Can mereological fusions change their parts? The axioms of classical mereology do not speak directly to this question, and yet a great many philosophers who take parthood to be governed by these axioms seem to assume they cannot change their parts.¹ Curiously, dissenters tend to depart from classical mereology at least when it comes to the uniqueness of composition: no two mereological fusions ever fuse exactly the same objects.² I would like to argue that this is more than a remarkable coincidence; there are reasons of principle why one’s adherence to classical mereology should exert some pull towards the hypothesis that fusions cannot change their parts. There is, however, no direct route from the combination of classical mereology and propositional modal logic to this hypothesis.

Why should anyone expect fusions to have their parts necessarily? One may perhaps be motivated by a suggestive model of the part–whole relation as partial identity as intimated by authors such as D. M. Armstrong and D. Baxter.³ Identity is generally supposed not to be a source of contingency: identical objects are necessarily identical and distinct objects are necessarily distinct. Why would we expect parthood to be different in this respect?

Let me explain. The necessity of identity is a consequence of Leibniz’s Law of indiscernibility of identicals and the further premise that every

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¹ One reason to think this is not merely a misimpression on my part is that van Inwagen (2010) appears to be motivated by a similar state of affairs. He provides some evidence in the form of examples in footnote 1.
² Two examples are Fine (1999) and Thomson (1998).
object is necessarily self-identical. Suppose you think identical objects are necessarily identical. It is not then unnatural to think that two partially identical objects are necessarily partially identical. But if parthood is to be understood in terms of partial identity, then there is some reason to think fusions have their parts necessarily.

If, like others, you find partial identity obscure, you may instead retreat to a more modest analogy between parthood and identity, which, admittedly, seem to be alike in certain key respects. No relation of course is more intimate than identity—the relation an object bears to itself and nothing else—but the part–whole relation is supposed to come close. It is difficult to make this heuristic thought more precise but Sider (2007) has articulated a picture of parthood by means of a family of theses motivated by the thought that it is an intimate relation akin to identity. Apart from distinctive mereological principles such as unrestricted fusion or the uniqueness of composition, there is the thesis, for example, that parthood is topic-neutral: all objects without exception, regardless of what ontological category they may belong to, have parts. This is one respect in which parthood is analogous to identity. For another example, consider the thesis that parthood is a two-place relation not to be relativized to a time, a place, a world, or a sortal. Or consider, finally, the thesis that parthood is not a source of indeterminacy.

Now: suppose that unlike Sider (2007), you take at face value the thought that identity is not a source of contingency. If you think that identical objects are necessarily identical, if they exist, then it is not unnatural to think that the part–whole relation is not a source of contingency either: if one object is part of another, then the one is necessarily part of the other if they exist.

In the interest of disclosure, I find the model of parthood as partial identity obscure, but I’m not persuaded that we should take the alleged intimacy of parthood at face value. I’m inclined to think that parthood should at the very least be relativized to a time and that it is indeed often a source of contingency. I prefer a pluralist view of parthood on which different part–whole relations may be appropriate to distinct ontological categories: what it is for a set to be part of another need not coincide

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4 You may perhaps object that even if identity is not a source of contingency, existence is. If objects are self-identical only if they exist, then the premise that every object is necessarily self-identical is false and the argument fails to establish the necessity of identity. Nevertheless, you may still rest content with the weaker hypothesis that identical objects are necessarily such that they remain identical, if they exist. The same comment applies to the part–whole relation.
with what it is for a material object to be part of another. In fact, I doubt
that the axioms of classical mereology are a helpful guide to parthood
across ontological categories. Nevertheless, I’m interested in the question
of whether adherence to the axioms of classical mereology as the logic
of parthood should by itself give one some reason to think that mereo-
logical fusions have their parts necessarily—or even essentially. To that
purpose, I will look at formulations of classical mereology in the language
of quantified modal logic. While it is hopeless to expect a derivation of
the necessity—or even the essentiality—of parthood from the axioms of
modal classical mereology, I would like to suggest that the model of part-
hood as akin to identity calls for an expansion of its axioms to include one
from which the necessity—and essentiality—of parthood will follow. The
philosophical significance of this fact is that the question of what modal
profile we should attribute to mereological fusions is intimately connected
to the question of whether we should accept extensional mereological
principles such as uniqueness of composition, as they will play a pivotal
role in the arguments.

1. Modal Classical Mereology

In order to look at the interaction of modality with classical mereology, we
move to a first-order modal language, whose vocabulary includes the usual
propositional connectives such as ¬, ∧, ∨, →, and ↔; quantifiers ∀, ∃;
and modal operators □, ◊. Of these, ¬, ∧, ∀ and □ are treated as primi-
tive and the others are given the usual definitions.

There are two primitive two-place predicates: = for identity and ≪ for
the part–whole relation. We now assume some of the usual definitions for
other mereological relations:

\[ x \prec y , \text{ read } \text{“} x \text{ is a proper part of } y \text{,” abbreviates: } x \preceq y \land \neg x = y. \]
\[ x \circ y , \text{ read } \text{“} x \text{ overlaps } y \text{,” abbreviates: } \exists z (z \preceq x \land z \preceq y). \]
\[ Fu(y, \phi), \text{read } \text{“} y \text{ is a fusion of whatever objects satisfy condition } \phi \text{”, abbreviates: } \forall x (\phi(x) \rightarrow x \preceq y) \land \forall x (x \preceq y \rightarrow \exists z (\phi(z) \land x \circ z). \]

\[ ^5 \text{ This is the definition of Type-2 Fusion in Hovda (2009).} \]
The axioms of modal classical mereology will combine the axioms of classical mereology with the axioms of propositional modal logic. The axioms for modal classical mereology now fall under five groups:

I. Tautologies and modus ponens as a rule of inference.
II. The classical theory of quantification.
III. Axioms for identity:

\[ x = x \]  Reflexivity
\[ x = y \to (\phi \left( \frac{x}{z} \right) \to \phi \left( \frac{y}{z} \right)) \]  Leibniz’s Law

IV. Axioms for classical mereology:

\[ x < y \land y < z \to x < z \]  Transitivity
\[ x < y \to \exists z (z < y \land \neg < x) \]  Weak Supplementation
\[ \exists x \phi (x) \to \exists y \phi u (y, [\phi]) \]  Unrestricted Fusion

This succinct axiomatization of classical mereology demotes three familiar mereological principles from axioms to theorems.6

\[ x = x \]  Reflexivity
\[ x < y \land y < z \to x = y \]  Anti-symmetry
\[ \phi u (y, [\phi]) \land \phi u (z, [\phi]) \to y = z \]  Unique Fusion

V. Axioms of the propositional modal logic KT:

\[ \Box (\phi \to \psi) \to (\Box \phi \to \Box \psi) \]  K
\[ \Box \phi \to \phi \]  T

If \( \phi \) is a theorem, then \( \Box \phi \) is a theorem.  RN

The rule of necessitation and the axiom K are generally considered part of the minimal modal logic, but the axiom T is not. However, on the alethic

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6 This and similar axiomatizations are discussed in Hovda (2009), where proofs for these facts are supplied.
interpretation of the box, T is the axiom that whatever is necessary is the case, which seems uncontroversial.

