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Thomas Aquinas embraces a controversial claim about the way in which parts of a substance depend on the substance's substantial form. The substantial form is responsible for the identity/nature of the parts of the substance such a form constitutes. Aquinas' controversial claim can be roughly put as the view that things are members of their kind in virtue of their substantial form. The aim of this paper will be to defend Aquinas' claim that, every time the *x*s come to compose a *y*, those *x*s have to undergo a change in kind membership. After defending the Thomistic account, I propose that approaching problems of material composition as a Thomist has a significant, oft-overlooked advantage of involving a thorough-going naturalistic methodology that resolves such problems by appeal to empirical considerations.

Thomas Aquinas embraces a controversial claim about the way in which parts of a substance depend on the substance's substantial form. On his metaphysics, a 'substantial form' is not merely a relation among already existing things, in virtue of which (for example) the arrangement or configuration of those things would count as a substance. The substantial form is rather responsible for the identity or nature of the parts of the substance such a form constitutes (Marmodoro and Page 2016, 17–18). Substantial forms thus do not have substance-parts as that which they characterize, i.e. their matter. However, the implication is that if some substances come to compose another substance as proper parts, those things that become parts must *ipso facto* cease to be substances. Conversely, if a material part ceases to compose a substance as a part, that thing will become a substance or a heap of substances. Aquinas' controversial claim can be roughly put as the view that things are members of their kind in virtue of their substantial form. When a part ceases to compose a substance, it ceases to be that kind of thing that it was when it composed its parent substance, and so loses all of the properties or powers that are associated with being a part of that substance.

As an illustration of the implications of this claim, consider the death of Socrates. Aquinas holds that, "the soul … is the form of the whole body and each of its parts. …Thus it is necessary that each part of a man and that of an animal receive its existence and species from the soul as from its proper form."[1] When Socrates dies, all of his parts, his body and his eyes and his skin, cease to have their act of existence and cease to be the things that they were when they composed Socrates. Socrates' corpse does not have eyes or hands or skin, at least properly speaking, because, after the soul leaves the body, "neither eye nor flesh nor any part remains except equivocally."[2] To put it simply, Aquinas' claim results in the implication that, every time the *xs* come to compose a *y*, those *xs* have to undergo a change in kind membership (Koslicki 2008, 147).

This has been called the "homonymy principle," and it follows from Aquinas' view of substantial forms, and specifically from the position that substantial forms inform prime matter, rather than substance-parts. Consequently, a substantial form must account for the determinate actuality of every part of the substance. Yet the homonymy principle has appeared to many to be so counterintuitive as to practically require a belief in the existence of substance-parts of substances. Kathrin Koslicki argues that, if the homonymy principle were true, it would be impossible to explain continuity in change.[3] The aim of this paper will be to defend that the Thomistic claim that substantial forms account for the determinate actuality of every part of a substance is plausible and coherent. After defending the Thomistic account, I propose that approaching problems of material composition as a Thomist has a significant, oft-overlooked advantage of involving a thorough-going naturalistic methodology that resolves such problems by appeal to empirical considerations.

1 Being a Part of a Thomistic Substance

The Thomistic claim about substantial forms would not be controversial merely if it held that parts ceased to be parts when they ceased to compose a substance, or that something became a part when it composed something else.

1 Thomas Aquinas, *Quaestiones Disputatae de Anima* [*QDA*], a. 10, resp. [anima… [est] enim forma et totius corporis, et cuiuslibet partis eius. Unde oportet quod quaelibet pars hominis et animalis recipiat esse et speciem ab anima sicut a propria forma.]

2 *QDA*, a. 10, resp. [neque oculus neque caro neque aliqua pars remanet nisi aequivoce.]

3 This remains true Koslicki (2018, 217–220).

One could think, for this reason, there was a problem if we were to characterize 'substances' merely as those material objects which are not parts of any other. What seems to be missing from my characterization of a substance is the way in which a substance is a properly unified thing, as would result from having a substantial form that actualizes all of that substance's parts, making it one *kind* of thing. Stump points out, for example, that on Aquinas' view of what it is to be a substance, "the ability to exist on its own is a necessary but not a sufficient condition for something's being a substance" (Stump 2003, 42).

Stump attempts to appeal to the contemporary metaphysical concept of emergence as that which sets apart Aquinas' view of substance. But she contrasts her view of emergence with other contemporary views because, "on Aquinas's way of thinking about material objects what can emerge when form is imposed on matter is not just properties but substances" (Stump 2003, 196–197). She defines what it is to be an emergent whole, i.e. a substance: "W is an emergent thing if and only if the properties and causal powers of W are not simply the sum of the properties and causal powers of the constituents of W when those constituents are taken singillatim, outside the configuration of W" (Stump 2003, 43). Non-substances, like artifacts, are nothing more than "the sum of [their] parts" because the properties and powers of such wholes are nothing over and above the properties and powers of their parts (Stump 2003, 44).

Obviously, Stump's claim can be misleading without a further qualification. As Marmodoro and Page point out, emergence is overly permissive as a criteria of substancehood: "There are plenty of examples of material objects having—on account of their structure or external relations—emergent properties or functions that the parts individually do not have, without such objects *ipso facto* being substances" (Marmodoro and Page 2016, 4). Yet Stump's claim is not that it is sufficient for something to be a substance if the parts actually composing some substance lack properties or powers individually which the whole substance possesses. Rather, Stump's claim is that a substance has powers and properties that are not a sum of the powers and properties of the parts that could *potentially* come to compose it. That is the sense of the qualification that these parts must be considered apart from the actual configuration of the whole.

Similarly, Stump's definition would be an insufficient characterization of Aquinas' views if it was understood as presuming this claim: that one and the same thing can come to have properties or powers in virtue of composing another substance as a proper part; or, that one and the same thing can

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lose powers or properties when ceasing to compose a whole and becoming a substance. Such a view would violate Aquinas' homonymy principle. Aquinas' case of the death of Socrates showed that his body could not be identical when it was actually alive and when it was a corpse; "neither eye nor flesh nor any part remains except equivocally."[4] At the moment that Socrates dies, his body ceases to exist and a corpse (or, more accurately, a heap of substances) comes into existence. As all his parts go out of existence when his soul ceases to compose his body, no parts of Socrates are found in his corpse. Socrates' substantial form informs prime matter directly, and the *only* matter that persists over a change of substances is prime matter.

