

## *The Transitivity of Material Constitution\**

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### I. Introduction

Material constitution and physical realization are both relations that have been used in articulating views in metaphysics and the philosophy of mind. For example, Lynne Baker<sup>1</sup> has recently defended the idea that material constitution is a general relation that holds between statues and what they are made of, dollar bills and pieces of paper, and persons and bodies, continuing a longer tradition within metaphysics that takes constitution to be an important relation holding between pairs of things in the world.<sup>2</sup> Appeal to physical realization, especially to multiple realization, has been central to the discussion of mental causation and non-reductive forms of materialism about the mind.<sup>3</sup>

Both constitution and realization are often contrasted with the relation of identity. Formally, identity is reflexive, symmetrical, and transitive. Constitution and realization, by contrast, are irreflexive and asymmetrical. But are constitution and realization transitive relations?

In metaphysics, the view that material constitution is transitive is ubiquitous, an assumption expressed by both proponents and critics of constitution views.<sup>4</sup> Likewise, it is typically assumed within the philosophy of mind that physical realization is a transitive relation. In both cases, this assumption of transitivity plays a role in discussion of the broader implications of a metaphysics that invokes either relation. Here I provide reasons for questioning this assumption and the uses to which this appeal to transitivity is put. As my title suggests, I shall focus on the case of *material constitution*, using a brief discussion of realization at the outset to motivate the discussion of the transitivity of material constitution at the core of the paper.

There are at least two ways in which a *prima facie* plausible appeal to the transitivity of a relation can fail. First, it might fail because a relation that appears to be transitive in fact is not transitive. An appeal to the transitivity of the relation “always defeats” in drawing conclusions about who will win soccer finals or hockey play-offs exemplifies this first kind of failure. Second, such an appeal might fail because the logical form of the arguments assuming transitivity is not one to which the rule of transitivity applies. The interesting and, in the current context, relevant such failures are those in which arguments relying on a rule of transitivity appear to be of the correct logical form but in fact are not. For example, consider the following simple argument:

Tall Slim is bigger than Bulky  
 Bulky is bigger than Beanstalk

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Tall Slim is bigger than Beanstalk

Here the inference from premises to conclusion relies on the assumption that “bigger than” is transitive, and the argument appears to be of just the right logical form for the rule of transitivity to apply. But as the names in the example, might suggest, it is possible for the premises here to be true yet the conclusion false, if Tall Slim’s *being taller than* Bulky is the basis for the first premise, while Bulky’s *being heavier than* Beanstalk is the basis for the second premise.<sup>5</sup> In short, understood in this way, this argument equivocates on the meaning of the relational predicate “is bigger than”. Thus, despite appearances, the argument is not of the correct logical form to legitimately appeal to the transitivity of “bigger than”. This remains true *even if both disambiguations of the predicate are themselves transitive*.

The basic claim of this paper is that a range of innocent-looking arguments that assume the transitivity of material constitution suffer from either or both of these failures. To shift from merely motivating examples to a context closer to those targets, let’s return to the relation of physical realization.

## 2. The Transitivity of Physical Realization

Even though “constituted by” and “realized by” are sometimes used interchangeably, material constitution has typically been invoked in discussions of the relationship between physically-bounded material entities, such as physical objects, while physical realization has been invoked in characterizing pairs of properties, processes, events, and states, where these typically have been thought to occur at distinct levels of organization. The issue of whether realized properties (such as mental properties) are *something more than* their realizers (such as neural properties) is manifest in debates over the related problems of mental causation and of the epiphenomenal nature of

the mental, as well as in discussions of the causal powers of mental states, of reductionism about the mind, and of individualism about the mental.

Perhaps due to the centrality of such debates and discussions to the philosophy of mind over the past twenty years, the idea that there are distinct concepts of realization—and so the possibility of equivocation in arguments that appeal to realization—is well established. For example, over 25 years ago Sydney Shoemaker introduced the distinction between what he called *core* (or *partial*) and *total* realizations in diagnosing an equivocation in an influential argument that Ned Block and Jerry Fodor had given against a functionalist account of qualitative mental states.<sup>6</sup> Building on that distinction, I have more recently argued that both core and total realizations may extend beyond the boundary of the individual with the corresponding properties, and in effect have appealed to this kind of equivocation to challenge what I call *smallist* views in metaphysics that fail to recognize extended or wide realizations of mental and other properties.<sup>7</sup>

What of the transitivity of realization and the role that it plays in arguments as simple in apparent form as that with which we began? While both partial and total realization each appear to be transitive relations, equivocation between the two undermines the applicability of the rule of transitivity to mediate many otherwise innocent-looking inferences. For example, consider the following argument:

- A. Eve's believing that *p* is realized by having a token of *p* in her head.
  - B. Having a token of *p* in one's head is realized by some detailed, neural state.
- 
- C. Eve's believing that *p* is realized by some detailed neural state.