The interaction of the classical theory of quantification with propositional modal logic is not without consequence. The Converse Barcan Formula quickly becomes a theorem.\(^7\)

\[ \Box \forall x \phi(x) \rightarrow \forall x \Box \phi(x) \]  
(CBF)

One problem is that the necessity of existence is not far behind one of its instances:

\[ \Box \forall x \exists y x = y \rightarrow \forall x \Box \exists y x = y \]  
\(^8\)

This is reflected in the simple fixed-domain model theory for the language. A fixed-domain model \(< W, D, R, I >\) consists of a set of possible worlds \(W\), an accessibility relation on \(W, R\), a domain of individuals \(D\), and an interpretation function \(I\) for the non-logical vocabulary. \(I(\subseteq)\) is a function from \(W\) into \(D \times D\) which assigns to each world \(w\) a subset of \(D \times D\) as the extension of \(\subseteq\) at \(w\). An assignment \(\alpha\) maps singular variables to members of \(D\). The truth of a formula \(\phi\) at a world \(w\) relative to an assignment is defined recursively with respect to a model. \(x = y\) is true at \(w\) relative to an assignment \(\alpha\) if and only if \(\alpha\) assigns the same object to \(x\) and \(y\); \(x \subseteq y\) is true at \(w\) relative to an assignment \(\alpha\) if and only if \(< \alpha(x), \alpha(y) > \in I(\subseteq)\). \(\phi\) is true at \(w\) relative to \(\alpha\) if and only if \(\phi\) is not true at \(w\) relative to \(\alpha\); \(\phi \land \psi\) is true at \(w\) relative to \(\alpha\) if and only if \(\phi\) and \(\psi\) are true at \(w\) relative to \(\alpha\); \(\forall x \phi\) is true at \(w\) relative to \(\alpha\) if and only if \(\phi\) is true relative to every assignment \(\beta\) which differs from \(\alpha\) at most in what it assigns to \(x\). Finally, \(\Box \phi\) is true at \(w\) relative to \(\alpha\) if and only if \(\phi\) is true at every world \(w\), accessible from \(w\) relative to \(\alpha\).

\(^7\) The argument relies on the interaction of standard axiom schemata for quantification and K:

1. \(\forall x \phi(x) \rightarrow \phi(x)\) \hspace{1cm} PL
2. \(\Box \forall x \phi(x) \rightarrow \Box \phi(x)\) \hspace{1cm} RN, K, 1
3. \(\Box \forall x \phi(x) \rightarrow \forall x \Box \phi(x)\) \hspace{1cm} PL, 2

\(^8\) Here is the argument:

1. \(\forall x \exists y x = y\) \hspace{1cm} PL
2. \(\Box \exists y x = y\) \hspace{1cm} RN, 1
3. \(\Box \exists y x = y \rightarrow \forall x \Box \exists y x = y\) \hspace{1cm} CBF
4. \(\forall x \Box \exists y x = y\) \hspace{1cm} PL, 2, 3
5. \(\Box \forall x \exists y x = y\) \hspace{1cm} RN, 4
The definition of validity is as usual. A formula \( \phi \) is valid in a model if and only if \( \phi \) is true in every possible world in the model relative to every assignment.\(^9\)

Not only does the model theory validate the Converse Barcan Formula, it validates the Barcan Formula, which, in the absence of axiom B, is not a theorem of the system:

\[
\forall x \Box \phi(x) \rightarrow \Box \forall x \phi(x)
\]

The validity of the Barcan Formula may strike one as uncomfortable. It tells us that if it is possible for a formula to be satisfied by some object, then there is some object, which possibly satisfies the formula. If it is possible for there to be immaterial angels, then some object is possibly an immaterial angel. But even if the antecedent strikes you as true, the consequent appears incompatible with popular metaphysical assumptions.

To avoid the validity of BF and CBF, we could weaken the theory of quantification and frame modal classical mereology against the background of a “free” quantified modal logic. We will do this later, but in the meantime, we will disregard these concerns to focus on the more immediate question of whether it is possible to extend arguments for the necessity of identity to arguments for the necessity of parthood. It will be helpful to know whether parthood can ever be a source of contingency, even if existence is not. If the answer is not, then we should be able to adapt the arguments to deal with the scenario in which existence is indeed a source of contingency.

Now, while the necessity of identity is a theorem of the present formulation of modal classical mereology, it is trivial to provide fixed-domain models, which validate all the axioms above but not the necessity of parthood. To make sure the models do what we want them to do, we need to make sure that the interpretation of \( \approx \) satisfies the axioms of classical mereology in every possible world in the model. To ensure that some mereological fusions have their parts only contingently, we may simply exploit the flexibility in the interpretation of \( \approx \).

\(^9\) Note that we allow an open formula to be valid if it is true relative to every assignment.
Consider a model \(<W, R, D, I>\) in which:

\[ W = \{0, 1\} \]

\[ R = \{<0, 0>, <0, 1>, <1, 1>\} \]

\[ D = \{a, b, c\} \]

\[ I(\leq) = \{<a, a>, <a, c>, <b, b>, <c, c>, <b, c>, <c, b>, <b, b>\} \]

The model invalidates the necessity of parthood:

\[ x \leq y \to \Box x \leq y \quad (\Box \leq) \]

The formula \( x \leq y \) is true at 0 relative to an assignment \( \alpha \) on which \( \alpha(x) = b \) and \( \alpha(y) = c \). Yet, \( x \leq y \) is false at 1 relative to the same assignment. So, \( x \leq y \to \Box x \leq y \) fails at 0 relative to \( \leq \). Less formally, while \( c \) is a fusion of \( a \) and \( b \) in 0, it is not a fusion of \( a \) and \( b \) in 1; \( b \) is. Thus while \( b \) is part of \( c \) at 0, \( b \) is not part of \( c \) at 1; in fact, \( c \) is part of \( b \) at 1.\(^\text{10}\)

It follows that the necessity of parthood is not a theorem of modal classical mereology.