Stump's characterization of a substance as an 'emergent whole' aims to capture this relation by noting that the parts actually composing a substance are not identical with the things that potentially compose it, and similarly for the properties and powers of those parts. A substantial form is precisely that form which accounts for the existence of material substances in general, including those that might be part-less simples, and therefore accounts not only for the composition of some parts into a whole, but for the *matter* of the whole. Aquinas draws a distinction between two senses a material composite can have matter. One is the familiar sense in which a material substance has its *integral* parts, such as my hands or fingers or toes, which are the material parts composing me. These are the 'proximate matter' of a material substance. Another sense is much less familiar. This is the way of considering matter in a general sense as a part of any material composite substance. And Aquinas indeed is known for characterizing this sense of matter as a *potentiality*. This potentiality is what Aquinas calls 'prime matter' (*materia prima*):

> Prime matter is … matter without any form at all, 'materiality' (as it were) apart from configuration. When it is a component in a matter-form composite, prime matter is the component of the configured composite which makes it the case that the configured thing can be extended in three dimensions and can occupy a particular place at a particular time. But by itself, apart from form, prime matter exists just potentially; it exists in actuality only as an ingredient in something configured. So we can remove form from prime matter only in thought; everything which exists in reality is configured in some way. For this reason, Aquinas some-

4 *QDA*, a. 10, resp. [recedente anima, neque oculus neque caro neque aliqua pars remanet nisi aequivoce.]

> times says that form is the actuality of anything. Configuration or organization is necessary for the existence of anything at all; without form, nothing is actual. (Stump 2003, 37)

Aquinas's prime matter is not one obscure material stuff which is a part of every object, an ultimate material substrate of which everything else is a modification (Jaworski 2016, 332). Aquinas is strongly against such a theory, in fact, as he argues that prime matter must not be a special kind of matter, in the sense in which my flesh or calcium are kinds of matter, but needs be devoid of all form. If all material objects had one substratum with its own form, and this substratum was part of every material object, he argues that substratum would be the only true substance and every other object would be a modification of it.[5] It would be an inverse of an atomistic universe, with all everything forming one 'blobject.'

Prime matter is thus not an integral part, but the potential to be a material object, considered apart from any particular actual way something could be a material object by being a member of a determinate kind of thing. The characterization of prime matter as the potentiality for a thing to have location in space-time and extension in three dimensions follows from the fact that Aquinas holds these features as proper to all material objects in general, of any kind. These features of matter in general are not merely a relation, or a feature of our concepts or definitions of matter, but is essential to matter in general; i.e. "…the potentiality of matter is nothing other than its essence."[6] Aquinas' claims about prime matter are therefore claims that what is essential in being a 'material object' is that something has dimensions and spatiotemporal configuration, but not that one has those features in any determinate way. For something to be 'material' is only to have indefinite dimensions and space-time location. Prime matter a role aside from being the principle in virtue of which things have dimensions because, as we will see, prime matter plays a theoretical role in how we should understand certain kinds of material changes. Prime matter is the matter *from* which some set of integral material parts are constituted.[7]

Inasmuch as prime matter is only the potential to be a material substance, Aquinas therefore holds that prime matter could not exist without having a substantial form to give it particular properties and to determine what *actual*

5 See *De Substantiis Separatis,* c. 6.
6 ST I, q. 77, a. 1, ad. 2. See also Wippel (2000, 319).
7 *Pace* Dumsday (2021). See further ST I, q. 66, resp.

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dimensions or location would have. Moreover, Aquinas argues that prime matter alone *necessarily* cannot constitute any particular kind of object, as it is strictly *contradictory* to claim that prime matter to exist without being informed by any substantial form. For prime matter to exist by itself, without the actuality of any form, would be to say that something purely potential could be actually existent yet without being actual in any way. That would be nonsense.[8] All this is to say, in short, that prime matter is a *metaphysical part* of material composites, having a similar kind of relation to a substance as that which a substantial form does: as Aquinas puts it, prime matter is "*incomplete* being without the substantial form" (Marmodoro and Page 2016, 12).

Aquinas' idea can then be put much more simply: substances are the place where the buck stops for existing, being actual, composing, or having properties or powers. Substances are what really exist, whereas parts only have existence insofar as they are parts of substances: "Only the composite whole [viz. a substance] has existence (*esse*), properly speaking. All the other parts of the substance…though things of a certain kind, nevertheless exist only in an improper sense, in virtue of the whole's existence" (Pasnau 2011, 624). Aquinas therefore distinguishes two ways of attributing existence to things either as substances or as modifications 'in' another:

> …existence (*esse*) is attributed to something in two ways. In one way, as to that which properly and truly has existence or exists, and in this way it is attributed only to a substance that subsists *per se*. Thus *Physics* I [186b4–8] says that a substance is what truly is. All those things, on the other hand, that do not subsist *per se*, but are in another and with another—whether they are accidents or substantial forms or any sort of parts—do not have existence in such a way that they truly exist, but existence is attributed to them in another way—that is, as that by which something is—just as whiteness is said to be not because it subsists in itself, but because by it something has existence-as-white (*esse album*).[9]

8 ST I, q. 66, a. 1. Cf.: Quodlibet III, q.1, a. 1, resp.

9 Aquinas, Quodlibet IX (translated by Pasnau (2011), 624), q. 2, a. 2, resp. [Uno modo ut sicut ei quod proprie et vere habet esse vel est. Et sic attribuitur soli substantiae per se subsistenti: unde quod vere est, dicitur substantia in I Physic. Omnia vero quae non per se subsistunt, sed in alio et cum alio, sive sint accidentia sive formae substantiales aut quaelibet partes, non habent esse ita ut ipsa vere sint, sed attribuitur eis esse alio modo, idest ut quo aliquid est; sicut albedo dicitur esse, non quia ipsa in se subsistat, sed quia ea aliquid habet esse album.]

Aquinas therefore defines forms in terms of their role, forms being that in virtue of which something has actual existence in some way: "all that from which something has existence [*esse*], whether that existence is substantial or accidental, is able to be called a 'form'. …and because form makes [something] to be in actuality, therefore form is said to be an actuality [*actus*]."[10] As prime matter lacks any actuality and is essentially a potentiality for being configured by a form, the substantial form of a given substance accounts for everything in terms of which that material thing is a determinate member of its kind, e.g. having essential properties or powers (Stump 2003, 38). According to Aquinas' way of thinking, "there is no such thing as existence beyond the specific ways of functioning manifested by specific kinds of things" (Pasnau 2012, 492). This is why quinas claims that a "substantial form gives being [*esse*] to matter *simpliciter*."[11]

Further, corresponding to the way in which there are two senses as to what the 'matter' is in a material substance, Aquinas distinguishes two senses of what potentiality in a substance that the substantial form actualizes. Even though the matter *from which* every material composite is constituted is prime matter, and "no other substantial form intervenes between [a substantial form such as] the soul and prime matter,"[12] no object is merely actualized prime matter. Instead, the matter *of which* some material substance is composed is its proximate matter, e.g. its integral parts. Hence, the immediate potentiality which the human soul makes actual is a living human body (and all its parts); "the human body is the matter proportionate to the human soul; and it is related to the soul as potency to actuality."[13] Aquinas considers such proximate matter brought into existence by the substantial form as a *particular way* in which the potentiality of prime matter is actualized. Since no one substantial form actualizes all of the potential of prime matter, this is only some specific potentiality of matter that corresponds to the specific actuality that a substantial form brings about: whatever matter, under whatever determinate conditions, that is essential to the kind of substance the form constitutes.

