

## *Logical Parts*

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In my office I have a large, comfortable red chair. This chair is a whole—an object composed of its parts. Applying mereological concepts to objects allows us to make sense of how objects in the world (like chairs) that occupy a region of space are composed of many smaller objects that occupy subregions of the region. The objects that occupy these subregions are held to be proper parts of the chair as a whole.

The approach allows us to understand many facts about the chair in terms of the objects that compose the chair, and to explain a number of seemingly contradictory claims we might want to make about it. We might say the chair is curved and flat, meaning that the part of the chair that is the armrest is curved and the part of the chair that is the seat is flat. We might say the chair is clean and dirty, meaning that the part of the chair that is the headrest is clean but the armrest where I placed my sandwich is dirty. Although I can pick out at least two different objects that have a left armrest as a proper part, an object that is my chair including the headrest and an object that is my chair excluding the headrest, I don't think there are two distinct left armrests in my office, since the first object entirely overlaps the second.

But what if we want to think of the chair in a different way? We can think of the chair as having many different spatial components, but we can also think of the chair as having many different *qualitative* components. The chair has armrests, a headrest, a back and a seat, but it also has the properties of being red, of being large, and being comfortable. The chair is the sum of its spatial components, but it might very well be that the chair is also the sum of its qualitative components. In other words, it makes sense to think of the chair as composed of many smaller (and partly overlapping) objects that are spatial parts of the chair. Why not also think of the chair as being made up of many smaller (and partly overlapping) objects that are qualitative parts of the chair? Indeed,

we can make the case that thinking of the chair in terms of its qualitative parts can give us a more fundamental account than one in terms of its spatial parts—perhaps the chair is composed of a very large number of microparticles that lack smaller spatial parts. The microparticles might not have (proper) spatial parts, but they may still be composed of ‘smaller’ qualitative parts such as having mass and having charge.

Recognizing that objects have such parts will allow us to develop simple and successful solutions for some outstanding problems in the metaphysics of ontology. Since by the term ‘mereology’ I simply mean a theory of parts and wholes (and associated concepts), what I am suggesting is that we can make good sense of—and good use of—a property mereology. Once we recognize that the primitive notion of part and whole has applications that extend past the purely spatiotemporal, we have the tools to develop new approaches to problems involving properties, persistence and material constitution.

## 1. Objects

If objects have properties as parts, then a simple way to define objects is as (certain) fusions of properties.<sup>1</sup> Defining objects in this way amounts to subsuming the bundle theory<sup>2</sup> under the aegis of mereology.<sup>3</sup> Start with sums or fusions of properties, where the properties that compose the fusion are parts of the whole. Since the properties in the fusion need not be qualitative (e.g., they could be the having of locations), call the properties that are parts of the whole “logical parts” rather than “qualitative parts”.<sup>4</sup> So a logical part of a fusion is a property which is included in the fusion. The basic mereological definitions for any fusions  $x$  and  $y$  are thus:

D1:  $x$  *logically overlaps*  $y$  iff  $x$  and  $y$  have a logical part in common.

D2:  $x$  is *logically distinct* from  $y$  iff  $x$  and  $y$  have no logical part in common.

D3:  $x$  is a *logical fusion* (sum) of  $ys$  iff  $x$  has all the  $ys$  as logical parts and no logical parts distinct from the  $ys$ .

(The rest of this section addresses some technical details of my theory of objects. Readers who are not interested in these details may wish to skip to the following section.) To subsume object theory under mereology, we need to decide on the preferred metaphysics of composition: is composition entirely unrestricted, so that any collection of properties composes a fusion?<sup>5</sup> Or is composition restricted, so that only some collections compose fusions? As Peter van Inwagen puts it, “[w]hen does unity arise out of plurality?”<sup>6</sup>

I have some sympathy for restricted composition for any kind of spatial, temporal and property mereology—this implies that as a matter of contingent fact, some fusions exist and others do not. It is unclear to me what the metaphysical benefits are of accepting unrestricted mereological composition, and very

clear what the costs are: many more fusions than we'd have any commonsensical—and perhaps even metaphysical—reason to countenance. But as (a) I wish to remain (at least officially) uncommitted to restricted composition, (b) the simplest and most familiar systems have unrestricted composition, and (c) if we keep composition unrestricted we can distinguish objects from mere fusions, I shall formulate the theory of logical parts in terms of unrestricted composition.

Following Nelson Goodman's (1966) pioneer work, allow any (nonempty) collection of properties to compose a fusion, but distinguish the fusions that are objects by defining a primitive predicate which as a matter of contingent fact applies only to fusions that are actual and to no other fusions. Goodman reads his primitive predicate as "is with" or as "are together": no entity corresponds to the predicate, it merely applies to actual fusions in order to distinguish them as objects. Similarly, I shall use the primitive predicate "are together" to apply to all and only fusions that are actual, that is, to all fusions that are objects.<sup>7</sup> So the only fusions that are objects are those in which all of the properties of the fusion *are together*. No other fusions are objects.

Bundle theorists who take objects to be sets of properties often use "coinstantiation" or "compresence" to distinguish objects from mere collections (for any collection of properties gives us a set just as it gives us a fusion). Some bundle theorists define objects as sets of colocated properties. Unless we want to say that a fusion of properties is an object iff the properties in the fusion all have the same spatiotemporal location, then "colocation" is merely a primitive that is misleadingly named. But taking sameness of location as a sufficient condition for objecthood is unacceptable: (i) contemporary physics cannot be right if it implies that numerically distinct particles or things can occupy the same place at the same time, (ii) numerically distinct interpenetrating material objects are impossible, (iii) unlocated objects are impossible, and (iv) questions like those about the relation between the statue and the clay that constitutes it are decided by fiat. A primitive notion of "coinstantiation" is better.

