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In Favour of Mereological Nominalism: reply to Cumpa and Declos

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Abstract
Mereological nominalism is the thesis that properties are identical to mereological fusions of their instances. Cumpa and Declos have raised two problems for the view. This paper is a reply to both problems.

Keywords Properties · Ontology · Mereological nominalism · Dependence

In an earlier paper [Effingham 2020] I defend merelogical nominalism: the thesis that properties are mereological fusions of their instances. Cumpa and Declos [2021] replied; this paper is a response to that reply. Cumpa and Declos—C&D henceforth—have two problems: § 2 deals with one, §§ 3–5 deal with the other.

1 Mereological Nominalism

1.1 The Inheritance Problem

'Instances' of a property are objects instantiating that property e.g. I am an instance of the property *Philosopher* and an electron is an instance of *Charge*. Mereological nominalists endorse:

Properties are instance fusions: Every property is a fusion of its instances.

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So *Philosopher* is a scattered object composed of people and *Charge* is a scattered object composed of charged particles.

Traditionally, people assumed mereological nominalism accepted:

Instantiation is mereological: *x* instantiates *Fness* iff *x* is a part of *Fness*.

But Instantiation is mereological has a problem. *Philosopher* is the fusion of all philosophers. My left foot is part of that fusion. Because parthood is transitive, Instantiation is mereological absurdly entails that my left foot is a philosopher.

In my original paper, I deny Instantiation is mereological whilst retaining Properties are Instance Fusions, breaking apart the ontological from the ideological in order to avoid this 'inheritance problem'. What replaces Instantiation is mereological varies; mereological nominalists should take the theory that would otherwise be compelling were mereological nominalism set aside, and then help themselves to its ideology. By stealing the ideological commitments of its supposed best competitor, mereological nominalism avoids the inheritance problem. So, we cannot simply discuss whether mereological nominalism is true or not. Instead, we must consider multiple versions of mereological nominalism, showing that at least one version is better than the theory you would otherwise opt for.

1.2 Three versions of Mereological Nominalism

C&D object to three versions of mereological nominalism, each of which is paired with a realist competitor.

The first pair is 'constituent realism' and 'constituent mereological nominalism'. Constituent realists believe properties exist and particulars, like material objects, are constructed out of those properties. To instantiate a property is to have it as a constituent; call that claim Instantiation is constituency. Constituent realists usually add that metaphysical constituency and mereological parthood are different relations: my left foot is a part of me, not a constituent; *Philosopher* is a constituent of me, not a mereological part. Constituent mereological nominalists play on that distinction, endorsing Instantiation is constituency instead of Instantiation is mereological. Now, *Philosopher* is a metaphysical constituent of me, but not my left foot (even though both myself and my foot are mereological parts of *Philosopher*); therefore we need not say that my left foot is a philosopher.

The second pair of theories are 'vanilla realism' and 'vanilla mereological nominalism'. Vanilla realists believe properties are abstract objects standing in primitive instantiation relations to their instances. Call the latter claim Instantiation is primitive. Vanilla mereological nominalists swap out Instantiation is mereological for Instantiation is primitive. Then, just as the vanilla realist says, they add that I stand in that primitive to the property *Philosopher* whilst my left foot does not. Problem solved.

The third pair is 'state realism' and 'state mereological nominalism'. State realists believe the world is a world of states of affairs [Armstrong 1997], each comprised of the properties and objects they are about. For instance, where '[[ϕ]]' is the name for

the state of affairs of ϕ being the case, [Nikk Effingham is a philosopher] would be constituted by myself and *Philosopher*. State realists endorse:

> Instantiation is co-constituency: *x* instantiates *Fness* iff there exists a state of affairs with *Fness* as its property-constituent and *x* as its object-constituent.

State mereological nominalism also endorses Instantiation is co-constituency. Whilst there's a state of affairs [[*Nikk Effingham* Nikk Effingham is a philosopher]], there's no corresponding state for my left foot. Again, the inheritance problem is solved.

