

Principles of Composition and Criteria of Identity¹

Katherine Hawley, University of St Andrews

Abstract:

I argue that, despite van Inwagen's pessimism about the task, it is worth looking for answers to his General Composition Question. Such answers or 'principles of composition' tell us about the relationship between an object and its parts. I compare principles of composition with criteria of identity, arguing that, just as different sorts of thing satisfy different criteria of identity, they may satisfy different principles of composition. Variety in criteria of identity is not taken to reflect ontological variety in the identity relation; I discuss whether variety in principles of composition should be taken to reflect ontological variety in the composition relation.

1. Introduction

In his agenda-setting *Material Beings*, Peter van Inwagen distinguishes a 'general' question about composition from two 'special' questions [1990]. The General Composition Question asks about the relationship between a whole and the objects which jointly compose it; the Special Composition Question asks about the relationship which holds amongst some objects when they jointly compose a whole; the Inverse Special Composition Question asks about the property an object instantiates when it has proper parts. Van Inwagen devotes most of his book to answering the Special Composition Question; there is now a substantial body of literature on this issue [e.g. Markosian 1998a; Merricks 2001; Sider 2001]. The Inverse Special Composition Question is addressed in recent work by Ned Markosian and others on mereological simples [Markosian 1998b]. But the General Composition Question has been neglected, following van Inwagen's pessimistic lead: 'I am inclined to think that there is no way of answering the General Composition Question...What I am sure of is that I know of no way to answer, or even to approach, the General Composition Question' [1990: 51].

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I think a little more optimism is justified. Van Inwagen requires that the General Composition Question (GCQ) be answered by a non-mereological analysis of the concept *composition*; presumably he is right that no such analysis is available. But this requirement is much more stringent than those he imposes upon the Special Composition Question (SCQ) and Inverse SCQ. There is space for answers to the GCQ which do not meet the very highest standards but which are nevertheless illuminating and nontrivial. Although we may be unable to say what composition fundamentally *is*, we may be able to say quite a lot about it. Moreover, what we say may legitimately be different for different sorts of things.

In section 2, I will compare the standards which van Inwagen sets for answers to his various questions, and argue that the lower standards set for the SCQ and Inverse SCQ can also be applied to the GCQ. In section 3, I will draw some analogies with identity: although we may be unable to say what identity fundamentally *is*, we can say quite a lot about it. Criteria of identity can differ for different sorts of thing; I shall argue that the same is true for answers to the GCQ. In section 4, I will argue that, although the multiplicity of identity criteria does not reflect a multiplicity of identity relations, some philosophers have reason to posit a multiplicity of composition relations.

A note about composition and parthood: as it is usually understood, composition is a relation which holds between a plurality of non-overlapping objects, on the one hand, and a single object, on the other (setting aside the question of whether the same plurality may simultaneously compose two distinct objects). A plurality may compose an object even though that object has parts not amongst that plurality: a certain plurality of subatomic particles composes me right now (ignoring vagueness), but my head is a part of me, and is not a subatomic particle. Similarly, my left and right halves collectively compose me, even though my head is also a part of me.

2. Three Questions about Composition

For each of his three Composition Questions, van Inwagen provides both an informal gloss on the question and a more formal characterisation of what a good answer would be.

Questions: ‘the General Composition Question may be identified with the question, What *is*

composition?’ [1990: 39]. Both the SCQ and the Inverse SCQ may be glossed as ‘Under what conditions does composition occur?’ [39, 48], but the SCQ asks ‘In which cases is it true of *certain objects* that *they* compose something’ while the Inverse SCQ asks ‘In which cases is it true of *an object* that there are objects that compose *it*?’ [48, italics in original].

