Non-Concrete Parts of Material Objects

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This article offers a novel solution to the problem of material constitution: by including non-concrete objects among the parts of material objects, we can avoid having a statue and its constituent piece of clay composed of all the same proper parts. Non-concrete objects—objects that aren't concrete, but possibly are—have been used (by Bernard Linsky, Ed Zalta and Timothy Williamson) in defense of the claim that everything necessarily exists. But the account offered shows that non-concreta are independently useful in other domains as well. The resulting view falls under a 'non-material partist' class of views that includes, in particular, Laurie Paul's and Kathrin Koslicki's constitution views; ones where material objects have properties or structures as parts respectively. The article gives reasons for preferring the non-concretist solution over these other non-material partist views and defends it against objections.

1 Introduction

Asked to list a tree's parts, we will likely mention its roots, trunk, branches and leaves. But philosophers have thought the list should include things that are less familiar. 'The tree at 12 noon' and 'the tree at 12:01pm', some say, refer to distinct temporal parts of the tree. Others have claimed its properties, or its tree-structure are parts. Why the push for more parts? One central reason[1] is the ancient problem of material constitution: a statue and its constituting clay seem identical since they share all the same parts, yet they also seem non-identical since they differ in properties. There have been numerous solutions proposed to this problem. But the solutions considered in this paper belong to what I'll call the 'partist' class. These views agree that composite objects that share all the same proper parts are identical, yet they argue that the statue and constituting clay in fact differ in proper parts. This being so, we can resist identifying them with each other.

The different partist solutions are naturally divided into two categories: *material* and *non-material* partisms. The former category, which includes Worm Theory (e.g., Lewis 1986; Heller 1984) and Modal Parts Theory (e.g., Yagisawa 2010), says that material objects only have material parts. The latter category of views denies this. Most prominently, this includes Laurie Paul's (2002, 2006) bundle theory on which material objects have their properties as parts and Kathrin Koslicki's (2008) hylomorphism on which an object's structure is a part of the object (see also Wallace 2014b). Notice that I don't include Endurantism or Stage Theory in either category since they aren't *partist*; that is, they don't have constitutionally-related objects differ in parts. They might differ in counterparts, but that's not the same as differing in *mereological* parts. (Perhaps Andrew Graham's (2015) Actualist Five-Dimensionalism isn't a partist view either.[2])

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[1] Vagueness as a linguistic phenomenon has also been a strong motivation for temporal and modal parts (e.g, Sider (2001) and Wallace (2014a)). Such a motivation can also be given for non-concrete parts. But it's not really a *separate* argument for such parts, since we only arrive at them if we assume—as the problem of material constitution presents things—that no two objects can share the same proper parts. Without this assumption, we only get the conclusion that there are multiple coinciding objects with different temporal or modal properties.

[2] Graham's Actualist Five-Dimensionalism is like Modal Parts Theory, except that only an object's *actual* modal proper part exists (if he wants to say the same for an object's *present* temporal part, then it's not a partist view).

The primary aim of this paper is to present a novel kind of non-material partist view that includes *non-concrete* parts in material objects. The idea of a non-concrete object is a more recent one stemming from the work of Bernard Linsky and Edward Zalta (1994) and Timothy Williamson (2002, 2013). For them, a non-concrete object is essentially much like an abstract object, the main difference being that it only *contingently* fails to be concrete. Thus, such an object won't have mass, location or causal abilities, nevertheless there's a possible world in which it does have those properties.[3] Though Williamson *et al*. posit such objects to help make sense of Necessitism[4]—the thesis that necessarily, everything necessarily exists—the view I offer doesn't require Necessitism to be true.

I will also present the virtues of the non-concretist solution. I will first briefly explain why problems of material constitution motivate non-material partist views in general; but my focus will then be on comparing the non-concretist solution to the other non-material partist solutions and explaining why the former is to be favored. The structure of the paper is as follows: in §2 I further spell out the problem of material constitution and the motivation for non-material partist solutions. In §3 I explain how the non-concrete partist view works, and present problems for Paul and Koslicki's non-material partisms in §4. I end by responding to objections to the non-concrete partist view in §5.

2 Proper parthood and material constitution

Here I present the motivation for non-material partisms from material constitution. The motivation involves controversial assumptions. But since these assumptions have been defended at length in the literature, I will be brief here and attempt only to present the assumptions and highlight some of the reasons for them.

The notion of proper parthood is a familiar one. The relation is irreflexive, asymmetric and transitive. And though objects can partially overlap—such as in the case of two intersecting roads—it seems impossible for them to *completely* overlap. That is, the following seems true:

Extensionality
$\forall x \forall y$(If x and y are composite objects with the same proper parts, then $x = y$).[5]

This might make it sound as though his is a Worm Theory where a tree, say, is identical to some temporally extended worm—it's not *modally* extended since there are no other modal parts to be extended over. Yet this isn't quite right either. On his view, a tree isn't *identical* to its longest temporal part (its actual modal part)—such a temporal part is world-bound, but the tree is not (p. 18). Graham's view turns out to be an unhappy middle ground between Modal Parts Theory and Worm Theory since it doesn't avoid non-identical completely overlapping objects. A tree and its actual modal part are distinct (unlike Worm Theory), yet they don't differ in parts (unlike Modal Parts Theory) since the tree doesn't have any other-worldly parts.

[3] At least this is true of the class of non-concrete objects I'm interested in. This is in contrast to the suggestion that there might be non-concrete objects that, when concrete, would just be 'pure spiritual beings'—that is, conscious non-material objects.

[4] Necessitism implies that the Eiffel Tower, for example, couldn't have failed to exist. Yet it would be absurd to say that in every possible world *someone builds* the Eiffel Tower. Instead, we should think that in worlds in which it isn't built, it's simply a non-concrete (and existent) object.

[5] This formulation taken from Varzi (2008).

For instance, take two roads A and B. They are composite objects since they have proper parts—such as the bits of concrete each is made up of. But if A and B have all the same proper parts, Extensionality implies that the roads are *identical*.

Extensionality was thought of as so obvious, that it was treated as axiomatic in the earliest rigorous formulations of the principles of mereology, as found in Leśniewski's work (see Barnett's (1992) translation) and Leonard and Goodman's (1940).[6] Many others have since denied the principle, citing cases of constitution—e.g. a statue and its constituent piece of clay—as violations. But such a denial is difficult to maintain. We would have distinct material objects exactly occupying the same region of space. Some problematic issues (cf., Lewis 1986, p. 252; Zimmerman 1995, pp. 87-90; Sider 2001, pp. 154-156) then arise: why doesn't the one object 'crowd out' the other? And if the objects individually weigh ten pounds, why don't they combine to weigh twenty?[7] (There might also be a further problem for explaining an object's modal and sortal properties in terms of its non-modal and non-sortal ones; see section 5 for further discussion). For these sorts of reasons, I will here assume that we should preserve Extensionality.