Premise (A) is a vivid, popular, cartoon version of a more serious, functionalist account of what believing a proposition is, but what I am about to say of it applies to that more serious account.<sup>8</sup> The plausibility of (A) requires that “realization” refer to a partial or core realization of the relevant belief state, for two reasons. First, (A) says something about the particular bit of Eve's total psychological state that concerns this particular belief. Second, the externalist arguments that originate in the thought experiments of Hilary Putnam and Tyler Burge have led to widespread recognition that having a particular belief depends, in part, on being located in the appropriate linguistic or physical contexts. If realizations are to be metaphysically sufficient for the properties that they realize, as is commonly assumed, then total realizations of the propositional attitudes will typically extend beyond the boundary of the organism. Thus, any traditional functionalist account of (say) belief will specify at most a core or partial realization of that state.<sup>9</sup> Yet the notion of realization used in (B) is that of total realization.<sup>10</sup> Hence, even granting the truth of both (A) and (B), one cannot appeal to the transitivity of realization to arrive at (C), since the argument equivocates on “realization”.

Is the relation of physical realization itself transitive? Although I have just said that both partial and total realization appear to be transitive relations, whether this is true of realization *per se* turns on what varieties of realization there are and how they are understood or analyzed. In other work, for example, I have re-articulated the conception of a core realization as the part of a total realization that is *most causally salient*, and on this account of what core realizations are, they are *not* transitive.<sup>11</sup> In a series of papers, Carl Gillett has argued that the standard ways of thinking about realization are governed by principles that apply at best to a skewed range of examples, and that we need an enriched framework for conceptualizing how realization operates across the sciences.<sup>12</sup> It may turn out that the transitivity of realization ends up on this list of principles, and that there turn out to be a number of forms of realization that are not transitive.

I shall argue that this is very much the situation in the case of the relation of material constitution. But I first want to underscore the *prima facie* transitivity of this relation before motivating challenges to it.

### 3. Probing the Transitivity of Material Constitution

Having already noted the ubiquity of the assumption that the relation of material constitution is transitive, this underscoring can be brief. Consider a standard and representative example, involving a metal chain, in which the transitivity of material constitution operates as an assumption:<sup>13</sup>

- 1a. This chain is constituted by metal links.
  - 1b. Those metal links are constituted by physical particles.
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- 1c. This chain is constituted by physical particles.

Premises (1a) and (1b), together with the assumption of the transitivity of material constitution, entail (1c). With that assumption, this argument is valid. In addition, both of these premises are true, and so if material constitution is transitive, the conclusion must be true as well.

In characterizing this example as “standard and representative”, I mean to imply that it is typical of a variety of examples in which material constitution appears as a transitive relation holding between constituted entities and constituents: a liquid in a glass and the molecules of water that constitute it; a garden and the plants, soil, and other features that comprise that garden; and even a person’s body and the various body parts (e.g., arms) or bodily systems (e.g., the circulatory system) that make up that body. Such examples may feature either singular or plural referring expressions, definite or indefinite descriptions, or proper names or common noun phrases. The question is whether such arguments are *fully* representative of arguments that appeal to the transitivity of material constitution.<sup>14</sup>

Consider an example that, in this respect, might be thought to contrast with argument (1), one that involves Eve's counterpart, Adam:

- 2a. Adam is constituted by his body.
  - 2b. Adam's body is constituted by physical particles.
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- 2c. Adam is constituted by physical particles.

While this argument may appear to have just the same form as (1), here the conclusion (2c) will strike at least some as problematic in a way in which (1c) does not. The underlying intuition is something like this: unlike a metal chain, which is *nothing more than* links arranged in a certain way, and so ultimately nothing more than physical particles arranged in a corresponding way (to constitute links, appropriately arranged), a person *is* something more than physical particles, however they are arranged, and so ultimately something more than physical particles, however they are arranged. The question is whether such an intuition is defensible and, if so, what we should say about the argument from (2a), (2b) and the transitivity of material constitution to (2c).