This exposition is only brief. For more about how these ideological swaps solve the mereological nominalist's problems and how mereological nominalists can overcome objections to those swaps, seemy original paper. This paper ignores those problems in favour of focussing on those that C&D introduce.

2 The inconsistency problem

I consider C&D's objections in a reverse order to how they presented them in their paper. The first objection I discuss is that the relations the mereological nominalist relies on are unsuitable to take mereological fusions as relata. The specifics of the objection differ depending upon which variety of mereological nominalism one has in mind.

2.1 Against Constituent Mereological Nominalism

Against constituent mereological nominalism, C&D write:

> By co-opting the ideology of the constituent realist, [constituent mereological nominalism] must now say that properties are non-mereological parts of their instances. As such, they have to be metaphysically simple. This obviously conflicts with their characterization in mereological terms by [Properties are instance fusions]. In other words, if properties are non-mereological constituents, they cannot be *also* mereological wholes. Consequently […] the non-mereological theory of instantiation envisioned by Effingham forbids properties to be identical to fusions [C&D 2021: 9009]

I agree with the first sentence but believe the remainder does not follow. C&D says constituents are 'metaphysically simple', which can mean one of two things. The first is that a metaphysical simple has no constituents, in which case constituents cannot themselves have constituents. But what of it? Mereological nominalism demands only that properties have *mereological parts*, not that they have *metaphysical constituents*.

The second possible meaning of 'metaphysically simple' is 'mereologically simple'; C&D would say that all constituents lack proper parts. But consider counterexamples. It is standard to believe that a singular proposition, e.g. < Nikk Effingham is a philosopher>, has metaphysical constituents e.g. myself and *Philosopher*.

Clearly, those constituents need not be mereological simples (for I am not a simple). Or consider Socrates and {Socrates}. It is not unusual to treat Socrates—a composite object!—as being a constituent of the singleton [Fine 2010].

C&D might reply that only constituents that are properties have to be mereologically simple (perhaps endorsing constitutional pluralism, saying that the constitution relation between a singleton and its member is a different relation from that between an object and its properties). But that's just special pleading. What would motivate such a claim? Without a motivation, it's not unreasonable for mereological nominalists to simply deny that there is a ban on properties being composite. Certainly, other philosophers have failed to recognise any such ban. Consider a mereological construal of structural universals whereby structural universals (e.g. *Methane*) are mereologically composed out of other properties (e.g. *Hydrogen*, *Carbon*, and *Bonding*). In that debate, even those antagonistic to mereological structural universals believe they need relatively sophisticated arguments to undermine the view; they never indicate that they think it's crazy *merely because* properties aren't mereologically simple [e.g. Lewis 1986: 33–41]. So the mereological nominalist would only be saying something that others already find reasonable.

(One referee argued that it's widely accepted that constituents are never material objects—see, e.g., Olson [2017: 62]—and that this might be what motivates C&D's worries. But whilst I agree that people widely accept that constituents are not material objects, to elevate that view to the status of a metaphysical truism would be to straightforwardly beg the question against constituent mereological nominalism.)

2.2 Against Vanilla Mereological Nominalism

Against the vanilla mereological nominalist, C&D say:

> The question arises whether fusions, understood by [vanilla mereological nominalism] as a certain informative analysis of properties, can be relata of primitive relations of instantiation, as Effingham assumes. Now, if instantiation is a non-mereological relation, then, we submit, mereological fusions cannot be relata of primitive instantiation relations. [C&D 2021: 9008]

Prima facie, this is false for there is no reason why non-mereological primitives cannot relate mereological fusions. Consider Lewis's metaphysical system [Lewis 1986]. One primitive of that system is spatiotemporal relatedness [Divers 2002: 46] and, obviously, composite objects can be spatiotemporally related. Another example: Set membership. It is not unreasonable to believe set membership is a primitive irreducible relation. Yet, clearly, sets stand in that relation to composite objects e.g. {Socrates}.