The mereological bundle theory I advocate fits well into the class of extant theories of objects. However, to make use of the theory of logical parts, any mereological theory of objects and their properties can be employed (although the solutions to problems I discuss below may differ somewhat). I simply prefer bundle theory because it gives us the simplest and most elegant theory of objects. (Every acceptable reductive theory of objects has its primitives: bundle theorists need a way to mark out actual objects, substrate-attribute theorists have primitive substrates and "havings" of properties, and substance theorists have primitive substances, sorts and the like.) Below, we shall see that a mereological theory of objects provides us with a number of solutions to pressing problems in ontology, the benefits of which show how useful adopting a reductive theory of objects can be and that a mereological theory is far superior to the alternatives.<sup>8</sup>

Proper logical parts of objects exhibit the usual formal properties of proper parts: nothing is a proper logical part of itself (irreflexivity), if  $L_1$  is a proper logical part of  $L_2$ , then  $L_2$  is not a proper logical part of  $L_1$  (asymmetry), and if  $L_1$  is a proper logical part of  $L_2$ , and  $L_2$  is a proper logical part of  $L_3$ , then  $L_1$  is a proper logical part of  $L_3$  (transitivity). The object that is the fusion of being red and being round is not a proper logical part of itself, and if the object that is the fusion of being red and being round is a proper logical part of an object  $O$ ,  $O$  is not a proper logical part of the object that is the fusion of being red and being round. Further, if being red is a proper logical part of an object that is a fusion of being red and being round, and if the object that is a fusion of being red and round is a proper logical part of a fusion of being red, being round, and being made of rubber, then being red is a proper logical part of the object that is the fusion of being red, being round, and being made of rubber. We can also extend the notion of logical parthood to cover improper parts (in the usual way), so that every object is an improper logical part of itself.

Sometimes it can be important to recall the distinction between proper parts and improper parts, as well as between logical parts and other kinds of parts, such as spatial parts. We need to pay attention to improper parts in order to interpret trivial claims such as “ $O$  has the property of being identical to  $O$ ”. The part described by the predicate “being identical to  $O$ ” is just the fusion that is  $O$  and of course  $O$  is an improper part of itself.<sup>9</sup> We also have to be clear about what *kinds* of parts we are making claims about: when, for example, I say that a spatial part of my chair, the cushion, includes the logical part of being cushion-shaped, it does not imply that my chair includes the logical part of being cushion-shaped, for we are talking about different kinds of parts. (Transitivity implies that a logical part of a logical part of  $O$  is itself a logical part of  $O$ . It does not imply that a logical part of a spatial part of  $O$  is a logical part of  $O$ .)

## 2. An Example

To familiarize the reader with the view being developed, consider as an example a red ceramic cup. The cup’s property of being red is a logical part of the object, the red cup, and this particular is the fusion of all its parts. The red cup has many logical parts, including the properties of being red, being ceramic, and being in my office.

I have defined objects fairly broadly, i.e., in accordance with the idea that a proper part of an object is an object in its own right. Just as a proper spatial part of an object is an object in its own right, such as the proper part of my cup that is the cup excluding a few molecules from the rim, a proper logical part of an object is an object in its own right. Just as there exist many different partially spatially overlapping objects that my cup overlaps, there are many different partially logically overlapping objects my cup as a whole overlaps. So as not to appear to be endorsing the existence of too many objects, some

prefer to reserve the term “object” for the actual fusions that are normal everyday objects, such as the object that is my red ceramic cup, and the term “part of an object” (or even “incomplete object”) for proper parts of such fusions (such as the fusion of being red and ceramic which is a proper part of the fusion that is my red ceramic cup). In principle I have no quarrel with this, but for simplicity’s sake I will not adopt it here.

Objects that are proper spatial parts of my cup are objects that are *different* but not *distinct* from the cup as a whole, for distinctness implies non-overlap. Likewise for the objects that are proper logical parts of my cup. And just as the objects we can identify by mentally subtracting away various spatial parts of the cup as a whole *really exist* as objects in their own right even if the spatial parts aren’t actually subtracted away, objects that we can conceive of by mentally subtracting away various logical parts of the cup—even if we can’t easily imagine them—*really exist* as objects in their own right, even if the logical parts aren’t actually subtracted away. (So for example, the red ceramic cup overlaps objects that are its proper parts, for example, the fusion of the property of being red and the property of being ceramic. This object is as real as the object it is a part of.)

From now on, when I use the terms ‘overlap’, ‘distinct’ or ‘fusion’, I shall mean logical overlap, logically distinct or logical fusion (as opposed to spatial or temporal overlap, distinctness or fusion) unless otherwise specified. My view is that there are many overlapping objects that are proper parts of the whole of my red ceramic cup. For example, we have the object that is the property of being red fused with the property of being ceramic, which is a proper part of the object that is the property of being red fused with the property of being ceramic and the property of having the shape of the cup, and each of these are proper parts of the whole cup.

I turn now to an exploration of some of the ways in which logical parts can help us develop solutions to problems in the metaphysics of ontology. Aspects of the theory will be fleshed out further as we address specific problems.

### 3. Properties

Attention to logical parts and wholes can explain the sameness of different instances of the same property. We often speak of different particulars having the same property. Two cups can be the very same shade of red, two leaves of a tree can have the same shade of green. A natural conclusion to draw from such claims is that the cups have the same property, a particular shade of red, and the leaves have the same property of green. The claim seems to imply that there is a property of redness shared by the cups and a property of greenness shared by the leaves.