Consequently, integral parts are *actually* what they are only in virtue of composing their substance. The actuality of the parts "is in some sense derived from the actuality of the whole, inasmuch as the whole substance, including

10 Thomas Aquinas, *De Principiis Naturae* (Leonine edition, 1972), caput 1, 5.
11 *Sententia libri Metaphysicae* [*SLM*] (Taurini edition, 1950), 775.
12 *QDA*, a. 9, resp.
13 *QDA*, a. 1, ad 5

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all of its parts, shares in just a single existence."[14] Conversely, every part of a substance, merely by being a part, is something "in potentiality" (*in potentia)* to the substantial form of that substance. And Aquinas draws this conclusion quite clearly:

> … that parts [of a substance] are in potentiality alone is apparent because none among them is separate, inasmuch as, given that all the parts, insofar as they are parts, are united in a whole. For everything which exists actually ought to be distinct from other things, because one thing is distinguished from another by its own actuality and form… But those things, which are taken to be parts, are separated from each other when the whole dissolves, then indeed they are beings in actuality, surely not as parts, but as matter existing in privation from the form of the whole. Just as, clearly, in the case of earth, fire, and air, which, when those are parts of a mixed body, are not actually in existence, but only potentially [existing] in a mixture. When they become truly separated, then they are in actual existence and are not parts. For, none of the elements, before they are arranged (that is, before they are altered in the mixture and become one mixed thing [composed] from those elements), is one [element] with another, except in the sense that a heap of stones is one thing *secundum quid* [i.e. in some qualified sense] and not simply.[15]

Obviously, on this way of understanding forms as being that in virtue of which not only some parts are configured into a composite material substance, but that all of that substance's matter *exists,* it is not easy to see what pluralism about substantial forms could mean. If a substance had two substantial forms, this would be for one and the same substance to exist 'twice over,' and that

14 *QDA*, a. 1, ad 5

15 *SLM*, 1632–1633. [Et quod partes sint in potentia tantum, patet, quia nihil de numero earum est separatum; immo omnes partes inquantum sunt partes, sunt unitae in toto. Omne enim quod est in actu, oportet esse ab aliis distinctum, quia res una dividitur ab alia per suum actum et per formam, sicut supra dictum est. Quando autem ea, quae ponuntur partes, fuerint separata abinvicem dissoluto toto, tunc quidem sunt entia in actu, non quidem ut partes, sed ut materia existens sub privatione formae totius. Sicut patet de terra et igne et aere, quae quando sunt partes corporis mixti, non sunt actu existentia, sed potentia in mixto; cum vero separantur, tunc sunt in actu existentia, et non partes. Nullum enim elementorum antequam digeratur, idest antequam per alterationem debitam veniat ad mixtionem, et fiat unum mixtum ex eis, est unum cum alio, nisi sicut cumulus lapidum est unum secundum quid, et non simpliciter.]

just seems nonsense. Aquinas therefore treats pluralism about substantial forms as a conceptual confusion: "since every form gives a certain *esse*, and it is impossible for one thing to have two substantial existences (*esse*), it is necessary that if the first substantial form coming to matter gives substantial *esse* to it, a second superadded form must give an accidental existence (*esse*)…."[16] Forms either make a substance to exist, simply speaking, or they otherwise configure that substance to exist in some way (e.g. as having a property). And if the substance already exists, any further forms in the substance can only bring about modifications within that already-existing substance; i.e. further forms would not be *substantial* forms.

It is easy to misunderstand Aquinas' claim about parts as in potential to the substantial forms of the substances they compose. Pasnau sees in Aquinas' claim that parts of substances only exist potentially as an attempt "to distinguish a thing from its existence, as if it is one kind of question to ask whether a thing is real, and another kind of question to ask whether it exists" (Pasnau 2011, 627). Pasnau is assuming that Aquinas' view is that one and the same thing becomes a potential thing when it is a part and then is an (actually) existent thing when it becomes a substance, where both potential and actual things are real.[17] But Aquinas is more radical: he is not going to countenance material parts or wholes 'surviving' substantial changes of these sorts. As Koslicki notes of Aquinas' views, "no object that is *not* already part of a whole that is unified under a single form can survive *becoming* part of such a whole; and no object that *is* already part of such a whole can survive *ceasing* to be part of it."[18] So it would be strictly false, on Aquinas' view, that one and the same thing could be characterized at one time as a part and at another as a substance. Potential parts of substances are not the same things that are the actual substances they can become.

Aquinas therefore also treats the view that a substance can have other substances as parts as a conceptual confusion. Having other substances as proper parts is just what it is to be an aggregate, and not a substance. Substantial forms, on Aquinas' view, account for the existence of a substance precisely because they account for the existence of every part of that substance:

16 *In II Sent.*, dist. 18, q. 1, art. 2, corp. [trans. J. Wippel, in "Thomas Aquinas and the Unity of Substantial Form," in *Philosophy and Theology in the Long Middle Ages: A Tribute to Stephen F. Brown* Edited by K. Emery Jr.,R. Friedman, and A. Speer (Leiden, 2011), 122].

17 Pasnau thinks Thomas' response requires appeal to the doctrine of a "real distinction" between "essence and existence" (2011, 626–627).