2. The Necessity of Identity

The necessity of parthood may not be a theorem of modal classical mereology, but it comes close. The extensionality of overlap is a theorem of classical mereology:

\[ \forall z (z \circ x \leftrightarrow z \circ y) \to x = y \quad \text{Extensionality of overlap.} \]

In combination to Leibniz’s Law of indiscernibility of identicals, we have:

\[ \forall z (z \circ x \leftrightarrow z \circ y) \leftrightarrow x = y \]

\(^{10}\) Two Hasse diagrams provide an illustration of the model in which we have omitted the accessibility relation:

```
   a
   /\  c
  /   \  \
 b   a   b
    \  /  \\
   c /   \
```

We read the diagram as usual: a node stands in the relation to another if they are identical or the first lies below the second in the diagram.
By necessitation, modal classical mereology proves:

$$\Box \forall z (z \circ x \leftrightarrow z \circ y) \rightarrow x = y$$

Now, consider the necessity of identity:

$$x = y \rightarrow \Box x = y \quad (\Box =)$$

By a familiar proof, we know that this is a theorem of modal classical mereology. But the combination of the preceding two facts yields another theorem of modal classical mereology:

$$\forall z (z \circ x \leftrightarrow z \circ y) \rightarrow \Box \forall z (z \circ x \leftrightarrow z \circ y)$$

Modal classical mereology may allow for fusions to change their parts across worlds, but the changes are subject to stringent coordination constraints. The contrapositive of the preceding theorem tells us that two fusions can overlap different objects only if they already do. Modal classical mereology allows for a statue to change its parts. However, we cannot distinguish the statue and a portion of clay that constitutes it merely on the grounds that they can overlap different objects—namely, the statue can survive the replacement of some limbs and come to overlap different portions of clay. For it is not genuinely possible for the statue and the portion of clay to overlap different objects in other possible worlds. Since they overlap the same objects, they are, after all, one and the same object by the lights of classical mereology.

The necessity of distinctness follows from the necessity of identity in the presence of the Brouwerian principle (B) which tells us that whatever is the case is necessarily possibly the case:

$$x \neq y \rightarrow \Box x \neq y \quad (\Box \neq)$$

It follows that different fusions can never overlap exactly the same objects:

$$\neg \forall z (z \circ x \leftrightarrow z \circ y) \rightarrow \Box \neg \forall z (z \circ x \leftrightarrow z \circ y)$$

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As usual:

1. $x = y \rightarrow (\Box x = x \rightarrow \Box x = y)$ Leibniz’s Law
2. $x = x$ Reflexivity
3. $\Box x = x$ RN, 2
4. $x = y \rightarrow \Box x = y$ PL, 1, 3
The statue and its torso are different fusions—one is a proper part of the other. The preceding theorem tells us that it is not possible for them to overlap exactly the same objects, which you might have expected to happen if the statue happened to lose its head and limbs.

The last observation places stringent constraints on the modal variability of the part–whole relation but as we noted earlier, they cannot quite amount to the claim that it must obtain necessarily if at all. However, the standard proof of the necessity of identity suggests another route to \((\Box \leq\)). First, some definitions in the context of classical mereology:

\[ Fu(y, x_1, x_2) \]

abbreviates: “\(Fu(y, \{x = x_1 \lor x = x_2\})\)”

\[ x_1 + x_2 \]

abbreviates: “\(\ulcorner yFu(\ulcorner y, x_1, x_2)\urcorner\)”

Here is another theorem of classical mereology:

\[ x \leq y \rightarrow \forall z (Fu(z, x, y) \rightarrow z = y).^{12} \]

In other words, \(x\) is part of \(y\) if and only if \(y\) fuses \(x\) and \(y\). Since \(x + y\) is defined as “the mereological fusion of the objects that satisfy the condition \(<u \equiv x \lor u = y>\),” or, more colloquially, the mereological fusion of \(x\) and \(y\), we have the following theorem:

\[ x \leq y \rightarrow y = x + y. \]

We appear to have an argument for the necessity of parthood \((\Box \leq)\):

1. \(x \leq y \rightarrow y = x + y \)
   \quad CM
2. \(y = x + y \rightarrow (\Box x \leq x + y \rightarrow \Box x \leq y) \)
   \quad Leibniz’s Law
3. \(x \leq y + x \)
   \quad CM
4. \(\Box x \leq y + x \)
   \quad RN

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12 Let \(z\) be a fusion of \(x\) and \(y\), i.e., \(Fu(z, \{ x = y \lor u = x \}). By definition of fusion, we have \(y \leq z\). Strong supplementation, \(\forall x (x \leq y \rightarrow x + z \rightarrow x \leq z)\), which is a theorem of classical mereology, allows us to infer that \(z \leq y\). By the definition of fusion, we have that \(u \leq z\) only if \(u = y\) or \(u = y\). Since \(x \leq y\), we have that \(u \leq z\) only if \(u = y\). By strong supplementation, \(z \leq y\). By anti-symmetry, we have \(y = z\).
We know that (\(\Box \approx\)) is not a theorem of modal classical mereology, which means that the proof cannot be successful. The challenge is to identify the problem and check whether we could supplement the axioms of modal classical mereology to vindicate a closely related argument.

Never mind, for now, the concern that \(x\) cannot necessarily be part of \(x + y\) unless it exists necessarily; we will deal with that concern separately. The argument outlined above suffers from a much more serious problem. It is well known that sound applications of Leibniz’s Law in modal contexts require the identity predicate to be flanked by rigid designators whose value does not change from world to world. Even if we assume variables such as \(x\) and \(y\) are rigid designators, what reason is there to assume the complex term \(x + y\) to be rigid as well? We introduced it by means of a definite description designed to refer to the fusion of \(x\) and \(y\), but for all we know, different objects can fuse \(x\) and \(y\) in different possible worlds. If we allow for variation in the value of \(x + y\), then at first glance, the argument given above is no better than the crude blunder made by someone who concludes that the number of planets is necessarily odd from the premises that nine is the number of planets and nine is necessarily odd.