Partists think the best way to preserve Extensionality in the face of material constitution is to attribute more parts to material objects.[8] For instance, Worm Theorists attribute temporal proper parts to them. The statue David, which is created out of the pre-existing piece of clay Clump, will lack some temporal parts that Clump has. Likewise, David and Clump wouldn't occupy the exact same space*time* region; in which case material constitution is just as unproblematic as *partial* overlap. However, simply adopting a Worm Theoretic view doesn't solve the essential problem. As Alan Gibbard (1975) points out, there are possible cases where the statue and its constituent clay come into and out of existence at the same times—i.e. the coincidence is *permanent*. Thus, the statue and piece of clay—call them 'Davey' and 'Clumpy' respectively—would share all of their spatial and temporal parts. Yet Davey wouldn't be identical to Clumpy since only the latter could survive being smushed into a ball.

In response, Worm Theorists have gone one of two ways. The first is to identify Davey and Clumpy and use counterpart theory to account for the difference in modal properties (e.g., Heller 1998). The second is to appeal to *modal* parts—material objects aren't spread out only in space and time, but also *across worlds* (e.g., Yagisawa 2010). In this case, Davey and Clumpy differ since Clumpy has a concrete spherical object in a concrete merely possible world that Davey lacks. But there are many reasons one might be dissatisfied with these options.[9] Non-material partists think better answers are found elsewhere.

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[6] Lesniewski's Axiom IV reads "If P is a class of objects *m*, and P_1 is the class of objects *m*, then P is P_1" (Barnett 1992, p. 136). Given his definition of a 'class of objects *m*' (p. 135), the phrase is synonymous with what we would now call a 'mereological sum of *m*'. Leonard and Goodman use the notion of two objects being 'disjoint' to define mereological notions. Their principle 1.12 essentially says: for any *x* and *y*, if everything disjoint from the one is disjoint from the other, then $x = y$. (1940, p. 49)

[7] Defenders say that, unlike a person trying to walk through a wall, the coincidence in question would be unproblematic since the objects would share the same parts (Wiggins 1968, Moyer 2009). The point seems to be that the composite objects don't themselves have mass, but must 'borrow' mass from its parts. Zimmerman (1995, 89) thinks this is mysterious since composites are physical objects themselves—as opposed to sets of material objects—so should have mass intrinsically. A second problem is in identifying *which* objects have mass in their own right; it couldn't just be the objects at the 'lowest level' since this wouldn't make sense of gunky worlds. (See also Eddon's (2010) response to Moyer.)

[8] Of course partism isn't the *only* way to preserve Extensionality. For presentation and criticism of many of the alternatives, see Sider's (2001, ch. 5) and Hawley's (2001, chs. 5 + 6).

[9] Counterparts might seem irrelevant for *de re* modality (Kripke 1980, p. 45 n. 13; Plantinga 1974, p. 116), counterpart theory might be semantically inadequate (Feldman 1971, Plantinga 1974, p.108-14) or its use of mind and

3 Non-concrete parts

I propose that we instead think of material objects similar to Modal Parts Theory. But where the Modal Parts Theorist has non-actual concrete parts, I prefer *actual non-concrete* parts. I intend to use the phrase 'non-concrete object' the way Williamson *et al* do: it designates objects that aren't concrete—they don't have mass, location, causal abilities, etc.—but are possibly concrete. (Though, reader beware, I do consider a modification to the nature of non-concreta in section 5.) On the other hand, I intend the term 'non-material' to be *neutral* about whether or not the object is possibly material or concrete (as when I classify views as being 'non-material partist'). Let's call the view in question Non-Concrete Partism.

For a better intuitive grasp of it, a simple illustration of the view along the temporal dimension and comparison to Worm Theory is helpful. Consider the tree in my front lawn, Titan, and its development from a mere sapling to a full-grown tree. We can pictorially represent how Worm Theory spells out the metaphysical story of Titan's growth in Fig. 1.

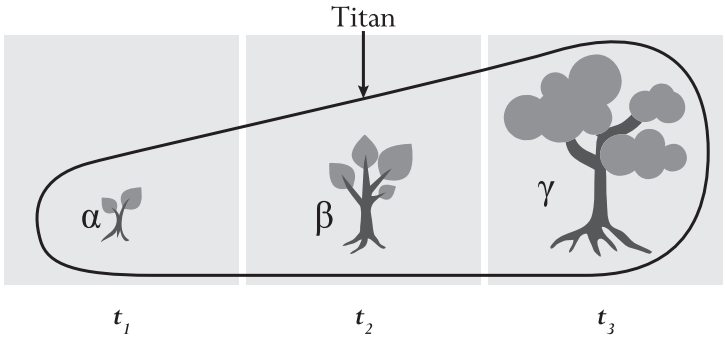

Fig. 1 α, β and γ are Titan's temporal parts; Titan is the fusion of these—represented by the encircling figure

Non-Concrete Partism, on the other hand, is represented by Fig. 2.

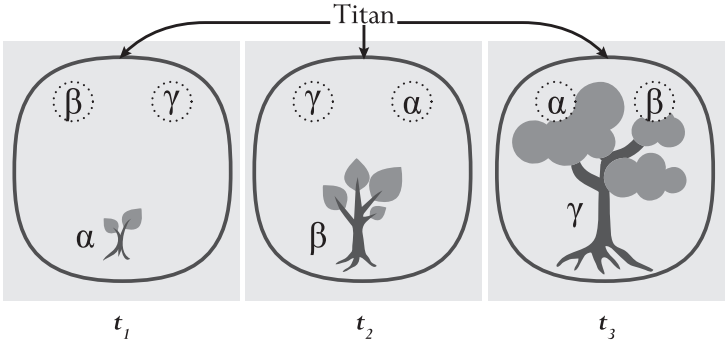

Fig. 2 Titan has α, β and γ as parts, but unlike Worm Theory, α exists and is part of Titan not only at t_1, but also at t_2 and t_3; nevertheless, α is *concrete* only at t_1

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context-dependent modal properties—which are essential to its solution to the problem of material constitution (Graham 2015, p. 19)—might be found objectionable (Merricks 2003, p. 528-30, Paul 2006, p. 643). For Modal Parts Theory, one might object to its commitment to concrete non-actual worlds (for why should concrete objects spatio-temporally disconnected from us be considered 'non-actual' or 'unrealized possibilities'? (van Inwagen 1986, p. 199 and Stalnaker 1976, pp. 69-70)), its commitment to timeless/worldless parts (van Inwagen 2000, pp. 440-443, Olsen 2006), having one's consciousness spread out across worlds (see Yagisawa 2010, p. 116 for discussion), or its license of immoral behavior (Heller 2003).