18 SO, 147.

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> [...] the soul as the form of the body...is united directly to the whole body, because it is the form of the body as a whole and of each of its parts. And this must be maintained, for, since the body of a man or that of any other animal is a certain natural whole, it will be said to be one because it has one form whereby it is perfected, and not simply because it is an aggregate or a composition, as occurs in the case of a house and other things of this kind. Hence each part of a man and that of an animal must receive its act of existing and species from the soul as its proper form.[19]

Notice, however, this way of thinking entails that substantial form is *intrinsic* to the substance and all of its parts. An arrangement, for example, is not something intrinsic to the things arranged, and this is what makes an arrangement an accidental rather than a substantial form—it is only a relation among substances. Aquinas uses the illustration that a mass of bronze coming to be a statue only involves an accidental change or alteration because "the bronze, before the advent of the form or figure, has actual existence and its existence does not depend on that figure…."[20] If the statute's shape were a substantial form, that shape would not only result in the existence of bronze shaped-as-a-statue, but the existence of its matter as well. "A form must be something *of* that to which it gives existence, for form and matter are intrinsic principles constituting the essence of a [corporeal] thing."[21]

Similarly, a substantial form is not like a causal *agent* internal to some parts, e.g. gathering them together or pushing them through space. To say then that a substantial form is that in virtue of which a substance exists or is actual is not to say that the substantial form creates or generates its own material parts. A chemist who makes a new chemical compound by combining the constituents in the right way is bringing into existence that compound, certainly, but in a different sense. Aquinas thinks of a causal agent as making some matter *to have a form*: "corporeal forms are caused… by matter being brought from potentiality into act by some composite agent."[22] This account of causal agency, even though utilizing an act-potency distinction, presumes that forms play a distinct role. The forms are that *in* what is actual, whereas

19 *QDA*, a. 10, resp. (Trans. John Patrick Rowan, St. Louis & London: B. Herder Book Co., 1949)
20 *De Principiis Naturae*, caput 1, 8.
21 *De Principiis Naturae*, caput 1, 8.
22 ST I, q. 65, a. 4, resp. (Trans. English Dominican Fathers)

the agent remains outside of what she actualizes. Whereas the chemist does not become the chemical compound she mixes up, the substantial form and the matter actualized by it "must have one and the same act of existing (*esse*), something which is not true of an efficient cause and an effect to which it gives *esse*" (Wippel 2011, 124).

Aquinas' controversial claim can then be stated more fully as follows: the substantial form not only accounts for the existence of the substance and the composition of other material parts in a whole substance, but for *everything that is essential to the parts*, whether existence or actuality or powers or properties. As we saw, this claim entails that a substance ceases to exist when it begins to compose a part of something else. Then, given that the substance no longer exists when it becomes a part, all of its properties or powers also cease to exist. Similarly, composing a whole with certain properties, like being human, entails that the parts also have certain properties in virtue of being parts. Thus, my hand is a human hand merely in virtue of composing me, but ceases to be a hand when it ceases to compose me.

2 The Puzzle of Parts

Now a puzzle looms. Aquinas' claims about Socrates' hand ceasing to be a hand when he dies, or his body ceasing to be a body, both seem empirically false. Consider a case presented by William Jaworski as a counter-example to Aquinas' theory of composition:

OXYGEN: in a process of respiration, oxygen atoms, as molecular oxygen (O_2), enter a human bloodstream. Those atoms oxidize red blood cells, becoming parts of those cells and, by extension, a human being. After circulating in human blood, those same oxygen atoms are eventually expelled, albeit in a different molecular configuration (CO_2).[23]

If we assume that oxygen atoms, molecules, and human beings are all substances, Aquinas is apparently committed to saying that these oxygen atoms were not the same atoms at every point in this process. As Jaworski puts it: "that atom does not survive being incorporated into me. It is instead replaced by something else—something that perhaps has many of the same characteristics as the original atom, but that is nevertheless numerically different from it" (Jaworski 2016, 118). Aquinas appears therefore to claim that, when those atoms begin to compose a human being, those atoms *ipso facto* cease to exist.

23 I have made the case more specific. See below.

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In fact, Aquinas would be committed to the stronger claim that those atoms *never* existed because they always composed some other substance at every step of the case.

Yet we see no such replacements happening when substances come to acquire new parts; the oxygen atom does not appear to be replaced by a 'token' oxygen look-alike. We could have used radioactive isotopes to 'tag' the atoms within the molecular oxygen and then identify the same two atoms at every point in the process. If these atoms ceased to exist or never existed, how could we track each particular atom, their properties, and their causal powers? Oxygen atoms do not disappear when they compose other molecules, nor do their properties or powers just cease to exist. Cases like OXYGEN are not exceptional or infrequent. When we break up a composite substance, the ingredient substances can come back into full existence, with entirely the same properties they had before they composed anything. Oxygen atoms do not just "pop" into existence when we break up, e.g. H_2O molecules with hydrolysis; the atoms were parts of the molecular structure itself! The Thomist view thus appears straightforwardly empirically false.

This puzzle should not be as puzzling as it might seem. Aquinas holds that substances cannot be parts of other substances, and if an atom becomes a part of a molecule, *ipso facto* that atom ceases to be a substance. Nevertheless, Aquinas does not hold merely that the atom no longer exists. Rather, his claim is simply that the thing that was an atom substance *became* an atomic part of a molecule. For Aquinas, if the oxygen atom was a substance and remained a substance over the event described in OXYGEN, the atom would not compose that molecule but only become, at best, spatially co-located with the molecule. More accurately, as molecules are not separable things from the atoms that compose them, it would be that molecules are nothing more than spatial arrangements of atoms; i.e. molecules are not genuine material objects, but pseudo-objects.

Further, every substance exists in a determinate way, that is, as a member of a kind. If *oxygen atom* and *hemoglobin protein* each are a distinct kind, it is easy to see that the implicit assumption is likely empirically false. When incorporated into an oxyhemoglobin molecule, an oxygen atom is configured differently from when it is not incorporated into a protein. When, in respiration, oxygen atoms are incorporated into the hemoglobin in red blood cells, those atoms bond with the hemoglobin and their structure changes. A free-floating oxygen atom undergoes a series of changes when it bonded with hemoglobin, such that it comes to have different properties and structural

relations to other things (e.g. the hemoglobin—see, for example, Van Kessel 2003, 122). In becoming a part of a protein, then, the Thomistic account holds that the oxygen atom ceases to be a substance when it becomes a structural component of the substance that is the protein. It is no part of the account, *pace* Jaworski's objection, that the oxygen atom is replaced with a completely identical look-alike when it bonds with hemoglobin; instead, the oxygen atom becomes quite different structurally and in its other properties at the moment it becomes a structural component of a protein.

Consider for a moment the simpler case of H_2O molecules. H_2O and O_2 are distinct molecules with distinct properties and powers. These two molecules have distinct properties and powers because they are distinct structurally. Further, their oxygen parts are distinct structurally as well: the oxygen in H_2O has two distinct covalent bonds with hydrogen, and dioxygen's atom parts have a double covalent bond. These kinds of bonds modify the distinct properties of the whole in a way that the whole has properties and powers distinct from other possible configurations, but it is also true that the oxygen atoms being so bonded are distinct in powers and properties from a single free-floating oxygen atom. Thus, an individual atom might react under certain conditions (hydrogen gas will react with O_2 in combustion), whereas in the molecule it does not so react (H_2O does not combust, even as a gas). If each constitutes a distinct kind of substance, it is not clear how molecular oxygen coming to compose a thing of a distinct kind has *not* ceased to be an instance of 'molecular oxygen'.

