS

2.1 Merricks's Motivation for ECPs

The Vagueness Argument (VA) and the Over-determination Argument (OA) militate against the view that material objects sometimes (but not always) compose something. Before examining Toner's and Koons's respective commitments to ECPs, it pays to appreciate how Trenton Merricks's appeal to ECPs answers VA and OA and so distinguishes a composite *y* from some objects arranged *y*-wise.

VA is the composition literature's most popular argument for unrestricted composition, i.e., some *x*s always compose a *y*. It assumes for *reductio* that composition is restricted. It then claims that if composition is restricted, then there is a composition continuum. Each point on a composition continuum represents a case in which the *x*s satisfy (to a greater or lesser degree) the necessary and sufficient conditions for composing a *y* or fail to satisfy them. From this, one of two things follows: either the continuum includes a point dividing the cases in which composition occurs and those in which it does not, or at some point composition is vague. On the one hand, it is extremely implausible that the continuum includes such a cut-off point.[9] On the other, composition is never vague. Therefore, there is no composition continuum. Therefore, composition is unrestricted.

OA, while not strictly an argument for compositional nihilism, i.e., some *x*s never compose a *y*, tends strongly in that direction. OA supposes for *reductio* that there is a composite *y*. Next, for any event *E* that *y* supposedly causes, *y* is causally irrelevant to whether its atoms x_1, x_2, $x_3 \ldots x_n$ cause *E*. Our best physics tells us that x_1, x_2, $x_3 \ldots x_n$ cause *E*. *E* is not over-determined.

[9] For proponents of VA, such a cut-off point is as likely to exist as a number *n*, where a person is bald *iff* he has fewer than *n* hairs on his head (see Toner, "Emergent Substance", 282).

Therefore, *y* does not cause *E*. But for a macrophysical object to exist is (at least in part) to have causal powers. Therefore, *y* does not exist.[10]

Merricks argues that the mereological moderate can successfully answer VA and OA on condition that her ontology includes ECPs. Regarding VA, recall that the argument's conclusion depends on the implausibility of a composition continuum that includes a non-arbitrary cut-off point. Such a composition continuum is not implausible, however. Consider the following argument:

1. Composition is restricted.[11] [Assumption]
2. If composition is restricted, then every composite object *y* has some irreducible property or other.[12]
3. *Y* has some irreducible property or other.
4. In virtue of its irreducible properties, *y* can cause effects that its atoms working in concert do not cause, i.e., *y* has ECPs.[13]
5. It is neither arbitrary nor vague if *y* has ECPs.

Conclusion: Therefore, it is not implausible that a composition continuum includes a non-arbitrary, yet sharp cut-off.

Since VA succeeds only if it is implausible that there is a composition continuum that includes a non-arbitrary, yet sharp cut-off, VA fails.

Committing to ECPs allows one to answer OA, too. Recall OA's final premise (TM): "for a macrophysical object to exist is (at least in part) to have causal powers." If an object *y* causes an event *E* that the *x*s arranged *y*-wise do not cause, then by TM, *y* exists "over and above" the *x*s. In sum, if some *y* has ECPs, *y* is irreducible to the *x*s, and mereological nihilism is false.

2.2 Toner and ECPs

As a moderate compositionist, Toner, like Merricks, is keen to answer OA and VA. Unlike Merricks, however, Toner answers OA and VA by identifying material composites with substances, which he characterizes in terms of ECPs: "When I speak of a substance, I mean an object with non-redundant (i.e., irreducible) causal powers," e.g., "libertarian free will, which (to

[10] Merricks propounds OA in *Objects and Persons* (Oxford: Oxford University Press, 2003), 56-84.

[11] According to Merricks, "This [premise] begs no questions. For what is at issue […] is not whether composition is restricted. What is at issue is, instead, what restricted composition implies. In particular, we want to know whether restricted composition implies that composition is sometimes vague. To answer this question, we assume - for the sake of argument - that composition is restricted. We then see what follows"–Merricks, "Composition and Vagueness", 627-28). Of course, the VA itself also assumes that composition is restricted.

[12] Merricks argues for this premise as follows: If every composite is reducible to its parts, then "[restricted composition] is virtually unintelligible. The distinction that defines restricted composition is the distinction between objects that have a sum and objects that do not. But that distinction is suspect, given the reduction of sums to their parts. It is suspect to say that there is something composed of the *x*s – which is nothing more than the *x*s – while denying that there is something composed of the *y*s – though the *y*s exist, and if they composed something it would be nothing more than the *y*s. Indeed, if everything about a composite is reduced to the objects that compose it, whenever you have those objects, you thereby seem to have something they compose - that 'something' is nothing more than the original objects[…] If composition is restricted, then something about each composite object is not reduced to its parts. If composition is restricted, each composite object has some irreducible property or other"–Merricks, "Composition and Vagueness", 631.

[13] Merricks, "Composition and Vagueness", 632.

me) seems unexplainable in a purely reductionistic way."[14] Of a piece with Toner's commitment to substances is his endorsement of Strong Anti-Atomism (SAA), "according to which no substance has a substance as a proper part."[15] From SAA it follows that when an atom *x* is incorporated into a substance *y*, *x* ceases altogether to be a substance. Since for Toner only substances bear causal powers, "[w]hen atoms compose a substance, they lose their causal powers. The causal powers of a substance – all of them – reside in the substance as a whole, and not in its parts."[16]

In virtue of these commitments, Toner can answer OA in two ways. First, he can answer OA as Merricks does. Recall that according to OA, alleged composites don't cause anything. Instead, the effects one habitually attributes to them are in fact caused by their atomic components. Therefore, by TM, composites don't exist. But if an alleged composite bears ECPs, it can cause events that its atoms working in concert do not cause. For example, a person making a free choice causes an event that her atoms working in concert do not cause. Therefore, her atoms compose a person, and mereological nihilism is false. In virtue of his commitment to emergent substances, Toner has an additional answer to OA. Assuming SAA, "[O]nce composition occurs, the only object that remains is the emergent substance: nothing remains 'down there' at the microphysical level (with any causal powers of its own)."[17] Therefore, for a substance *y* composed of some atoms, the *x*s, there is no effect *E* produced by the *x*s working in concert. Since the *x*s are no longer substances and the causal powers once residing in the *x*s have all migrated upward to *y*, *E* is an effect of *y*. Therefore, by TM, one cannot eliminate *y* by means of OA.

Committing to ECPs provides Toner with an answer to VA, too. He claims that having ECPs is necessary for substancehood. As Merricks's refutation of VA showed, it is neither arbitrary nor vague if an object has ECPs. Moreover, it is not implausible that there are ECPs, e.g., libertarian free will. Therefore, it is not implausible that there is a composition continuum that includes a non-arbitrary, yet sharp cut-off. The implausibility of such a continuum is a premise of VA. Therefore, if bearing emergent causal powers is a necessary condition for substancehood, then VA fails. In sum, supposing (1) that ECPs are the mark of substancehood and (2) SAA, then some atoms, the *x*s, *sometimes* but not *always* compose a substance *y*.