Answers: the GCQ requires ‘a sentence containing no mereological terms that [is] necessarily extensionally equivalent to “the *xs* compose *y*”’ [39]. The SCQ requires ‘a sentence which contains no mereological terms and in which no variable but “the *xs*” is free and which is necessarily extensionally equivalent to “ $\exists y$ the *xs* compose *y*”’ [31]. And the Inverse SCQ requires ‘a suitable replacement for “For some *xs*, the *xs* properly compose *y*”, a sentence containing a free singular variable’ [48]. So each question may be answered by a biconditional: for example, an answer to the GCQ takes the form ‘the *xs* compose *y* iff’. Such an answer to the GCQ is called a ‘principle of composition’.

In some respects the standards set for answers to the three questions are the same: in each case, mereological terms are barred from the right-hand side of the biconditional (a mereological term is a word or phrase ‘that can be given a trivial definition in terms of “part”.’ [31]). And in each case the biconditional must be necessarily true.

On the other hand, there are clear differences between the answers required: the GCQ requires a condition on the composers and the composed object, the SCQ requires a condition on the composers, and the Inverse SCQ requires a condition on the composed object. As van Inwagen explains, these differences are significant. An answer to the GCQ will entail answers to both the SCQ and the Inverse SCQ, by existential generalisation over the two variable places respectively. Suppose the answer to the GCQ is that the *xs* compose *y* iff the *xs* stand in the relation *R* to *y*. Then an answer to the SCQ is that $\exists y$ (the *xs* compose *y*) iff $\exists y$ (the *xs* *R* *y*), and an answer to the ISCQ is that for some *xs* (the *xs* compose *y*) iff for some *xs* (the *xs* *R* *y*). But claims thus derived from the answer to the General Question will not always provide the most interesting true answers to the Special Questions. Conversely, answers to the SCQ and Inverse SCQ do not suffice, even in combination, to determine an answer to the GCQ. Roughly, finding what composing pluralities are like and what

composite objects are like won't automatically tell us about the relationship between a plurality and the object composed by that plurality.

So the three questions differ in form and content. But his informal glosses on the questions suggest that van Inwagen expects not just something different but something more from an answer to the GCQ than he does from answers to the SCQ or Inverse SCQ. This comes out in his discussion of one candidate answer to the GCQ:

(*Composition*): The *xs* compose *y* iff no two of the *xs* occupy overlapping regions of space and *y* occupies the sum of the regions of space occupied by the *xs*.

Composition permits distinct objects to coincide exactly, so long as they have the same parts. For example, some molecules may compose both a statue and a distinct lump of clay. But exactly coinciding distinct objects with different parts would falsify *Composition*. For example, suppose there were exactly coinciding distinct objects made of different sorts of matter, which did not share any parts. The parts of the first object would collectively occupy the space occupied by the second object, but would not compose the second object.

Answers to the GCQ must be necessarily true, so the mere possibility of such coinciding but mereologically-unrelated objects would undermine *Composition*. Are they possible? Van Inwagen writes 'It may, of course, be that spatially coincident objects [of this troublesome kind] are metaphysically impossible. But that they are impossible is a substantive metaphysical thesis and should not, therefore be "built into" what is essentially an explanation of parthood.' [50] Van Inwagen acknowledges *Composition* as his own best attempt at answering the GCQ, but argues that this best attempt fails, even if a counterexample is impossible, because a counterexample is conceivable. He likens approaches to the GCQ to attempts 'to give an "external" account of modal or moral (or existential or spatial or temporal) concepts'. He speculates that any such attempt may be liable to an open-question argument: 'Couldn't the skeptic say... "Yes, I admit that for any *xs*, whatever the *xs* compose will have the property *occupying the sum of the regions of space the xs occupy*. But I think I can imagine an object which is *not* one of the things the *xs* compose and which also has that property" [?]' [51]

Van Inwagen demands that an answer to the GCQ be not only a necessary truth but also something like a conceptual truth, to which counterexamples are inconceivable. This is tricky ground: different authors make different distinctions between what is obviously true, what cannot conceivably be false, what is analytic, what *a priori* and so on [Gendler and Hawthorne eds. 2002]. But what's clear is that van Inwagen requires answers to the GCQ to meet some very high standard of being both non-trivial (non-mereological) and yet non-substantive or, at least, uncontroversial. Well, he formulated the question, and he may legitimately set himself such high standards. Nevertheless, these standards are much higher than those he sets for answers to the SCQ and the Inverse SCQ, which suggests that an answer to the GCQ could be illuminating without meeting these high standards.