(A referee worried that this might be true of primitives *other than* instantiation i.e. that instantiation was different and that at least one relatum of instantiation must be mereologically simple. Again, this is special pleading. If primitives can, in general, relate composites, why not the instantiation primitive? And, again, mereological structural universals would be a counterexample, for a methane atom would instantiate the composite *Methane*. Finally, it seems arbitrary to allow that one relatum of

the instantiation primitive can be a composite object (e.g. me) but that the other (e.g. *Philosopher*) cannot.)

Nevertheless, whilst the principle seems *prima facie* false, C&D have an argument for it. They start by saying a lot that I believe is true:

> […] properties are instantiated; but fusions are summed. While the primitive relationship of instances and properties is a predicative relation of the non-mereological form: x is y, the primitive relationship of parts and fusions is a parthood relation of the mereological form: x is a part of y. [C&D 2021: 9008]

I agree that: properties are instantiated; instantiation is a non-mereological relation; fusions are summed; fusing/parthood is a mereological relation. (I *disagree* with the wording. 'Properties are instantiated; but fusions are summed' implies that nothing is both instantiated and summed. Unless one is begging the question against mereological nominalism, there's no reason to accept that implication.)

These truths in place, C&D's argument continues:

> Thus, it is really hard to see how a mereological fusion can be non-mereologically instantiated. *A primitive or non-informative analysis of instantiation seems to require a primitive or non-informative analysis of properties.* In other words, [Properties are instance fusions] is inconsistent with a primitive instantiation relation. [C&D 2021: 9008; my emphasis]

Here I struggle with the argument. The crux is the italicised sentence. Presumably, it means:

> (1) If a primitive relates things of an ontological kind *K* then there can be no (informative) analysis of what a *K* is.

For (1) to lead to a problem for mereological nominalism, we must further believe:

> (2) Properties fall under the ontological kind **Property**.
> (3) If something has mereological parts then the ontological kind it falls under can receive an informative analysis.

Given vanilla realism, properties are the relata of a primitive instantiation relation. Given (1) and (2), **Property** has no informative analysis. But—given (3)—it must have. So we have a contradiction, which can be avoided by denying mereological nominalism.

But this argument is demonstrably unsound, at least from the viewpoint of the vanilla realist. For any arbitrarily selected*x*, *x* will instantiate at least one property. Given Instantiation is primitive, *x* is a relatum of a primitive relation; given (1), whatever kind *x* falls under cannot receive an informative analysis; given (3), *x* cannot have parts. Thus, *nothing* has parts! That's absurd and so vanilla realists will deny one of (1) and (3); thus, there is then no comparative problem if the vanilla mereological nominalist does likewise.

2.3 Against State Mereological Nominalism

C&D say the problems for state mereological nominalism are similar to constituent mereological nominalism, saying:

> […] insofar as [state mereological nominalism] construes states of affairs non-mereologically, properties are here understood as metaphysical constituents which do not have any kind of mereological composition. [C&D 2021: 9009]

But states of affairs can clearly have mereological composites as constituents e.g. Joe Biden is a composite object and a constituent of [[Joe Biden is President]]. So why cannot composite properties also be constituents of states of affairs?

(Similarly, C&D say: 'Properties […] are in no mereological sense parts of states of affairs. As such, they must be metaphysically simple.' [C&D 2021: 9009] That argument is likewise invalid. Compare: Biden is in no mereological sense a part of the state of affairs [[Joe Biden is President]] but it doesn't follow that Biden cannot be a composite object.)

3 The Constituent Dependence Problem

The rest of this paper deals with C&D's other problem for mereological nominalism. Again, the specifics of the problem vary depending upon which version of mereological nominalism we consider. Start with C&D's attack on constituent mereological nominalism. They believe:

> Wholes depend on parts: If *x* is a fusion of the *y*s then *x* metaphysically depends on the *y*s.
> Complexes depend on constituents: If *x* is a metaphysical complex (i.e. *x* has metaphysical constituents), then *x* metaphysically depends on its constituents.

Given Properties are instance fusions, *Charge* is a fusion of every charged particle. So, given Wholes depend on parts, *Charge* partially depends on some given electron, *e*. Given Complexes depend on constituents, *e* partially depends upon *Charge*. Assuming that partial dependence is asymmetric, we have a contradiction.