The only way in which the case of OXYGEN could be a counter-example to Aquinas' theory of composition is if it described a case where something came to compose another without any change of essential properties. First, the case does not plausibly show this, since it is an empirical matter whether there *is* such a natural kind as an 'oxygen atom,'[24] and the atom in the case underwent a great deal of changes that contrast with the way that we ordinarily take an atom to be determinate when it is *not* part of those compounds. Second, it is not clear how such a case *could* disprove Aquinas' views without assuming what it intends to refute. Aquinas' views are that something only counts as an instance of material composition when the parts depend on the whole in a certain way. If the case was taken to describe merely extrinsic changes of spatial location among the atoms, Aquinas would just flatly deny that the

24 Kerry McKenzie has written extensively in criticism of the view that particles are fundamental entities; see McKenzie (2014); McKenzie and Muller (2017) and McKenzie (2011, 244–255).

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atoms composed anything throughout the process. Instead, Aquinas' claim only entails that the atom, when it composes a molecular substance, is at best a derivative property-bearer in virtue of that substance (if it is the right integral part of the molecule to do so), and that any properties it has that result from being a part of a molecule would cease when it ceases to compose that molecule.

In fact, the puzzle of parts is actually not a puzzle about material composition, but a puzzle about what persists over substantial change, or the change of one substance into another substance (there would be *no* puzzle if there were no changes of parts). And Aquinas' perspective, bluntly, is that the wrong place to look for continuity in change is in what it is to be a substance. The right place to account for continuity in substantial change is in the relation among the substances that go into or come out of existence, while carefully distinguishing the material parts involved in the changes. The reason that H_2O can be split into oxygen and hydrogen by electrolysis is not that there was both molecular oxygen and a water molecule spatially co-located at the beginning of the process. Rather, the reason one can split out these two components is because water molecules are such that they can be decomposed into hydrogen and oxygen atoms.

What we should appeal to in order to account for continuity in substantial changes is the actuality or potentiality corresponding to the substance (and its integral parts') ability to undergo the relevant changes. Hydrogen and oxygen atoms are 'potential parts' of water molecules because they are the proximate matter essential to being a thing of the kind 'water molecule.' H_2O does not exist without them. But it is not essential to hydrogen or oxygen atoms to constitute H_2O. Further, we can assume H_2O molecules have distinguishable integral parts such that we can identify the hydrogen and oxygen atomic parts, that is, the parts can have their own properties that they bear in virtue of being parts of that substance (the parts bear properties derivatively). Then we can say that, when the water molecule is decomposed in hydrolysis, there are two senses in which *the same* integral parts are what became one hydrogen and two oxygen atom substances.

On one hand, the matter *from which* they were constituted is just the same matter that came from the molecule because their coming into existence consists in an actualization of that potential—prime matter—that was formerly 'in' the water molecule. They did not 'pop' into existence from nowhere. On the other, the material integral parts of the water molecule were characterized as (derivative) property bearers that had their own internal structures and

properties, in virtue of being essential parts of the water molecule. When the water molecule decomposes into the atoms, the new substances only need to lose those properties that were essential to the whole they composed. We can imagine, for example, the hydrogen atomic part being tagged with an isotope is a property that is accidental to both the molecule and the hydrogen. If they bore any properties which were unique to themselves as the parts, these would be accidental to the water molecule, and could come to characterize the new substances as well. There is nothing preventing the hydrogen atom substance, resulting from the decomposition of the molecule, from likewise being characterized by the isotope tagging.

It might be alleged that, in these cases, "scientists do not claim to be tracing powers, but things that bear the powers" (Pawl and Spencer 2016, 138). But Aquinas' view does not require thinking that all we track are only powers of oxyhemoglobin. Instead, some parts can bear properties insofar as a substance can have a property *in,* or in virtue of, one of its parts,[25] where the whole will be the subject even of accidental properties of the parts; as when, for example, I have the property of 'being wounded' in virtue of my foot being wounded. And one of these integral parts can be such that it can become a numerically distinct substance, bearing that property in its own right, when it ceases to compose the whole. Atomic parts are just like this. There does not seem to be any empirical reason to think that, in tracking an oxygen atom through my body with a radioactive isotope, we need more than Aquinas' account can give: a certain isotope was introduced into my body, and, in virtue of a chemical change, becoming composed as a part of one of my atomic parts; that atomic integral part of me was tracked, in virtue of the radioactive properties now associated with that atomic part, and then the isotope part or the atomic part ceased to compose me, eventually (see further Toner 2008, 281–297).

Yet, Pasnau alleges there is the *inverse* problem of that posed by Jaworski: how to explain the fact that *exactly similar* properties persisting over substantial changes. His example is that the skin color of Socrates can be identical with the skin color of Socrates's corpse a moment after death, and "it seems nothing short of miraculous that, without that form, the corpse retains so many exactly similar accidents" (Pasnau 2011, 585). Here again it is important to note that, while it is true that Socrates' substantial form is that in virtue of which Socrates and his parts are characterized by essentially human prop-

25 Aquinas draws this very contrast between properties and parts. Properties, accidents, are not 'particular things.' But parts, even though they too are dependent entities like properties, can be considered particular things in ways that properties cannot (*QDA*, a. 1, ad. 9).

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erties, Aquinas' claim is *not* that no qualitatively similar kind of property or part, even an *exactly* similar property, could ever characterize anything else.[26] There is no reason that Socrates and Socrates' corpse could not be qualitatively identical in regard to skin color (and Aquinas does say that they could be).[27] Aquinas' view only require holding that Socrates' corpse is not the same substance as Socrates' body and that no essentially human properties 'survive' Socrates' demise.

Some kinds of substances, given their proximate matter, have the potential to become other substances, whereas others have integral parts such that those parts can become substances in various ways. For that reason, organ transplants are not a metaphysical mystery. A heart, when detached and "on ice," is no longer a part of any particular human, although it is suited to become the heart of another person because of its physical characteristics; the heart can retain those properties, while detached, that did not derive solely from composing a human being. E.g. muscular cells are still capable of moving under electric shocks and the whole heart is capable, when reattached, of pumping blood.[28] Nothing about Aquinas' position requires that the heart, when it is *in via* during a transplant, will not be a thing 'suited to beat and pump blood.'[29] All that is required, on Aquinas' metaphysics, is that my heart has undergone some intrinsic, essential change when it ceased to compose my body, such that it is a distinct thing when it is a part of me and when it is not. What we want to know is why, if it is a distinct thing, that the heart outside of my body has apparently very similar properties. On Aquinas' view, the answer is that my heart was just the kind of part that could become such a substance—acquire *that* kind of substantial form—when it was detached from my body, given the proximate matter of which human being from which it was taken was composed essentially included a heart.