Above I claimed that Toner commits to ECPs for the sake of privileging substances relative to accidental unities. It now seems his answers to OA and VA are incompatible with belief in accidental unities, however. Since substances, but not accidental unities, have ECPs, accidental unities do not survive OA, and so are not composites.[18] How, then, can Toner include them in his ontology? Toner answers this question by claiming that one can go reductionist instead of eliminativist about accidental unities. Although Toner's bar for substancehood is high, his bar for existence is low: "[T]o say 'Chairs exist' is simply to say that the property *chair* is

[14] Toner, "Emergent Substance", 285.
[15] Toner, "Emergent Substance", 287. Toner does not deny that substances have parts. Instead, he distinguishes between spatial and substantial parts and insists that substances have only the former. Anti-Atomism asserts that when a carbon atom *c* becomes part of a substance *y*, *c* undergoes a substantial change. Weak Anti-Atomist claims that *c* undergoes a substantial change, but remains a substance after being incorporated into *y*. Strong Anti-Atomism insists that *c* ceases to be a substance, with the result that *y* "owns" the causal powers that once belonged to *c*.
[16] Toner, "Emergent Substance", 286.
[17] Toner, "Emergent Substance", 284-285.
[18] As he says, "I do not consider desks or chairs or baseballs to be substances, because I believe none of these objects has non-redundant causal powers. That is, I believe everything things do is fully explainable in a bottom-up way"–see Toner, "Emergent Substance", 286.

instantiated."[19] Nevertheless, although *chair* is instantiated, since what instantiates it does not bear ECPs, there is no composite object such that it is a chair. Instead, many objects instantiate *chair* when a chair-wise relation obtains among them.[20] Therefore, "[a]n accidental unity is[…]not a real unity, not a real object. It is, rather, a pseudo-object."[21] In sum, by claiming that possessing ECPs is necessary for substancehood, Toner manages both to answer the two most popular arguments against restricted composition and to provide a criterion for telling substances from accidental unities.

2.3 Koons and ECPs

Robert Koons observes that according to Aristotle's hylomorphism, "[t]he acquisition of form involves a real change in the intrinsic natures of the body's components." That a body's components undergo change to their intrinsic natures is what makes the body a substance. Its components are no longer autonomous entities; rather, it is essential to each to be part of the whole. In contrast, "faint-hearted hylomorphism" (FH) regards form as "merely a matter of [a body's components] acquiring certain relations or beginning to cooperate autonomously in certain ways, as the strings of a lyre cooperate in producing harmony."[22] Acquiring new spatial relations does not change an entity's intrinsic nature, however. Therefore, according to FH, there are accidental unities, but no composite substances.[23] Moreover, since every material object is spatially related to every other material object, FH gives rise "to extreme ontological inflation, with large numbers of overlapping and coincident objects. This inflation in turn results in massive causal over-determination, of the kind discussed by Trenton Merricks."[24]

Staunch hylomorphism (SH) attempts to avoid "extreme ontological inflation" and the "massive causal over-determination" it implies. SH asserts that there are substances, i.e., beings that are not proper parts of anything.[25] According to Koons, "The crucial question for staunch hylomorphists is this: What is the relation between the powers of a whole substance and the powers of its proper parts?" One answer is the "wholly grounded" conception of composites (WG). According to WG, "all of the powers of the whole are wholly grounded in the powers of its parts, together with their extrinsic (spatial) relations to each other." Rejecting WG, Koons notes that it "has the consequence that no composite thing can have any fundamental powers. This is clearly in tension with the staunch hylomorphist's commitment to the fundamentality of

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[19] Toner, "Meta-ontology and Accidental Unity", 552.

[20] Toner, "Meta-ontology and Accidental Unity", 552. Toner has no worries about many objects instantiating a property like *chair*. He says, "Compare: we used to think water was an element. Now, we think it is not. We think, instead, that it is made of hydrogen and oxygen atoms. This discovery did not shake our confidence in the existence of water. Similarly, taking a strongly reductionist line about chairs leads only to the conclusion that what instantiates the property chair is quite different from what we might have been inclined to assume"–Toner, "Meta-ontology and Accidental Unity", 555.

[21] Toner, "Meta-ontology and Accidental Unity", 556.

[22] Koons, "Staunch vs. Faint-hearted Hylomorphism", 152.

[23] As Koons indicates, "In Aristotle's terminology, when some material things acquire a new set of extrinsic relationships to each other, the result is an *accidental unity*, not a *substance*"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 152; emphasis in original.

[24] Koons, "Staunch vs. Faint-hearted Hylomorphism", 153. "For example," Koons explains, "when a baseball breaks a window, the causes of the breaking will be multiplied in proportion to the number of coincident objects and pluralities of objects associated with the material components of the baseball in motion."

[25] Koons says, "[*X*] is a substance iff *x* is unencompassed (i.e., not a proper part of anything)"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 173.

composite substances." If substances are not fundamental, i.e., if substances have substances as proper parts, there is no distinction between SH and FH. "Thus," Koons reasons, "the staunch hylomorphist should reject the wholly grounded conception of wholes and should instead embrace *emergent* powers of composite substances.[26]

Nevertheless, Koons detects a danger for the hylomorphist in committing to ECPs, i.e., substance dualism. He wonders, "If the 'whole' has emergent causal powers, in what sense can it be said to be wholly composed of its parts, as opposed to being a separate entity that interacts with those parts?"[27] The following argument expresses Koons's worry:

> 1. For any material whole *y*, *y* is wholly composed of material objects, the *x*s.
> 2. For any emergent causal power *P* of *y*, *P* is not wholly grounded in the powers of the *x*s and the *x*s' mutual spatial relations.
>
> Conclusion: Therefore, *P* is at least partially grounded by an entity *z* separate from *y*.

ECPs were supposedly the mark of substances, distinguishing them from mere arrangements of materials. If this argument is sound, however, ECPs characterize certain conjunctions of substances. Since hylomorphism conceives of itself as a *via media* between materialism and substance dualism, that result is just as bad as FH. For Koons, the staunch hylomorphist thus faces the dilemma "of ensuring the differentiation of hylomorphism from materialism by positing emergent powers [i.e., affirming Premise 2] without collapsing into a version of substance dualism [i.e., blocking the inference from Premise 2 to the Conclusion]."[28]

Parts as Sustaining Instruments (PASI) is Koons's solution to the dilemma. PASI consists of two conditions, the first of which is Sustenance:

> For any composite substance *y* with proper parts the *x*s and any moment *t* at which the substance exists, the existence of *y* at *t* is wholly grounded in the actual persistence of some process *P* in some interval of time beginning at some instant t_0 and ending at *t*, which process *P* is such that its participants from t_0 until and including *t* are exactly the *x*s (or exactly *y* itself and the *x*s).[29]

The proponent of SH is keen to avoid implying that a substance is separate from its parts. According to Sustenance, for a substance *y* composed of some *x*s, whenever *y* exists, *y* depends on the cooperation of the *x*s at that time. Since there is no such cooperation without the *x*s,

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[26] Koons, "Staunch vs. Faint-hearted Hylomorphism", 157. Koons says that the proponent of SH should embrace emergent causal powers because she rejects WG. Koons would be more consistent to urge the converse, however. Among SH's principal tenets is a powers ontology: "The natures of substances confer fundamental powers on those substances"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 152. The staunch hylomorphist's belief in fundamental powers is thus part and parcel of her commitment to "the fundamentality of composite substances." But a substance's fundamental powers just are its emergent powers, i.e., powers inhering in a whole substance without being grounded in powers of the substance's parts. The proponent of SH should not embrace emergent powers because she rejects WG; instead, she should reject WG because she embraces emergent powers.

[27] Koons, "Staunch vs. Faint-hearted Hylomorphism", 157.

[28] Koons, "Staunch vs. Faint-hearted Hylomorphism", 163-164. Koons also poses as follows: "Is the whole something over and above its parts? Yes, if we are to avoid faint-hearted hylomorphism, a version of materialism. But if we answer "yes", then how can we ensure that the supposedly composite substance is truly *composed of* some smaller material elements, as opposed to being a wholly separate substance?"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 164.

[29] Koons, "Staunch vs. Faint-hearted Hylomorphism", 172.

Sustenance successfully ties together parts and whole. Therefore, if the hylomorphist can endorse Sustenance, she can also avoid substance dualism.