Several reasons can be given for rejecting the view that (1) and (2) differ in the way described above, none of which I think are adequate. Materialists might view what I referred to as the "underlying intuition" as signifying an explicit or implicit dualist (or even immaterialist) view of the nature of persons, claiming that consistency requires that we treat persons just as we treat any other material object, such as a metal chain, a glass of water, a garden, and a physiological body. They might well point to the formal parallels between our two arguments as underwriting this consistency claim. In effect, this would be to reject the intuition that (1c) is true yet (2c) false by claiming that (2c)'s rejection turns on the rejection of (2a), whether as an explicit denial based on a commitment to dualism about persons, or as an entailment of one's other commitments. Dualists are mistaken, however, to deny (2a); proponents of *material constitution views* in metaphysics are at least typically committed to (2a), and so, the argument goes, (2c).

That these appeals to materialism and to consistency are not only distinct but need to be separated out becomes apparent when we turn from (2) to another standard example that has featured in the literature on constitution views in metaphysics, that of statues and their constituent matter. Consider Michelangelo's David and the piece of marble that constitutes it. We can readily construct an argument that shares the apparent form of our previous two arguments:

- 3a. David is constituted by a piece of marble.
  - 3b. This piece of marble is constituted by physical particles.
- 
- 3c. David is constituted by physical particles.

Again, just as some will resist embracing (2c), some will resist embracing (3c), and for much the same reason. We can point to the same kind of intuition about a chain being nothing more than physical particles arranged in a certain way, yet a statue being something more than this, as a basis for thinking that (3) is problematic in a way in which (1) is not. Whatever else we say about this intuition, it is implausible to say that it stems from a dualist (let alone immaterialist) view of the nature of *statues*. Suppose that this is correct, and that we should look for a unified treatment of both sets of intuitions, and so of (2) about persons and (3) about statues. Then in determining whether these intuitions are defensible we need to focus on claims of *consistency* and what claims constitution theorists are committed to.

I believe that these arguments about persons and statues belong to a large class of examples. In addition to (2) and (3), arguments beginning with each of the following premises generate just the same kinds of underlying intuitions:

- 4a. This dollar bill is constituted by a piece of paper.
- 5a. This flag is constituted by a piece of cloth.
- 6a. This gene is constituted by a sequence of DNA.
- 7a. This island is constituted by a landmass.

In short, there are persistent intuitions to the effect that all of these things—persons, statues, dollar bills, flags, genes, and islands—are something more than physical particles arranged in certain ways. And this is so despite the fact that in each of the corresponding arguments (2) through (7) there is no tendency to think that the same is true of the mediating premise that posits a relation of material constitution between the constituent entity—a body, a piece of marble, a piece of paper, a piece of cloth, a sequence of DNA, and a landmass—and aggregates of physical particles.<sup>15</sup>

Does consistency thus require that *all* of these arguments, i.e., arguments (1)–(7), be viewed in the same way, namely, as valid arguments that rely on an assumption of the transitivity of constitution that is true? If so, then the intuitions I have appealed to so far need to be given up. I shall argue, however, that while there is a pattern to the arguments (2)–(7), these should be distinguished from our initial argument (1), and from the larger class of arguments that that original argument represents. This pattern provides the basis for thinking that the intuitions mentioned above are defensible after all, and thus for further probing into the appeal to the transitivity of material constitution that each makes.

I shall propose that each of the arguments (2)–(7) equivocate on the concept of constitution. David is constituted by a piece of marble, and that piece of marble is constituted by physical particles, *but not in the same sense*. The same is true of the corresponding arguments that begin with (4a)–(7a) as premises and conclude by claiming that each of these constituted entities is

constituted by physical particles. Thus, although the explicit premises of each of these arguments are true, the arguments as a whole fail to be of the right logical form to rely on an assumption of transitivity. In this respect, they are like the case of “is bigger than” with which I began, and “is realized by” that I continued with. But also like the case of realization, once we disambiguate the meaning of “is materially constituted by” we will see reasons to question whether at least one of the corresponding relations of material constitution itself is transitive.

#### 4. The Mere Addition and Arrangement of Matter Argument

To further motivate the idea that the intuitions separating (2)–(7) from (1) are robust, and that they should be understood as reflective of an equivocation in the former set of arguments, consider the following argument, which I call the *mere addition and arrangement of matter argument*.