When we answer the SCQ, the resulting biconditional ($\exists y$ the *xs* compose *y*) iff (the *xs* are F) should be necessarily true. But it needn't be a conceptual truth: van Inwagen would surely dismiss any open-question argument against his own preferred answer to the SCQ. He argues that ' $\exists y$ (the *xs* compose *y*) iff the activity of the *xs* constitutes a life (or there is only one of the *xs*)' [82]. Plenty of us think we can imagine cases in which some objects compose another even though their activity does not constitute a life (consider the particles in your chair). And some philosophers think they can imagine cases in which some objects fail to compose anything, even though their activity does constitute a life [Merricks 2001]. The bulk of van Inwagen's book is dedicated to arguing that such intuitions can be captured only by flawed views of composition; these arguments involve matters of substantive metaphysics.

Van Inwagen does not discuss the Inverse SCQ at any length, but ongoing debate about the conditions for mereological simplicity, and the (im)possibility of extended simples suggest both that an open-question response is available for any of the currently-proposed answers to the Inverse SCQ and that such a response would usually be beside the point.

Answers to the SCQ and Inverse SCQ do not jointly entail an answer to the GCQ. They typically 'fall short' in a second way too, being substantive metaphysical truths, not conceptual truths. But these two features are mutually independent: the difference in form between the general and the special composition questions does not of itself require a

difference in the standards for answers. So there is logical space for an answer to the GCQ which does not meet van Inwagen's high standards, a principle of composition which does not achieve a non-mereological analysis of 'composition' but which is nevertheless metaphysically necessary. Like van Inwagen, we should distinguish between asking what composition *is*, and asking under what conditions composition occurs. But we should recognise that the latter question may be answered by supplying a relational condition on composing and composed objects.

Perhaps aiming for general, necessary truth is too ambitious, even without the aspiration to conceptual truth. Suppose, as van Inwagen suggests, that if there is anything entirely general to be said about composition, then it is to be said in terms of spatial location. Then there can be no composition among entities like universals, numbers and sets, if these are non-spatial, and coincident but mereologically unrelated objects are impossible. These are substantial commitments: for example, the ban on nonmereological coincidence outlaws the possibility that an individual spatially coincides with its singleton [Lewis 1991: 33]. We might want instead to maintain that, while physical objects in worlds like ours obey (*Composition*), there are actual and merely possible objects which obey other principles of composition. Perhaps no fully general, necessarily true answer to the General Composition Question is available.

Nevertheless, answers to the GCQ are worth pursuing, for there may be interesting principles of composition which have more limited scope, different principles for different sorts of thing. We have a precedent for this in the case of identity. Identity is not subject to any illuminating, non-trivial analysis in 'non-identity' terms, and moreover there may be no perfectly general, necessarily true yet non-trivial biconditional about identity. But criteria of identity for different kinds of thing can be informative. In the remainder of this paper, I will expand upon the analogy between principles of composition and criteria of identity (section 3), then discuss whether variety in principles of composition reflects ontological variety in relations of composition (section 4).

3. Criteria of Identity and Principles of Composition

An answer to the GCQ, a principle of composition, is a biconditional with a composition claim on the left, and some correlated condition on the right. A criterion of identity is a biconditional with an identity claim on the left, and some correlated condition on the right. Just as we seem unable to supply an analytic principle of composition which avoids mereological terms on the right hand side, we seem unable to supply an analytic principle of the form ‘ x is identical to y iff xRy ’ which avoids the concept of identity on the right hand side. Even if Leibniz’s Law and the principle of the identity of indiscernibles together constituted a necessarily true, universal criterion of identity, this would be a matter of substantive metaphysics in van Inwagen’s sense. An open question response would be available: ‘I think I can imagine two objects which share all their properties and yet are distinct’. The principle of the identity of indiscernibles is uncontroversial if we have an extensional account of properties, but of course such an account is itself a matter of substantive metaphysics.