We may codify the rigidity of the complex term \(x + y\) by means a formula that states that some object which necessarily fuses \(x\) and \(y\):

\[\exists z \Box z = x + y .\]

The problem is that nothing in the axioms of modal classical mereology allows us to derive the formula. All we should hope for is the much weaker:

\[\Box \exists z z = x + y .\]

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13 If you find the argument attractive, then you will be similarly impressed by the argument for the determinacy of parthood that results from the substitution of \(\Delta\) for \(\Box\). If the argument for the necessity of parthood relies on the necessity of identity, the argument for the determinacy of parthood is similarly supported by the determinacy of identity. The suggestion would be that the necessity and determinacy of parthood is inherited from the necessity and determinacy of identity, which, for present purposes, is beyond question. A variant of the suggested argument for the determinacy of parthood has been suggested by Weatherson (2003), and, to my mind, effectively criticized by Williams and Barnes (2009).
This may tell us that there necessarily is a fusion of $x$ and $y$, but different objects may play this role in different worlds.\footnote{Remember that we have set aside the question of whether modal mereology needs to be qualified in order to take seriously the contingency of existence; otherwise, you may think that the most we should expect is the claim that there is necessarily a fusion of $x$ and $y$ in every world in which $x$ and $y$ exist.} It is important to clarify at this point that the objection is not that there is no object that necessarily fuses $x$ and $y$ but rather that there is nothing in the axioms of modal classical mereology to guarantee this. But if composition is like identity in key respects, then it is not unnatural to think that whatever object fuses $x$ and $y$, will do this across possible worlds. Friends of the necessity of parthood may at this point consider expanding the axioms of modal classical mereology in order to be able to derive the first formula as a theorem.

One option at this point is to supplement modal classical mereology with a single axiom:

$$\exists z \Box z = x + y.$$  

No matter what $x$ and $y$ are, there is an object $z$, which not only fuses $x$ and $y$ but fuses them necessarily. This is a very natural thought, one which need not be exclusive to those proponents of classical mereology motivated by the analogy between parthood and identity. Leave aside the question of whether a fusion of $x$ and $y$ could fuse $x$ and $y$ necessarily unless $x$, $y$, and $z$ are necessary existents. Many philosophers who explicitly reject both the necessity and the essentiality of parthood would welcome (a suitably restricted version of the) principle stated above; indeed, many of them appear to think that no matter what some objects are, they have a fusion which, necessarily, has them as parts if they exist. Thomson (1998), for example, uses the label “all-fusion” to refer to fusions with certain temporal and modal profiles: an all-fusion of a certain condition $\phi$ exists at all and only those times at which all objects that satisfy $\phi$ exist; and necessarily, an object is part of it at a time if and only if it has no parts at the time that are discrete from all the objects that satisfy $\phi$.\footnote{Thomson (1998) speaks of all-fusions of sets, but it is not difficult to adapt the definition for the case of conditions. In addition, her definition is closer to what Hovda (2009) calls “type-1 fusions” than to our fusions. It is again not difficult to alter the definition to have them be closer to “type-2 fusions.”} Likewise, consider the idea of a rigid embodiment introduced by Fine (1999), where composition requires some objects to be bound by a certain relation. In the limiting case in which the relevant
relation requires nothing more than the existence of the parts, necessarily, the fusion will have them as parts if they exist.

What unites opponents of (modal) classical mereology, it seems to me, is not the thought that no fusion has its parts necessarily but rather the thought that different fusions may overlap exactly the same objects because they may exemplify a variety of modal profiles: some fusions necessarily overlap exactly the same objects whenever they exist, but many other fusions need not. To the extent to which ordinary objects have parts, many of them are fusions that have their parts only contingently. Likewise, one of the lessons of the problem of material constitution, the suggestion continues, is that two fusions, e.g., the statue and the portion of clay of which it is made, can share all of their parts while differing in their modal profiles. While the portion of clay has many of its parts necessarily whenever they exist, some of them are not necessarily parts of the statue even when they all exist.

3. How to Extend Modal Classical Mereology

You may object at this point that the principle that no matter what \( x \) and \( y \) are, there is an object \( z \), which necessarily fuses \( x \) and \( y \) looks ad hoc or perhaps insufficiently general. Or, more to the point, you may think that the principle above ought to fall out as a consequence of a much more general principle of unrestricted fusion. The strategy now would be to extend the axiom of unrestricted fusion in order to make sure that no matter what \( x \) and \( y \) are, there is some object, \( z \), which necessarily fuses \( x \) and \( y \). The problem with the suggestion is that it is not obvious how to implement it. It will not do merely to insert a box immediately after the second occurrence of an existential quantifier in the axiom of Unrestricted Fusion:

\[
\exists x \phi(x) \rightarrow \exists y \Box \text{fu}(y,[\phi])
\]

If a given condition, \( \phi \), is satisfied by different objects in different worlds, then the parts of the relevant fusion would have to track the extension of \( \phi \) across possible worlds. Informally, if \( \phi \) is satisfied by Tom in one world, Dick in another world, and Harry in yet another world, then the axiom would require the existence of an object which necessarily fuses Tom in one world,
Dick in another world, and Harry in another world. But this is just what we would like to avoid.

One may rise to the challenge by adopting as axioms only instances of the modalized version of comprehension corresponding to certain select conditions. We stipulate that a formula $\phi(x)$ is rigid only if the axioms listed under I–V above suffice to prove the conditional: $\phi(x) \rightarrow \Box \phi(x)$.

The proposal would be to supplement modal classical mereology with instances of $\Box Fu$ generated by rigid conditions. It turns out that this move will do for a derivation of $(\Box \not\equiv)$. The reason for this is the observation that $<x = y_1 \lor x = y_2>$ is indeed a rigid condition. More generally, modal classical mereology proves:

$$\forall x = y_k \rightarrow \Box \forall x = y_k$$

as a theorem. On the present proposal, we are entitled to all instances of the schema:

$$\exists x \forall x = y_k \rightarrow \exists y \Box Fu(y, [\forall x = y_k])$$

But all we need in order to vindicate the argument from the last section is one of the form:

$$\exists x(x = y_1 \lor x = y_2) \rightarrow \exists y \Box Fu(y, [x = y_1 \lor x = y_2])$$

Once the suggested axiom is in place, $(\Box \not\equiv)$ becomes provable and all fusions are required to have their parts necessarily.

