Duplication and Collapse

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Abstract

Kris McDaniel has argued that strong composition as identity entails a principle he calls the Plural Duplication Principle (PDP), and that (PDP) is inconsistent with the possibility of strongly emergent properties. Theodore Sider has objected that this possibility is only inconsistent with a closely analogous principle he calls the Set Duplication Principle (SDP). According to Sider, however, the friend of strong composition as identity is under no pressure to accept (SDP). In this paper, I argue that she has strong reason to accept either (SDP) or a principle that is also inconsistent with the possibility of strongly emergent properties.

Keywords. Collapse; composition as identity; mereology; plural duplication.

Theodore Sider (2007, 2014) argues that strong composition as identity, that is, the view that any xx are identical to the fusion of the xx,[1] entails:

> **Collapse**: Something is among the xx iff it is a part of the fusion of the xx.

[1] A more accurate statement of the view would be to say that, for any xx and every y, if y is a fusion of the xx, the xx are identical to the y. But, for the sake of simplicity, I will assume both unrestricted composition and the uniqueness of composition. Nothing I say depends on these assumptions.

This has several disheartening consequences for the friend of strong composition as identity. However, Sider (2014) also argues that one consequence of Collapse is that it undermines Kris McDaniel's (2008) argument from the possibility of strongly emergent properties. If Sider is right, then Collapse has at least one heartening consequence for the friend of strong composition as identity. Sadly, he is not, or so I will argue.

The dialectic requires a little set up. First, we'll say that a function f is a *naturalness isomorphism* iff f is a 1-1 function that preserves perfectly natural properties and relations. Second, we'll say that x is a *duplicate* of y iff some naturalness isomorphism has domain $\{z|z<x\}$ and range $\{z|z<y\}$, where 'z<x' symbolizes "z is a part of x". Third, we'll say that a set X is a *set duplicate* of a set Y iff some naturalness isomorphism f has domain X and range Y and every member z of X is a duplicate of $f(z)$. Finally, we'll say that the xx are *plural duplicates* of the yy iff $\{z|z\prec xx\}$ is a set duplicate of $\{z|z\prec yy\}$, where 'z$\prec$xx' symbolizes "z is among the xx". Now, we may state the following principle:

> **Plural Duplication Principle (PDP):** If the xx are plural duplicates of the yy, the fusion of the xx is a duplicate of the fusion of the yy.

McDaniel argues that strong composition as identity entails **(PDP)**, and that **(PDP)** is inconsistent with the possibility of strongly emergent properties, which he defines as perfectly natural properties exemplified by composite material objects that do not locally supervene on the perfectly natural properties and relations exemplified by only atomic material objects (2008: 131). Since, according to McDaniel, strongly emergent properties are indeed possible, it follows that strong composition as identity is false.

Sider concedes that strong composition as identity entails **(PDP)**, but he argues that Collapse undermines the motivation for thinking it is inconsistent with the possibility of strongly emergent properties, which is that this possibility seems to entail:

(1) Possibly, for some x and y, and for some perfectly natural property F, the atomic parts of x are plural duplicates of the atomic parts of y, and yet x has F but y does not.

While this is clearly inconsistent with **(PDP)**,[2] Sider argues that, given Collapse, the plural terms "the atomic parts of x" and "the atomic parts of y" that occur in **(1)** fail to refer (2014: 217).[3] At most, what follows from the possibility of strongly emergent properties is:

(2) Possibly, for some x and y, and for some perfectly natural property F, {z|z<x and z is atomic} is a set duplicate of {z|z<y and z is atomic}, and yet x has F but y does not.

And this is perfectly consistent with **(PDP)**. Now, **(2)** might be inconsistent with an analogous principle, such as:

> **Set Duplication Principle (SDP):** If X is a set duplicate of Y, the fusion of the members of X is a duplicate of the fusion of the members of Y.

However, Sider argues that, while the friend of strong composition as identity is committed to **(PDP)**, she is under no pressure to accept **(SDP)** on the grounds that "she identifies an object o with some [xx] whenever [o is a fusion of the xx]; but she does not identify o with a set A whenever [o is a fusion of the members of A]" (2014: 219). Sider then goes on

[2]This is because, trivially, x and y are each members of {z|z is a part of x} and {z|z is a part of y} respectively, from which it can be shown that the former is not a set duplicate of the latter. Hence, x is not a duplicate of y, even though their respective atomic parts are plural duplicates of one another.

[3]This is because, if "the atomic parts of x" refers at all, it refers to a plurality zz such that something is among the zz iff it is an atomic part of x. But, provided that x has more than one atomic part, there can be no such zz. For, given Collapse, the existence of such zz would require that every part of x is an *atomic* part of x. Since x is not an atomic part of itself, there are no zz for "the atomic parts of x" to refer to. The same goes for "the atomic parts of y".

to argue that the friend of strong composition as identity *cannot* identify objects with sets in this way.[4]

Sider is correct that the friend of strong composition as identity cannot identify objects with sets in a way that would commit her to **(SDP)**. But she has strong reason to accept either **(SDP)** or a principle that is also inconsistent with the possibility of strongly emergent properties. For her view is largely motivated by the intuition that a full description of the parts is a full description of the whole, and given Collapse, the only good way she has of giving formal expression to this intuition is by accepting one of these principles.