There is a general metaphysical difference between the relationship between some entities (like chains) and their constituent matter, and other entities (like statues) and their constituent matter. Consider any chunk of physical matter. If you merely add physical matter to this chunk, there will be a way to do so that itself creates a chain. But there is *no* such way of proceeding here that creates a statue; the same is true of a dollar bill, a flag, a gene, or an island. No mere addition and arrangement of matter can produce instances of any of these kinds of entity, since what they are is determined, in part, by the physical, biological, intentional, or social relations that pertain in the broader locale of that constituent physical matter. To create those entities, you need to ensure that whatever physical thing is created through the addition and arrangement of matter to a particular physical chunk of matter stands in the appropriate kinds of relations: statues to aesthetic practices, dollar bills and flags to social conventions, genes to larger systems of inheritance and development, and islands to surrounding bodies of water. To create some objects, such as chains, it is sufficient to add matter in a particular way to a given arrangement of matter; to create others, such as statues, dollar bills, flags, genes, and islands, no amount of such adding and arranging will suffice. Rather, for such objects to exist, the world beyond those objects needs to be (or have been) a certain way.<sup>16</sup>

This difference implies that, in (1), the relationship between constituent matter (metal links) and constituted entity (chain) is *necessitating*: there is some state or arrangement of the constituent matter that necessitates the existence of the constituted entity. And it implies that, in at least (3a)–(7a), the relationship between constituent matter and constituted entity is *not* necessitating. Thus, the relations in these two sets of cases cannot be identical, since they differ with respect to at least one property. But we properly use “constitutes” to refer to both of these relations. Thus, there are (at least) two concepts of constitution.

To see how this connects up with the charge of equivocation in (2)–(7), consider argument (3) again:

- 3a. David is constituted by a piece of marble.  
 3b. This piece of marble is constituted by physical particles.

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3c. David is constituted by physical particles.

The relation of constitution referred to in (3b), like that referred to throughout (1), is necessitating: there is some way to arrange physical particles that necessitate your having a piece of marble. The relation referred to in (3a), however, is not necessitating, since for David to exist—indeed, for *any* statue to exist—a piece of marble must exist in a certain kind of context, one in which it is produced through recognized artistic means, practices, and intentions, and perhaps for some or other appreciative audience. An earthquake 200 000 years ago (i.e., before there were any of the relevant aesthetic practices) that produced something intrinsically identical to David from a chunk of existing marble might have produced a piece of marble (indeed, many pieces). But it could not have created a statue at all, let alone David. Hence, (3), whose conclusion putatively follows from (3a) and (3b), together with the assumption of the transitivity of constitution, equivocates between two senses of “is constituted by”.

## 5. Two Concepts of Material Constitution

I have argued elsewhere that there are two concepts of material constitution, and that they can be more precisely distinguished along the lines gestured at in the previous section.<sup>17</sup> These concepts share two necessary conditions that I think any adequate analysis of material constitution must satisfy:

*y* is materially constituted by *x* during *p* only if

**Coincidence:** *x* is completely material in itself, or the *x*s are completely material in themselves, and *y* is spatially and materially coincident with *x* (or the *x*s) during *p*.

**Distinctness:** it is possible for *x* (the *x*s) to exist without there being anything of *y*'s type that is (even partially) spatially and materially coincident with *x* (the *x*s).

These conditions are motivated by two central intuitions about material constitution: that entities that stand in this relation bear a particularly intimate or close physical relationship to one another (hence Coincidence), yet those entities nonetheless have distinct conditions of existence, and so are not strictly identical to one another (hence Distinctness).

These core intuitions, and thus the resulting conditions of Coincidence and Distinctness, pull in opposite directions, the first of which suggests that



materially constituted entities are *nothing more than* their constituents arranged in a particular way, and the second of which denies this suggestion. Note that this is just the intuition that underpinned the putative difference between (1), on the one hand, and (2)–(7), on the other, in our initial consideration of appeals to the transitivity of material constitution. We might thus wonder whether additional conditions could be added to Coincidence and Distinctness to characterize two distinct concepts of material constitution. A concept of constitution with additional conditions that, in effect, temper any putative implication of Distinctness that *x* and *y* are (really) separate entities—that is, further than Coincidence does already—would further narrow the ontological gap between constituents and what they constitute. This is just what one should expect of a concept underlying the “nothing more than” intuition elicited by (1). And a concept of constitution that tempers any putative implication of Coincidence that *x* and *y* are (really) strictly identical entities—that is, further than Distinctness does already—would widen the ontological gap between constituents and what they constitute. This is just what one should expect of a concept underlying the “something more than” intuition elicited by (2)–(7).

The first of these concepts, what I call *compositional constitution*, has two further necessary conditions, Intrinsic Necessitation and Constituent Necessitation:

**Intrinsic Necessitation:** *x* is in some intrinsic state(s), or the *x*s that compose *y* are arranged, during *p* such that *x* itself, or the *x*s themselves, necessitate the existence of *y*.

**Constituent Necessitation:** whenever *y* exists, there must be something of *x*'s type that is (at least partially) spatially and materially coincident with *y*.