Defenders of universals argue that particulars have the same property by virtue of sharing in the same universal: the particulars exemplify the same property by instantiating the same universal. This amounts to the claim that ‘same’

in the claim ‘this property is the same as that one’ should be interpreted as meaning strict identity. There are two varieties of realism about universals: we can call them ‘transcendent realism’ and ‘Aristotelian realism’. Transcendent realists hold that universals are transcendent entities that stand apart from particulars. Aristotelian realists hold that universals are immanent; they exist ‘in’ particulars, such that the universal is wholly present in the particular that instantiates it.<sup>10</sup>

But both theories of universals, as characterized, make seemingly inexplicable ontological claims. Defenders of transcendent universals postulate an extra ontological entity in its own special realm separate from the particulars that exemplify the property, but where (somehow) the particulars instantiate or share in the universals. Defenders of immanent universals reject transcendence as inexplicable and ontologically excessive, and hold that the universal is (somehow) wholly contained in each particular which instantiates it. This latter claim, as made by contemporary defenders of immanent universals, is the claim that universals are entities that can be multiply located in space. An immanent universal is an entity that can have different locations in space at the same time, in virtue of being a constituent of spatially distinct particulars (or states of affairs) that exemplify the same property at the same time. This ability to be multiply located, while unusual, is a kind of primitive fact about the way universals are.

Nominalists reject multiple location and the inexplicability of transcendence. Some argue that properties must be defined as collections of particulars, and some argue that they should be defined as sets of resembling tropes. But the view that properties are collections suffers from the fact that different properties may be had by all and only the same particulars (unless one accepts modal realism). Sets of exactly resembling tropes can be taken to define properties, so that what makes one cup the same color as another is the fact that the trope of the first exactly resembles the trope of the second, but the relation of exact resemblance must be taken as an undefined primitive.

Universals have the advantage of allowing us to be realists about properties without accepting possible worlds distinct from the actual world, and without postulating a primitive relation of exact resemblance between tropes. But worries about the inexplicability of transcendence and the undesirability of taking multiple location as a primitive count against realism about universals just as the postulation of primitive resemblance relations counts against tropes and the need for a realist take on *possibilia* counts against the set theoretic account.

But logical parts will allow us to consider qualitative properties aside from the spatiotemporal properties they are bundled with in order to explain how objects can have the same property, without accepting the claims that multiple location, transcendence or exact resemblance must be taken as primitive or inexplicable. Logical parts will allow us to argue that characterizations of properties as tropes and universals are just different sides of the same coin, and combine the benefits of tropes and universals without their attendant problems.

Consider two particulars, our cups in the example above, that have the property of being red. Suppose that each shade of red exactly resembles the other: some might say that we have two exactly resembling tropes and some might say each cup instantiates the same universal. I say that both claims are true. When we have resembling tropes we have two different objects which overlap with respect to (at least one of) their logical parts.

The objects that we have called the red cups with all their properties have all their logical parts, including their spatial locations, and so the objects that are the cups are spatially distinct. But when we subtract away the proper logical parts which are the particular spatial properties (and perhaps other relevant parts, such as the part of being a cup) we are left with the part of redness; in other words, we are left with just one object.

This lone object grounds the claim that the redness of each cup is the same. Here, there is just one object *that has no location properties as parts*. This object—call it *R*—partly overlaps objects that include location properties as parts, but *R* does not include the location properties themselves. So *R* does not have particular locations as parts, even if it overlaps or exists in association with objects that do. In this way, two spatially distinct cups have the same logical part, redness, in virtue of the fact that *R* logically overlaps each cup. The sameness of the redness of each cup only seems inexplicable when we tie ourselves to a purely spatiotemporal mereology.

By saying the rednesses are the same, we are making a claim about an object, *R*, that does not have particular spatial location properties as parts, but which overlaps objects which do. We say *R* logically (not spatially!) overlaps two different objects having location properties as parts, *not* that *R* has two locations included in the fusion that it is, for *R* has *no* location properties as parts. Only in a derivative sense, if *R* overlaps objects that include spatial and temporal locations as parts, should we say that *R* ‘has’ different locations.

This distinguishes the view from extant theories of immanent universals.<sup>11</sup> Moreover, *R* is not transcendent, at least not in the usual sense of the term. The point here is that we can pick out and hence distinguish *R* from objects that include locations as parts because *R* overlaps these located objects, not that *R* exists in some mysterious realm distinct from particulars. If we maintain that there is an ontological distinction between the determinable property of being in spacetime and the determinant properties of having particular spacetime locations, we can even hold that *R* includes the part of being in spacetime while not including parts of having particular locations, allowing us to distinguish the view even more sharply from the theory of transcendent universals.

The view collapses most of the differences between the realist and the trope theorist, and explains how the views are related. We can call the objects that have redness fused with different spatial and temporal properties ‘red tropes’ and *R*, the redness part by itself, the ‘redness universal’ without fear of contradiction. We might even redefine *instantiation* to be the fusing of objects like *R* with locations.

Since the relation between rednesses where particular locations are excluded is identity, there is no need for an inexplicable relation of exact resemblance when property bundles including different spatial locations exactly resemble each other. Since where spatial locations are included we can interpret ‘same property’ as meaning that there exists an object that logically overlaps spatially distinct objects, there is no need for the immanent theorist’s primitive multiple location or the mysterious ‘sharing’ of transcendence.

With such a view, I can also make sense of claims such as ‘*a* and *b* are the same object’, where *a* and *b* are particulars with different locations in space-time. For example, if I receive two pairs of red woolly socks for Christmas, one pair from Mother and one pair from Father, I might ask “Didn’t you two talk to each other? You both gave me the same thing for Christmas!” I have already discussed the case where two particulars have the same property; now consider the claim that ‘this pair of socks is the same as that pair’. The claim here is that the pairs of socks share one or more properties: being pairs of socks, being red, and perhaps every qualitative property we can discover. The fact that the pairs of socks have different spatial locations at the same time leads many metaphysicians to claim that qualitative identity could only be similarity in all respects, not strict identity. We should certainly grant that we have two objects, *x* and *y*, that resemble each other very strongly. But we also have another object that overlaps *x* and *y*—we have what we often call the ‘type’—which is a proper part of *x* and a proper part of *y*. So we have two pairs of socks which share an object, the type we can call ‘pair of red socks’; and so we can see how qualitative identity is grounded on strict identity—identity with respect to a certain kind of proper part—after all.