In OXYGEN, the relation among the substance kinds to which the oxygen, the hemoglobin, and oxyhemoglobin belong explained the potentiality of the oxygen atom to become a part of oxyhemoglobin. Other things could not compose hemoglobin unless they both underwent some suitable external stimulus *and* were suitable to have potentialities to compose oxyhemoglobin.

26 Quodlibet I, q. 4, a. 1 (trans. Sandra Edwards, *Quodlibetal Questions 1 and 2*. Mediaeval Sources in Translation, 27. Toronto: Pontifical Institute of Mediaeval Studies, 1983).

27 *De Ente et Essentia*, c. 5.

28 *Pace* Pawl and Spencer (2016, 144).

29 I am speaking generally because a detached heart is likely not a substance, but a collection of individual substances (cells).

However, in fact, all of these conditions were met in OXYGEN. Thus, when actualized by some stimulus conditions, the proximity of the oxygen atom to the hemoglobin initiated a chemical reaction of oxidization of that protein, and oxyhemoglobin was composed from those other substances. Similarly, after it comes to compose oxyhemoglobin, that oxygen atom substance becomes an atomic part, typical to oxyhemoglobin and having a certain set of chemical bonds with the protein. Not every oxygen part of any molecule is of such a type as *this* oxygen part of oxyhemoglobin: not every oxygen part bonds with the particular geometry involved in an oxygen part's bond to the rest of the oxyhemoglobin molecule (i.e. an 'end-on bent' configuration in bonding with the Fe_2 parts of that molecule).[30] Yet some other kinds of molecules could have oxygen in the same type of configuration as the oxygen parts of oxyhemoglobin.

An objector might point out that the homonymy principle entailed, for Socrates, that Socrates' eye is no longer an eye after he dies. The objector could then argue that we should not think that "atom" is being used homonymously of the atom substance and the atomic part of oxyhemoglobin: "These are 'atoms' in just the same sense, whether or not they compose anything! Whereas it might be plausible that 'eye' is a functional term for a certain kind of part, and we can imagine it ceases to apply to an eye when it is separated from its functional system, surely atoms are not a functional part of that sort."

In response, first, it seems likely to me that Aquinas and Aristotle treat the aforementioned 'transplant' cases as the organ ceasing to have any biological properties merely because organ transplants were not then medically possible, and they did not know that an organ's cells do not immediately cease to be alive on detachment. Yet, even if we *were* committed to the homonymy principle for all parts, this can be plausible when we specify the nature of the kinds in question. If we assume that kinds are kinds *of substances*, and substances are those objects composing no other, then a kind such as 'oxygen atom" cannot apply to the oxygen in oxyhemoglobin. An oxygen atom as a substance is, by stipulation, something that does not compose anything else, and the oxygen in hemoglobin clearly composes it. As an integral part that essentially characterizes molecules of the kind, the atomic part now belongs to the kind 'oxyhemoglobin' in virtue of composing the whole.

The only thing further the objector might be looking for, as we saw with Jaworski, is *numerical identity* of the thing having the property, at every time it

30 See the case study of carbon monoxide poisoning in Gaffney and Marley (2018, 233–234).

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has the property (whether as a part or a whole). But numerical identity strikes me as something we cannot just *see,* because we characterize the substances (even for Jaworski) in terms of what is essential to them. For something to be numerically identical is to say that it underwent no change in what it is essentially. To say that the atom is 'numerically identical' whether it composes the molecule or not entails both that the oxygen differs in *no* way when it composes oxyhemoglobin, and that oxyhemoglobin is not a kind of molecule. Both seem empirically false.

The atoms in oxyhemoglobin have distinct shapes, properties, and powers from the oxygen atoms composing O_2. If oxyhemoglobin were not a kind of molecule, in addition, then the example could not undermine Aquinas' overall thesis, as the atom only gets spatially located very close to the other. Similarly, if the objector were to insist that numerically identical *properties* characterize the oxyhemoglobin and the oxygen atom that results from its decomposition, even though it is conceded that they are exactly similar, such a response would appear to beg the question against Aquinas that only substances (e.g. atoms and molecules) bear properties. The properties, to be 'numerically identical,' would have to be substances, in Aquinas' sense. If they were substances, however, they could not compose a material object without, necessarily, ceasing to be substances. Thus, it is not clear how to make sense of either attempt to cash out 'numerical identity' in a way that does not beg the question against Aquinas' position.

3 The Plausibility of the Solution

The ontologically-relevant payoff of distinguishing between prime matter and the proximate matter of material parts is that it allows Aquinas to draw a distinction such that he can affirm both that, even though these parts potentially could constitute something else, these parts actually compose a substance's essential parts. On one hand, distinguishing a substantial form as a particular, a metaphysical part of a composite, is to say that the substantial form is not identical with those material parts or the whole they compose.[31] Substantial forms are *particulars* which, in virtue of characterizing some set of material parts, account for why those parts constitute a whole of some kind. It is not a feature of our counting or conceptual schemes that the material *x*s are such

31 *Pace* Scaltsas (1994) Cf.: SLM, 1674, (trans. John P. Rowan, Chicago, 1961.). Compare: Keinänen and Hakkarainen (2017, 139–116); Keinänen (2018, 109–124).

that they compose *y*, but an extra-mental fact about the *x*s that they compose *y,* since they do so by reason of the substantial form that is intrinsic to that material object and all its parts.[32] This is what it is to say that the substantial form is the actuality *of* that substance *y* and its parts, the *x*s, is that each of the *x*s (and the substantial form) are such that they *actually* compose *y* in virtue of something that is essential to them (the substantial form[33]), even though the substantial form is not identical with the *x*s or the *y*.

On the other hand, there remains a sense in which *those* material things, the *x*s, could have composed *z* instead of *y.* Insofar as the *x*s are adequately characterized by being 'material' (i.e. composed of prime matter as a metaphysical part), Aquinas holds that material objects in general are essentially such that they can undergo a change of kind—one material object can serve as matter *from which* we generate the matter of another material object of a different kind because prime matter is just the potentiality of any material object to come to constitute a distinct kind of material object under the relevant conditions (Brown 2005, 79–83). It is not essential to their matter that the *x*s compose *y*, and thus *z*'s parts could be composed *from* the *x*s.