It is compositional constitution that features in both premises and conclusion in (1). As one might expect (given at least the name of this form of constitution), we might well look to mereology, as the theory of the relationship between parts and wholes, to further unpack the conditions that distinctively characterize it.<sup>18</sup>

The second of these concepts, what I call *ampliative constitution*, is characterized not by these necessitation conditions but by two conditions that direct one beyond the part-whole relation to contextual and relational features of both constituent and constituted entity:

**Extrinsic Necessitation:** *x* (the *x*s) is (are) in extrinsic conditions during *p* that themselves necessitate the existence of *y*.

**Relational/Intrinsic Constraint:** *y* is relationally individuated and *x* (the *x*s) intrinsically individuated.

The concept of ampliative constitution has been of particular importance in recent discussion of constitution views of persons, and it is this concept that has been drawn on, I believe, by Lynne Rudder Baker. Although Baker favors a different analysis of the concept, one cast in terms of the notion of primary kinds, there is much shared by her analysis and the one above. Both attempt to articulate a view of material constitution that supports the intuition that materially constituted entities are something more than their constituting matter, however that matter is arranged.

There is much more to be said in defense of the distinction between compositional and ampliative constitution, and the implications it has for ongoing debates over constitution views in metaphysics.<sup>19</sup> But I hope to have said enough already to return to the particular focus of this paper: appeals to the transitivity of material constitution.

### 6. Compositional vs Ampliative Constitution and Transitivity

Given the distinction between compositional and ampliative constitution, it is relatively easy to explain why the appeal to transitivity in argument (1) is unproblematic. Both premises and the conclusion use a notion of compositional constitution, and compositional constitution (like composition itself) is transitive. This is why the conclusion to (1) is viewed as unproblematically true, and there is no even *prima facie* problem with the inference that leads to it via the assumption of the transitivity of compositional constitution.

With (2)–(7), the situation is more complicated and interesting. Given the argument of the paper to this point, the most natural view of these arguments is as follows. Although they appear to have just the same logical form as (1), in fact they all instantiate the following form, (F):

$x$ is ampliatively constituted by $y$ .	
$y$ is compositionally constituted by the $z$ s.	
$x$ is ampliatively constituted by the $z$ s.	

That the conclusion to each of these arguments concerns ampliative constitution is what explains the underlying intuition that the constituted entity in the first premise and conclusion—a person, a statue, a dollar bill, a flag, a gene, an island—is *something more than* the physical particles that constitute it. Parity of reasoning suggests that the same is true of the first premises to all of these arguments. Yet given that precisely this intuition is absent when considering the corresponding second premises, each of which links a constituent entity—a body, a piece of marble, a piece of paper, a piece of cloth, a sequence of DNA, a landmass—to *its* physical constituents, it is not ampliative but compositional constitution that is drawn on in that premise. If this is correct, then these arguments equivocate on the concept of constitution in

much the way that our opening arguments equivocated on “is bigger than” and “is realized by”. Thus, they represent appeals to transitivity that fail for the same reason that these arguments fail. Consider three further, related issues.

The first concerns whether *ampliative* constitution is a transitive relation. As with the question of whether any particular form of the relation of physical realization is transitive, this issue in part turns on which particular analysis of ampliative constitution is correct. I have already noted the general difference between Baker’s analysis of ampliative constitution, given in terms of the notion of primary kinds, and the analysis I have offered above that appeals to the Relational/Intrinsic Constraint. While Baker’s view is compatible with the transitivity of ampliative constitution (even if it constrains the application of transitivity significantly, since few putative constituents are primary kinds), a view that accepts the Relational/Intrinsic Constraint is committed either to denying the transitivity of ampliative constitution, or to claiming that the world is such that the conditions for using this rule are never satisfied, since no one kind of entity can be both relationally and intrinsically individuated. In contrast to the transitivity of compositional constitution, the transitivity of ampliative constitution cannot simply be assumed, since it may be incompatible with a viable analysis of ampliative constitution.

The second issue concerns whether one might sidestep the question of whether ampliative constitution is transitive in understanding the putative difference between argument (1) and arguments (2)–(7). For suppose that (2)–(7) all instantiate (F), as I have argued. One might argue that (F) does not appeal to the transitivity of *either* ampliative or compositional constitution. After all, one might say, one can *just see* that it is not of the right form to support any such appeal to transitivity! Rather, (F) is its own truth-preserving argument form. This implies that one can understand the difference between (1), on the one hand, and (2)–(7), on the other, without claiming that these latter arguments are invalid. On this view, despite appearances, (1) and (2)–(7) instantiate different forms of argument both of which are truth-preserving, the first relying on the transitivity of compositional constitution, the second making *no* appeal to transitivity at all.