My approach, then, allows us to define types: a type is an object that overlaps the (suitably intrinsic) properties of other objects excluding their spatial and temporal location; it does not have a spatial or temporal location as a part. The objects with spatial and temporal properties that are overlapped are the tokens of the type, and so the type, ‘pair of red socks’, is an object that overlaps all the (suitably intrinsic parts of) all token pairs of red socks. Since universals are often considered to be property types, the connection between the definition of types and tokens and the definition of universals and tropes should come as no surprise.

#### 4. Endurance and Change

Logical parts can also be used to develop a new account of endurance and to solve the problem of change. Intuitively, some objects can persist through change. But if we hold that objects such as persons, cats or socks persist by enduring, a Humean worry can be raised: given the indiscernibility of identicals (if *x* is identical to *y* then *x* and *y* have the same properties), how can it be the case that the enduring object can have different properties at different times?<sup>12</sup> In other words, how can *x* at *t*<sub>1</sub> be identical to *x* at *t*<sub>2</sub> if *x* at *t*<sub>1</sub> has



properties that are different from the properties had by  $x$  at  $t_2$ ? This is the problem of how objects can persist through change.

To address this problem we must first have an account of how an object persists. Endurantists hold that objects persist through time by enduring: the very same object exists at different times, and the object is wholly present at the different times it exists. Perdurantists hold that objects persist through time by being a series of temporal parts. At each different time the object is said to exist, a different temporal part (that needn't spatially or temporally overlap earlier temporal parts in any way) of that object exists, and the object is the sum of all its temporal parts. Endurantism is the more natural view, capturing at least some of the content of our pretheoretic intuitions, but perdurantists claim that endurantism commits us to the Humean inconsistency described above.

One contemporary way of putting this objection to endurantism makes use of temporary intrinsic properties.<sup>13</sup> At time  $t_1$  Gloria is sitting, so she has the property of being bent-shaped. At  $t_2$ , she stands up, so she has the property of being straight-shaped. Shape properties seem intrinsic to Gloria, that is, seem like the right sorts of properties to include when we talk about the object that is Gloria. It seems right to say the object at  $t_1$  is Gloria, and also right to say the object at  $t_2$  is Gloria, namely, because Gloria persists through changes of shape. But what does this mean? No object can have incompatible properties, so no object can have both the property of being bent-shaped and the property of being straight-shaped. And how can the object at  $t_1$  be the same object at  $t_2$  if the objects have different properties?

This is a version of the Humean worry: if we think of Gloria as enduring from  $t_1$  to  $t_2$ , or as being wholly present at each time  $t_1$  and  $t_2$ , we seem to land in a puzzle. If Gloria is wholly present at  $t_1$  and wholly present at  $t_2$ , then the entity that is Gloria is at  $t_1$  and is at  $t_2$ : one object, Gloria, is located at two different times. But by the indiscernibility of identicals, if  $x=y$ , then  $x$  has all and only the properties of  $y$ . Since Gloria at  $t_1$  has the property of being bent-shaped, and Gloria at  $t_2$  has the property of being straight-shaped, and no object can have both the property of being bent-shaped and the property of being straight-shaped, Gloria at  $t_1$  is not identical with Gloria at  $t_2$ . (The perdurantist grants for expository purposes that having different temporal locations is an extrinsic matter for the endurantist and hence not relevant to the indiscernibility worry.)

This seems to make it false that the same object (Gloria) is at  $t_1$  and  $t_2$  or endures through time, since different objects are located at the different times. Perdurantists solve the problem by holding that objects persist by being sums of (appropriately causally related) momentary temporal parts. The momentary temporal parts are taken to be distinct entities that need not spatially or temporally overlap. The temporal part of Gloria at  $t_1$  does not overlap the temporal part of Gloria at  $t_2$ , and Gloria, the person, is not wholly located at two different times. Instead, the object that is the person, Gloria, is the spatiotemporal

streak made up of the temporal parts of Gloria, and so is not wholly present at any single moment. The trouble with this view is that it is radically at odds with common sense, because it identifies Gloria with an *event*. Normally, we'd say that Gloria, the person, is not identical to the event that is Gloria's life. But under the perdurantist account we lose this distinction.

The endurantist, in response to the perdurantist objection, could reject the claim that an object *O*'s having a property *p* is merely a matter of *O*'s being *p*.<sup>14</sup> One could do this by holding that the so-called temporary properties of the object are really relations to times, or by endorsing adverbialism, the view that instantiation is a three place relation between a object, a relation and a time, or by bringing in propositions that can obtain at some times but not others.<sup>15</sup> However, the theory of logical parts allows us to sidestep such moves by making available a new account of endurance and change.<sup>16</sup>

First, define endurance *simpliciter*. When an object *G* endures through time without changing, it does so by logically overlapping different times. It does this by being part of two or more temporally distinct (but continuous) objects which are appropriately causally connected, each of which includes *G* plus the property of being located at a time. So, to have endurance of *G*, we have a sequence of momentary objects  $G+t_1$ ,  $G+t_2$  ..., where *G* logically overlaps each of  $G+t_1$ ,  $G+t_2$  ..., and *G* includes certain origin and other historical-causal properties. So for an object like *G* to endure it must logically overlap parts (excluding parts that are particular temporal properties) of an appropriate sequence of momentary objects. In this way, the theory of logical parts gives us a simple and straightforward characterization of endurance.