Aquinas does not hold that matter is fundamentally or essentially particulate, and it is apparent now why he cannot think it is. If matter were fundamentally particulate, it would be essential to those particles that they are mereologically simple, and it would consequently be false that they could ever compose a whole object. Aquinas' claims that matter is not essentially particulate does not merely constitute medieval empirical speculation lacking knowledge of the existence of fundamental physical particles, but follows directly from the assumption that there are material composites (and that any arbitrary two or more material things do not compose an object)—that is, that material composition occurs only under some restricted circumstances.

An account of material composition would be involved in an infinite regress if it only specifies the conditions under which some things come to compose a whole without explaining what the things are which *get* composed. This would be akin to explaining what it is to be a bearer of properties, a thing defined in terms of being what bears properties, by appeal to a distinct property of that thing (see discussion in Loux 2006, 84–120). Aquinas' earlier objection to a plurality of substantial forms in one substance is that it involves one in

32 ST I, q. 76, a. 8, resp.: "an act is in that of which it is the actuality: wherefore the soul must exist in the whole body, and in each of its parts."

33 By reflexivity, every part is a part of itself. The form is thus a metaphysical part of itself, itself that in virtue of which it composes the whole as a metaphysical part.

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an infinite regress of exactly the same sort; it infinitely defers the question as to what has the potentiality to be composed or it assumes an ultimately atomistic account of reality as a necessary truth (viz. Peter van Inwagen's account of composition—compare: Renz 2018, 20–36). If matter were essentially particulate, then this would seem to mean that *to be a material object* is just to be one of the particles, that is it *necessary* for the material objects that they be mereologically simple. But this position would involve a confusion between two different senses of what it is to be a material object: being the sort of thing that essentially has integral parts and being the sort of thing that essentially has dimensions, occupying a spatiotemporal location. But it is false that having the sort of thing with dimensions and a spatiotemporal location necessarily entails that all the material objects are essentially mereologically simple.

To put it another way, even though prime matter characterizes every material object, it is only a way to describe the potentiality to be a material object and has *no* essential characteristics at all. Prime matter is thus an explanatory principle in virtue of which it is a contingent matter whether *any* material substance exists—i.e. it is not essential to any material thing, merely in virtue of being material, that it be actual. Consequently, whatever constitutes 'materiality' cannot be something that has any essential properties (neither a property or a property-bearer), but rather that special sort of potentiality that corresponds to the potential to be a material substance: namely, that no material object exists necessarily, but only contingently. Prime matter has to be 'pure potentiality' in this way in order to thread the needle between the views that composition among two or more material things occurs of necessity (Universalism) and that material objects are essentially mereologically simple (Nihilism).

In fact, Aquinas argues that, if there are things having dimensions and spatiotemporal location, they are *by that very fact* composite objects—composites precisely inasmuch as they possess spatial parts: "from the fact that matter has corporeal existence through forms, it immediately follows that there are dimensions in matter whereby it is understood to be divisible into different parts, so that it can receive different forms corresponding to its different parts."[34] Inasmuch as material objects have parts that are spatially distinguished, these are *integral parts*, and we find that distinct integral parts can bear distinct

34 *QDA*, a. 9, resp. (trans. John Patrick Rowan, *The Soul*, St. Louis & London: B. Herder Book Co., 1949).

properties or evince different structures (that is, spatial parts of one object can bear distinct accidental forms). Aquinas' point is that spatial parts of a substance are the right kind of thing themselves to have properties in various ways. We can, for example, characterize one spatial region of the same substance as hot and another as cold, because spatial parts can have distinct properties.

John Heil denies this and argues, to the contrary, that if substances can only have spatial or temporal parts, then that is enough to claim that they are "mereologically simple" (2012, 18–19). The only realistic candidate substances would be particles or fields, whereas macroscopic entities like humans are not (Heil 2012, 19–22; see also Heil 2003, 177–192). This is because fields or particles would not have parts that bear distinct properties from the whole. The whole field has one set of properties borne directly by the field, and all of its spatial parts (considering the field's extension in space way to divide it into spatial parts) have the same properties. Whereas a substance like a field or a particle can have many properties, properties are not parts of those things. Properties are not parts of their substances (Heil 2012, 107). The argument is to the effect that, if Aquinas admits that a material object has integral parts, and these parts can bear properties, then those parts must be substances. Aquinas would therefore be contradicting the shared assumption that only substances are property-bearers.

But Aquinas has not assumed that integral parts of a substance, among which are that object's spatial parts, are bearers of properties *in their own right*. Aquinas just denies this implicit premise of Heil's argument. What is required is a distinction between the fact that some things essentially bear properties and that other things bear properties in a derivative way. That is, there is no contradiction if integral parts bear properties only *accidentally*, i.e. only in virtue of composing something that is *essentially* a property-bearer, a substance. When my hand is white, then *I* am white with respect to my hand. My hand is not a property-bearer in its own right, but bears properties only in virtue of being a part of me. Yet, understanding integral parthood in this way such that integral parts bear properties in an only accidental way, we not only can divide an object according to its spatial dimensions—top half, right half, etc.—but also in terms of the way in which each distinct part can bear distinct properties, or have a power, or be structured.

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4 Conclusion

The reason that Heil restricts the parts of objects to merely spatio-temporal parts, however, seems independently motivated. At root, the difference lies in how to identify or classify which things are the genuine material objects, and so which things are the genuine parts or properties of them. Stump's elaboration of the phenomena associated with 'emergence' in contemporary metaphysics aims to make it plausible, with appeal to empirical data, that there exist properties that come to be seated in one whole, rather than merely a collection of substances. These properties are not such that they could be merely the properties of a complex of substances, but must be of an emergent whole. By contrast, Heil is inclined to hold that the scientific data shows that the world is perhaps fundamentally composed only of fields, or that they are the only things which qualify, empirically, as having properties.

Further, Aquinas' substances are emergent wholes in the sense that the whole is not identical with the ingredients that lead to their emergence, because he believes substantial change of one substance into another is possible. [35] Heil would likely disagree with the terminology of 'emergence' because, e.g. it is not clear the circumstances under which two fields could come to compose a distinct object. One field does not appear to be the thing that could become another field. Heil's vision then seems to entail that there is only accidental change among the fields that exist.

35 Even if Aquinas were wrong about the substantial change of macroscopic entities, the claim becomes far more plausible in the subatomic world. The identities of some physical particles appear inseparable from the physical systems they form—for example, when electrons become "entangled" in a quantum state. Aquinas could hold that these states are, in fact, hylomorphic composite substances, without any parts other than spatial and temporal parts. Electrons appear to cease to exist (except "virtually") in these states they compose. As with the way Aquinas elsewhere treats an Aristotelian homogenous "mixture", cf.: *De Mixtione Elementorum*, electrons still relate to the subsequent entangled state in virtue of a mathematical "structural" correspondence between the individual quantum state (and powers/properties) of the electrons before their being entangled and that state after they are entangled. This way of considering particles allows us to hold that particles are substances in certain circumstances, even if these particles can come to compose entangled quantum states. This would entail realism about the quantum wave-function The relation of particles as substances to the quantum states would be composition, and of the quantum state to the distinct particles which result from a "collapse" of the wave-function would be decomposition. The issues here are obviously highly simplified. See further, Ney and Albert (2013). And it seems to me that there are philosophical accounts of the metaphysics of the wave function already being proposed that are compatible with my loose characterization: cf.: Gao (2017). Robert Koons appeals to Aquinas in this way in Koons (2018).