Before we look at the demands imposed by the contingency of existence, let me note that the newly proposed axiom is not quite what is at stake in the debate over whether parthood is ever a source of contingency. Unless a philosopher has some specific concerns over the existence of fusions for rigid conditions—or is moved by the contingency of existence—the existence of fusions with the modal profile indicated above is unlikely to raise a separate concern. In particular, the existence of such

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16 Here is an argument sketch:

1. $\forall x \forall y \exists z(x = y \rightarrow \forall z \Box x = y)$
2. $\forall x \Box x = y_k \rightarrow \Box \forall x = y_k$
fusions is perfectly consistent with the rejection of classical mereology on the grounds that two fusions may overlap exactly the same objects.

To allow for a fusion to have its parts necessarily, after all, is not to deny that a mereologically coincident fusion could not have its parts only contingently. Quite generally, opponents of classical mereology will object to the necessity of parthood on the grounds that the relation may obtain contingently, which means that there cannot, by their lights, be a sound argument for the necessity of parthood.

Indeed, opponents of classical mereology have no use for the master argument for the necessity of parthood we based on an application of Leibniz’s Law of indiscernibility of identicals. They will of course object to the introduction of a functional term \( x + y \) allegedly referring to a unique fusion of \( x \) and \( y \). Absent a principle of uniqueness of composition, we are not entitled to assume that only one object will count as a fusion of any two given objects \( x \) and \( y \). Nor will they think much better of the identification of \( y + x \) and \( y \) on the grounds that they overlap exactly the same objects, which is what allows for the application of Leibniz’s Law in the second step of the argument. The step is available only to philosophers committed to the extensionality of overlap.

While classical mereology is commonly objected to on the grounds that it is too profligate by positing all variety of fusions by means of the principle of unrestricted fusion, there is another respect in which it is, in fact, very restrained. For given certain objects, there is one and only one fusion that has them as parts, and, consequently, there is one and only one modal profile this fusion can exemplify. When we enrich the language of classical mereology to include modal operators, we must make a choice as to what the modal profile of a fusion of the condition \( \forall_{x,y} x = y \) should be. The proposed modal extension of unrestricted fusion makes such a choice, and it is difficult to think of any other principled alternative choice.

4. The Contingency of Existence

We have argued that it is not difficult to extend modal classical mereology with a reasonable further principle in order to obtain the necessity of parthood as a consequence. However, we have operated under the assumption that modal classical mereology is suitably axiomatized by the axioms listed under I–V in section 1. The time has come to place this assumption
under closer scrutiny. Many philosophers are troubled by the combination of the classical theory of quantification listed under II and propositional modal logic listed under V on the grounds that it does not do justice to the thought that existence is contingent. The derivability of the Converse Barcan Formula and the necessity of existence are cases in point. It turns out that the usual strategies to weaken the classical theory of quantification in order to deal with these anomalies complicates the task of finding a principled extension of modal classical mereology from which to prove the essentiality of the part–whole relation. But let us begin with the usual response to the derivability of necessity of existence from the combination of propositional modal logic and the classical theory of quantification. To the extent to which you want to make allowance for objects that might not exist, you should replace the classical theory of quantification with a free version in which a predicate of existence is added to the language of two-sorted modal classical mereology.\footnote{You might, for example, weaken the axiom of universal instantiation:}

The move is generally accompanied with a switch from a fixed- to a variable-domain model theory. A variable-domain model $<W,D,\text{dom},R,I>$ consists of a set of possible worlds $W$, an accessibility relation on $W$, $R$, a domain of individuals $D$, a function $\text{dom}$ from possible worlds into subsets of $D$, and an interpretation function $I$ for the non-logical vocabulary. The main novelty with respect to fixed-domain models is the availability of a distinction between the outer domain $D$ of individuals and the inner domain of quantification $\text{dom}(W)$ associated with each world $w$. We may, if we wish, constrain the interpretation of the non-logical vocabulary to make sure an $n$-tuple falls under the extension of a non-logical predicate only if its components are members of the inner domain. Let us momentarily assume that

$$I(\mathcal{E})(w) \subseteq \text{dom}(w) \times \text{dom}(w).$$

The definition of validity remains unchanged as does the definition of an assignment. The truth of a formula $\phi$ at a world $w$ relative to an assignment

17 You might, for example, weaken the axiom of universal instantiation:
is defined recursively with respect to a model: \( x \preceq y \) is true at \( w \) relative to an assignment \( \alpha \) if and only if \( \langle \alpha(x), \alpha(y) \rangle \in I(\preceq) \). \( \phi \) is true at \( w \) relative to \( \alpha \) if and only if \( \phi \) is not true at \( w \) relative to \( \alpha \); \( \phi \land \psi \) is true at \( w \) relative to \( \alpha \) if and only if \( \phi \) and \( \psi \) are true at \( w \) relative to \( \alpha \); \( \forall x \phi \) is true at \( w \) relative to \( \alpha \) if and only if \( \alpha \) assigns the same member of \( \text{dom}(w) \) to \( x \). Finally, \( \Box \phi \) is true at \( w \) relative to \( \alpha \) if and only if \( \phi \) is true at every world \( w' \) accessible from \( w \) relative to \( \alpha \).

You will have noticed an omission. The adoption of a free theory of quantification is still compatible with two broadly different approaches to identity. One option is to allow for an atomic formula of the form \( xy \) to be true at a world relative to an assignment \( \alpha \) regardless of whether the values assigned to the variables lie in the inner domain of \( w \). In particular, a formula \( x = y \) is true at \( w \) relative to \( \alpha \) if and only if \( \alpha \) assigns the same member of \( D \) to \( x \) and \( y \); the alternative is to insist that \( x = y \) is true at \( w \) relative to \( \alpha \) if and only if \( \alpha \) assigns the same member of \( \text{dom}(w) \) to \( x \) and \( y \). On the first approach (\( \Box = \)) remains valid, which should not come as a surprise. Its derivation made no use of the Converse Barcan Formula; it relied on the axioms of identity in combination with the rule of necessitation.

Since we want to take seriously the contingency of existence, we may as well opt for the second approach and insist that \( x = y \) is true at \( w \) relative to \( \alpha \) if and only if \( \alpha \) assigns the same member of \( \text{dom}(w) \) to \( x \) and \( y \). Since (\( \Box = \)) is now invalid, we have to either renounce the rule of necessitation or the axioms of identity if we want to block the familiar derivation of the necessity of identity. One familiar option at this point is to disallow open formulas as axioms and substitute them instead with their universal generalizations.