I discuss this problem in my original paper [Effingham 2020: 173], arguing that the constituent mereological nominalist should either: (i) endorse priority monism; or (ii) deny Wholes depend on parts [Effingham 2020: 173].

3.1 Priority Monism

Orthodoxy says wholes depend upon their parts. Priority monists [Schaffer 2010] instead say that everything depends upon the fusion of all that exists ('the universe'). In that case, Wholes depend on parts is false. Given priority monism, the Constituent Dependence Problem is avoided.

C&D think priority monism is a contentious commitment. But I never argued that a mereological nominalist version of a realist theory is *strictly* better than the realist theory i.e. that it has *no* downsides compared to its realist competitor. The original paper was clear that there are (possibly contentious) commitments a mereological nominalist must buy into which the realist need not (e.g. the commitment that distinct objects can be composed of the same parts [Effingham 2020: 168 – 70]). Priority monism should be seen in the same light.

Nevertheless, I do now worry about relying on priority monism. If metaphysical dependence 'ran in reverse' (i.e. all parts were dependent upon the wholes they were a part of), it'd solve the problem. But the core proposal of priority monism is only that everything depends upon the world, which is consistent with things *usually* depending upon their parts. Assume: (i) the universe is metaphysically independent; (ii) everything is mereologically composed of mereological simples; (iii) the mereological simples depend upon—indeed, *immediately* depend upon—the universe; (iv) every composite (other than the universe) metaphysically depends upon its parts. That is a version of priority monism (and the version I nowadays find most attractive). Whilst Wholes depend on parts is false, the slightly weaker principle that every object *other than the universe* depends on its parts would still be true. And that weaker principle would be enough to show that *Charge* metaphysically depends upon the electrons that compose it (and, thus, that there's a contradiction given Complexes depend on constituents). So set aside priority monism as a solution.

3.2 Revisiting metaphysical over-determination

I also argued that the constituent mereological nominalist should endorse:

> No mereological dependence: No whole metaphysically depends upon its mereological parts.

Given No mereological dependence there is no Constituent Dependence Problem. Since *Charge* would not depend upon its mereological parts (and so Wholes depend on parts would be false).

C&D take issue with this defence, saying it's *ad hoc* and that we are owed a more detailed account of why we should believe it [C&D 2021: 9004*n*27].I believe I have already done this [Effingham 2020: 173] , having argued that worries about 'metaphysical overdetermination' drive us towards No mereological difference. This section re-examines what I had in mind, adding in alternatives solutions to 'metaphysical overdetermination' that I previously ignored. The conclusion is that any resolution to those overdetermination worries undermines the Constituent Dependence Problem.

Start by laying out the 'metaphysical overdetermination' worry. Consider a hydrogen atom composed out of an electron and a proton. Assume a simplistic bundle theoretic story whereby:

• The hydrogen atom is a bundle of three properties: *Electronegativity 2.1*, *Spin ½*, and *Mass of ~ 939 MeV*.

• The proton is a bundle of two properties: *Mass of ~ 938 MeV* and *Spin ½*.

• The electron is a bundle of two properties: *Mass of ~ 0.51 MeV* and *Spin ½*.
• Protons and electrons are mereological simples.

Given Complexes depend on constituents and their mereological simplicity, the electron wholly depends on *Spin ½* and *Mass of ~ 0.51 MeV* and the proton wholly depends on *Mass of ~ 938 MeV* and *Spin ½*. Given Complexes depend on constituents, the hydrogen atom depends on its properties and given wholes depend on parts it also depends on the electron and proton. But what does it *wholly* depend upon?

Imagine it wholly depends on its parts *and* it wholly depends on the properties. In that case, the hydrogen atom has not one but two *whole* explanations for its existence; its existence is 'over-determined'.