Yet Aquinas is not claiming that it is necessarily the case that there are material objects, but only that there would be no problem of material composition if there were no material objects. From Aquinas' perspective, if the scientific data shows us that the world is built entirely from fields, and fields are things that entirely lack spatial parts and spatiotemporal location, then it would merely be the case that the existence of spatiotemporally-located objects is merely *apparent.* (Of course, one would need to explain how the fields exist and how these fields generate the apparent spatiotemporal world). The point is that, once we admit that there are objects that have spatial dimensions, we are committed to the fact that there exist material composites and, subsequently, we can pose questions as to the way in which their composite parts compose one whole. Consequently, if there are material objects with parts, they at least that bear the property of being a *y* such that the *x*s compose it, and so these are all *ipso facto* going to be the kind of thing that can bear (one or more) properties by reason of the kind of thing they are.

But this points to an advantage of Aquinas' account of substances. What fills out the account, beyond the claims he makes about matter and form composition, is the way in which Aquinas thinks we discover and identify the natural kinds. Picking out the things with substantial forms thus requires us to identify *the causal process* by which some things are modified in order to become a whole. There are real differences among the causal processes that might produce distinct kinds of substances or parts. The account in fact rests the nature of what resolves the problem of material composition on the extra-mereological considerations that should lead us to hold that some causal processes produce (or lead to the destruction of) instances of a natural kind. A causal process produces a substance, for instance, when that process brings some things together as parts such that the things that are the parts of the resultant substance cannot be described as essentially the same as the things that became those parts. Conversely, the process that leads to a destruction of a substance is one in which that substance 'loses' some essential part or property over the course of the change and, *ipso facto*, ceases to exist. Even a 'brute' theory of composition on which there is an infinite series of conditions under which the *x*s compose *y* can be hylomorphic if those conditions are interpreted as corresponding to different natural kinds of object; there would be no conflict with hylomorphism's account of the nature of material composition if there were infinitely many natural kinds, even if there might be some other good reason to think it is impossible for there to be truly be an 'infinite' number of such kinds (Markosian 2007, 19). The account

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of natural kinds therefore tells us which are the things that have substantial forms, and so are the 'genuine material objects.'

This Thomistic way of approach material composition makes an empirical, scientific method for identifying the substances by appeal to facts about causal processes a promising one. What it *means* for a thing to be unified is to be a member of a natural kind, to be a material object of a determinate nature.[36] Whether an atom comes to compose a molecule, for example, is determined by whether that atom's essential properties changed in virtue of becoming an apparent part. These give us those criteria in virtue of which there is unity among the molecule's atomic elements, quarks, and electrons. And those criteria for molecules are of a very different sort from the criteria for other substances. Different natural kinds exemplify different kinds of unified causal powers or activities among the parts; it would be impossible to give a general characterization of what that unity consists in, in general, without a minimal account of the natural kinds. Different natural kinds exemplify different essential activities or properties or powers or structures, and so their parts are unified according to different criteria.

In the Thomistic picture, then, the role that the form has in unifying some parts into a whole depends on *the rights kinds of changes in virtue of which some object changes kind membership* and thereby becomes a part of another thing of a distinct kind. That is, if substances can never compose other substances as parts, things must cease to be members of one kind and become members of another kind at the time they become parts.[37] For human beings, the unity among our parts is explained by facts about our organic chemistry as animals of a special sort. Captain Hook, as a human, is a living, organic thing of a particular natural kind *human being*, where his parts are unified by bio-chemical bonds and various bio-organizational interactions. That in virtue of which all of his material parts are of the same kind *human being* is what makes those parts belong to Hook, but Hook is neither identical with his kind (the essence of *human being*), nor is Hook merely that which makes him a member of the kind or all his parts human (his soul). Rather, Hook is a substance formed of his material parts, suitably informed and united by his soul. His hand, Captain Hook loses his hand to the crocodile *because* that

36 One should note the way this account is similar to the way in which Jansen criticizes and modifies Kit Fine's account of embodiments around the notion of a sortal: see Jansen (2019)

37 Koslicki recognized this implication, where she notes that accepting Aristotle's Homonymy principle requires that, if a substance becomes a part, "any such transformation would essentially involve a change in *kind membership*…" (SO, 147).

action causes his hand to cease to have the right bio-chemical bonds and interactions, so that Hook's substantial form ceases to be something Hook shares in common with that piece of matter that formerly was his hand. When Captain Hook acquires a hook made of iron and wood, and puts the hook in the place of his hand, that hook is not a part of Captain Hook because the hook is not changed into the right *kind* of thing that could be a part of his living, organic body. His substantial form cannot overlap the hook, because the substantial form just is that in virtue of which Hook is a biological organism of a kind, and the hook is not the right kind of thing to be part of a biological organism.[38]

In sum, on the Thomistic theory, the only way to determine the way in which a substantial form accounts for the unity of the parts of a substance is to determine the nature of the substance in question. This seems the best reason to commend the Thomistic account of substantial forms. Questions about the unity of material objects can be resolved to a certain degree at an abstract, metaphysical level, but are fundamentally a matter to be resolved through empirical investigation. Hylomorphism of the Thomistic sort appeals to forms to explain material composition, but what and how a form accounts for the composition of a substance depends on the *kind* of the substance it informs. This reliance on natural kinds grounds answers to 'what it is in virtue of which the *x*s compose *y*' soundly on empirical concerns; the question of what kinds there are, or their properties, can be given a fully satisfactory answer only in tandem with scientific investigation.[39]

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38 For example, a human being *could* digest iron and make it part of its organism, but the hook as-is has not been digested or appropriately modified to form part of Hook's body. The same would be true of any sophisticated prosthetic; as long as these are such that they are not 'biologically continuous' with the human organism, they are not parts of that organism except in perhaps an extended or metaphorical sense. By contrast, if we created a biological replica of Hook's hand, growing a cloned set of Hook's cells and structuring them in an appropriate way, then attaching such a biological prosthetic *would* be able to become part of Hook's body (if it was not rejected by his immune system, etc.).

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