But we are still in a position to adapt the proof of the Converse Barcan Formula to a proof of a weaker principle:

\[
\Box \forall x \phi(x) \rightarrow \forall x \Box (Ex \rightarrow \phi(x)) \tag{QCBF}
\]

In the presence of the weaker QCBF, we may still adapt the standard derivation of (\( \Box = \)) to a proof of what is commonly known as the essentiality of identity:

\[
\forall x \forall y (x = y \rightarrow \Box (Ex \rightarrow x = y)) \tag{E =}
\]
Here is the proof:

1. \( \forall x \forall y (x = y \rightarrow (\Box (E x \rightarrow x = x) \rightarrow \Box (E x \rightarrow x = y))) \)
   \quad \text{Leibniz’s Law}
2. \( \forall x x = x \)
   \quad \text{Reflexivity}
3. \( \Box \forall x x = x \)
   \quad \text{RN, 2}
4. \( \forall x \Box (E x \rightarrow x = x) \)
   \quad \text{QCBF, 3}
5. \( \forall x \forall y (x = y \rightarrow (\Box (E x \rightarrow x = y)) \rightarrow \Box (E x \rightarrow x = y)) \)
   \quad \text{PL 1, 4}

The essentiality of identity tells us that even if existence is contingent, identity is, by itself, never a source of contingency. The obvious strategy for parthood would now be to weaken the derivation of \( (\Box \equiv) \) to \( (F \equiv) \). In particular, once we assume (QCBF), we may argue:

1. \( \forall x \forall y (x \equiv y \rightarrow y = x + y) \)
   \quad \text{CM}
2. \( \forall x \forall y (y = y + x \rightarrow (\Box (E y + x \rightarrow x \equiv y + x) \rightarrow \Box (E y \rightarrow x \equiv y + y))) \)
   \quad \text{Leibniz’s Law}
3. \( \forall x \forall y \forall x \equiv y + x \)
   \quad \text{CM}
4. \( \Box \forall x \forall y \forall x \equiv y + x \)
   \quad \text{RN, 3}
5. \( \forall x \forall y \Box (E y \rightarrow (E x \rightarrow x \equiv y + x)) \)
   \quad \text{QCBF, PL, 4}
6. \( \forall x \forall y \Box ((E y \land E x) \rightarrow x \equiv y + x) \)
   \quad \text{PL, 5}
7. \( \forall x \forall y \Box (E y + x \rightarrow x \equiv y + x) \)
   \quad \text{CM, 6\textsuperscript{18}}
8. \( \forall x \forall y (y + x = y \rightarrow \Box (E y \rightarrow x \equiv y)) \)
   \quad \text{PL 2, 7}
9. \( \forall x \forall y (x \equiv y \rightarrow \Box (E x \rightarrow x \equiv y)) \)
   \quad \text{PL 1, 8}

Unfortunately, this argument suffers from the same problem as the argument from section 2. In this case, however, it would be too much to ask for some independent guarantee that some object necessarily fuses \( y \) and \( x \); it would suffice to be able to guarantee that some object \( z \) is such that necessarily, if \( y + x \) exists, then \( z \) is identical to \( y + x \). At the very least, we would like to satisfy ourselves that:

\[
\forall x \forall y \exists z \Box (E y + x \rightarrow y + x = z)
\]

\textsuperscript{18} Note that the step from 5 to 6 assumes we are able to infer \( E y \land E x \) from \( E y + x \), which modulo some of our definitions and axioms, is not difficult to do when one explicitly defines \( E t \) as: \( \exists z z = t \).
Thus far the situation seems analogous to the situation faced in section 2. One solution at this point would be to add the sentence above as an axiom, which at least some friends of classical mereology will welcome as addition to the axioms of modal classical mereology in the present context. Much like before, opponents of classical mereology will still object to the assumption that there is a unique fusion of \(x\) and \(y\)—and if one doubts the extensionality of overlap, one will object to the use of a functional term such as \(x + y\)— but not to the existence of an object, which is necessarily a fusion of \(x\) and \(y\).

However, proponents of classical mereology may still be bothered by the lack of generality of the axiom. It would be desirable to be able to derive the sentence above from a suitably modalized version of the principle of unrestricted fusion. Unfortunately, some of the tools we used to a similar purpose in earlier sections are no longer available to us. In particular, notice that once we disallow an open formula such as \(xx\) as an axiom and we weaken the classical theory of quantification to avoid the necessity of existence, we are no longer able to derive the necessity of identity, which means that not even \(x = y\) qualifies as a rigid formula.

It follows that the restriction of \(\Box Fu\) to rigid conditions no longer has any bite.

What to do? The derivability of \((E \leq)\) suggests an obvious alternative. Call a formula \(\phi\) semi-rigid if and only if the reformed axioms allow us to prove: \(\forall x(\phi(x) \to (Ex \to \phi(x)))\). The essentiality of identity tells us that a formula such as \(x = y\) is semi-rigid, since \(\forall x \forall y (x = y \to \Box(Ex \to x = y))\) is a theorem of the system.

More generally, it is not difficult to check that we have:

\[
\forall x \forall y_1 \cdots \forall y_k (\forall x = y_k \to \Box (Ex \to \forall x = y_k))
\]

This tells us that the formula \(\forall_{1 \leq k \leq n} x = y_k\) is semi-rigid.\(^{19}\)

One may hope to make do with a restriction of \(\Box Fu\) to semi-rigid formulas. Unfortunately, this will not do for present purposes. For consider what happens, for example, when three objects \(a, b,\) and \(c\) exist in one world

\(^{19}\) As follows:

1. \(\forall_{1 \leq k \leq n} x = y_k \to \forall_{1 \leq k \leq n} (Ex \to \Box x = y_k)\) \hspace{1cm} (E =) \hspace{1cm} \text{PL}

2. \(\forall_{1 \leq k \leq n} (Ex \to \Box x = y_k) \to \Box \forall_{1 \leq k \leq n} (Ex \to x = y_k)\) \hspace{1cm} \text{K, PL}
0 but only \( b \) exists in another accessible world 1. (Assume each world is accessible from the other.) Fix an interpretation of \( \equiv \) on which neither \( a \) is part of \( b \) nor vice versa and \( c \) fuses them in 0.\(^{20}\) Different objects will satisfy the formula \((x = y_1 \lor x = y_2)\), which is semi-rigid, in different worlds relative to an assignment \( \alpha \) where \( \alpha(y_1) = a \) and \( \alpha(y_2) = b \): \( a \) and \( b \) will do this in 0 but only \( b \) will do this in 1. Even when restricted to semi-rigid conditions, \( \Box Fu \) will fail in both worlds. It will fail in 0 because while \( c \) fuses the condition \((x = y_1 \lor x = y_2)\) in 0, \( c \) is not available in 1 to fuse the condition there; \( b \) itself fuses the condition \((x = y_1 \lor x = y_2)\) in 1. But the restricted principle will fail in 1 as well. While \( b \) fuses the condition \((x = y_1 \lor x = y_2)\) in 1, it clearly fails to do this in 0 since only \( c \) does.\(^{21}\)

What we would like is a modalized version of unrestricted fusion, which for each condition, generates a fusion which, on the one hand, exists in all and only those worlds in which the objects which satisfy the condition (with respect to the world of evaluation) exist, and, on the other, such that it exists only as a fusion of the objects which satisfy the condition (in the world of evaluation). A natural suggestion at this point might be to state a principle which for each semi-rigid condition, manages to specify existence and identity conditions for the fusion in question. Unfortunately, it is not clear how to implement the suggestion.