Sustenance is insufficient to resolve the dilemma, however. The only causes Sustenance refers to are the *x*s whose activities wholly ground *y*'s existence. Therefore, unless supplemented with another condition, Sustenance "runs the danger of falling into a kind of non-reductive materialism, with the whole substance lacking causal efficacy."[30] To remedy what Sustenance lacks, Koons adds a second condition to PASI, i.e., Instrumentation:

> For any composite substance *y*, any causal power *P* of *y* at any moment *t*, there is a proper part *x* of *y* at *t*, a power *P** of *x* at *t*, such that *P** is at least partly grounded in *P*, and the exercise of *P** at *t* would contribute to the natural end of *y*.[31]

Whereas Sustenance demands that a substance's existence *diachronically* depends on its parts, Instrumentation requires that the causal powers of the parts are *synchronically* dependent on those of the whole substance.[32] Instrumentation ties a substance to its parts by insisting that a substance does not act independently of its parts. According to Instrumentation, whenever a substance *y* exercises a causal power *P* for the sake of *y*'s natural end, *y* does so through at least one of its parts *x*, exercising a power *P*∗. As Koons says, "The whole acts because it has a part capable of acting in a certain way, and the part acts or is acted upon because it plays a certain role in the constitution of the whole."[33] PASI thus avoids substance dualism: although some of the *P*s are emergent relative to the *P*∗s, *y* is not a substance distinct from the *x*s and interacting with them, for *y* does not exercise its causal powers independently of the *x*s.

Just as importantly, however, Instrumentation ensures the causal efficacy of the substance *y*. According to Instrumentation, the causal powers of the *x*s do not wholly ground *y*'s causal powers; on the contrary, the grounding relation runs in the opposite direction, with *y*'s causal powers (at least partly) grounding those of the *x*s. If the *x*s bear causal powers in virtue of *y*'s powers, then the *x*s also act in virtue of *y*'s activities. Therefore, Instrumentation ensures *y*'s causal efficacy.

At this point, one wonders how a substance's powers are fundamental relative to those of its parts. Koons proposes that every elementary particle *E* has "primary material powers, that is, powers that, when exercised in combination with suitable powers of other fundamental entities,

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[30] Koons, "Staunch vs. Faint-hearted Hylomorphism", 166. Koons asserts this about Upward Sustenance, another candidate solution to the dilemma upon which Sustenance is based.

[31] Koons, "Staunch vs. Faint-hearted Hylomorphism", 172.

[32] Koons notes, "PASI avoids the problem of circularity that afflicts some versions of emergence"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 172. One thinks, for example, of Jaegwon Kim's criticism of so-called "synchronic reflexive downward causation," according to which, possibly, for a whole *W* having a part a_j that bears a power P_j at a time *t*, an emergent property *M both* emerges from *W*'s lower-level properties (among which is P_j) at *t, and* causes/determines a_j to bear P_j at *t*. As Kim argues, this picture is incoherent, since by the "causal- power actuality principle," the claim that a higher-level property *F* can cause the very conditions from which *F* emerges is viciously circular (Jaegwon Kim, "Making Sense of Emergence", *Philosophical Studies* 95/1-2 [1999]: 28-29). PASI seems tailor-made to avoid precisely this sort of circularity. As Koons explains, "The synchronic dependency is top-down, with the powers of parts grounded in the powers of the whole, while the diachronic dependency is bottom-up, with the later existence of the whole dependent on the earlier activity of the parts. Hence, there is no circularity; instead, the dependency diagram is a zig-zag path, running down at each moment and up as time advances"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 172.

[33] Koons, "Staunch vs. Faint-hearted Hylomorphism", 172.

result in the existence and persistence of a composite substance with certain causal powers."[34] In addition to its primary causal powers, *E* has secondary causal powers "that result from the exercise of their primary powers in various circumstances." *E* has two sets of secondary powers: those it exercises when it is an independent substance and those it exercises when part of a substance *y*. When *E* interacts with other particles such that *y* is generated, all the particles surrender the secondary causal powers they exercised as independent substances. Those powers "migrate" upward where they are merged into *y*'s primary causal powers.[35] *Y*'s primary causal powers then (at least partly) ground the substance's lower-level causal powers in a "stepwise" fashion.[36] Since *y*'s powers partially ground the activities of *y*'s parts, *y* is not causally redundant relative to its parts. In sum, whereas Koons distinguishes PASI from materialism by attributing ECPs to *y*, he distinguishes PASI from substance dualism by tying *y*'s exercise of ECPs to the operations of *y*'s proper parts.

3. EMERGENT CAUSAL POWERS AND SUBSTANTIAL UNITY

3.1 Toner

From the preceding discussions, it appears that Toner's and Koons's claim that possessing ECPs is a necessary condition for substancehood pays off. It permits them to defend restricted composition and to avoid implying causal over-determination. Moreover, it is in principle empirically verifiable whether an object's activities are emergent or wholly grounded in the activities of its parts. Therefore, hylomorphic theories which, like Toner's and Koons's, include TM´, provide an empirically verifiable criterion for judging if an object is a substance or an accidental unity: if a composite bears ECPs, it is a substance; if, instead, it lacks ECPs, it is an accidental unity.

Of course, these results are genuine payoffs only if TM´ is compatible with the principal thesis that Toner and Koons share, i.e., that substances do not have substances as proper parts. In section 3 I argue that TM´ is inconsistent with what hylomorphists traditionally claim about the unity proper to a substance. Hylomorphists conceive of their theory as a *via media* between substance dualism and materialism. While dualism holds that a composite is a conjunction of two independent substances, materialism asserts that a composite is just an arrangement of fundamental particles. In 3.1 I argue that the use Toner's theory makes of ECPs implies

[34] Koons, "Staunch vs. Faint-hearted Hylomorphism", 167. Koons takes elementary particles' primary powers to be even more basic than what physics regards as their most basic properties. He says, "[T]he powers of charge and mass would not be primary powers of the electron but only secondary ones, brought into being only when the electron's primary material powers are exercised in certain ways"–Koons, "Staunch vs. Faint-hearted Hylomorphism", 168.

[35] Since there is empirical evidence that a substance's elementary particles are not powerless, Koons posits another powers transaction: when *E* is part of *y*, *E* exercises its primary powers such that *E*'s secondary powers are similar, yet numerically distinct from those it has when not part of *y* (see Koons, "Staunch vs. Faint-hearted Hylomorphism", 167).

[36] Koons, "Staunch vs. Faint-hearted Hylomorphism", 173. For example, consider a chordate's circulatory power. On Koons's account, the circulatory power grounds the heart's power to pump blood for the sake of the animal's circulation. Descending further, the heart's power to pump blood grounds the power of a cell in the heart's sinoatrial node to produce action potentials for the sake of the heart's pumping action. The stepwise descent of causal powers continues to the level of the animal's elementary particles. Since grounding is a transitive relation, the chordate's circulatory power ultimately grounds the powers whereby the heart's elementary particles contribute to healthy circulation.

substance dualism. In 3.2 I argue that in Koons's theory the commitment to ECPs entails a version of atomistic materialism.

What does Toner take to be the cause of ECPs? Although he does not explicitly say, one infers the answer from some of his other commitments. For example, Toner endorses Kathrin Koslicki's "Neo-Aristotelian Thesis" (NAT): "The material and formal components of a mereologically complex object are proper parts of the whole they compose."[37] For Toner, in addition to their proper material parts, "substances have *structures* as proper parts - or, put another way, they have *formal* parts."[38] Every substance has a formal part, i.e., its substantial form, which structures it by causing its material parts to compose something of a specific kind.

Since there are material and formal parts among a substance's components, a substance's ECPs arise either from (1) the activities of some of its material components, (2) the activity of the structure that unifies the material components, or (3) interaction between the substance's structure and material parts. Obviously, Toner would not admit (1) since (1) entails that none of a substance's powers are emergent relative to the powers of its material parts. Moreover, (3) is equivalent to (2). For suppose the interaction between a substance's structure and its material parts produces ECPs. In that case, the material parts contribute to the production only insofar as they are empowered to do so independently of the structure. Thus, if (3) is true, then what is genuinely emergent, i.e., irreducible to a substance's material parts, about ECPs originates in a substance's structure, i.e., its formal part. That is just to say that (2) is true. According to Toner, then, for any substance *y*, *y*'s formal part *F* causes *y*'s ECPs.