On Non-Concrete Partism, material objects have parts that are *like* temporal parts since they are *concrete* for only a moment. But they are unlike temporal parts since they exist and are *part* of the object at every time where the object exists. In other words, on Worm Theory, objects persist through time by having different temporal parts; but on Non-Concrete Partism, though objects have all the same parts at each time, what differs is which is *concrete*.[10]

To spell out the view in more precise terms, I need to clarify three notions. First, a 'wholly concrete' object is a concrete object that has only concrete parts. On the current view, Titan, though concrete, doesn't count as wholly concrete. Second, I will talk of 'time-world coordinates', which can be written as '(t, w)', where only instants of time are substitutable for 't' and possible worlds for 'w'. These coordinates therefore pick out a particular instant at a particular world. Finally, let's say that 'x's coordinates' are those coordinates at which x is concrete (even if only partially). The view then is this:

Non-Concrete Partism
Necessarily, for each material object x, and each of x's coordinates (t, w), there is a y that:
(i) has as parts at (t, w) all and only the wholly concrete objects that are part of x at (t, w),
(ii) fails to be concrete (even partially) at every coordinate other than (t, w), and
(iii) is a (concrete or non-concrete) part of x at each of x's coordinates.[11]

Notice that if we subtracted conditions (ii) and (iii), the principle would be compatible with Modal Parts Theory.[12] Adding condition (ii) ensures that the objects posited in (i) are 'time-world-bound'. That is, they are concrete (and wholly so) at only a single time-world coordinate. (Notice that these time-world-bound parts are analogous to Modal Parts Theory's temporal slices of modal parts.) And (iii) ensures they are parts of material objects at all times at which the material objects in question exist.

Consider now how this view addresses the material constitution problem. As a warm-up, let's start with the David-Clump case where the coincidence is only temporary.

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[10] The claim that objects don't lose or gain parts might seem implausible. But we should notice that even if claims such as 'Leafy the leaf is part of Titan at t_1 but not t_2' aren't strictly speaking true on Non-Concrete Partism, neither are they strictly speaking true on Worm Theory either. On Worm Theory Leafy is temporally 'too big' to be a part of Titan (or to fit into t_1). Nevertheless, Worm Theorists can analyze the claim as: Leafy has a t_1 temporal part that is part of Titan, but Leafy has no t_2 temporal part that is part of Titan. (Even though only a *proper part* of Leafy, and not Leafy itself, is a part of Titan, Heller (1984, 328-9) points out that proper parts can ordinarily characterize the whole object in this sort of way. If Whitey, the piece of paper, were put in a drawer with a corner sticking out, it would be (loosely speaking) true that 'Whitey is in the drawer' despite the fact that (strictly speaking) only a proper part of Whitey is.) Non-Concrete Partists can adopt a similar strategy. That is, the claim can be analyzed as: Leafy has a t_1 time-bound part that is part of Titan, but Leafy has no t_2 time-bound part that is part of Titan. A time-bound part of Leafy at t_1 is an object that overlaps all and only the wholly concrete things (things with only concrete parts) Leafy overlaps at t_1 and is concrete at no other time.

[11] Note that 'part' in (iii) should not be understood as 'proper part', otherwise a material object that is concrete at a single time-world coordinate would be a proper part of itself.

[12] It wouldn't exactly be Modal Parts Theory since it wouldn't imply that the things that would be a part of an object in some merely possible world do in fact *exist*. (That is, if we make the Contingentist assumption that $\Diamond\exists x\mathrm{F}x$ doesn't entail $\exists x\Diamond\mathrm{F}x$.)

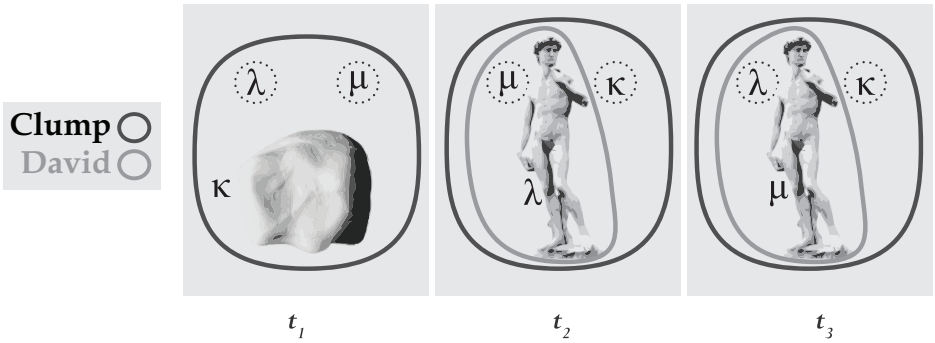

Fig. 3 David is the fusion of λ and μ at t_2 and t_3, and Clump is the fusion of κ, λ and μ at all three times; each of κ, λ and μ are concrete at a single time, but exist at all other times.

Since Clump is concrete at t_1, condition (i) ensures that there is a spherical object, κ, which is wholly concrete at t_1. The object κ is wholly concrete at t_1 since (i) tells us that it has *only* wholly concrete parts at t_1. (And since κ has as parts *all* of the wholly concrete things Clump has as parts at t_1 and those things combine to form a spherical object at t_1, κ turns out to be spherical at t_1 as well.) Condition (ii) ensures that κ is concrete *only* at that time. And condition (iii) ensures that κ is also a part of Clump at the other times—in conjunction with (ii) this requires that κ is *non-concrete* at the other times. The same can be said, *mutatis mutandis*, of Clump at t_2 and t_3. Objects κ, λ and μ can be said to be Clump's 'time-world-bound' parts since they are concrete at only a single time-world coordinate. This is in contrast to Clump and David, which are concrete at multiple coordinates.

We can therefore avoid violating Extensionality by pointing out that David and Clump differ in time-world-bound parts. Since David wasn't concrete at t_1, David did not have κ as a part and never does. One complicating feature is that Extensionality is stated in terms of a two-place parthood relation, whereas Non-Concrete Partism is stated in terms of a three-place parthood relation that includes a relativitzation to a time-world coordinate. We need a way to bridge this gap in order to have a solution to the problem. To do so, we can recognize that Extensionality implies[13] the time-world-relativized claim:

TWR-Extensionality
$\forall w \forall t \forall x \forall y$(If x and y are composite objects with the same proper parts at (t, w), then $x = y$).

We can then state the original problem with David and Clump like this (where W is the world in question): at t_2 David and Clump are composite objects that have all the same proper parts at (t_2, W); yet they aren't identical (since only David was created at (t_2, W)). This is a violation of TWR-Extensionality, and since Extensionality implies TWR-Extensionality, Extensionality is falsified as well. The Non-Concrete Partism solution is to deny that David and Clump have all the same proper parts at (t_2, W)—only Clump has κ as a part at (t_2, W). Hence TWR-Extensionality, and likewise Extensionality, are preserved.

[13] Assuming, as I do, that there are time-world coordinates. Notice that I'm not making the controversial claim that TWR-Extensionality implies Extensionality (Worm and Modal Parts Theorists think there's a 'timeless' and/or 'worldless' sense of parthood not captured by the time-world-relativized notion).

Turn now to the case of permanent coincidence. Unlike the previous case, Clumpy and Davey have all the same time-world-bound parts that are ever concrete in the world in question. Nevertheless, they differ in time-world-bound parts that are concrete in other possible worlds.