My original worry was that this is bad for the same reason that it is bad in regular causal cases. A causal overdetermination case occurs when multiple independent causal chains both wholly cause some event e.g. a soul's desire and a brain's neurons firing both wholly causing me to drink a cup of tea, or two bombers coincidentally simultaneously denotating bombs to destroy a bridge. Whilst possible, causal overdetermination is not commonplace, thus we should avoid theories saying overdetermination is routine. Similarly, we should not think that (routinely) two separate collections of facts wholly metaphysically explain some further fact. And that is exactly what is the case if the hydrogen atom wholly depends both on its parts and on its constituents.

One referee worried that there was a disparity between metaphysical and causal explanation which means that metaphysical overdetermination is innocuous. Consider the state of affairs [[P∨Q]]. If only [[P]] exists, [[P∨Q]] wholly depends on it; if only [[Q]] exists, it instead wholly depends on [[Q]]; but what if both [[P]] and [[Q]] exist? It seems that [[P∨Q]] wholly depends on both [[P]] and [[Q]], which is a case of metaphysical overdetermination. Assuming disjunctive states of affairs are commonplace then, unlike causal overdetermination, metaphysical overdetermination *is* commonplace.

But if we consider 'disjunctive entities' like [[P∨Q]] in the metaphysical case, we can consider disjunctive entities in the causal case. Consider some 'disjunctive event' corresponding to two actual events e.g. the event of 'Britain leaving the EU or Biden winning the 2020 Election'. That event has occurred; further, it is wholly caused to occur by two independent causal chains (namely that leading to Brexit and that leading to Biden being elected). But consideration of such disjunctive events should not make us think that cases of routine overdetermination are not worrisome! To solve this we might limit the ban on routine overdetermination only to non-disjunctive events. But then we must say the same in the metaphysical case, allowing for [[P∨Q]] to be overdetermined but denying that non-disjunctive entities like hydrogen atoms can be overdetermined. Or we might simply deny that disjunctive events exist at all. But then we must say the same in the metaphysical case: There are no disjunctive states of affairs.

So the atom does not wholly depend both on its properties and on its parts. Thus, the bundle theorist is left with three options:

(i) Deny that the hydrogen atom depends (at all) upon its mereological parts.
(ii) Deny that the hydrogen atom depends (at all) upon its constituents.

(iii) Say that the atom wholly depends upon the collection of parts and constituents pooled together.

Option (i) was my original position: an endorsement of No mereological dependence that avoids the problem for mereological nominalism. However, I incorrectly ignored (ii) and (iii). Consider them in turn, starting with (ii).

The motivation for (ii) must be either that (ii.a) no material object depends upon its constituents or (ii.b) that no *composite* material object depends upon its constituents. Given (ii.a), Complexes depend upon constituents is false and the Constituent Dependence Problem is now avoided. (It bears noting how odd (ii.a) is in any case: having adopted a constituent ontology over a relational property ontology [van Inwagen 2011], it's strange to then believe that things don't depend on their constituents—what work could constituency do if dependency is not part of that package?)

Given (ii.b), Complexes depend upon constituents is false but, as with priority monism and Wholes Depend on Parts, its falsity does not help the mereological nominalist; whilst *some* complexes fail to depend upon their constituents, *e* would nevertheless still depend on *Charge* and that is enough to cause a problem. However, (ii.b) is *ad hoc*—why think that simples depend upon their constituents, but composites do not? (This worry of being *ad hoc* is particularly noteworthy given C&D level the same complaint against me [C&D 2021: 9004*n*27].) We can further draw out this *ad hoc*-ness by considering gunky worlds (that is: worlds at which every material object has proper parts). At gunky worlds, there are no simples but there are objects; given (ii.b), whilst objects exist at that world, none of them depend upon their properties. But, if there are worlds—worlds that presumably are very similar to our own—where objects don't depend on their properties, what is to be gained by claiming that in our world some objects *do* depend on their properties? Isn't it a theoretical extravagance to place a demand on the protons and electrons of our world that does not apply to the gunky electrons and gunky protons of other worlds? (Perhaps the bundle theorist will simply deny the possibility of gunky worlds, but that has its own costs for there are reasons to think such worlds are possible [Sider 1993; Effingham 2011.)