In addition to its ECPs, *y* also has causal powers that are non-emergent. Their exercise consists in *y*'s material parts working in concert. Unlike *y*'s ECPs, *y*'s non-emergent causal powers are unnecessary for *y*'s substancehood. Therefore, to claim that *F* causes *y*'s non-emergent powers would be completely unmotivated. For example, since Mary's digestive power is "reducible" in Toner's sense, i.e., its exercise involves nothing "over and above" the activities of her material parts, to claim that Mary's soul causes her digestive power would be unmotivated. From this it follows that *y*'s non-emergent powers are explicable apart from *F*. This explains why Toner does not insist on Mary's substancehood because she can digest. Instead, he founds his commitment to Mary's substancehood upon her ECPs, e.g., libertarian free will. It is not open to Toner to assert – without the assertion being otiose – that Mary's soul is responsible for the operations of her material parts.

The distinction between emergent and non-emergent causal powers, at least as it occurs in Toner's theory, compromises a substance's hylomorphic unity. For Toner, Mary is a composite of material parts and a formal part. Mary exercises her ECPs independently of her material parts. Therefore, Mary exercises her ECPs exclusively through her formal part. In contrast, as I have argued, Mary's non-emergent causal powers and their exercise are independent of her formal part. She exercises her non-emergent powers exclusively through her material parts. Therefore, the operations of her formal part and those of her material parts are separate and independent of one another. Since "each thing operates according as it exists,"[39] that the operations of Mary's form and those of her material parts are separate from one another entails that her form and material parts exist independently of one another. Mary is not a

[37] Kathrin Koslicki, *The Structure of Objects* (Oxford: Oxford University Press, 2008), 181, emphasis in original; cited in Patrick Toner, "On Aristotelianism and Structures as Parts", *Ratio* 26/2 (2013):151.
[38] Toner, "On Aristotelianism and Structures as Parts", 149.
[39] "Sic autem unumquodque operatur secundum quod est" (Thomas Aquinas, *Quaestiones disputatae de spiritualibus creaturis*, a. 2, resp.).

hylomorphically unified substance; rather, she is a conjunction of separate entities. Koons's worry about attributing ECPs to substances is apropos here. Recall from 1.3 that Koons asks, "If the 'whole' has emergent causal powers, in what sense can it be said to be wholly composed of its parts, as opposed to being a separate entity that interacts with those parts?"[40] For a substance *y*, how is the claim that *y* has powers it does not exercise by means of its material parts compatible with the claim that *y* is a *material* substance? This question is even more pointed for one who, like Toner, claims that *y* is a substance in virtue of having powers it does not exercise by means of its material parts.

One foresees an attempt to answer the charge of substance dualism: admittedly, operations like Mary's digestion are nothing over and above certain of her parts working in concert. Nevertheless, Mary's formal part is responsible for her non-emergent powers insofar as it structures the whole whose material parts cooperate in activities like digestion. As Koslicki explains, a form structures a matter-form compound in three ways. First, it opens positions for the compound's material parts to occupy. Second, it establishes constraints about the kinds of materials that fill those positions. Third, it determines how those materials occupying the available positions are geometrically or topologically configured in the compound.[41] A substance's material parts cooperate in its non-emergent activities only if form structures the substance. Mary can digest breakfast only if her soul calls for her body to include the parts of a digestive tract and specifies the type and configuration of the tract's parts. The same goes for each of her non-emergent powers: although its exercise is nothing over and above activities of her material parts, it depends on her soul to open positions for those parts and to specify their type and configuration. Since a substance's non-emergent powers depend on its form, Toner's distinction between emergent and non-emergent powers does not entail substance dualism.

Unfortunately, this defense requires a radical change in Toner's view of the necessary conditions for material composition. Suppose he answers the charge of substance dualism along the lines I have just sketched. Of course, he does not want the claim that a substance's structure is responsible for its non-emergent powers to be otiose. In that case, since things like worms and sunflowers also digest, Toner must assert that, as in Mary's case, such beings have structures that are responsible for their non-emergent causal powers. According to Toner, a structure is a formal part. Therefore, if worms and sunflowers have structure, they are material composites. But assuming worms and sunflowers lack emergent causal powers, Toner denies that they are material composites. Therefore, the defense of Toner's theory that I have sketched is not available to him.

3.2 Koons

As explained, Parts as Sustaining Instruments (PASI) is Koons's attempt to navigate the dialectical straight between materialism and substance dualism. Unfortunately, PASI entails that a substance's smallest parts are substances, a claim that Koons rejects.[42] In that case, "substances" are not substances, but only accidental unities of tiny substances, and staunch hylomorphism is false.

These bad results follow from Koons's claim that a substance's components have "natures and primary powers" that "do not change when the component is incorporated or

[40] Koons, "Staunch vs. Faint-hearted Hylomorphism", 157.
[41] Koslicki, *The Structure of Objects*, 259.
[42] See footnote 25 for Koons's definition of substance.

extruded by a composite substance."[43] Recall that for Koons an elementary particle's secondary powers vary according to whether it is a substance or a proper part of a substance. Koons distinguishes between primary and secondary causal powers to ensure that PASI does not entail the negation of Aristotle's Substrate Principle, which states that a numerically identical substrate underlies every change.[44] For suppose that an elementary particle has only one set of causal powers. According to PASI, when the interactions of many such particles generate a substance, each particle loses its causal powers. Since "the nature of a material entity consists in a bundle of fundamental or primary causal powers," it follows that the particles change substantially when the new substance is generated. But what underlies the change? Not the particles that existed before the change, for each of them has changed substantially. Not the new substance since it did not exist before the substantial change. Therefore, nothing underlies the substantial change. Therefore, PASI violates Aristotle's Substrate Principle, a bad result. By distinguishing between primary and secondary powers, however, Koons can maintain that although a particle's secondary powers vary, its primary causal powers, i.e., its nature, remain the same regardless of its circumstances. In that case, for any substantial change, there is a collection of elementary particles that underlies it such that every particle that existed before the change is identical to a particle that exists after the change. Therefore, as Koons says, a substance's "lowest level consists of independent parts, the enduring substrate of substantial change."[45]

Unfortunately for Koons's theory, for any object *y* composed of some elementary particles, the *E*s, *y* is a substance only if every *E* assumes a new nature when *y* is generated. To see why, recall what Koons says about the acquisition of form. Faint-hearted hylomorphism takes some objects' acquiring a new form as "merely a matter of their acquiring certain relations or beginning to cooperate autonomously in certain ways." By contrast, for staunch hylomorphism, "[T]he acquisition of form involves a real change in the intrinsic natures of the body's components."[46] Now suppose that, as Koons claims often happens, some elementary particles, the *E*s, interact and generate a substance *y*. For any *E*, after *y*'s generation *E* retains its primary material powers, whose exercise brings *E*'s secondary powers into being. At the same time, *E* loses one set of secondary powers and gains another set. That such secondary powers come and go entails that they are essential neither to *E* nor to *E*'s nature; rather, they are among *E*'s accidental properties. From this it follows that when *y* incorporates *E*, *E* merely undergoes accidental change; the properties that are essential to *E*, i.e., *E*'s primary material powers, remain. Generalizing, one correctly says that when *y* incorporates the *E*s, each *E* undergoes an accidental change. Therefore, the form the *E*s corporately acquire is a mere accidental form. Therefore, *y* is and accidental unity, and not a substance. Since any accidental unity's smallest parts are independent substances, even when they compose *y*, the *E*s are substances.

PASI's collapse into a version of FH follows partly from the Substrate Principle. (*Nota bene*: as I argue below, on another interpretation of the Substrate Principle, it does not entail FH.) In fact, PASI's collapse has more to do with the notion of an emergent power. Koons holds that a material being is a composite substance only if it has ECPs. In virtue of its ECPs, a substance is causally non-redundant relative to its parts. A substance's ECPs emerge when its

[43] Koons, "Staunch vs. Faint-hearted Hylomorphism", 167.
[44] Koons, "Staunch vs. Faint-hearted Hylomorphism", 162. For support that Aristotle is committed to the Substrate Principle, Koons appeals to *Physics* I,7, where Aristotle claims that for each instance of substantial generation and corruption, there is numerically one and the same substrate that exists before and after the change.
[45] Koons, "Staunch vs. Faint-hearted Hylomorphism", 173.
[46] Koons, "Staunch vs. Faint-hearted Hylomorphism", 152.

elementary particles surrender their causal powers. These then migrate upward to the substance taken as a whole. Since the elementary particles obviously do not remain powerless, Koons attributes to each elementary particle primary material powers whose exercise brings its secondary powers into existence. Therefore, Koons's ontology includes both primary and secondary causal powers because his account of the way powers emerge requires them. Since this distinction entails that elementary particles undergo only accidental change when they begin to compose something, it is a sufficient cause of PASI's collapse into a version of FH.