Once we have defined endurance *simpliciter*, we need to consider how something like a person can endure. For a person to endure is not merely for a particular fusion to endure, for a person can change her properties while remaining the same *person*, even if not the same *fusion*. If essentialism is accepted, we can say a person can endure only if her essential properties endure, but these essential properties can be combined with different accidental properties at different times and still result in the same person. (My account of endurance assumes essentialism merely for the sake of simplicity. We could instead reject essentialism and hold that there is some conventionally specified collection of properties that we take to define sameness of a person, and hold that *x* is the same person as *y* only if *x* and *y* overlap with respect to these properties.)

It seems intuitively right to think that at  $t_1$  we can have an object that is Gloria which is composed of properties such as having a certain origin and history, a certain genetic profile, a (broadly specified) set of psychological dispositions, etc. which are her essential properties, but which also includes some accidental properties such as having a sitting shape. It also seems intuitively right to think that at  $t_2$  we can have Gloria where she is composed of her essential properties (having a certain origin and history, a certain genetic profile, a (broadly specified) set of psychological dispositions, etc.) along with accidental properties such as having a standing shape.<sup>17</sup>

This suggests that we determine sameness of persons in terms of sameness of their essential properties while allowing them to have a varied range of accidental properties. In such cases, although we recognize the object at  $t_1$  that is the person at  $t_1$  is in some important sense not the *same object* as the object at  $t_2$  that is the person at  $t_2$  (since the objects include different properties), we still want to say that *each object is the same person*. To preserve this central intuition, the easy—but wrong—thing to do would be to reject the indiscernibility of identicals or the transitivity of identity.<sup>18</sup> But I want to keep the indiscernibility of identicals and the transitivity of identity. To do this while doing justice to the intuition that a person can remain the same person through changes of certain properties<sup>19</sup>, the move to make is to hold that a person is a highly specified *kind* of object, i.e., what we can call a *complex object*. Here,  $x$  is the same complex object as  $y$  only if  $x$  and  $y$  overlap with respect to their essential properties and  $x$  and  $y$  include a (possibly different) selection of certain accidental properties. The properties that are essential to an individual (and thus determine what kind the individual is) would normally include properties of that person's causal-historical origins, genetic profile, and the like.

When a person endures through change, she endures only if the *kind* of object she is endures, i.e., an instance of the same kind  $K$  is included in an appropriately causally related chain of temporally continuous bundles  $K+t_1$ ,  $K+t_2$ ... When Gloria endures through the change from sitting to standing, she endures only if each object that is a member of an appropriately causally related, temporally continuous, chain is an instance of Gloria, i.e., an instance of a  $K$ : an object that includes all her essential properties and some selection of her accidental properties. The point is that although the  $K$ s that are included in  $K+t_1$ ,  $K+t_2$ ... may be different (finegrained) objects, they are instances of the same person because they are instances of the same complex object.

Although thinking of persons and other individuals as kinds may seem foreign at first, I think it makes the best sense overall of how we want to allow things like persons to endure through change. When the endurantist is challenged with the indiscernibility of identicals by the perdurantist, a natural response is to want to exclude certain properties when applying the indiscernibility test. In other words, when making certain judgments about identity across time (or across worlds) we want to cut the property cake a little thicker than the indiscernibility of identicals will allow us to do. We might be tempted to exclude modal properties, extrinsic properties, or even temporal properties when making the judgment of sameness, but when this runs up against identity criteria based on sameness of properties we find ourselves in a dilemma.

Treating individuals as highly refined kinds, e.g., as defined by origins and the like, allows us to cut the thicker slices we find intuitively desirable without rejecting the indiscernibility of identicals. Hence, seeing individuals as complex objects gives us a formally acceptable way to preserve our informal intuitions and to solve the problem of change. Recognizing that an individual is a complex object; a kind of object defined by having certain origins, genetic

properties, etc., allows us to make good sense of how we can judge that an object which changes its accidental properties remains the same (complex) object while at the same time accepting the indiscernibility of identicals. Although the view is revisionary in terms of its formal characterization, it preserves and makes good sense of our important common sense intuition that things like persons and cats can endure through change. I think the result is well worth the cost.<sup>20</sup>

### 5. Material Constitution

I turn now to a topic that has engaged metaphysicians since ancient times: the problem of material constitution. Imagine we have a statue made of soft clay.<sup>21</sup> For simplicity, I will assume that in the world of our example, the clay statue begins its existence fully formed, and exists unchanged for a few hours until abruptly incinerated. It seems reasonable to say that, while it exists, the clay constitutes the statue.

But we can ask about this relation of constitution—is it a familiar relation, or a brand new one? A seemingly straightforward answer is that the relation is the familiar one of identity. After all, the answer runs, the clay and the statue have the same spatial (proper) parts, and a standard principle of classical spatial mereology called the *extensional principle* tells us that objects with all and only the same spatial (proper) parts are identical.<sup>22</sup> The claim that constitution is identity is based on recognizing the intuitive plausibility of this principle: since the clay and the statue occupy precisely the same spatial region and hence have the same spatial proper parts, they must be identical.

But if we think objects such as statues and lumps have different *de re* modal properties, this view comes into conflict with the indiscernibility of identicals—a principle at least as intuitively appealing as the extensional principle. In particular, if  $x=y$  and  $x$  is possibly  $F$  or  $x$  is necessarily  $F$ , then  $y$  is possibly  $F$  or  $y$  is necessarily  $F$ . So if it is the case that when the clay constitutes the statue, the clay and the statue are identical, then the clay and the statue must have all the same properties, including their modal properties. But the clay and the statue have different modal properties: for example, the clay could survive being squashed and then molded into a pot, but the statue could not.