That leaves option (iii), whereby the hydrogen atom partially depends upon its properties, partially upon its mereological parts, and wholly depends only on the collection of both. But consider the bundle theoretic story whereby we explain the existence of things in terms of their properties. Why does that story do everything in the case of mereological simples like the proton and electron and not in the case of the hydrogen atom? If bundles of properties are all we need for *some* objects, why not *all* objects? What is to be gained by endorsing (iii) and complicating our theory of dependence, 'mixing' how dependence works when it comes to composite objects?

That this is a problem is ever more convincing once we see that there are different *types* of dependence. The dependence between complex and constituent is metaphysical dependence. Just as causal dependence comes hand in hand with 'causal biff', metaphysical dependence is 'metaphysical oomph', with the lower-level entities metaphysically 'pushing' the higher-level entities into existence. But we needn't say the same of the dependence of wholes on their parts; that could instead just be some sort of modal dependence. When we say that the whole 'depends' upon its parts, we capture a counterfactual story whereby (in some specific context) if the parts did not exist, then the whole would not exist either. Mereological dependence is analo-

gous, not to causal biff, but to causal counterfactual dependence. So the two types of dependence are different. All this said, why be attracted to option (iii)'s 'hybridising' of the hydrogen atom's metaphysical dependencies when we can instead accept that there are two *distinct types* of dependence. In that case, there's no sense in which the hydrogen atom wholly depends on the collection of both its parts and its constituents in the same way that there's no sense that I depend on the combination of my parents' procreative act and my working at the University of Birmingham. I depend on the former *causally*. I depend on the latter *financially*. In no sense do I wholly depend upon both together. Similarly, the hydrogen atom *metaphysically* depends on its constituents but *modally* depends on its parts. There is no single dependence relation between the atom and the collection of properties and parts. In that case No mereological dependence is true; again, the Constituent Dependence Problem is avoided.

In brief: I was too quick to think the mereological nominalist must accept No mereological difference because of worries with metaphysical overdetermination. But the only plausible alternative is (ii.a), which denies Complexes depend upon constituents and gets the mereological nominalist out of the problem case anyhow.

4 The Vanilla Dependence Problem

Against vanilla mereological nominalism C&D say:

> […] recall that [Instantiation is primitive ∧ Properties are instance fusions] states that instantiation is a primitive relation between instances and properties. Since properties are mereological fusions of instances, this proposal implies that instantiation is a primitive relation between instances and property-fusions. [C&D 2021: 9001]

That much I agree with. However, they continue:

> But this, it seems, makes the existence of instances depend on that of property-fusions: *there could be no instances, indeed, if there were no property-fusions in the first place.* This understanding of instantiation, in other words, presupposes or requires the existence of property-fusions. If this is so, [Instantiation is primitive ∧ Properties are instance fusions] ends up with a circular claim: the existence of properties depends on that of their instances, and vice versa. [C&D 2021: 9001-2; my emphasis]

Consider the italicised portion first. It's true if interpreted as saying that the existence of instances necessitates the existence of properties. But such modal dependencies are obviously unproblematic, as the mutual necessitation of Socrates and {Socrates} ably demonstrates. So, the italicised portion must instead be interpreted as a claim about metaphysical dependence: the instances can only exist given the properties exist because instances metaphysically depend upon properties. But, whilst the constituent realist and constituent mereological nominalist both believe that claim (because Complexes depend on constituents is true), the vanilla realist and vanilla

mereological nominalist need not. So the vanilla mereological nominalist would simply deny the italicised fragment.

Additionally, consider the remainder of the quote. The crucial portion is the first line: C&D move from an instance and a property standing in a primitive relation to one another, to the existence of one relata depending on the other. I do not see why we should accept that leap. Firstly, even were standing in a primitive relation an indication of dependence, why believe that it is the instances that depend on the properties, rather than the other way around? Secondly, it just seems false that things standing to one another in a primitive relation entails some sort of dependence relation. Consider again Lewis's theory, according to which spatiotemporal relatedness is a primitive relation. Things are spatiotemporally related without one metaphysically depending on the other e.g. I'm spatiotemporally related to Ghenghis Khan but he doesn't depend upon me nor me upon him.