4. A NOVEL MOTIVATION FOR FIRST MATTER

Section 3 argued that positing ECPs as necessary for substancehood threatens substantial unity in two ways. First, it can imply substance dualism. From Toner's view it follows that none of a substance's activities are attributable to the whole substance. Instead, while some of its activities are performed entirely by its form, others are performed entirely by its material parts. If a substance's form and its material parts act independently of each other, and a being acts according as it is in act, then in a "substance" the actuality of form and the actuality of matter are distinct. Therefore, it falls out of Toner's theory that matter and form (or body and soul) are separate substances.

Second, positing ECPs as necessary for substancehood can threaten substantial unity by implying that a substance's elementary parts are substances. As part of the machinery Koons posits to explain how powers emerge, he ascribes a stable nature and primary powers to elementary particles. From this it follows that when an elementary particle is incorporated into a substance, it retains its essence, changing only accidentally. Therefore, the elementary parts of a substance are substances, and a composite "substance" is a mere accidental unity.

Section 4 uses Thomas Aquinas's hylomorphism to motivate first matter in a novel way. Like Toner and Koons, Aquinas denies that substances have substances as proper parts. Unlike them, however, he rejects TM´. I argue that he rejects TM´ because he endorses the doctrine that first matter, i.e., pure potentiality, is a metaphysical part of any material substance, and that this doctrine is incompatible with TM´. In 4.2 and 4.3, I show that first matter and TM´ are incompatible by examining Aquinas's claim that a substance's form is wholly present in each of its physical parts. In that case, the matter that receives a substance's form is more basic than physical matter. In 4.4 I argue that the doctrine of first matter has two advantages over claiming that ECPs are necessary for substancehood. First, it entails that every activity of a substance is an activity of the whole. The hylomorphist thus avoids the threat of substance dualism, unlike Toner. Second, if any material substance has first matter as a metaphysical part, then for any material part *x* of a substance *y*, it is essential to *x* to be part of *y*. For example, an electron that is part of Socrates is essentially Socratic. The hylomorphist committed to first matter thus avoids the threat of atomism, unlike Koons. Hylomorphists keen to explain the unity proper to substances should deny TM´ and instead commit to first matter.

Above I noted that hylomorphic theories which, like Toner's and Koons's, include TM´, provide an empirically verifiable criterion for judging if an object is a substance or an accidental unity. Although I believe that the doctrine of first matter entails that there is such a criterion, showing why is the work of another paper. For now, let it suffice to show that, unlike theories that include TM´, hylomorphisms that include first matter can ensure the *per se* unity of substance.

4.1 Aquinas and TM´

Of course, Toner and Koons are not the first hylomorphists to attribute emergent causal powers to substances. Thomas Aquinas, for example, held that human beings have causal powers which they do not exercise through a bodily organ. For example, he says, "The principle of [understanding] is not a form whose being depends on a body and is bound to matter or immersed in it, because this operation does not happen through a body[…][H]ence, the principle of this operation operates without sharing in bodily matter."[47] Aquinas says the same of the human will.[48] A human being's intellect and will are emergent relative to the powers of her material parts, for when she understands or wills she does something none of her parts do. Nevertheless, Aquinas denies that ECPs are necessary for substancehood. In *SCG* II, 68, he claims that the less a form's operation depends on matter, the nobler the form is. The least noble forms, he says, "are incapable of any operations except those to which qualities that are material dispositions extend […] like the forms of the elements."[49] For example, whatever the form of fire does, it does in virtue of fire's material dispositions, i.e., the hot and the dry. Therefore, fire lacks ECPs. Nevertheless, that Aquinas speaks of fire as having a form entails that he considers fire a substance. For Aquinas, besides intellectual souls, the form of every material substance is "totally encompassed by and immersed in matter."[50] Further, as he says in the same chapter, "Everything operates according as it is." Therefore, for Aquinas, for a substantial form *F* of any non-human material substance *y*, every operation of *F* is encompassed by and immersed in *y*'s matter. But the exercise of a substance's ECPs is not encompassed by matter. Therefore, for Aquinas, human beings are the only substances possessed of ECPs. Therefore, Aquinas denies TM´.

4.2 Form's Presence *in qualibet parte corporis*

To establish that Aquinas denies TM´ is not to explain why he does so. Why doesn't Aquinas take a view akin to that of Toner or Koons? I argue that for Aquinas, TM´ is incompatible with the claim that every material substance has first matter as a metaphysical part. Since Aquinas endorses the latter claim, he denies TM´. To see the incompatibility of the doctrine of first matter and TM´, it helps to examine Aquinas's view that a substantial form is not only in a substance taken as a whole, but also and in a substance's proper material parts taken singly.

For Aquinas, since God and the soul – or, more generally, any substantial form – are both causes of *esse*, a form's way of being in a body is like God's way of being in the universe. Aquinas notes that one entity can be "in" another in the sense that the former causes the latter to exist. As part of his account of God's ubiquity, Aquinas says:

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[47] "Principium autem huius operationis non est forma aliqua cuius esse sit dependens a corpore, et materie obligatum siue immersum; quia hec operatio non fit per corpus, ut probatur in III De anima: unde principium huius operationis habet operationem sine communicatione materie corporalis" (*DSC*, a. 2, resp.).

[48] "Manifestum est autem ex supra dictis quod quaedam operationes sunt animae, quae exercentur sine organo corporali, intellegere et velle" (*STh* I, q. 77, a. 5, co.).

[49] "Invenimus enim aliquas infimas formas, quae in nullam operationem possunt nisi ad quam se extendant qualitates quae sunt dispositions materiae, ut calidum, frigidum, humidum, et siccum, rarum, densum, grave et leve, et his similia: sicut formae elementorum" (Thomas Aquinas, *Summa contra gentiles* II, c. 68).

[50] Aquinas says, "Unde oportet quod illud principium quo homo intelligit, quod est anima intellectiva, et excedit conditionem materiae corporalis, non sit totaliter comprehensa a materia aut ei immersa, sicut aliae formae materiales" (*SCG* II, c. 68).

> Located things are in a place inasmuch as they fill a place, and God fills every place. He is not said to fill a place as does a body, inasmuch as [a body] does not suffer another body [to be compresent] with it. But God's presence in any place does not exclude other beings from being there: on the contrary, he fills all places because he gives being to all located things which fill every place.[51]

God and a body *b* are compresent in a place *p* because they are present in *p* in different ways. Unlike *b*, which is quantitatively present in *p*, God is present in *p* inasmuch as God gives being (*esse*) to all the things located in *p*, and to *p* itself, for that matter.[52] Although two entities with quantity cannot be simultaneously present in the same location, God and *b* can be present simultaneously in *p*, for God causes *b* to exist.

Aquinas entertains the following objection: God does not have parts. From this it follows that if God exists in a place *p*, he exists wholly in *p*. If God exists wholly in *p*, God does not exist anywhere except *p*. Therefore, God is not ubiquitous.[53] Aquinas's response requires distinguishing between a totality of essence and a totality of quantity. A being's essence is divisible only into "rational," i.e., conceptual, parts, "as form and matter are called parts of a composite and genus and difference [are called] parts of a species."[54] Since an essence is not *really* divisible, however, wherever there is an essence, it exists in its totality. Thus, *x* is present in a region *r* according to the totality of *x*'s essence *iff x* is essentially present in *r*. In contrast, if *x* has a quantity *q*, *x* is really divisible in virtue of having *q*, such that *q* is present in its totality only where *x* is present in *x*'s totality. Aquinas remarks that only regarding totality of quantity is it the case that an entity existing wholly in *p* exists solely in *p*. Since some water in a cup is a quantitative whole composed of quantitative parts, and "the quantity of a located thing is commensurate with the quantity of the place,"[55] if the water exists wholly in the cup, it exists nowhere except in the cup.