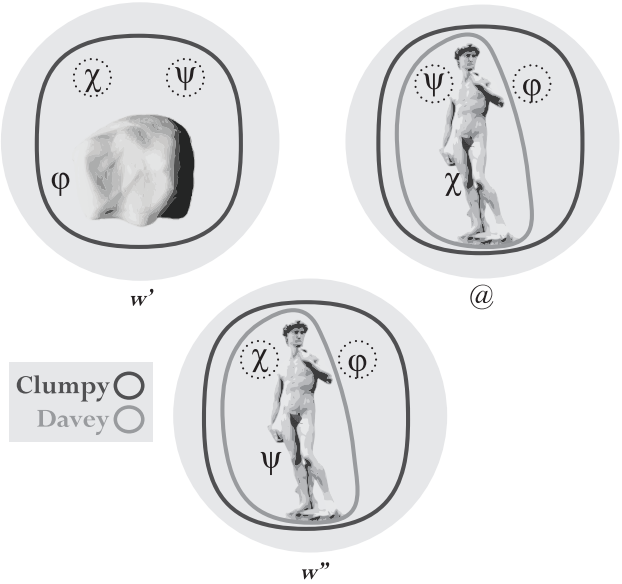

Fig. 4 Davey is the fusion of χ and ψ at @ and *w''*, and Clumpy is the fusion of φ, χ and ψ at all three worlds; each of φ, χ and ψ are concrete at a single time-world coordinate. (For simplicity, the diagram only presents a single time-slice of each world.)

Since Clumpy is possibly (though not actually) a ball of clay, condition (i) implies that, at some (*t*, *w*) at which Clumpy is so shaped, there is a spherical object—φ—that is a part of Clumpy at (*t*, *w*). By (ii) and (iii), φ is non-concrete and a part of Clumpy at every other time-world at which Clumpy is concrete. Though φ is a time-world-bound part of Clumpy at each of Clumpy's coordinates, it isn't part of Davey at any of his coordinates. Davey necessarily fails to have it as a part since he couldn't possibly be a ball. Therefore, Davey and Clumpy fail to share the same proper parts at every time-world coordinate. Hence, they don't violate TWR-Extensionality and so the problem for Extensionality is avoided.[14]

Non-Concrete Partism is therefore well equipped to preserve Extensionality. It consequently avoids saying that David and Clump are exactly located in the same location in a strong sense. But let me spell out what this 'strong sense' is. We can start by stipulating '*x* is weakly located at region *r* at (*t*, *w*)' to mean that *r* isn't completely free of *x* at (*t*, *w*). For example, the swimming pool isn't completely free of me if I'm swimming in it (or even if I'm just dipping my big toe in). We can then introduce:

> *x* is *exactly located* at *r* at (*t*, *w*) $=_{df}$ for any region *r'*, *r* overlaps *r'* at (*t*, *w*) if and only if *x* is weakly located at *r'* at (*t*, *w*).

[14] Non-Concrete Partism can also deny that there are any intelligible versions of Extensionality framed in terms of 'timeless' or 'worldless' parts.

We might spell out the problem of colocated objects like this: two distinct objects can't both be exactly located in the same region at the same time-world coordinate. But on Non-Concrete Partism, there are two different ways to be exactly located:

> x is *exactly located*$_L$ at r at $(t, w) =_{df}$ x is exactly located at r and every part of x is located somewhere at (t, w).

> x is *exactly located*$_{\sim L}$ at r at $(t, w) =_{df}$ x is exactly located at r and not every part of x is located somewhere at (t, w).

On Non-Concrete Partism, David and Clump aren't exactly located$_L$ at any region at t_2 (when the clay has been shaped into a statue) since they have non-concrete parts. Yet they are both exactly located$_{\sim L}$ at the same region at t_2—this is because every region that the one is weakly located at, so the other is as well at t_2. But the Non-Concrete Partist can point out that colocation is problematic only when understood in the first sense: two distinct objects can't both be *exactly located*$_L$ in the same region at the same time-world coordinate. Even though David and Clump are exactly located$_{\sim L}$ at some region R at t_2, this is only because there's a *single* wholly concrete object that is a part of both of them that is exactly located$_L$ at R. In other words, if asked how many wholly concrete objects are exactly located at R, the Non-Concrete Partist can answer 'one'. And though David and Clump are also exactly located at R, this is only in a derivative sense—it's in virtue of having a wholly concrete part that is exactly located there. Similarly, we can say that even though David and Clump each have mass m, they don't combine to have a mass of $2m$. This is just because David and Clump don't each have mass m in and of themselves, but rather in virtue of having a wholly concrete part that has m.

Before turning to objections, let's take a look at other non-material partisms on the market. I will compare them to the view I propose and offer reasons for preferring Non-Concrete Partism.

4 Other non-material partisms

4.1 Paul's mereological bundle theory

It's natural to make a distinction between particulars—trees, statues, apples, electrons, etc.—and the properties they have. Bundle theories conceive of particulars as mere 'bundles of properties'. They say, for example, that a particular is just the 'coinstantiation' or 'compresence' of various properties. Paul's (2002, 2006) view is a bundle theory, but she finds such locutions obscure and instead reduces the 'bundling' of properties to mereological fusions of properties (2002, p. 579; 2006, p. 633). In other words, what it is for a property p to be one of the properties that x is a bundle of is for p to be a proper part of x. Since the notion of proper parthood is meant to be the familiar notion, Paul is also eager to attribute to it the traditional features of being irreflexive, asymmetric and transitive. Also, the fundamental proper parts of an object are universals rather than tropes—though tropes still exist, they are just fusions of universals with locational properties (2002, pp. 583-584). Hence, *this* red apple and *that* red balloon, though spatially distinct, share the redness property as a part (p. 584). Paul's bundle theory is also richer than some others since she's willing to reify *modal* properties and include these in bundles. This allows her to solve the material constitution problem: though a statue and its constituent clay will have the same material properties, such as statue-shapedness, solidity, etc. as parts,

they differ in their modal property parts. Hence only Clumpy has the property of being possibly spherical as a part and only Davey has the property of possibly having greater mass as a part (pp. 590-591).

One problem for Paul's view, however, concerns whether or not Paul's properties are *self-characterizing*. For instance, is redness *itself* red, 2-poundedness *itself* 2 pounds? It seems the answer must be 'yes'. Otherwise, how could having the properties merely as *parts* make the sum red and 2 pounds? If redness and 2-poundedness were just quality-less, non-self-exemplifying abstracta, wouldn't the fusion of them be just as quality-less and abstract as its parts? Though fusing objects can bring new properties not found at the level of the part—e.g. the parts are all one lb., the whole is ten—it's mysterious how fusing quality-less abstracta together should bring about a composite that has color or weight. This issue arises because the notion of parthood doesn't have instantiation 'built into' it. (Garcia (2016, p. 503) also raises this problem of non-self-characterization, but in connection with tropes.) But if these properties are indeed self-characterizing, the mystery fades; it's much clearer why having a property that is itself red as a part should make the whole red. (At the very least, we can understand it on analogy to spatial parts: if I build a house solely out of grey bricks, how could it be that the resulting house is red? But if we build it out of red bricks, it's clearer why the resulting house would be red.) We should note that I'm not claiming the following: *x* being a red property part of *y* is *sufficient* for making *y* red. Perhaps more needs to be built into the antecedent. But I do take it to be a *necessary* condition. The same holds for the distinctively modal properties. If possible-redness and possible-two-poundedness aren't self-characterizing, it's mysterious why having them as parts should make the sum possibly red and possibly two pounds. It's better therefore to say that possible-two-poundedness is itself possibly two pounds. And since *x* being possibly *F* entails that *x* is *F* in some possible world, possible-two-poundedness is *itself* two pounds in some possible world.