Suppose that this is what one ultimately says about the two argument forms, and so there is a sense in which questions about the transitivity of ampliative constitution are irrelevant to understanding the difference between (1) and (2)–(7). Two points: (i) in virtue of the form these arguments *appear* to share, the issue of whether talk of material constitution can be unproblematically combined with appeals to the transitivity of constitution remains a live one. Minimally, in engaging in such talk there is a need to clarify which concept of constitution is in play, just as there is in the case of physical realization. To diagnose what goes wrong in at least some such appeals, the analysis in terms of equivocation that I have given is revealing.

(ii) the truth-preserving nature of (F) implies that whether or not ampliative constitution is transitive, it is a relation that is preserved under at least *compositional* constitution. For views such as my own, according to which ampliative constitution is not transitive, arguments of the form of (F) provide a means of articulating just how constitution can be used in an ontology that stretches from the very small through to everyday objects.

The final issue here is whether we *could* or *should* challenge my diagnosis of (2)–(7) by interpreting these arguments as making claims only about compositional constitution. If this were so, then the symmetry with argument (1) would be restored. On this view, the original intuitions that persons and statues are something more than physical particles arranged in a certain way would turn out to be mistaken or indefensible, as would the similar intuitions about persons and bodies, on the one hand, and statues and pieces of marble, on the other. The same general view might then be adopted with respect to each of (4a)–(7a) and the corresponding arguments in which they each feature that appeal to the transitivity of constitution. My own view is that this would make each of (2a)–(7a) *false*—certainly it would make them claims facing an uphill battle against many of the intuitions that have motivated philosophers to explore constitution views in metaphysics. In any case, the strategy of interpreting (2a)–(7a) as making claims only about compositional constitution in effect denies the existence of ampliative constitution, for there are no better putative examples of this relation. If ampliative constitution is not transitive, as I have suggested it is not, such a denial is *required* for anyone who wants to defend the idea that constitution *per se* is a transitive relation.

## 7. Conclusion

Philosophers have long been wary of easy and common appeals to constitution, in part because in some contexts (e.g., being a male is a constituent of being a bachelor) the relevant notion of constitution is conceptual or semantic, while in others (e.g., particles are constituents of chairs) it is physical or material in nature. “‘Constitutes?’—*in what sense?*” is one common plea heard around the philosophy table (or should be). If the argument of this paper is correct, then we have reason to be similarly wary of appeals to *material* constitution *simpliciter*, and to ask “‘Materially constitutes?’—*in what sense?*”. Rather than suggesting that this wariness should lead us to eschew the concept of material constitution altogether, I have tried to show how attention to a more fine-grained view of this concept helps to explain some core intuitions about material constitution, and to see our way through some puzzles involving that concept.

That is at least the view of the forest. The substance of the paper, focused as it is on a few trees, has been on one putative property of material constitution, transitivity. In probing this ubiquitously assumed property of

material constitution we have seen reasons to question both whether relations of material constitution need be transitive and whether arguments invoking material constitution that appear to make appropriate use of a transitivity rule in fact do so.

The case of physical realization is not only instructive but perhaps also reassuring when it comes to the implications of the failures of appeals to transitivity for which I have argued. A general metaphysics incorporating physical realization may have to accept that there are forms of this relation that are not transitive. The same is true, I have argued, of material constitution. Those of us deploying constitution or realization should not assume that either relation is or must be transitive, or that we can simply appeal to transitivity in arguments that start with claims about the constitution of ordinary physical entities, such as people or statues, or the realization of familiar properties, such as intentionality and consciousness.

### Notes

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<sup>1</sup> See Lynne Rudder Baker, “Why Constitution is Not Identity”, *Journal of Philosophy* 94 (1997): 599–21; *Persons and Bodies: A Constitution View* (New York, Cambridge University Press, 2000); and recently “When Does a Person Begin?”, *Social Philosophy and Policy* 22 (2005): 25–48. Baker’s views have been the subject of much recent discussion; for a sustained, critical exploration of her views, see Dean Zimmerman, “The Constitution of Persons by Bodies: A Critique of Lynne Rudder Baker’s Theory of Material Constitution”, *Philosophical Topics* 21 (2002): 295–338.

<sup>2</sup> Well-known earlier appeals to constitution include those by David Wiggins, “On Being in the Same Place at the Same Time”, *Philosophical Review* 77 (1968): 90–95, and *Sameness and Substance* (New York: Blackwell, 1980); Mark Johnston, “Constitution is Not Identity”, *Mind* 101 (1992): 89–105; and Sydney Shoemaker, “Self, Body, and Coincidence”, *Proceedings of the Aristotelian Society* supp. 73 (1999): 287–306.