In contrast, totality of essence and totality of place are incommensurate, such that "it is not necessarily the case that what exists as a whole in one thing by the totality of essence does not exist in any way outside that thing."[56] Totality of essence and totality of place are incommensurate for a form which has quantity only accidentally, e.g., a particular whiteness which has quantity only insofar as it exists in a body having quantity *per se*. *A fortiori*, totality of essence and totality of place are incommensurate for a substance lacking quantity altogether. Aquinas writes, "There is no totality in incorporeal substances, however – either *per se* or *per accidens* – except according to the perfect *ratio* of essence. And, therefore, just as a soul is whole in each part of a

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[51] "Item, locata sunt in loco inquantum replent locum: et Deus omnem locum replet. Non sicut corpus enim dicitur replere locum, inquantum non compatitur secum aliud corpus; sed per hoc quod Deus est in aliquo loco, non excluditur quin alia sint ibi: imo per hoc replet omnia loca, quod dat esse omnibus locatis, quae replent omnia loca" (*STh* I, q. 8, a. 2, co.).

[52] Immediately before the quoted passage, Aquinas says, "[S]icut [Deus] est in omnibus rebus, ut dans eis esse et virtutem et operationem: sic enim est in omni loco, ut dans ei esse et virtutem locativam" (*STh* I, q. 8, a. 2, co.).

[53] *STh* I, q. 8, a. 2, arg. 3.

[54] "Est autem duplex pars: scilicet pars essentiae, ut forma et materiae dicuntur partes compositi, et genus et differentia partes speciei; et etiam pars quantitates, in quam scilicet dividitur aliqua quantitas" (*STh* I, q. 8, a. 2, ad 3 [Ed. Leon., IV], 86).

[55] "[Q]uantitas locati commensuratur quantitati loci" (*STh* I, q. 8, a. 2, ad 3).

[56] "Sed totalitas essentiae non commensuratur quantitati loci. Unde non oportet quod illud quod est totum totalitate essentiae in aliquo, nullo modo sit extra illud" (*STh* I, q. 8, a. 2, ad 3).

body, so God is whole in all things and every single thing."[57] Since God is incorporeal, God lacks quantitative wholeness. He does have essential wholeness, however. Since essential wholeness is indivisible, God is wholly *in* each and every place in the sense that he gives *esse* to each place and to the whole universe.

Like God, a substantial form is a cause of *esse*. A body's substantial form gives a whole body *esse* in two ways. First, it causes a body to exist *simpliciter*, i.e., unqualifiedly. As Aquinas says, "[T]hrough form, which is the actuality of matter, matter is made a being actually and a *hoc aliquid*."[58] For Aquinas, a *hoc aliquid* is a concrete particular, i.e., a substance. Second, the substantial form gives the *hoc aliquid* specific being (*esse specificum*), causing it to belong to a specific kind.[59] Since a cause of *esse* is in an entity whose *esse* it causes, a substantial form is in a whole body in virtue of causing its *esse* in these two respects. Moreover, like God, a substantial form lacks quantitative wholeness.[60] Finally, a substantial form has the sort of essential wholeness that does not admit of degree.[61] Since such essential wholeness is incommensurate with totality of place, a substantial form's invisibility entails that it is wholly present wherever it gives *esse*. For Aquinas, a substantial form gives *esse* not only to a whole body, but also to each of a body's proper parts. He says, "Both the whole body and all its parts have substantial and specific being through the soul."[62] Therefore, a substantial form is wholly present both in a body taken as a whole and in each of the body's proper parts. As Aquinas says, "[S]ince every actuality is in that of which it is the actuality, it is necessary that the soul, which is the actuality of the whole body and of all its parts, is in the whole body and in each part of it."[63]

Nevertheless, the mode of its presence is not the same in the whole and in each part. Aquinas clarifies, "[T]he whole [body's] relation to the soul differs from that of [the body's] parts. For the soul is indeed the act of the whole body primarily and *per se*, but [it is the act] of

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[57] "In substantiis autem incorporeis non est totalitas, nec per se nec per accidens, nisi secundum perfectam rationem essentiae. Et ideo, sicut anima est tota in qualibet parte corporis, ita Deus totus est in omnibus et singulis" (*STh* I, q. 8, a. 2, ad 3).

[58] "Per formam enim, que est actus materie, materia efficitur ens act et hoc aliquid […][O]portet ut essentia qua res denominatur ens non tantum sit forma, neque tantum materia, sed utrumque, quamuis *huiusmodi esse suo modo sola forma sit causa*" (Thomas Aquinas, *De ente et essentia*, c. 2, emphasis added). Elsewhere, comparing the causal efficacy of substantial and accidental forms, Aquinas says, "Et quia forma facit esse in actu, ideo forma dicitur esse actus; quod autem facit actu esse substantiale est forma substantialis, et quod facit actu esse accidentale dicitur forma accidentalis […] Quando enim introducitur forma substantialis, dicitur aliquid fieri simpliciter; quando autem introducitur forma accidentalis, non dicitur aliquid fieri simpliciter sed fieri hoc" (Thomas Aquinas, *De principiis naturae*, 1).

[59] Aquinas says, "[C]um materia sit propter formam, hoc modo forma dat esse et specie materie secundum quod congruit sue operationi" (Thomas Aquinas, *Quaestiones disputatae de anima*, q. 10, ad 2).

[60] Aquinas admits that some substantial forms have quantity *per accidens*, as a particular whiteness has quantity insofar as it inheres in a surface that has quantity *per se*. Aquinas explains, " Set hec est illarum tantum formarum que coextenduntur quantitati, quod ex hoc competit aliquibus formis quia habent materiam similem aut fere similem in toto et in parte: unde forme que requirunt magnam dissimilitudinem in partibus non habent huiusmodi extensionem et totalitatem sicuti anime precipue animalium perfectorum" (*DSC*, a. 4, resp.). Thus, although the substantial form of a primary body or mixture has quantity *per accidens*, the form of an organism does not.

[61] For Aquinas, the perfection of essence admits of greater or less among accidental forms, e.g., surfaces can be more red or less red, but not among substantial forms (see *DSC*, a. 4, resp.).

[62] "[S]et et totum corpus et omnes eius partes habent esse substantiale et specificum per animam, qua recedente, sicut non manet homo aut animal aut uiuum, ita non manet manus aut oculus aut caro aut os nisi equiuoce, sicut depicta aut lapidea" (*DSC*, a. 4, resp.).

[63] "[C]um omnis actus sit in eo cuius est actus, oportet animam, que est actus totius corporis et omnium partium, esse in toto corpore et in qualibet parte" (*DSC*, a. 4, resp.).

the parts in relation to the whole [body]."[64] A substantial form *F* gives *esse substantiale* first and foremost to the substance *y* that *F* actualizes. Therefore, *F* is wholly present first and foremost in *y*. In contrast, *F* is wholly present in a substance's proper parts only insofar as they are ordered to *y*. Aquinas presents the following argument as evidence for the latter claim:

> Since matter is for the sake of form, it is necessary that such matter suits form. Among corruptible things, less perfect forms, which are less powerful, have few operations, for which a diversity of parts is not required, as is clear among all inanimate bodies. But the soul, since it is a form of higher and greater power, can be the principle of diverse operations, for whose performance a diversity of bodily parts is needed. Therefore, every soul requires a diversity of organs in the parts of the body whose [*cuius*] act it is; and the greater the diversity [of parts], the more perfect the soul is. Therefore, the lowest forms perfect their matter uniformly, but a soul perfects [its matter] variously, in order that from dissimilar parts is constituted the integrity of the body whose act the soul is primarily and *per se*.[65]

As already explained, since a substantial form does not have quantity *per se*, it is *per se* indivisible. Therefore, it is wholly present, wherever it is. Nevertheless, a substantial form is a principle of causal powers. A soul, the form of a living substance, is the principle of many causal powers, which it confers on a living substance by perfecting the substance's matter. The diverse causal powers a soul confers require the living substance to have diversely perfected material parts, with each part bearing causal powers according as the soul perfects it.[66] Nevertheless, none of those parts is perfected for its own sake; rather, form perfects each part, fitting it to exercise causal powers for the sake of the whole body. The only being that the soul perfects primarily and *per se* is the living substance, taken as a whole. Therefore, although the soul – or, more generally, any substantial form – is wholly present in each proper part of a substance, it is wholly present primarily and *per se* in the substance taken as a whole.