But now we face difficult and awkward issues concerning the relationship between such modal properties and their non-modal counterparts. Consider Rocky the rock, which is two pounds. On Paul's view, Rocky has the property two-poundedness as a part. But since Rocky is also *possibly* two pounds, surely it also has the distinct property of *possible*-two-poundedness as a part. (This would be a distinct property from two-poundedness since Rocky would still have the property even if it instead weighed three pounds.) Self-characterization requires that two-poundedness be two pounds, and self-characterization *also* seems to require that possible-two-poundedness is two pounds. But the problem is, if Rocky has these two different and non-overlapping parts, each of which is two pounds, shouldn't Rocky itself be (at least) four pounds contra our original assumption?

I don't see any satisfying way to respond to this problem. We might deny that possible-two-poundedness has a mass. But given self-characterization, possible-two-poundedness is itself possibly two pounds. Hence, there must be some time-world coordinate at which it is two pounds. At which time-world coordinates? Supposedly at those at which Rocky is two pounds, in which case it's two pounds in the case under consideration. (But even if we deny that it's two pounds in this case, there must be some (*t*,*w*) coordinate at which it's two pounds. The problem can then be stated for that time.[15]) We might instead respond that possible-two-poundedness is two pounds only in a derivative sense—only in virtue of having two-poundedness as a proper

[15] Say possible-two-poundedness is two pounds at (*t*,*w*). Then the problem will arise for whatever object instantiates possible-two-poundedness at (*t*,*w*). (And there will be such an object that the property is a part of at (*t*,*w*). To deny this is to deny Paul's view that the properties cannot exist uninstantiated.)

part. But what other proper parts would possible-two-poundedness have? It seems it would have no other[16], in which case possible-two-poundedness violates the Weak Supplementation principle: if *x* has *y* as a proper part, then there is some *z* that doesn't overlap *y* and is part of *x*. But I take Weak Supplementation to be too costly to deny.

In any case, the view of modal properties I have been criticizing isn't exactly Paul's own. Instead she analyzes modality in representational terms: Clumpy is possibly spherical because it is *represented* as spherical (by virtue of being similar to a spherical ersatz counterpart). So Clumpy doesn't have possible-sphericality as a part, but rather the property *represented-as-*spherical as a part (2006, p. 646). Though not Paul's explicit intention, this account seems to avoid the sort of problem raised for possible-two-poundedness. Nevertheless, a different problem of self-characterization arises: it's absurd to think represented-as-spherical is *itself* represented as spherical. This is just because what is represented as spherical is Clumpy's *material core* (the material object that is part of both Davey and Clumpy). As Paul claims, it's the similarity between the material core and the counterpart that generates the representation in the first place (p. 645). Unlike the material core, the property represented-as-spherical doesn't have shape and size, which are needed to sustain the relevant similarity; so the property isn't what is represented as spherical.

Could Paul hold that represented-as-spherical is a part of Clumpy while *denying* that it's self-characterizing? If so, she would need to provide some alternate explanation for why fusing the material core to the property makes the fusion represented as spherical. It's tempting then to look to the material core to fill that role: the fusion is represented as spherical because its *material core* is represented in that way. But this line of response isn't available to Paul. Clumpy's material core has too many representational properties. On one similarity/counterpart relation, it's also represented as having a greater mass. (It's this other counterpart relation that generates Davey's representation property represented-as-having-more-mass (p. 646).) So if Clumpy inherits all of the material core's representational properties, it will also have properties that only Davey is intended to have.[17]

In sum, the problem is this: why should fusing represented-as-spherical to the material core get us something that is represented as spherical? If having represented-as-spherical as a part is supposed to do the job, then the property must be self-characterizing. Yet it can't be, since what is represented as spherical isn't the property, but the material core. On the other hand, if the material core is supposed to do the job, the fusion will inherit too many representational properties. So Clumpy (the fusion of the material core and representational property) turns out not to have the intended representational properties—consequently, it lacks the intended *modal* properties.

For Non-Concrete Partism, on the other hand, it's clear why having a possibly spherical non-concrete object as an (essential) part—such as φ in Fig. 4—should make Clumpy possibly

[16] It's tempting to say that it also has the property *possibleness* as a part. But I'm skeptical that this is a coherent suggestion. For one thing, it doesn't seem like there is such a thing as *possibleness simpliciter*. Objects can have the property of being possibly red, possibly true, possibly existent, possibly instantiated etc. but not possible *simpliciter*. For another thing, even if it had such a property as a proper part, what other proper parts would it have when it's not red? It seems that there would be none, in which case we arrive at the original problem.

[17] Though Paul adopts the counterpart theoretic strategy of analyzing modality in terms of representation, her view is intended to avoid the context- and mind-dependence of those modal properties by making the representational properties part of the object (2006, 644-5).

spherical.[18] And this doesn't raise the sorts of problems raised for possible-two-poundedness. That issues involved the problematic relation between the self-characterizing property of possible-two-poundedness and the self-characterizing property of two-poundedness. But no analogous problem seems to arise for non-concrete parts of material objects.[19]

A second problem for Paul's view concerns *locational* properties. Consider electron *e* that is located at spacetime point S. According to Paul, *e*'s being located at S reduces to *e*'s having the locational property located-at-S-ness as a part (2002, p. 584; see also Shiver 2014). Now consider *e*'s charge property: negative-charge-hood. Does this property have the locational property as a part? There are problems either way we answer this. Begin with a 'yes' answer; this is problematic for two reasons. The first, and Paul's own reason for rejecting it, is that the property would be oddly multi-located. Since the same charge property is had by every electron in the universe, it would be located *anywhere* there is an electron (2002, p. 583). A second and I think more pressing problem is that not only would negative-charge-hood be located wherever an electron is, but electron *e itself* would also be located at all those places—*every electron would be located where any other electron is!* Again, if negative-charge-hood has the locational property located-at-S-ness as a part, then it also has located-at-S_1-ness, …, located-at-S_n-ness as parts (for each spacetime point where negative charge is instantiated). But then it follows by the transitivity of qualitative parthood[20] that electron *e* has all of those locations as parts; hence *e* (and every other electron) is located at all of those places as well! Clearly this result is to be avoided.[21]

Paul's own answer is 'no'—negative-charge-hood doesn't have any location properties as parts (2002, p. 584). Instead the property is multi-located only in the derivative sense of being fused to locational properties; that is, it is part of things that themselves have locational properties as parts. But the conceptual difficulty that I have now concerns how fusing negative-charge-hood to located-at-S-ness makes any empirical difference. Paul's view should imply that their fusion ensures that negatively and positively charged things will be repelled and attracted (respectively) to S. Yet I don't see that it does. There's a head of a hammer in the garage and its handle in the office. But fusing the two doesn't get us a hammer—at least nothing that is useful for heavy-duty hammering. You just end up with a scattered object that is partially in the garage and partially in the office. The lesson is that *mereologically* fusing the head and handle doesn't suffice for *mechanically* fusing them. Likewise, I don't see that mereologically fusing negative-charge-hood to located-at-S-ness gives us anything useful for repelling electrons from S. If electrons aren't repelled from S before fusing the two properties, then they're not going to be re-

[18] And even though it's only κ that would strictly speaking be spherical, it still makes sense to say Clump is spherical in virtue of having the spherical part. For example, it makes sense to say to someone "you're swelling up like a balloon!" even if only her toe is swelling.