The following will not do even if we restrict attention to semi-rigid conditions:

\[
\exists x \phi(x) \rightarrow \exists y \Box \big((E y \leftrightarrow \forall x(\phi(x) \rightarrow E x)) \land (E y \rightarrow Fu(y, < \phi > ))\big)
\]

One problem is that the quantifiers succeeding the box range over the inner domain of worlds accessible from the world of evaluation. For example, in the model sketched above, the open formula \( \forall x((x = y_1 \lor x = y_2) \rightarrow Lx) \) is satisfied in 1 with respect to an assignment \( \alpha \) on which \( \alpha(y_1) = a \) and

\(^{20}\) Here is an illustration of the model in which we have omitted the accessibility relation:

\[\begin{array}{ccc}
a & \overset{c}{\longrightarrow} & b \\
0 & \overset{\rightarrow}{\longrightarrow} & 1
\end{array}\]

\(^{21}\) More formally, let \( < W, U, \text{Dom}, R, I > \), where \( W = \{0, 1\} \), \( U = \{a, b\} \), \( R = \{< 0, 0, < 0, 1, >, < 1, 1 >\} \)
\( \text{dom}(0) = \{a, b, c\} \), and \( \text{dom}(1) = \{b\} \). Moreover, let \( I(\equiv)(\{\}) = \{< a, a \geq, < a, c \geq, < b, b \geq, < b, c \geq, < c, c \geq \} \)
and \( I(\equiv)(\{\}) = \{< b, b \geq > \} \). If \( \alpha \) is an assignment such that \( \alpha(y_1) = a \) and \( \alpha(y_2) = b \), then 0, \( \alpha \models Fu(c, < x = y_1 \lor x = y_2 >) \) but 0, \( \alpha \npreceq Fu(c, < x = y_1 \lor x = y_2 >) \). Moreover, 1, \( \alpha \models Fu(b, < x = y_1 \lor x = y_2 >) \) but 0, \( \alpha \npreceq Fu(b, < x = y_1 \lor x = y_2 >) \).
\[ \alpha(y_2) = b \] despite the fact that \( a \) does not exist in 1. (The problem is that the quantifier \( \forall x \) does not range over \( a \) in 1, since \( a \) is not in \( \text{dom}(1) \).)

But this is not the only problem. We do no better merely by resorting to outer quantification in the formulation of the principle:

\[ \exists x \phi(x) \rightarrow \exists y \square \left( \{Hy \leftrightarrow \forall x > (\phi(x) \rightarrow Ey)\} \land (Ey \rightarrow Fu(y, < \phi>)\} \right) \]

The problem now is that not even the semi-rigidity of \( \phi(x) \) is sufficient to guarantee that if an object satisfies the formula in the world of evaluation, then the object will continue to satisfy the formula in worlds that are accessible from the world of evaluation. To return to our example, the open formula \( < \forall x > (x = y_1 \lor x = y_2) \rightarrow Ez(x) \) is still satisfied in 1 with respect to an assignment \( \alpha \) on which \( \alpha(y_1) = a \) and \( \alpha(y_2) = b \) despite the fact that \( a \) does not exist in 1. (The issue now is that \( a \), which is now in the range of the outer quantifier, does not satisfy the open formula \( x = y_1 \lor x = y_2 \) in 1. We have after all, presupposed an existence-dependent approach to identity.)

This suggests we must respond to the problem in a different fashion. One solution at this point is to expand the expressive resources of the language of modal classical mereology in order to allow us to rigidify the condition of the modalized principle of comprehension. One instance of this strategy would be to enrich the language of modal classical mereology with a backspace operator, which liberates \( \phi(x) \) from the scope of its immediately preceding modal operator.\(^{22}\)

\[ \exists x \phi(x) \rightarrow \exists y \square \left( \{Hy \leftrightarrow \forall x > (\downarrow \phi(x) \rightarrow Ez)\} \land (Ey \rightarrow Fu(y, < \downarrow \phi>)\} \right) \]

An appropriate model theory for \( \downarrow \) would tell us to evaluate \( \downarrow \phi(x) \) with respect to a world accessible from a given world of evaluation in terms of the evaluation of \( \phi(x) \) in the world of evaluation. That solves the problem since relative to an evaluation of the principle with respect to 0, \( < \forall x > (\downarrow (x = y_1 \lor x = y_2) \rightarrow Ez(x) \) is no longer satisfied in 1 with respect to an assignment \( \alpha \) on which \( \alpha(y_1) = a \) and \( \alpha(y_2) = b \). For \( a \) is both in the domain of the outer quantifier, and the use of the backspace operator requires us to look at whether \( a \) satisfies \( x = y_1 \lor x = y_2 \) not

\(^{22}\) See for example Hodes (1984).
in 1 but rather in 0, which is the world of evaluation. In order to be able to prove the essentiality of parthood we would have to supplement the deductive system with appropriate axioms and rules to deal with the backspace operator.