4.3 Form's Presence *in qualibet parte corporis* and First Matter

For Aquinas, a substantial form thoroughly saturates the substance to which it belongs. It is wholly present not only in the substance taken as a whole, but also in each of the substance's proper parts. This view entails at least two things. First, that first matter is a *meta*physical part of every material substance. Second, that TM´ is false.

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[64] "Set tamen aliter se habet totum ad animam et aliter ad partes eius: anima enim totius quidem corporis act est primo et per se, partium vero in ordine ad totum" (*DSC*, a. 4, resp.).

[65] "[C]um materia sit propter formam, talem oportet esse materiam ut competit forme. In istis rebus corruptibilibus forme imperfectiores, que sunt debilioris uirtutis, habent paucas operationes ad quas non requiritur partium dissimilitudo, sicut patet in omnibus inanimatis corporibus; anima vero, cum sit forma altioris et maioris uirtutis, potest esse principium diuersarum operationum, ad quarum executionem requirantur dissimiles partes corporis. Et ideo omnis anima requirit diuersitatem organorum in partibus corporis cuius est actus, et tanto maiorem diuersitatem quanto anima fuerit perfectior; sicut igitur forme infime uniformiter perficiunt suam materiam, set anima difformiter, ut ex dissimilibus partibus constituatur integritas corporis, cuius primo et per se anima est actus" (*DSC*, a. 4, resp.).

[66] For this reason, Aquinas distinguishes a third sort of wholeness, i.e., according to power (*secundum virtutem*). He says, "Reliquitur autem quod secundum totalitatem essentie simpliciter enuntiari possit esse tota in qualibet corporis parte, non autem secundum totalitatem uirtutis, quia partes difformiter perficiuntur ab ipsa ad diuersas operationes…" (*DSC*, a. 4, resp.). Exemplifying how the soul perfects parts *difformiter*, he says, "[N]on secundum quamlibet suam potentiam [anima] est in qualibet parte corporis; sed secundum visum in oculo, secundum auditum aure, et sic de aliis" (*STh* I, q. 76, a. 8, co.).

To see the first entailment, consider first that for Aquinas there are many sorts of physical matter: the four primary bodies (earth, air, fire, and water) and mixtures of these.[67] Of course, today we know that physical matter is much more heterogeneous: the sorts of matter Aristotle lists as mixtures are divisible into cells, organelles, molecules, atoms, and sub-atomic particles. Are the particles that physicists now regard as elementary in fact indivisible? Maybe not, even in the actual world. Moreover, even if electrons, say, are indivisible, it seems a stretch to insist that, as a matter of metaphysical necessity, matter is ultimately particulate. Setting aside the question of whether there is a fundamental physical level, suppose that for any substance *y* having a substantial form *F*, there are some physical entities, the *p*s, that collectively are the ultimate matter that *F* en-forms. For my purposes, it matters not whether the *p*s are elementary particles, or there is a single *p* that is an extended simple. What matters is that the *p*s are *y*'s potentiality and that *F* is *y*'s actualizing principle, such that the *p*s and *F* together metaphysically compose *y*. Since whatever exists physically exists actually, and since the *p*s, as *y*'s matter, are physical independently of *F*, the *p*s are actual independently of *F*. For example, if the *p*s are elementary particles, then each *p* is actual independently of *F*. Regardless of the nature of the *p*s, although they are potentiality relative to *y*, they are actual *per se*.

But since every *p* is a proper part of *y*, if a substantial form saturates a material substance in the way Aquinas claims, then for any *p*, *F* is *p*'s actualizing principle. Therefore, *p* is not actual independently of *F*. If *p* is not actual apart from *F*, then neither is *p* physical independently of *F*. Therefore, neither are the *p*s collectively the ultimate matter that *F* actualizes. Since *F* actualizes some potentiality or other, and the potentiality *F* actualizes is not any sort of physical matter, the ultimate matter *F* actualizes is metaphysically more basic than physical matter. Since such metaphysical matter is more basic than physical matter, it does not have any form essentially, but is essentially potency to substantial form. In other words, *F* actualizes metaphysical first matter.

In that case, what follows for TM´? According to TM´, a material being is a substance only if it possesses ECPs, i.e., causal powers that are not grounded in the causal powers of its parts. If ECPs are necessary for substancehood, then a substance's non-emergent powers, as upwardly determined, do not depend on its form, and so do not evince its substancehood. But if a substance's ultimate matter is metaphysically more basic than its physical matter, then not only the substance taken as whole, but also its physical matter, i.e., each of its physical proper parts, is an effect of substantial form actualizing metaphysical first matter. As noted earlier, this is precisely what Aquinas says, i.e., "Both the whole body and all its parts have substantial and specific being through the soul."[68] If each of a substance's physical parts has substantial and specific being because of the substance's form, then those parts' causal powers are also among substantial form's effects. Again, as noted earlier, Aquinas's claim is just that: depending on whether it belongs to an elemental, mixed, or living body, a substantial form perfects it matter either uniformly or variously, equipping each part with the powers it needs to serve the whole substance. Therefore, if a substance's ultimate matter is metaphysical first matter, then for any substance *y*, all *y*'s causal powers – including those that are grounded in the powers of its proper parts – evince *y*'s substancehood. In other words, if first matter is a metaphysical part of any material substance, then TM´ is false.

[67] For example, Aristotle lists animals' "flesh, bone, sinew, skin, viscera, hair, fibres, veins" and plants' "wood, bark, leaves, roots" as mixtures–Aristotle, *Meteorology* IV,10, 388a17-21.

[68] "[S]et et totum corpus et omnes eius partes habent esse substantiale et specificum per animam…" (*DSC*, a. 4, resp.).

4.4 First Matter and Substantial Unity

So far 4 has argued that (1) Aquinas's account of how a substance's form is present in each of its proper parts entails that first matter is a metaphysical component of any material substance, and (2) that embracing first matter allows Aquinas to reject TM´. The possession of ECPs is not a necessary condition for substancehood. In 4.4 I argue that unlike those who believe that ECPs are necessary for substancehood, the proponent of first matter can explain why a substance is an intrinsic (*per se*) unity.

In 3.1 I argued that Patrick Toner's theory of emergent substances collapses into a version of substance dualism. If, as Toner claims, possessing ECPs is necessary for substancehood, then the operations of a substance's formal part and those of its material parts are distinct and independent from one another. Since "nothing acts or operates except according as it actually is,"[69] Toner's theory implies that a substance's formal part and material parts exist distinctly and independently of one another.