[19] Perhaps it arises if we marry Non-Concrete Partism with the view that there are self-characterizing modal properties like possible-2-poundedness. But I deny that there are such self-characterizing modal properties.

[20] Paul has separate mereological principles given the kinds of parts under consideration: one for qualitative (property) parts and one for spatiotemporal parts. Transitivity holds between parts of a single kind, but not between kinds. For example, my body has a hand as a part, my hand has hand-shapedness as a part. But this doesn't imply that my body has it as a part since this crosses categories.

[21] On Worm Theory, *e* is located it more than just S, since *e* is extended through time. Nevertheless Worm Theorists can preserve the intuitive idea that *e* is *just* located at S, since we are restricting our quantifier to the *present* moment. It's implausible that a similar move could be made here: when asking where the electron is located, even if we tacitly include a 'with respect to the present' qualifier, we aren't tacitly including a 'with respect to spacetime point S' qualifier.

pelled from S, all else being the same, *after* mereologically fusing them.[22] Mereological notions don't seem cut out to do the bundling work Paul sets out for them.

Non-Concrete Partists, on the other hand, can recognize that the goal of analyzing instantiation in mereological terms is misguided. They can instead prefer to analyze it in other terms, take it as a *sui generis* relation or even be nominalists about properties.

4.2 Koslicki's mereological hylomorphism

Aristotle's hylomorphism, on which ordinary objects have matter and form as constituents, is the inspiration for Koslicki's (2008) view. Many contemporary metaphysicians are suspicious of hylomorphism; they are unsure whether there are intelligible notions of 'form' and 'matter' at play, and whether we can make sense of having them as constituents.[23] On Koslicki's account, the *structure* of an object is a form of the object. Such a structure comes with 'slots' that specify how the parts of the object can be arranged and what sorts of things can fill those slots. For example, the structure of a water molecule specifies that it should have two hydrogens and an oxygen arranged in a particular formation—if the formation were broken the molecule would be destroyed (pp. 172-173). The hydrogens and oxygen of a particular water molecule can also be thought of as the *matter* of the molecule (p. 118). Finally, what it is to have the matter and structure as constituents is to have them as *proper parts* (p. 181). The solution to the problem of material constitution is to have the statue and piece of clay differ in which structure they have as a proper part: Davey has a statue-structure and Clumpy has a piece-of-clay-structure as a part.

My primary concern with Koslicki's account is with what *matter* is on her view. To begin with, we might think of it as a structure-less entity—that it lacks a structural part; hence, it doesn't have specifications of what ways it can or cannot vary. Such a conception seems incoherent.[24] For surely there are facts about what sorts of changes the matter can survive—for example, there must be a fact about whether the matter could or couldn't be shaped differently, and a fact about whether it must be a part of the statue or could exist without it, etc. Koslicki acknowledges that to deny matter of such modal properties makes the conception "needlessly murky." (2008, p. 118) What's the alternative? Matter itself must have modal properties, and so have its own structure that determines these properties. The matter of Davey, *M*, is therefore *itself* a matter-form compound. This results in a regress: by the same reasoning, the matter of *M*—*M'*—is *also* a matter-form compound, etc. *ad infinitum*.

We might try to avoid the regress by holding that 'the matter of Davey' *plurally* refers to smaller bits that compose Davey—such as his molecules. Hence there is no single thing that is Davey's matter.[25] Nevertheless, supposing that quarks are material simples, then 'the matter of *that* quark' will refer to a single thing. The issue will then arise at least at this fundamental level: the matter of the quark is a matter-form compound, and the matter of that compound is *also* a matter-form compound, etc. on to infinity.[26]

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[22] Put more precisely: suppose a theory fails to entail that electrons are repelled from S. Adding the claim "located-at-S-ness is fused to negative-charghood" to the theory won't remedy the issue.

[23] This sentiment echoed in Rea (2011).

[24] Such a concept of matter would be on a par with Alan Sidelle's conventionalist view on which "what is primitively ostended is 'stuff,' stuff *looking*, of course, just as the world looks, but devoid of modal properties, identity conditions, and all that imports" (1989, p. 55). See Carter and Bahde (1998), Blackson (1992), and Rea (2002) for objections to the coherence of such a conception.

[25] Furthermore, in gunky worlds Koslicki's account would violate the Remainder principle I introduce below.

[26] Koslicki denies that elementary particles would be hylomorphic compounds. She says "whether there is a *first* level of composition is not a question that *philosophy* is qualified to answer. And if it turns out that there is such a

But what exactly is problematic about the regress? Why should it be rejected rather than embraced? I think it violates a very plausible mereological principle that can be stated as:

Remainder
If *x* isn't composed of Fs, then there's a part of *x* that doesn't overlap an F.

(Here instances of 'F' should be understood as 'F *simpliciter*'. For example, though my table is wooden, it's not wooden *simpliciter* since it has some metal parts.) We can define '*x* is composed of *yy*' as: each *y* that is one of *yy* is a part of *x* and each part of *x* overlaps at least one of *yy*. We can then define '*x* is composed of *F*s' as: there are some *yy* such that, for each *y* that is one of *yy*, *y* is an *F*, and *x* is composed of *yy*. To illustrate: I have made a house entirely out of fifty wooden blocks. We can then say that the house is composed of things that are wooden (*simpliciter*). This is because there are some things (the blocks), such that every part of the house overlaps one of them, and each of those blocks is wooden (*simpliciter*) and is part of the house. In contrast, my table is *not* composed of wooden things—this is because it's constructed out of wooden things (the table top and legs) but also metal fasteners. We can also illustrate Remainder using this table example. Since the table is not composed of wooden things, Remainder tells us that there's a part of the table that doesn't overlap a wooden thing. And indeed there are: its nuts and bolts. Another example: the black and white chessboard isn't composed of things that are white—though it has white parts, not all of the chessboard's parts overlap them. Remainder therefore tells us that there's a part of the table that doesn't overlap a white thing. And indeed there are: its black tiles.

Turning now to the hylomorphic quark, it seems clear that it isn't composed of structures. If it *were* so constructed, then simply fusing structures with other structures could get us matter. But I think it's clear that this can't happen. Structures lack mass and solidity, the sorts of properties that only the *material* parts of a whole are responsible for. And since mass and solidity can't emerge by just fusing structures together (unlike the way a house can emerge by fusing non-house objects together), matter can't be composed of structures. Anyone who agrees with me on this point and the Remainder principle will also find the hylomorphic matter regress objectionable. Remainder tells us that the hylomorphic quark has a part that doesn't overlap a structure. But given the hylomorphic matter regress, this demand is left unfulfilled; matter *M* of the quark has a structure as a part, and the matter of *M*, *M'*, also has a structure as a part, and so on. Hence, the Remainder principle is violated.