5 The State Dependence Problem

Against state mereological nominalism, C&D say:

> [Properties are instance fusions] is plausibly taken to mean that the existence of a property-fusion depends on that of its instances. But [state mereological nominalism] in turn, seems committed to accept that the existence of instances depends, at least in part, on that of property-fusions. [C&D 2021: 9002]

The first sentence is a commitment to Wholes depend on parts. The second sentence is a commitment to:

> Intra-state dependence: For any state of affairs comprised of a particular and a property, the particular (at least partially) metaphysically depends upon the property.

C&D's argument must then be: given Wholes depend on parts, *Charge* partially depends upon each electron; given Intra-state dependence, any given electron partially depends on *Charge*; given partial dependence is asymmetric, state mereological nominalism is contradictory.

Set aside whether Wholes depend on parts is false (though state realists/state mereological nominalists will themselves face a version of § 3's overdetermination problem, and so may deny it anyhow). Focus instead on Intra-state dependence. It is an unappealing principle. For instance, why not think that *Charge* depends on the electron rather than the other way around? Further, why think co-constituency evidences *any* dependency in the first place—why not simply deny that co-constituents depend on one another *at all*? Certainly, there's no mereological analogue for intra-state dependence, since (non-overlapping) parts of a whole don't depend on one another. And the most famous state realist of them all, David Armstrong, in many places denies Intra-state dependence, saying that states of affairs are more funda-

mental than their constituents and that their constituents metaphysically depend on the state of affairs rather than on one another [Armstrong 1980: 447; 2010: 27].

(A referee pointed out that, at other junctures, Armstrong defends properties and particulars being partially identical to one another [Armstrong 2004; see also Baxter 2001]. If we add that, for all x, x depends on those things that x is partially identical to, Intra-state dependence would be true! However, properties must then also depend on particulars and partial dependence could not be asymmetric; the state mereological nominalist could therefore avoid the State Dependence Problem anyhow.)

So it's hard to see why we should believe Intra-state dependence. But C&D do provide an argument for it:

> [State mereological nominalism] accounts for the existence of a given instance of redness, such as a particular red apple, in terms of there existing a state of affairs which includes the fusion *Red* among its constituents. As such, there could be no red instances if the fusion *Red* did not exist. [State mereological nominalism] then, makes the existence of instances dependent on that of property-fusions. [C&D 2021: 9002]

Breakdown that first sentence. It implicitly appeals to:

> Particulars depend on states: An instance, x, that is F (partially) depends upon the state of affairs [[x is F]].

But to derive Intra-state dependence, we'd also need:

> States depend on their constituents: A state of affairs (partially) depends upon each of the particular(s) and properties that are its constituents.

Given Particulars depend on states, an electron, e, partially depends upon the state of affairs [[e is charged]]. Since that state of affairs has *Charge* as a constituent then, given States depend on their constituents, it partially depends on *Charge*. Given the transitivity of partial dependence, e partially depends on *Charge*; more generally, particulars depend upon the properties they instantiate i.e. Intra-state dependence is true.

However, independent of anything to do with mereological nominalism, no-one who accepts that partial dependence is asymmetric should believe both Particulars depend on states and states depend on their constituents. Consider [[e is charged]]. Given Particulars Depend on States, e partially depends upon [[e is charged]]. Given States depend on their constituents, [[e is charged]] partially depends on e. If partial dependence is asymmetric, we have a contradiction. Therefore, state realists must either (i) deny that partial dependence is asymmetric or (ii) deny one of Particulars depend on states and states depend on their constituents. In either case, the state mereological nominalist can make the same move, thereby avoiding the State Dependence Problem.

(One last consideration: C&D may tweak what they say. Rather than States depend on their constituents, they may say that states of affairs depend only on

the properties that they have as constituents and, whilst they also have particulars as constituents, they *don't* depend upon them. But why believe that principle? It just seems *ad hoc* to say that an entity depends upon some of its constituents but not others.)

Overall: C&D's objections to mereological nominalism are unsuccessful.

Declarations

Conflict of interest The author declares that they have no competing interests.

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