Like Toner, Aquinas believes that a rational soul endows a human being with ECPs, i.e., intellect and will, whose exercise does not coincide with activities of any bodily organ. Because he is committed to first matter, unlike Toner Aquinas does not regard the rational soul as the principle of understanding and willing alone, however. For suppose that Mary's metaphysical components are a rational soul *S* and first matter. Because *S*'s material correlate is first matter, which is metaphysically more basic than Mary's physical parts, the *x*s, each *x* and all its natural properties are effects of *S* actualizing first matter. As Aquinas explains in *DSC* 4, a soul such as *S* actualizes a diversity of physical parts, conditioning each to act as an instrument of *S*'s powers. For example, because *S* has a nutritive power, it perfects some of the *x*s to contribute to Mary's nutrition. In effect, Mary's esophagus, stomach, digestive enzymes, etc., embody *S*'s nutritive power such that they cooperate in Mary's nutritive activities because of *S*. More generally, each of Mary's physical parts embody one or more of her *S*'s powers, such that whatever role each *x* plays in Mary's operations, it does so because of *S*. For Aquinas, then, it is not the case that *S* carries out some of Mary's activities, i.e., understanding and willing, and the *x*s carry out others, e.g., nutrition. Instead, Mary's soul is the principle of all her activities, including those she performs by means of her material parts. Since everything acts according as it is in act, and a substance's material parts do nothing independently of its form, neither do they exist independently the same form.

Part of the payoff of Aquinas's view appears if one recalls Rob Koons's question about substances that supposedly bear ECPs: "If the 'whole' has emergent causal powers, in what sense can it be said to be wholly composed of its parts, as opposed to being a separate entity that interacts with those parts?"[70] Since, on Toner's view, a substance's formal part contributes nothing to the operations of its material parts, it is vulnerable to the charge that a formal part is "a separate entity that interacts with those [material] parts." No such problem faces Aquinas, however. For him, a substantial form does not interact with a substance's material parts; rather, it causes them to exist. Each of a substance's material proper parts partially embodies form and exercises form's powers. Of course, some forms, i.e., rational souls, have powers they do not exercise by means of material organs. Nevertheless, the selfsame rational soul that understands

[69] "Et quia esse rei proportionatur eius operationi, ut dictum est, cum unumquodque operetur secundum quod est ens…" (*DSC*, a. 2, resp.).
[70] Koons, "Staunch vs. Faint-hearted Hylomorphism", 157.

and wills is simultaneously embodied in a human being's physical parts and acts through them. Therefore, Aquinas's hylomorphism contains not even the slightest hint of dualism.

Aquinas denies that a substance's form is a separate entity interacting with its material parts because he endorses the doctrine of first matter. To see why, recall the scenario envisioned in 3.3, according to which a substance *y* has a substantial form *F*, and some physical entities, the *p*s, that collectively are the ultimate matter that *F* en-forms. In that case, there is no *meta*physical first matter. Moreover, since the *p*s are *y*'s ultimate matter, the *p*s, taken singly, are actual apart from *F*. *F* does not give substantial and specific *esse* to the *p*s, taken singly. In other words, *F* neither actualizes any *p*, nor causes any *p* to have the nature that it does. A nature, of course, is "a principle or cause of being moved and of being at rest in that to which it belongs primarily."[71] If for any *p*, *p*'s nature is the internal principle of *p*'s motion and rest, but *F* is not the cause of *p*'s nature, then *F* is not a principle of acts *p* performs from internal inclination. This does not exclude the possibility that *F* is a principle of some of *p*'s acts, however. But since *F* is extrinsic to *p*, *F* may cause *p* to act only by acting on *p* from without. In other words, since *F* is not internal to its parts, the *p*s, *F* can make a difference to their behavior only by interacting with them. Therefore, unless *y*'s ultimate matter is metaphysical first matter, *F* is extrinsic to the *p*s and merely interacts with them. In that case, the relation obtaining between *F* and the *p*s is not one between form and matter; rather, it is a relation among efficient causes. But *ex hypothesi*, *F* is a formal cause. Therefore, a metaphysic of material objects is "hylomorphic" in name only unless it holds that for any substance *y*, *y*'s ultimate matter is metaphysical first matter.

Recall from 3.2 that positing ECPs as necessary for substancehood can threaten substantial unity in a second way, i.e., by implying that a substance's elementary parts are substances. Recall that Koons seeks to explain how powers emerge in a way that is compatible with Aristotle's Substrate Principle. He thus distinguishes between elementary particles' primary and secondary causal powers. When some particles compose a substance, their secondary powers migrate upward. They retain their primary powers, however. A particle's complement of primary powers just is its nature. Since a particle's nature does not vary when it becomes part of a substance, elementary particles can serve as "the enduring substrate of substantial change."[72] Unfortunately, for the very same reason, when particles are incorporated into a composite, they change merely accidentally. Therefore, elementary particles compose only accidental unities, not substances. If elementary particles have the same nature when they compose a substance as when they do not, then they, and not what they compose, are substances.

Because Aquinas believes in metaphysical first matter, he avoids this bad result. Of course, Aquinas knew nothing of elementary particles. If he is correct about the existence of first matter, however, then even elementary particles are metaphysically composed of first matter and a substantial form. In that case, whenever an elementary particle – or any material object, for that matter – is incorporated into a substance, first matter underlies the change. Suppose a free electron *e* becomes a part of Mary at a time *t*. In that case, Mary's rational soul actualizes the first matter that an electron-form actualized before *t*. As a part of Mary, many of *e*'s causal powers are like the powers *e* bore before *t*. For example, *e* was negatively charged before *t*, and it is negatively charged as a part of Mary. Yet, if first matter underlies the substantial change *e* underwent at *t*, the powers *e* possesses at *t* (and for as long as *e* is among Mary's parts) are not identical to the powers *e* possessed prior to *t*. Instead, Mary's rational soul, which is far more powerful than the electron-form that formerly actualized *e*'s matter, endows *e* with every power

[71] Aristotle, *Physics* II, 1, 192b22-23.
[72] Koons, "Staunch vs. Faint-hearted Hylomorphism", 173.

e wields when it is among Mary's parts. Therefore, if first matter underlies the change whereby *e* becomes a part of Mary, distinguishing between *e*'s primary and secondary powers is unmotivated. More generally, if elementary particles are metaphysically composed of first matter and a substantial form, Koons's distinction between particles' primary and secondary powers is unmotivated. On the contrary, for a composite substance *y* having substantial form *F*, and for any particle *p* that is among *y*'s elementary parts, *F* is *p*'s substantial form and *F* causes all *p*'s powers. Therefore, *y* is an intrinsic (*per se*) unity.

5. CONCLUSION

Both Toner and Koons oppose atomism, i.e., the view that the tiniest physical entities are also metaphysically fundamental. Each correctly insists that in case "fundamental" particles compose a substance, the substance – and not the particles – is fundamental. Where they err, I believe, is in their contention that whenever some particles compose a substance, there is more causal power in the substance than in the particles. As I have been at pains to show, this contention implies that there are powers in the particles that are independent of the substance. Since causal power follows upon concrete existence, if in a particle *p* there are causal powers independent of the substance *y* to which *p* belongs, then *p* exists independently of *y*. (Koons welcomes this implication since he thinks that in virtue of their primary powers elementary particles are a substance's "independent parts," and so can serve as the substrate of substantial change.) But if *p* exists independently of *y*, then *y*'s form does not actualize *p*. Of course, the same goes for all the *p*s that compose *y*. Therefore, *y*'s form is only an accidental form, and *y* is only an accidental unity, not a substance.

In contrast, Aquinas's commitment to first matter entails that none of *y*'s physical parts are metaphysically fundamental. Instead, for any elementary particle *p* belonging to a substance *y*, *p* is an effect of *y*'s form *F* actualizing first matter. Therefore, *F* is the substantial form of *p* as well as of *y*. Since *F* is *primo et per se* the substantial form of *y*, but *F* gives *esse* to *p*, *p* neither exists nor has causal powers independently of *y*. Since the same goes for all the *p*s that compose *y*, *y* is a *per se* unity. In sum, the sure way to defend against atomism is to commit to first matter as a metaphysical part of any material substance.

Happily, as Aquinas shows, avoiding atomism in this way does not mean falling into dualism. Endorsing the doctrine of first matter, one can affirm that some substances bear ECPs without implying that form and matter are distinct substances. Moreover, one can endorse Aristotle's Substrate Principle without implying that a substance's tiniest parts are substances. Insofar as it allows the substance ontologist to ward off both atomism and dualism, her commitment to first matter is amply motivated.

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