(Criteria of identity are analogous to principles of composition, which answer the GCQ. There is also a ‘special identity question’, but its answer is boringly uncontroversial. Under what circumstances $\exists y (x = y)$? Under all circumstances in which x exists, of course. Unrestricted mereology is a controversial answer to the SCQ, but we all accept that each thing is identical to something or other.)

Criteria of identity seem to come in two forms: one-level and two-level criteria [Dummett 1981: 580-81]. A one-level criterion of identity for K s quantifies over K s, correlating K -identity with some relation between K s. For example: for any two material objects, the first is identical to the second iff they occupy the same spatiotemporal region. (Sample criteria and principles are intended to illustrate formal points: I make no claims for their truth.) A two-level criterion of identity for K s relies upon a functional relationship between K s and objects of a second kind, K^* s. It quantifies over K^* s, correlating K -identity with some relation between K^* s. For example: for any two lines, the direction of the first is identical to the direction of the second iff the lines are parallel.

Analogously, we can distinguish one-level from two-level principles of composition. In a one-level principle of composition, composed and composing objects are quantified over, and

composition amongst them is correlated with some other relation between them. Two examples: for any x s and any y , the x s compose y iff the properties of y are determined by the properties of the x s; for any x s and any y , the x s compose y iff no two of the x s occupy overlapping regions of space and y occupies the sum of the regions of space occupied by the x s. A two-level principle of composition characterises composers and composed via their relationship with other entities, then correlates composition with some relation between those other entities. Two examples: for any nonoverlapping regions the x *s and any region y *, the objects which occupy the x *s compose the object which occupies y * iff y * is the sum of the x *s; for any portions of stuff the x *s and portion of stuff y *, the objects made of the x *s compose the object made of y * iff the x *s compose y *. We might even countenance mixed-level principles of composition, in which either composers or composed are given a functional characterisation, but not both.

Two-level principles of composition can look like mere reformulations of one-level principles (or *vice versa*); analogous suspicions afflict the analogous distinction amongst criteria of identity [Lowe 1989]. Does it really make a difference whether we quantify over objects then invoke a relation of occupying-the-sum-of-the-regions-occupied-by, or just quantify over the regions? It can make a difference in two ways. First, the two-level criteria are viable only if *occupying* (a region) and *being made of* (some stuff) are functional relations, whereas the corresponding one-level criteria do not depend on this. Second, both criteria of identity and principles of composition are subject to non-circularity requirements, and how these are understood may depend upon whether we use the one-level or the two-level form.

Most obviously, it is unilluminating to remark that K s are identical if and only if they are identical. Some think that less obviously trivial criteria may be objectionably circular. For example, Davidson claims that events are identical iff they have all the same causes and effects; Lowe objects that this is 'impredicative', because Davidson claims that causes and effects are themselves events [Davidson 1980; Lowe 1989]. Williamson is even more stringent: he suggests that all one-level criteria are unsatisfactory [1990]. This is because they equate K -identity with some other relation between K s, a relation which cannot be more fundamental than identity. Two-level criteria at least offer the prospect of 'reducing' K -

identity to a relation amongst more fundamental objects. It seems unlikely that any criterion could avoid the notion of identity entirely: McGinn argues that identity for properties is likely to feature somewhere [2000].

Correspondingly, there is a range of noncircularity requirements we might impose upon principles of composition. It would obviously be trivial to point out that the *x*s compose *y* iff the *x*s compose *y*, or that the *x*s compose *y* iff *y* is a sum or a fusion of the *x*s. But it is not so obvious that all mereological terms must be banned: it may well be illuminating to correlate composition amongst the *x*s and *y* with some mereological relation amongst the quantities of stuff which compose the *x*s and *y*, or amongst the regions occupied by the *x*s and *y*, for example. If mereological terms are to be permitted, two-level principles seem preferable to their one-level counterparts.