Those who prefer the idea that the objects have different *de re* modal properties to individuating objects based on the extensional principle usually argue that constitution is not identity.<sup>23</sup> But denying the extensional principle seems to run against common sense. Critics ask: why think that there are two different, coextensive objects here, the statue and the statue-shaped lump of clay? Isn't this view unparsimonious and implausible? Moreover, doesn't the view rely on some sort of (unjustified) double-counting? For example, if there really are two objects here, why don't the two objects together weigh twice as much?<sup>24</sup> Different arguments for constitution as identity rely on different

premises, but one common theme is that since the lump and the statue have exactly the same location and exactly the same proper parts, it violates common sense to think they are different objects. Embracing coextensivity, claim the defenders of constitution as identity, seems to involve “a bad case of double vision”.<sup>25</sup>

So it seems that each side must accept a counterintuitive proposition: if constitution is identity, then we must hold that for some reason, the objects do not have different *de re* modal properties. If constitution is not identity, then we can embrace the difference in the objects’ *de re* modal properties, but must reject the extensional principle, and we must find a way to explain what this new relation of constitution is and why we aren’t counting objects twice (or more) over.<sup>26</sup>

The debate has a linguistic analog.<sup>27</sup> In the linguistic version, we name the lump of clay ‘Lump’ and the statue ‘Goliath’. We then examine the truth of ‘Lump is identical to Goliath’. We know that the proposition expressed by ‘Lump is identical to Lump’ is necessarily true. The main issue then centers around whether we can substitute ‘Goliath’ for ‘Lump’ *salva veritate* in sentences such as ‘Lump is identical to Lump’. If the names ‘Lump’ and ‘Goliath’ are rigid designators, so they designate the same individuals in all modal contexts (if they designate any individuals in these contexts), and if ‘Lump’ and ‘Goliath’ designate the same individual in the world of our example, then we should be able to substitute ‘Goliath’ for ‘Lump’ *salva veritate* in ‘Lump is identical to Lump’. This means the proposition expressed by ‘Lump is identical to Goliath’ should also be necessarily true.

But the proposition expressed by ‘Lump is identical to Goliath’, so understood, cannot be necessarily true, for it is false in worlds where Lump is squashed after ten minutes and reformed into a pot. In such worlds, Goliath exists for ten minutes, but Lump exists until it is incinerated, so Lump is not identical to Goliath.

Defenders of constitution as identity avoid this problem by rejecting the claim that the names ‘Lump’ and ‘Goliath’ function as rigid designators. Instead, in modal contexts, the names together with additional contextual or other information function by identifying objects relevantly similar to the actual clay or actual statue in other possible worlds. If we call the similar objects in nonactual worlds ‘counterparts’, then the name ‘Lump’ picks out a set of clay-counterparts in other possible worlds, and the name ‘Goliath’ picks out a set of statue-counterparts in other possible worlds. These sets are different, so the names are not substitutable *salva veritate* in modal contexts. But in order to respond this way, not only do we have to deny that the lump and the statue have different *de re* modal properties, but we must deny that proper names rigidly designate individuals. Many, including myself, are unwilling to make such a move.<sup>28</sup>

By now, the kind of solution I’m going to argue for using logical parts is probably obvious: when we consider the clay, we see that as an object it

includes its *de re* modal properties along with the rest of its properties, and likewise the statue, as an object, includes its *de re* modal properties along with the rest of its properties.<sup>29</sup> This means that the answer to whether the clay is identical to the statue is straightforward: considered with all its parts, the clay is not identical with the statue, although neither is it distinct from the statue! The object that is the clay with all its logical parts partially *overlaps* the statue with all its logical parts: the overlap includes parts that are what we might call ‘material properties’, such as having mass *m* and color *c*, but excludes many other parts.

This approach tells us quite a bit about constitution. First of all, we have more insight into how one object constitutes another, since we see that constitution involves the sharing of logical parts. Second, we learn that, in virtue of the sharing of parts, constitution does not imply double counting even if constitution is not identity. Finally, since the nonidentity of the objects follows from the fact that not all the proper parts of the objects are shared, we see how to deny that constitution is identity yet embrace the mereological intuitions that defenders of constitution as identity have been so concerned to defend.

If the clay and the statue had shared *all* of their proper parts, they would have been identical. The extensional principle, when suitably broadened so as to include *all kinds* of parts, *is* intuitively correct, and those who have had to reject it have had to reject a widely accepted mereological principle whose importance extends beyond the debate on constitution. But now we can see that mereology and material constitution need not conflict: rather, each can help us to understand the other.

Although my view shows how to understand aspects of constitution in terms of logical parts, it might seem that a problem remains when thinking of the clay and the statue as spatial wholes. After all, I’ve held that the clay and the statue share all their spatial proper parts but are not identical—doesn’t this imply that the extensional principle for spatial objects is false? And if so, aren’t we back (almost) where we started?

But the problem does not remain. The problem with material constitution arises when we think of objects in explicitly spatial terms while implicitly thinking of objects in broader terms (i.e., in modal terms). If we can pick out objects that are purely spatial objects, that is, objects that have spatial parts but have no modal parts (we might exclude other sorts of parts as well), then the spatial object that occupies the region of the clay *is* identical to the spatial object that occupies the region of the statue, because *all* the proper parts that these objects have are shared. So the extensional principle is correct when consistently applied within a restricted realm, just as it is when applied in a broader realm where objects that include more kinds of parts are considered.