Alternatively, we could resort to an actuality operator and offer the following version of the principle:

$$\exists x \phi(x) \rightarrow \exists y \Box ((Ey \leftrightarrow \forall x > (ACT \phi(x) \rightarrow Ex)) \land (Ey \rightarrow Fu(y, < ACT \phi >)))$$

The strategy in each case is to resort to additional expressive resources in order to liberate \( \phi \) from the scope of the box in the evaluation of the formula. The result is a principle that states the existence of a fusion, which exists in all and only worlds in which all actual satisfiers of the formula do and overlaps all and only objects which overlap with them. The essentiality of parthood is only to be expected.23

5. Conclusion

It is time to take stock. I have suggested that although natural arguments for the necessity and essentiality of parthood suffer from a crucial flaw, a friend of the partial identity model of parthood or the analogy between parthood and identity is in a position to improve on them by resorting to a further assumption, which would be unobjectionable even by the lights of those who regard parthood as a thoroughly contingent relation. Such theorists will instead object to the assumption that parthood is extensional in the way suggested by the axioms of classical mereology. In general, proponents of extensional mereological theories have reason to think that mereological fusions have their parts necessarily whenever they all exist. However, proponents of non-extensional approaches to mereology have no reason to accept even the essentiality of parthood for they leave room for mereologically coincident fusions with different modal profiles. A statue and a portion of clay, for example, may share all of their parts and yet differ with respect to what are possible parts for each of them.

23 Uzquiano (2011) explores a similar strategy for a modal theory of plural quantification.
Let me conclude with two speculative comments. One concerns kindred relations such as the element–set relation or the relation one object bears to some objects if and only if it is one of them. Unlike the case of the part–whole relation, there appears to be wide agreement that neither relation is ever a source of contingency. A derivation of the relevant claim in each case requires adjustments to the combination of set theory—or the theory of plural quantification—and modality, for example, which are remarkably similar to the ones we need for the part–whole relation. However, it turns out some of the moves available for the part–whole relation—and the element–set relation—are not available for the one of relation.²⁴

No one appears to be tempted to take seriously the possibility that the element–set relation—or the one of relation, for that matter—may fail to be extensional. However, there may be non-extensional relations in the vicinity of the element–set relation. Consider the relation of membership to a group. It seems to me that the case for the non-identity of the Supreme Court with a set of Supreme Court Justices is no weaker than the case for the non-identity of a statue with a portion of clay that constitutes it.²⁵ But if we make a distinction between the Supreme Court and the set of Supreme Court Justices, then we should presumably be able to make a broader distinction between membership of a group such as the Supreme Court and membership of a set such as the set of Supreme Court Justices. Once we do this, the question immediately arises of whether membership of a group is structurally analogous or different from the element–set relation. If the Supreme Court is to be different from the Special Committee on Judicial Ethics, then we had better allow membership of a group to be non-extensional. On this view, there would be no reason to expect membership to a group to never be a source of contingency.

Let me close with a second speculative comment concerning alternative interpretations of the box. Gareth Evans and Nathan Salmon thought that considerations similar to the Kripke–Marcus argument for the necessity of identity could help establish the determinacy of identity:

\[ x = y \rightarrow \text{Det } x = y \]

\[ \langle D = \rangle \]

²⁴ I have recently looked at this question in Uzquiano (2011).
It is only natural to ask whether the considerations we offer on behalf of friends of the analogy between identity and part–whole can now be extended to cover the determinacy of this relation:

\[ x \preceq y \rightarrow \text{Det } x \preceq y \quad (D \preceq) \]

It is not difficult to rehearse an argument. First one could extend unrestricted fusion in the following way:

\[ \exists y \text{Det Fu}(y, \langle \varnothing \rangle) \quad \text{Det – Fusion} \]

Given Tom, Dick, and Harry, it is not only determinately the case that they form a fusion; some fusion determinately fuses them. This would give one enough to argue for the determinacy of the part–whole relation. If \( x \) is part of \( y \), then by \( \text{Det – Fusion} \), there is a fusion \( z \), which is determinately a fusion of \( x \) and \( y \). \( x \) is therefore determinately part of \( z \). But on the other hand, if \( x \) is part of \( y \), then an object \( u \) will overlap \( z \) if and only if \( u \) overlaps \( y \), which, by CM, means that \( y \) and \( z \) are one and the same fusion. By Leibniz’s Law, whatever is true of \( z \) is true of \( y \). But since \( x \) is determinately part of \( z \), if \( x \) is part of \( y \), then \( x \) is determinately part of \( y \).

This is admittedly an argument for something, but it is not entirely clear what. The problem is that the argument will only be compelling to the extent to which the logical principles on which we rely remain in place when we introduce a “determinately” operator into the language of classical mereology. Unfortunately, different conceptions of indeterminacy will have a different impact on the question of what logical principles to accept. One approach to indeterminacy rejects bivalence and assigns a further truth-value to indeterminate sentences. The logic of indeterminacy is then supposed to build on a many-valued logic in which truth and falsity no longer exhaust the range of truth-values we can assign to sentences. Some such logics can still assume the connectives to be truth-functional, that is, the truth-value of a conditional, conjunction, disjunction, or negation is a truth function of the truth-value of the component sentences. But if a component sentence receives an intermediate truth-value, for example, then its negation could receive the same value.\(^{26}\) Similarly for a conditional. If it is

\(^{26}\) There are a variety of ways in which one could develop many-valued logic, and this is not the place to review them.
indeterminate whether $x$ is part of $y$, then the sentence $x$ is part of $y$ will receive an indeterminate truth value and the indeterminacy will probably extend to $x$ is identical to $z$ if $z$ is determinately a fusion of $y$ and $x$.

Perhaps there is a conception of indeterminacy that vindicates the classical, bivalent logical framework employed in the argument. Such a conception would be one on which parthood ought to come out as a relation that an object determinately bears to another if at all. But for now, it seems to me, we only have an argument in search of a conclusion.  

Appendix: A summary of the chapter in words of one syllable

Hud Hudson, who commented on an earlier version of this chapter, has kindly allowed me to include his summary of it in words of one syllable:

>If $x$ is $y$, then it must be the case that $x$ is $y$ (or, at least, it must be if both $x$ and $y$ are things). And if $x$ is in a set $S$, then it must be the case that $x$ is in the set $S$ (or, at least, it must be if both $x$ and $S$ are things). Now, let’s ask “Could parts be like that, too?” I mean, ‘to be a part of’ is so much like ‘to be the same as’ that you might think they will be like on this score, as well. That is, let’s ask “If $x$ is a part of $y$, must it be the case that $x$ is a part of $y$ (or, at least, must it be if both $x$ and $y$ have being)?” Of course, you might have thought the old view of parts says “Yes,” but not so; you will need to use at least one more claim to yield that view. But all is well; the claim you need is the right view to hold, and folks on each side of the old view of parts (both pro and con) will take it to be true, as well. Still, if you think that at some times parts can be had but need not be had by what has them, then you would do best to get rid of the old view of parts, since if you keep it, you will have to give up on that thought of what could have been.

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