<sup>3</sup> For example, see Jaegwon Kim, *Supervenience and Mind* (New York: Cambridge University Press, 1993); Lawrence Shapiro, “Multiple Realizations”, *Journal of Philosophy* 97 (2000): 635–654 and *The Mind Incarnate* (Cambridge, MA: MIT Press, 2004); and Robert A. Wilson and Carl F. Craver, “Realization: Metaphysical and Scientific Perspectives”, in Paul Thagard (editor), *Handbook of the Philosophy of Science, Volume 12, Psychology and Cognitive Science* (Dordrecht: Elsevier, 2007).

<sup>4</sup> For expressions of this view, see Fred Doepke, *The Kinds of Things: A Theory of Personal Identity Based on Transcendental Argument* (La Salle, IL: Open Court, 1996), p. 198 (discussing the view of David Wiggins) and pp. 201–203 (more generally); Lynne Rudder Baker, “Replies”, *Philosophy and Phenomenological Research* 64 (2002): 623–635, at pp. 623–624; E.J. Lowe,

*Kinds of Being: A Study of Individuation, Identity and the Logic of Sortal Terms* (Oxford: Blackwell, 1989), pp. 119–120; Dean Zimmerman, “Persons and Bodies: Constitution Without Mereology?”, *Philosophy and Phenomenological Research* 64 (2002): 599–606, at pages 601–603; and Ryan Wasserman, “The Constitution Question”, *Noûs* 38 (2004): 693–710, at p. 694. In both *Persons and Bodies* (pp. 45–46) and in “Unity Without Identity: A New Look at Material Constitution”, *Midwest Studies in Philosophy* 23 (1999): 144–165, at p. 164 (note 30) Baker claimed that constitution was nontransitive, changing her mind in her “Replies” in light of Zimmerman, “Persons and Bodies: Constitution Without Mereology?”.

<sup>5</sup> For the counter-model, assume that Tall Slim is 180 cm and 60 kg, Bulky is 160 cm and 100 kg, and Beanstalk is 200 cm and 80kg.

<sup>6</sup> To take the standard example, the *core* realization of pain in human beings is the stimulation of C-fibers. Those C-fibers (so stimulated), together with the activity of the rest of the central nervous system that allow C-fibers to play the causal role definitive of pain, form the *total* realization of pain. For the original discussion, see Sydney Shoemaker, “Some Varieties of Functionalism”, *Philosophical Topics* 12 (1981): 83–118, and Ned Block and Jerry Fodor, “What Psychological States Are Not”, *Philosophical Review* 81 (1972): 159–181. See also his “Functionalism and Qualia”, *Philosophical Studies* 27 (1975): 291–315, and the exchange in Ned Block, “Are Absent Qualia Impossible?”, *Philosophical Review* 89 (1980): 257–274, and Sydney Shoemaker, “Absent Qualia are Impossible—A Reply to Block”, *Philosophical Review* 90 (1981): 581–599. All three Shoemaker papers are reprinted in his *Identity, Cause, and Mind* (New York: Cambridge University Press, 1984).

<sup>7</sup> Robert A. Wilson, “Two Views of Realization”, *Philosophical Studies* 104 (2001): 1–30, and *Boundaries of the Mind: The Individual in the Fragile Sciences: Cognition* (New York: Cambridge University Press, 2004), especially chapters 5–6. Smallism is characterized here as “discrimination in favor of the small, and so, against the not-so-small” (*Boundaries of the Mind*, p. 22). My own view is that smallism operates throughout much thinking about the mind and biology. See also my *Genes and the Agents of Life: The Individual in the Fragile Sciences: Biology* (New York: Cambridge University Press, 2005), esp. pp. 38–41.

<sup>8</sup> The cartoon version, as well as the more serious, functionalist account, can be found in representational accounts of folk psychological states that draw on the language of thought hypothesis, such as Stephen Schiffer, *Meaning* (Oxford: Clarendon Press, 1972); Gilbert Harman, *Thought* (Princeton, New Jersey: Princeton University Press, 1975); and Jerry Fodor, *RePresentations* (Cambridge, MA: MIT Press, 1981).

<sup>9</sup> For two different ways to articulate this point, see Andy Clark and David Chalmers, “The Extended Mind”, *Analysis* 58 (1998): 10–23, and Robert A. Wilson, “Individualism”, in Stephen P. Stich and Ted A. Warfield (editors), *The Blackwell Companion to the Philosophy of Mind* (Oxford: Blackwell, 2003).

<sup>10</sup> At least that is what functionalist and materialists who favor the sort of account under consideration typically have in mind.