More stringently we might ban all mereological terms from the right hand side of any composition principle. This would leave space for two-level composition principles if the *sub-region-of* or *sub-portion-of* relation were set-theoretical and not mereological, for example. It would also permit one-level composition principles if these could be spelt out in terms of, for example, non-mereological correlations between the properties of the parts and the properties of the whole. It seems unlikely that there is a definitive non-circularity standard which must be met either by criteria of identity or by principles of composition. Instead, different standards will be appropriate according as we have different goals in seeking such criteria or principles.

Different criteria of identity apply to objects of different sorts: this is especially clear for two-level criteria, which rely upon sort-specific functional relationships. Similarly, principles of composition are at least potentially sort-relative. Van Inwagen's *Composition* elucidates composition in terms of the occupation of spatial regions. This principle could not apply to entities which lack a spatial location, so if universals, sets or numbers may enter into mereological relations without being spatially located, then they will obey different composition principles. Within the category of spatially-located things, it may be that some obey a principle of composition according to which the properties of a whole are determined by those of its parts, whilst others do not obey this principle.

There is scope for two dimensions of sort-relativity in composition principles: such principles may vary both with the sort of object composed and the sort of objects doing the composing (the relata of identity always match in sort, of course). For example, perhaps cats have both cat limbs and fundamental particles as parts, but the relationship between limbs and cat looks quite different from that between particles and cat. Similarly, the relationship between particles and cat looks quite different from that between particles and molecule.

It is received wisdom that the variety in identity criteria does not reflect variety in identity relations: personal identity, set identity and the like are all just identity. Criteria of identity do not tell us about identity as such. Instead, they tell us about minimal differences between objects of a given kind: distinct sets must differ in their membership, distinct physical objects (let's suppose) must differ in their spatial locations. Why is it so widely believed that there is only one identity relation? It's perhaps because the logical features of identity are believed to be universal, and so is Leibniz's Law. Moreover the variety of criteria of identity does not entail Geach-style relative identity, according to which a may be the same F as b , yet fail to be the same G as b , even while a and b are both F s and both G s. It looks as if economy directs us to believe in just a single identity relation.

What about composition? As with identity, we don't seem committed to Geach-style relativity of composition, despite the variety in principles of composition. Relativity would occur if there were as and a b such that the as were both F s and G s, the b was both a J and a K , and those F s composed that J , but those G s failed to compose that K . I, at least, can't think of any plausible examples of this pattern.

In contrast with identity, however, there is less pressure to think that a single composition relation underlies the various principles of composition. There is less agreement about the logic of parthood than there is about the logic of identity: for example, it is debatable whether parthood is transitive. Moreover there is no general principle which stands to composition (or parthood) as Leibniz's Law does to identity. The best candidate is something like this: x is a part of y iff whatever properties x has, y has partially. But it's hard to see how to unpack this 'partially' without making the principle either false or trivial.

The positive reasons to think that composition is the very same relation in different domains are slightly weaker than the positive reasons to think there is only one identity relation, but in the absence of reasons to think otherwise, economy would direct us to think there is only one composition relation. Are there reasons to think otherwise? Kris McDaniel argues that spacetime regions enter into a two-place parthood relation, while occupants of those regions enter into a three-place time-relative parthood relation [2004]; Peter Simons has also argued that entities in different ontological categories (things, portions of stuff, aggregates) may obey different mereological principles, though it's not clear whether he would take the further step of positing different composition relations to explain the differences in mereological behaviour [Simons 1987]. In the remainder of this paper I will discuss a case in which, given certain assumptions, we have reason to posit differences in the composition relation even within the broad category of material particulars.

4: Constitution without Identity?

According to some metaphysicians, two distinct objects may be wholly composed of the same basic parts at the same time. Supposed examples include a statue and the lump of clay from which it is made, an organism and the lump of flesh which constitutes it at a given moment, and a piece of bronze and the aggregate of particles which constitutes it at a given moment. In each case, we appear to have two coinciding objects which belong to different kinds: they have different persistence conditions, different modal features, and, usually, different histories. But they appear to be made of the same basic parts at the same time. There are various ways of explaining away these appearances, but for advocates of a three-dimensionalist (endurantist) account of persistence, the most straightforward option is to accept the situation at face value: two distinct objects may exactly occupy the same spatial region at the same time, and be wholly composed of the same parts at some level of decomposition. Since the relation between lump and statue (e.g.) is often called 'constitution', we may call this the 'constitution-without-identity' view.