Non-Concrete Partism, on the other hand, satisfies Remainder.[27] Even though objects like Davey and Clumpy aren't composed of non-concrete objects, they have concrete parts—namely, their concrete time-world-bound parts (such as κ in Fig. 3)—that don't overlap any non-concrete objects.

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level, then the structure/[matter] dichotomy simply breaks down at that point. For the very fact that what we are dealing with is a *first* level of composition, i.e., one whose constituents are completely *basic*, means that we cannot think of these entities as being *composed* of anything." (*ibid.*, p. 119) But this response confuses the distinction between *spatiotemporal* parts and parts *simpliciter*. It's the scientist's job to figure out if quarks have spatiotemporal parts. But even if they lack such parts, it's the *philosopher's* job to figure out if quarks have structures as parts. After all, such parts couldn't be literally cut out from the object. And if Koslicki is right that statues and pieces of clay have formal parts, then material simples also have such parts: they still have mass and charge properties; also it would have the modal property of indivisibility, and there would be facts about whether it could have a different mass or charge. Things without spatial parts would therefore still need structural parts that are responsible for these properties.

[27] Though see section 5 for a challenge to this claim.

5 Objections

Can non-material objects really be parts of material objects? Some principles might dictate against this: first, we might hold the 'spatialist' view that whenever some *x* is a proper part of a *y*, *x* is located at some subregion of *y*'s location (this is stronger than Markosian's (2014) spatial approach[28]). Second, we might hold the 'categorialist' view that things of different categories can't be parts of the same object.

Spatialism and categorialism probably hold true for many philosophers' favored ontologies. But this doesn't mean the principles are unassailable. After all, they don't seem to be *conceptual* truths. The non-material partist views seem like conceptual possibilities; merely recognizing that Paul's view violates spatialism or Koslicki's violates categorialism doesn't seem to render them incoherent. Furthermore, we ordinarily say things like 'stanzas are parts of poems' and 'exercise is a part of healthy living'; and many think humans are made up of both soul and body. So we might follow David Lewis (1991) and use such examples to inform our primitive notion of parthood. It may nevertheless be desirable for spatialism and categorialism to restrict our notion of parthood. But non-material partists think the problem of material constitution instructs us against giving in.

Let's now turn to objections that target Non-Concrete Partism in particular, rather than non-material partisms in general. It might be objected that Non-Concrete Partism inherits problems from Necessitism. One alleged problem then is that it's obviously false. Surely Davey is a contingently existing object—had no statues been fashioned or no pieces of clay formed, there would be no such thing as Davey! Another is that statues are essentially material. That is, we know that necessarily, if Davey exists, he is a material object—yet Necessitists hold that Davey could be an existent non-concrete object. (e.g., Tomberlin 1996; Korman 2015) Williamson has responded to these sorts of challenges by distinguishing two senses of the word 'exist'. The *concrete* sense just involves restricting our quantification to the concrete objects, a subdomain of the objects that exist in the *logical* and unrestricted sense of the word. Williamson's (2013, p. 9) claim is that our intuition expressed as "Davey could have failed to exist" just expresses the concrete sense of the word "exist". And so the intuition is compatible with Davey necessarily existing in the logical sense of "exist". Similar remarks hold for the material-essentialist intuition (see Williamson 2013, p. 8).[29]

But over and above Williamson's defense of Necessitism, there's an even more important defense of Non-Concrete Partism to be made: it's *compatible* with Contingentism and the sort of material-essentialist view at hand. Even though I have made use of non-concrete objects—an ontology typically employed by Necessitists—we needn't be Necessitists to adopt them. For Non-Concrete Partism in particular, it's formulated in a way that is consistent with Davey's possible non-existence (in the logical sense) and essential-materiality (couldn't have logically existed without a material part).[30] The view does, however, require that the *time-world-bound*

[28] Markosian leaves it open whether non-spatial, non-physical objects can enter into parthood relations (2014, p. 69).

[29] It might be objected that we not only have an intuition that can be expressed as "Davey could have failed to exist", but also a higher-order intuition that the "exist" expresses the *logical* sense of the term. Nevertheless the higher-order intuition seems much less certain and more negotiable than the lower-order intuition.

[30] It might be objected that in conjunction with Mereological Universalism, the view does imply Davey's possible non-concreteness. The reason is that Universalism—which can be defined for our purposes as the view that for any set of concrete or non-concrete objects, there is a fusion of its members—would imply that there is a world where

objects exist at times and worlds beyond those at which they are material (though they needn't *necessarily* exist; they needn't exist in worlds with no material objects). But I highly doubt that we have similar material-essentialist intuitions about such objects; it seems that these intuitions track ordinary objects like statues and trees rather than the more fleeting and theoretical time-world-bound objects.

Even if Non-Concrete Partism can evade issues linked with Necessitism, perhaps issues linked with the ontology of *non-concreta* are more damaging. Such objects might be thought to violate the grounding principle 'modal properties of objects are grounded in their non-modal properties!' Non-Concrete Partism implies that there is a non-concrete object o_1 that would be a spherical object were it concrete and another o_2 that would be a statue-shaped object were it concrete. Since o_1 and o_2 are both non-concrete, they have the same non-modal properties—both are non-located, shapeless, massless, etc.—yet they differ in their modal properties; hence the violation (Bennett 2006, p. 284). The grounding principle is especially relevant in this context because it has been used to support Extensionality (see Burke 1992, pp. 14-15; Zimmerman 1995, p. 87). With respect to other non-material partisms, Alan Sidelle (2014) raises the problem against Koslicki's view, and it's Paul's main reason for preferring representational properties as the grounds of modal properties (2006, pp. 636-48).

There are a few avenues of response available for the Non-Concrete Partist here. First, one might follow Williamson who thinks the grounding principle is defective since there doesn't seem to be a clear distinction between the modal and non-modal. For example, it's not evident which side of the divide the properties of weakness and strength should fall (for further explication, see Williamson 2013, pp. 380-391). Second, we might try to satisfy the grounding principle by pointing out that o_1 and o_2 *do in fact* differ in their non-modal properties: their identities. That is, o_1 has the property of being identical to o_1 and o_2 does not (see deRosset 2011 for further defense). But another strategy worth consideration is to make non-concreta *thicker* than Necessitists traditionally have. For instance, we might attribute *geometrical* properties to them. Which geometrical properties exactly? Naturally, just those that it would have were it concrete; since o_1 would be spherical were it concrete, o_1 is spherical *even when non-concrete*. And it would still make sense to call it 'non-concrete' since it would still lack mass, causal abilities, location, etc. We would then have a response to the grounding problem in the material constitution case as well: the non-modal difference between David and Clumpy is that only Clumpy has non-concrete parts that *are* spherical.