<sup>11</sup> See *Boundaries of the Mind*, pp. 108–111. In fact, in the broader discussion here I distinguish a range of forms of realization (such as *wide* realizations and *radically wide* realizations) that seem also not to be transitive.

<sup>12</sup> See, for example, Carl Gillett, “The Dimensions of Realization: A Critique of the Standard View”, *Analysis* 62 (2002): 316–323, and “The Metaphysics of Realization, Multiple Realizability and the Special Sciences”, *Journal of Philosophy* 100 (2003): 591–603.

<sup>13</sup> Having made it clear that my focus is on *material* constitution, for felicity I will simply talk of *constitution* throughout the series of examples that follows.

<sup>14</sup> For a sampling of the range of uses of “constitution” in the recent philosophical literature, consider the following examples (where it is explicit in the context that the “is” used is the “is of constitution”): ‘that heap of fragments there is the jug you saw the last time you came to this house’, ‘the jug is the coffee pot’, ‘The soufflé you are eating is flour, eggs and milk’, ‘The portico is wood and stucco’ (David Wiggins, *Sameness and Substance Renewed* (New York:

Cambridge University Press, 2001), pp. 34–37); ‘This ring is gold’, ‘A human body is a collection of cells’ (E.J. Lowe, *Kinds of Being: A Study of Individuation, Identity and the Logic of Sortal Terms*, p. 3); “Pieces of paper constitute dollar bills; pieces of cloth constitute flags; pieces of bronze constitute statues . . . strands of DNA constitute genes” (Baker, *Persons and Bodies*, p. 21); “Suppose a wall is composed of stones. Then they also constitute it . . .” (Peter Simons, *Parts: A Study in Ontology* (Oxford: Clarendon Press, 1987), p. 239); “The cells which constitute an organism at one time can be an entirely different batch from those which constitute it at a different time.” (Fred Doepke, *The Kinds of Things: A Theory of Personal Identity Based on Transcendental Argument*, p. 199.)

<sup>15</sup> To head off one thought: could the difference simply be that (1a) relates an entity to a plurality of constituent entities while (2a)–(7a) do not? Having said already that one way in which (1) is standard and representative is that variations on it could feature a wide range of referring expressions (see also the preceding footnote), clearly I don’t think so. Here are some more concrete, even if mundane, examples that support this view. Consider an argument that began with either (1a\*) or (1a+):

(1a\*) This chain is constituted by a material body

(1a+) This chain is constituted by a hunk of matter

Such arguments generate just the intuitions generated by argument (1) as it stands, even though, like (2a)–(7a), they relate a constituted entity to a single constituent entity. Likewise, an argument that began not with (3a) but (3a\*)

(3a\*) David is constituted by two pieces of marble

generates just the intuitions generated by argument (3) as it stands, even though like (1a) this premise relates a constituted entity to a plurality of constituents.

<sup>16</sup> It is a further (I think difficult) question whether the establishment of the corresponding physical, biological, social, or intentional relations is itself determined merely by adding and arranging matter in particular ways *to the world at a given time*. But it is clear that this is not simply a matter of adding and arranging matter *to the particular chunk of physical matter* that becomes the constituent entity or entities. It is only this latter claim that is needed in the Mere Addition and Arrangement of Matter Argument.

<sup>17</sup> Robert A. Wilson, “A Puzzle About Material Constitution and How to Solve It: Enriching Constitution Views in Metaphysics”, *Philosophers’ Imprint* Vol. 7, No. 5 (July 2007), pp.1–20.

<sup>18</sup> Since compositional constitution is a strict partial ordering, like the notion of a proper part in the formal theory of mereology, there is a natural way to reformulate these two conditions in mereological language, when an entity is compositionally constituted by a *plurality* of entities:

**Intrinsic Necessitation\***: the proper parts that compose *y* are so arranged during *p* that they themselves necessitate the existence of *y*.

**Constituent Necessitation\***: whenever *y* exists, there must be proper parts of *x*’s type that are (at least partially) spatially and materially coincident with *y*.

For more general discussion of mereology and its relationship to material constitution, see my “A Puzzle about Material Constitution and How to Solve It . . .” and “Material Constitution and the Many-Many Problem”, *Canadian Journal of Philosophy* 38 (2), June 2008, pp. 201–218.

<sup>19</sup> For further discussion, see the pair of papers cited in the preceding footnote. As pointed out to me by a referee for the journal, the distinction between compositional and ampliative constitution is reflected in standard dictionary definitions of “constitution”, as well as by philosophers who distinguish between what they call “composition” and “constitution”. I suspect, however, that such usages are not all that robust, and I intend the compositional/ampliative distinction to be a regimentation of existing usages, rather than a simple expression of them.