There are objections to this view, but they are not easily framed. In the context, it is question-begging merely to assert that two different material objects cannot exactly coincide.

We might feel, however, that the constitution-without-identity view violates some kind of dependency or determination principle: surely what the parts are like fixes what the whole is like, so there can't be two different objects made of the same parts arranged in the same way at the same time? Even granted some such determination claim, this objection needs work. Advocates of constitution-without-identity can accept that the existence and arrangement of the particles fixes that there is both a statue with certain properties and a lump with other properties.

More carefully, critics may ask what explains (or perhaps grounds) the differences in the two objects, given their shared parts. In response, advocates of constitution-without-identity typically point out that the statue and lump belong to different kinds, that they have different modal features, that they have different persistence conditions and perhaps different histories, and/or that they have different relational properties [Baker 2000; Lowe 2002]. The trouble is that these responses appear to rely upon the sort of facts whose possibility they are supposed to explain. If critics are puzzled about how two objects can differ, given that they are made of just the same parts arranged in the same way at the same time, they will be puzzled about how two such objects can differ in their kind-membership, persistence conditions, relational properties and so on. We appear to have a stand-off.

I recommend that advocates of constitution-without-identity take seriously the possibility of sort-relative composition. That's to say, they should take seriously the possibility that the relation between particles and statue is different from the relation between particles and lump. I will explain first why the constitution-without-identity view suggests that particles/statue obey a different principle of composition from particles/lump. I will then argue that advocates of the view should infer that this difference in principles reflects an underlying difference in the ontological relations of composition.

Many of the supposed differences between statue and lump point towards differences in principles of composition, regardless of whether these reflect differences in underlying relations of composition. An artefact can survive the replacement or removal of at least some of its parts, so long as it continues to function, or maintains the same aesthetic properties. A lump of clay, in contrast, is destroyed if enough parts are replaced. Moreover, an artefact

could have been made of entirely different parts in the first place, whilst a lump of clay doesn't enjoy such mereological flexibility: being that very lump of clay involves being made of those very parts, it seems. In typical cases of constitution-without-identity, the composite objects seem distinct because one seems more closely bound to the basic parts.

None of this is controversial, but it is not usual to think of these differences as differences in principles of composition. For both particles/statue and particles/lump, composition coextends with spatial coincidence. But the lump also obeys composition principles which the statue does not. For example, given some particles and a lump, the former compose the latter iff the existence of the lump counterfactually depends upon the existence and arrangement of the particles. The same cannot be said of statues, since although the statue needs some parts or other, it is not counterfactually dependent upon the very particles which in fact compose it.

Suppose then that the principles of composition which connect particles and lump differ from those which connect particles and statue (just as criteria of identity for people differ from those for directions). Is there any reason to suppose that this difference reflects a difference in the underlying relations of composition (a supposition we do not make in the case of identity)? Those who adopt the constitution-without-identity view have a reason provided by inference to the best explanation. Suppose there were two different composition relations in play. Then this relational difference between the statue and the lump explains (and grounds) their differences in respect of sortals, persistence conditions and modal features. It is because the statue and the lump stand in different relations to their basic parts that the former but not the latter can survive substantial change in parts.

To be explanatory, this reference to different relations must be ontologically serious. Whatever you think properties and relations are – universals, or fairly natural classes of concrete particulars or of tropes – the claim is that there is one relation which connects lump and particles and a different relation which connects statue and particles.