Using a property mereology, we can also see why we don’t have to worry about double-counting, e.g., how we can have two objects in a region without having to have twice as much mass in that region. In such cases, for example

in the case of the lump and the statue, we have multiple objects because we have multiple *overlapping* objects, rather than multiple *distinct* objects. The lump and the statue overlap with respect to many of their parts, and so they *share* parts such as having mass  $m$ .<sup>30</sup> Just as two bookcases can share a side, the statue and the lump share some logical parts. The double-counting objection is misguided: it isn't that there are two objects, each with mass  $m$ . Rather, there are two partly overlapping objects which share parts such as having mass  $m$ , just like we can have one side shared by two bookcases rather than two bookcase sides occupying the same region of spacetime.

I conclude that recognizing logical parts helps us to see how we can hold that objects like the statue and the clay have different *de re* modal properties without having to reject the extensional principle or accept double counting. Moreover, the seemingly mysterious relation of material constitution (mysterious if we reject the claim that the relation is merely identity) is made much less mysterious: material constitution of  $y$  by  $x$  involves partial overlap of  $x$  and  $y$ , where the overlap includes many (and in some cases perhaps all) of the logical parts of  $x$  and  $y$  that are material properties of  $x$  and  $y$ , such as mass, color, etc. (In cases where, for example,  $x$  endures for longer than  $y$ , we will need to be precise about the duration of the constitution of  $y$  by  $x$  and hence the duration and nature of the overlap.)

Although I have not provided a definition of the constitution relation,<sup>31</sup> I've shown that by understanding how objects have logical parts we come to a deeper understanding of the nature of constitution and how the problem with coextensivity is a red herring. The lesson is that the debate over constitution can be pushed forward once we are clear about the different ways in which objects can overlap and the appropriate way to apply the extensional principle. Once we see that objects can have logical parts as well as spatial parts, we have resources to defend and explain the thesis that constitution is not identity and to respond to the central objections of those who oppose this notion.

## 6. How Many Objects?

Thus far, many of the claims I have made about logical parts, while new ontological claims, should seem no stranger than the claims made by those who defend spatial parts. Just as objects have proper spatial parts which are objects in their own right, the proper logical parts of an object are objects in their own right. Just as objects spatially overlap their proper spatial parts, objects logically overlap their proper logical parts.

The obvious issue I need to address is the size of my ontology. Doesn't my theory of logical objects imply that when we count the number of objects in the world, we will find far more objects than we ever dreamt we had? The easy answer to this question is yes—we have more objects than we commonsensically thought we had.

But an increase in the number of objects we recognize as existing is a familiar consequence of accepting mereology. It isn't that when we embrace mereology we discover many new entirely distinct (or, one might say, *entirely* different) objects; rather, we discover many new partly overlapping objects, i.e., we discover proper parts, which are objects in their own right. Such a consequence amounts to discovering that when, for example, a person's body exists, a number of other objects it overlaps also exist, such as the object that is her left arm, the object that is her left hand, the object that is her left thumb, etc.

Related to this point, it is important to recognize that context determines how we count. In a theoretical context like the one established by this paper, we stand back and count many different overlapping objects; many objects that are not logically distinct from one another. But this is unusual—usually when we count, we count using some sort of spatial distinctness. In other words, in many familiar contexts we individuate by spatial locations as well as by, e.g., proximity to other objects, and count objects only when they are spatially distinct or suitably distant from other objects, etc. (Our commonsense method of counting by spatial location is part of what leads to the puzzles about the relation between the statue and the lump of clay.)

Recognizing the phenomenon of overlap amounts to the recognition that although we usually count by distinctness, we can also count by difference. Recognizing the existence of logical parts along with spatial (and in some cases, temporal) parts means recognizing that we can count by spatial, temporal and qualitative difference as well as distinctness. So in answer to the question, 'How many objects', we must say that *it depends*—it depends on how we are counting.<sup>32</sup> In a suitably theoretical context the increase in the number of objects we get when counting by difference rather than distinctness is not alarming, for the context of the question determines the way we should count.<sup>33</sup>

## Notes

<sup>1</sup> A property can be an object, just as a fusion of properties can be an object. Different predicates need not pick out different properties, and there are no negative properties, merely descriptions of such.

<sup>2</sup> Although the terms of the debate would change somewhat, a version of substrate-attribute theory could also be combined with logical parts: objects would be fusions of attributes and a bearer of those attributes (a substrate), and a logical part would be a *having of F* or being a substrate. Space limitations prevent me from developing the substrate-attribute version of the view here.

<sup>3</sup> A mereological version of bundle theory is suggested by Williams 1953, 6 and defended by Goodman 1966 (although Goodman's overall theory is very different from mine). Leonard and Goodman 1940 and Lewis 1991 also hold that parts need not be spatial or temporal parts and overlap need not be spatial or temporal overlap.

<sup>4</sup> I introduce "logical part" and "logical overlap" in Paul 1999 and Paul 2000. Fine 1999 introduces and defends a different notion of logical parthood.

<sup>5</sup> Casati and Varzi 1999 point out that this is a decision about one's metaphysics rather than a purely logical or mathematical decision (see esp. 44–5). van Inwagen 1990a calls the question of when an aggregate of things compose a whole the "Special Composition Question".



<sup>6</sup> van Inwagen, *ibid.*, 31.

<sup>7</sup> My predicate is interdefinable with Goodman's.

<sup>8</sup> A problem I have not addressed is the problem of the possibility of (non)identical indiscernibles. This problem faces those who defend reductive accounts and those who defend nonreductive accounts of objects alike. If we can have two numerically distinct, extended objects  $x$  and  $y$  (in a purely symmetrical, relational spacetime) that are qualitatively indistinguishable, on what grounds do we individuate the objects? There are several ways one can respond, and since I don't have room to do them justice here, a brief comment will have to suffice. (I address the issue in more detail in my *Objects*, in preparation.) The three main options for addressing the problem are (i) the objects are primitively individuated, (ii) the objects have individuating (nonqualitative) thinsnesses or haecceities as parts, or (iii) each object is composed of properties plus an individuating bare particular. I favor (i), as do many others. I deny that such indiscernible but numerically distinct objects share all of their properties—they differ with respect to *being identical with  $x$*  and *being identical with  $y$* . (The extensional principle discussed in section five is not violated, since differences between the proper spatiotemporal parts of  $x$  and  $y$  supervene on differences between the objects' locations, which in turn supervene upon the primitive difference between the objects.  $x$  and  $y$  do not share all of their proper parts.)