Perhaps the strongest mark against the 'thickening non-concreta' strategy is that it's hard to believe that something can be a ten-foot-tall statue-shaped object without being located anywhere. But is it so clear that having geometrical properties requires being located? Others deny it: Paul's sphericality property is itself spherical, despite not being located anywhere (Shiver's (2014) defense turns on the same claim). And Plato, on at least one popular interpretation,

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Davey doesn't have any concrete parts, yet the time-world-bound objects, the *x*s, that would compose Davey still compose some object *o* (this would hold true if there's such an object as 'the universe' that has all of the *x*'s as parts). Since *o* and Davey have all the same parts in @ (where Davey is concrete), Davey must be identical to *o*—hence Davey must also exist in worlds where he isn't concrete. There are a few reasons to doubt this line of thought. First, the claim that *o* and Davey must exist *at the same time* doesn't seem obvious. Why not hold that the *x*s compose different objects at different times? Why not say they compose Davey only in worlds where one of the *x*s is concrete? Second, the Non-Concrete Partist needn't be a Mereological Universalist. Perhaps it's a natural answer to the question 'why does *that* set of concrete and non-concrete objects compose something?' But it's not the only one available. One could instead hold to a version of Closest-Continuer Theory (see Yagisawa's (2010, pp. 101-6)) or Brutalism (see Markosian's (1998)).

thinks Circularity Itself is circular without being located anywhere (Vlastos 1981). Thick non-concreta would then be much like Paul's or Plato's shape properties, the main difference being that the non-concreta *possibly* have mass and location.[31] In any case, as already mentioned, this isn't the only strategy available to the Non-Concrete Partist.

A quite different objection to Non-Concrete Partism has to do with its commitments to *instants* of time. The view requires that there be time-world-bound objects—objects that are concrete at a single instant at a particular world. If there are no such things as instants, but only shorter or longer timespans (Arntzenius 2008), then neither are there time-world-bound objects. Here I will assume the objector is an Eternalist since Presentists tend to think the present is an instant.[32] It might appear that we can avoid this objection simply by reformulating Non-Concrete Partism by simply replacing the '*t*' variable—which accepts only instants of time—with the more flexible '*T*" variable that accepts either instants or timespans like this:

> Necessarily, for each material object *x*, and each of *x*'s coordinates (*T*, *w*), there is a *y* that:
> (i') overlaps all and only the wholly concrete objects *x* overlaps at (*T*, *w*),
> (ii') fails to be concrete (even partially) at every coordinate other than (*T*, *w*), and
> (iii') is a (concrete or non-concrete) part of *x* at each of *x*'s coordinates.

The problem with this formulation is that we get violations of the Remainder principle: if *x* is not composed of Fs, then *x* has a part that doesn't overlap an F. Consider Ball, a sphere that is wholly concrete for exactly two milliseconds in world *W** (and is concrete in no other worlds). Since we are assuming Eternalism, we can think of Ball as a four-dimensional worm, spread out through those two milliseconds in *W**. The problem is that we cannot consistently claim that Ball is wholly concrete in *W**. Condition (i') implies that Ball also has Firsthalf, a part that is concrete only in the first millisecond, and Secondhalf, another part that is concrete for just the second millisecond. Conditions (ii)' and (iii') would then imply that, during the second millisecond, Firsthalf would be a non-concrete part of Ball. But that contradicts our initial assumption that Ball is a wholly concrete object—i.e. has no non-concrete parts—during those two milliseconds. And no matter what putative wholly concrete object we pick, the same problem will arise; that is, it arises if we assume that there are no instants, in which case every object would have a first and second half. We would therefore have a violation of Remainder: Ball isn't (shouldn't be!) composed of non-concrete parts at those two milliseconds at *W**—that is, even if it has non-concrete parts, those aren't the only parts it should have—yet every part of Block overlaps a non-concrete object.

I think that the best way to revise the view is to deny that Firsthalf exists at a time other than the first millisecond of Ball's career. So instead of saying that Firsthalf is concrete for the first millisecond and is non-concrete for the second millisecond, we should instead hold that Firsthalf is concrete for the first millisecond and *doesn't even exist at*—i.e. isn't temporally located at—the second half. (Given Eternalism, it will still be true at the second millisecond that Firsthalf exists. For example, even though Socrates doesn't *presently exist*, Eternalism still tells

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[31] Another difference is that Paul thinks mereologically fusing the sphericality property to a location property suffices for having a spherical object. I have argued that this is incorrect (section 4.2); just because Clumpy has a spherical non-concrete object as a part, that doesn't suffice for Clumpy being spherical in the sense of importance—that is, when you look at Clumpy, it will still be in the shape of a man, rather than a ball.

[32] Though a Presentist that believes in an extended-present might be able to incorporate the insights given here.

us that it's *presently true* that Socrates exists. And the situation is just the same with Firsthalf at the second millisecond.)

We can state the modified view like this:

Non-Concrete Partism*

Necessarily, for each material object x, and each of x's coordinates (T, w), there is a y that:

(i*) overlaps all and only the wholly concrete objects x overlaps at (T, w),

(ii*) doesn't exist at any other timespan in w that doesn't overlap T,

(iii*) fails to be concrete (even partially) at any world other than w, and

(iv*) is a (concrete or non-concrete) part of x at each world where x is concrete.

Condition (i*) tells us that Ball has Firsthalf as a part—that is, it tells us that Ball has a wholly concrete part that overlaps all and only the wholly concrete objects Ball overlaps during the first millisecond. Condition (ii*) tells us that Firsthalf doesn't exist during the second millisecond or at any other timespan in W* that doesn't overlap Ball's first millisecond. When combined with Eternalism, this gets us a view of Ball that is essentially the same as Worm Theory (with respect to W*): Ball is spread out through those two milliseconds by having temporal parts, and doesn't have any non-concrete parts at any time at all in W*. This allows us to avoid the violation of Remainder proposed above. Worm Theory and Non-Concrete Partism* coincide in this manner because Ball was stipulated to be 'world-bound'—it's concrete in only a single world. The main difference between Worm Theory and Non-Concrete Partism* can be seen when considering *non*-world-bound objects such as Clumpy. Condition (iv*) ensures that Clumpy has more than its concrete parts. And, again, this is a desirable result as it helps avoid the violation of Extensionality with respect to cases of permanent coincidence.

6 Conclusion

I have shown that non-concreta can be used to solve the problem of material constitution. This solution preserves, among other things, the principle that a statue and its constituent piece of clay simultaneously exist without sharing all the same parts and without occupying the exact same location (in the sense of being exactly located$_{\sim C}$). Paul and Koslicki's non-material partisms also share these virtues, but I argued that Paul's view faces problems with self-characterization and locational properties and Koslicki's runs into a vicious non-material parts regress. As for problems facing non-concrete partism, I have argued that the view doesn't require Necessitism or its most counter-intuitive implications. The issue of grounding modal properties on non-modal properties does arise; but there are a few avenues of response available, one of which is to 'thicken' non-concreta. On balance, I think the non-concretist view compares favorably to its non-material partist counterparts. Though there are numerous other ways of addressing the problem of material constitution, non-concreta provide us with a novel and productive option.

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