How is this any more satisfactory than simply saying statue and lump differ because they fall under different sortals? Can't critics of the constitution-without-identity view reiterate their

puzzlement about how objects made of the same parts at the same time could differ? Not so easily. Critics of the constitution-without-identity view are motivated by the thought that an object's properties and relations are somehow determined by or depend upon those of their parts, and irreducible sortals violate this thought. Now, once we admit the possibility of a range of composition relations, the content of the dependency thought becomes less determinate. The constitution-without-identity view is compatible with a weak dependency principle according to which if two objects are made of parts arranged in the same way, *and stand in the same relation to those parts*, then they are alike in their sortal properties, persistence conditions and so on. Given an arrangement of parts, and a composition relation, the properties of the whole are determined.

In contrast to statue/lump cases, differences in composition relations are not available to explain or ground differences between coinciding distinct simples, or between coinciding distinct objects of a single sort. But these limitations are not devastating: coinciding distinct simples seem more far-fetched than the standard cases, and some constitution-without-identity theorists already subscribe to 'Locke's principle', which forbids coincidence under a sortal.

A more serious concern is this: supposing that the singleton of the lump depends for its existence upon the lump's existence, the singleton too will be counterfactually dependent upon the existence and arrangement of the lump's parts.² Does it follow that the particles stand in the same composition relation to the singleton as they do to the lump? This had better not follow: the singleton is not usually thought of as having the particles as parts, and, moreover, this possibility would undermine my claim that differences between coincident objects should be explained by reference to different composition relations.

Fortunately, all that follows is that counterfactual dependency cannot be the whole story about the ontological relation between the particles and the lump. For example, the physical properties of the particles will have different consequences for the properties of the lump (determining its mass and shape, for example) than they do for the properties of the singleton.

² An anonymous referee pointed this out.

Indeed, the consequences for the lump will be exactly the same as the consequences for the statue: in this respect the particles-lump relation is like the particles-statue relation.

The particles do not stand in the same composition relation to the lump singleton as they do to the lump. Do they stand in *any* composition relation to the singleton? Once we concede that different kinds of object may stand in different composition relations, what guarantee do we have that these are all genuine *composition* relations? There are a couple of different approaches we might take if we wanted to lay down necessary and sufficient conditions for something's being a composition relation [compare Lewis 1991: section 2.3]. First, we might try to isolate some core principles of mereology, and make satisfaction of these criterial; I am pessimistic about this strategy. Second, we might take inspiration from the tight link between identity and counting, and try to spell out the sense in which composition is a 'generating' relation: when some objects get together and get composing, an extra object exists. While I think this approach deserves further investigation, a couple of problems are immediately apparent: we shouldn't write the dependency of wholes on parts into the very notion of composition (or parthood); and in some cases, if a particular plurality hadn't got it together, another one would, ensuring that there would have been just as many composite objects.

To return to the more specific issue: I am recommending that constitution-without-identity theorists use inference to the best explanation to support a belief in multiple composition relations. Of course, there may be hard-core theorists who insist that the differences in sortals etc. do not stand in need of any explanation. (Indeed, they may argue that it is the difference in sortal properties which grounds the difference in relations to the parts.) And there may be hard-core critics of constitution-without-identity who insist that it remains utterly puzzling how one and the same collection of parts can stand in different composition relations to different objects. Nevertheless, multiple composition relations provide scope for a meeting of more moderate minds.

Even granted all this, opponents of constitution-without-identity are not yet compelled to convert: multiple composition relations are invoked to explain the difference between statue and lump, and those who do not believe there is any such difference do not have reason to believe in these relations. But it is compulsory to give up the claim that the constitution-

without-identity view inevitably conflicts with a straightforward dependency or determination intuition. If this was the only reason for rejecting the constitution-without-identity view, then conversion would now be appropriate.

5. Conclusions

Despite the fact that the concept *composition* resists nonmereological analysis, principles of composition are worth hunting down. Like criteria of identity, such principles can differ for different kinds of thing, even within a single broad ontological category. It is a further question whether this variety in principles of composition reflects ontological variety in relations of composition – I have argued that those who believe in constitution-without-identity have one good reason to posit a variety of such relations. More generally, recognition that this is a live option provides a new tool for metaphysics.

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