<sup>9</sup> Although I prefer to understand the case of  $O$ 's having the property of being identical to  $O$  as improper parthood, there is another way of treating trivial self-identity: distinguish between properties that are members of the fusion that is the object and properties that can be ascribed to the fusion but which are not included in the fusion itself. We need to make such distinctions in any case.

<sup>10</sup> Armstrong 1997.

<sup>11</sup> Armstrong 1997 claims that universals are somehow parts or constituents of multiple objects but never gives a developed explanation of what this might mean.

<sup>12</sup> Hume 1958 discusses (his version of) the problem in Book 1, Part IV, in 'Of Skepticism with Regard to the Senses', 199–207, esp. 199, 205–6, and in 'Of Personal Identity', 253–6.

<sup>13</sup> Lewis 1986, 202–4.

<sup>14</sup> Some endurantists reject the manifold theory of space and time (often called 'eternalism', and sometimes called 'four-dimensionalism') in order to avoid the problem of an object having incompatible intrinsic properties. The rejection of the manifold theory usually involves the rejection of the special theory of relativity. I am unwilling to adopt a view about something as intuitive as persistence that holds us hostage to empirical results about the nature of space and time. Zimmerman 1998 defends a presentist solution to the problem, and Rea 1998a has a good discussion of how presentism (at least as standardly construed) violates special relativity.

<sup>15</sup> Johnston 1987 argues for adverbialism (van Inwagen 1990 also argues for a version of adverbialism), and Haslanger 1989 argues for the propositional solution. Johnston 1983 argues instead that objects (in his terminology) partially endure.

<sup>16</sup> Lewis 1986 argues that taking properties to be relations to times resolves the inconsistency objection at the cost of pretheoretical intuitions about the nature of properties. Lewis 2001 argues that Johnston's and Haslanger's solutions fail, for adverbialism replaces objects' having *simpliciter* of properties with objects' standing in some relation to them, which alienates objects from their properties, and the propositional account leaves having an intrinsic property at a time unexplained, which at best evades rather than addresses the problem.

<sup>17</sup> Assuming there is the right sort of continuity, etc.

<sup>18</sup> viz. Geach 1967–8.

<sup>19</sup> In other words, what I've been calling accidental properties.

<sup>20</sup> The reference of the name 'Gloria' is rigid with respect to the person it picks out at successive times. I discuss related issues involving rigid designation, counterpart theory and transworld identity in my *Objects*, in preparation.

<sup>21</sup> Gibbard 1975—this isn't quite Gibbard's version.

<sup>22</sup> Assuming that the objects exist at the same time, and excluding, if such there be, objects that are simples and objects that have a single proper part. Simons 1987.

<sup>23</sup> e.g., Wiggins 1968. By “different *de re* modal properties” I mean *absolutely* different *de re* modal properties, i.e., different irrespective of conversational contexts and the like.

<sup>24</sup> e.g., Lewis, 1986, 252.

<sup>25</sup> Noonan, 1988, 222. Others have made similar claims. Gibbard says that his main reason for wanting to hold that the lump is the statue is that “[c]oncrete objects, like statues and pieces of clay, are a part of the physical world, and we ought, it seems to me, to have a systematic physical account of them. Concrete objects, I want to maintain, are made up in some simple, canonical way from fundamental physical entities. Now what I have said of the relation between a statue and its piece of clay fits such a general view of concrete objects. Suppose, for example, we take point-instants to be our fundamental physical entities, and let a concrete object be a set of point-instants. In that case, [the statue=the lump] simply because they are the same set of point-instants.” Gibbard (in Rea 1997), 98.

<sup>26</sup> The denier of constitution as identity could retain the extensional principle if she stipulated that spatial parts are individuated by more than the region of space they occupy, but then she’d still need to explain how to make sense of *coincidence*: how different spatial parts can occupy the very same spatial region at the same time. I discuss this approach in my ‘Contingent Identity is Mereological Difference’, in preparation.

<sup>27</sup> Following Rea 1997.

<sup>28</sup> I am using “individual” to mean things like statues, lumps, persons, bodies and the like. In the previous section, I argued that such things are really well-defined kinds of objects, and held that reference could be rigid with respect to such kinds. Those who defend constitution as identity must reject this.

<sup>29</sup> Interestingly, Johnston 1992 discusses and rejects the application of logical parthood to constitution, thinking that it would be used to argue that constitution *is* identity, rather than to argue that it *isn't*.

<sup>30</sup> Rea 1998b defends a view a bit like this—though using a very different approach to objects and their properties.

<sup>31</sup> Since overlap is a symmetric relation while constitution is not, the constitution relation cannot simply be the relation of partial overlap.

<sup>32</sup> Putnam 1987 argues that if we consider a world with individuals *x*, *y* and *z*, it seems right to deny that there is any fact of the matter whether the world contains three objects or whether the world contains seven objects. From this claim he draws the conclusion that certain types of realism are untenable. As I’ve argued, there is something right about the claim that there is no single answer to the question about the number of objects—but it isn’t right for the reasons that Putnam seems to think it is. The answer to the number of distinct objects there are in the world is context sensitive in the sense that the context of the question determines the partition in which we should assess the answer. It does not mean that there is no fact of the matter, or that, as Putnam seems to claim, we should be conceptual relativists about what there is.

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