According to McDaniel, **(PDP)** was intended to be "merely a formal restatement of Lewis's claim that, given composition as identity, a full description of the parts is a full description of the whole" (2008: 130). But, given Collapse, **(PDP)** fails to express this thought in full generality. This is easier to se by considering a particular instance of this general thought. Take Lewis's example of his two cats Possum and Magpie (1991: 85). It is intuitive that, once you give a full description of Possum and Magpie, there is nothing else you need to do to give a full description of their fusion. Talk of pluralities, together with the notion of plural duplication, was intended to allow us to express this thought by asserting:

(P) If the xx are plural duplicates of Possum and Magpie, the fusion of the xx is a duplicate of the fusion of Possum and Magpie.

But Collapse raises a problem. What are the referents of the plural term "Possum and Magpie" in the antecedent of **(P)**? Since our initial thought concerned a full description of Possum and Magpie, it should refer exclusively to Possum and Magpie. The problem is that, given Collapse, there

[4]This is because the same object can be both a fusion of the members of A and a fusion of the members of B even if A≠B, for A and B might correspond to different decompositions of that object.

is no plurality that has exactly Possum and Magpie among it. More carefully, there are no xx such that something is among the xx iff either it is identical to Possum or to Magpie. Any xx that have Possum and Magpie among them also have among them any parts of the fusion of the xx. This includes the fusion of the xx itself, every part of Possum and Magpie, as well as every fusion of any combination of those parts, such as the fusion of Possum's left ear and Magpie's tail. Hence, given Collapse, if "Possum and Magpie" in the antecedent of **(P)** refers to anything, it refers to the plurality of all and only the parts of the fusion of Possum and Magpie. But the thought we started with was not about a full description of all and only the parts of the fusion of Possum and Magpie—it was about a full description of only two of those parts, namely Possum and Magpie. Therefore, given Collapse, **(P)** does not capture this thought.

This problem results from a more general problem, namely that, given Collapse, talk of pluralities is too coarse-grained to allow us to refer to any particular level of decomposition of an object.[5] The fusion of Possum and Magpie has several levels of decomposition, such as the atoms that make up Possum and Magpie, and the elementary particles that make them up. Possum and Magpie themselves are one such level of decomposition. So it is no wonder that talk of pluralities does not allow us to refer exclusively to Possum and Magpie. In Sider's words, "plural expressions are never 'tied to a unique decomposition,' given strong composition as identity [...]. Unlike a singular term for a set, the plural referring expression 'the [xx]' does not 'divide reality' in a unique way: its sole function is to single out the portion of reality consisting of the fusion of the [xx]" (Sider 2007: 59).

Of course, given strong composition as identity, all the levels of decomposition of an object are identical to that object: the fusion of Possum and Mapgie is identical to Possum and Magpie, which are in turn identical to

[5]This is the same reason why "the atomic parts of x" and "the atomic parts of y" that occur in **(1)** above fail to refer, namely because they intend to refer to a particular level of decomposition of x and y respectively.

the atoms that make them up, which are in turn identical to the elementary particles that make up those atoms. However, it is clear that we *can* distinguish between them at least *in thought*. Consider again the thought that a full description of Possum and Magpie is a full description of their fusion. This is a case where we somehow manage to think about one particular level of decomposition of an object without thereby thinking about all of them. If the friend of strong composition as identity wants to be able to express this thought (and below I argue that she should), she needs a way to refer to Possum and Magpie collectively without thereby referring to all the parts of their fusion. Given Collapse, talk of pluralities won't do, but talk of sets will.

Talk of sets allows the friend of strong composition as identity to make finer distinctions than talk of pluralities. As we have seen, given Collapse, it is not true that, for every level of decomposition of an object, there are some xx such that something is among the xx if it is identical to some object in that level. By contrast, for every level of decomposition of an object, there is some set X such that something is a member of X iff it is identical to some object in that level. Thus, talk of sets, together with the notion of set duplication, allows her to express the thought that a full description of Possum and Magpie is a full description of their fusion by asserting:

(P') If a set X is a set duplicate of {Possum, Magpie}, the fusion of the members of X is a duplicate of the fusion of the members of {Possum, Magpie}.

Now, the friend of strong composition as identity does not merely want to say that a full description of Possum and Magpie is a full description of their sum. She wants to say that this is true of any number of material objects whatsoever that stand to an object the way Possum and Magpie stand to their fusion. In short, she wants to say that a full description of the parts is a full description of the whole. After all, why does anyone

end up believing in strong composition as identity? Surely one powerful reason is precisely because it promises to make sense of this intuition.

But now we are in a position to see that, given Collapse, **(PDP)** fails to express in full generality the thought that a full description of the parts is a full description of the whole. This is because **(PDP)** speaks of pluralities, and, given Collapse, for some material objects, there is no plurality that has exactly those objects among it, as the case of Possum and Magpie illustrates.[6] But **(SDP)** speaks of sets instead, and Collapse leaves unaffected the fact that, for any number of material objects whatsoever, there is a set that has exactly those objects as members. Hence, **(SDP)** says exactly what the friend of strong composition as identity wants to say.

I anticipate the objection that, for some instances of **(SDP)**, given Collapse, there will be no pluralities for the corresponding instances of "the members of X" and "the members of Y" to refer to, in which case **(SDP)** does no better than **(PDP)**. This objection trades on the ambiguity of the English phrase "the fusion of the members of", which could be understood in either of the following ways:

(i) w is a fusion of the members of X iff:

$\forall y(y{\in}X \rightarrow y{<}w) \wedge \forall y(y{<}w \rightarrow \exists z(z{\in}X \wedge Oyz))$.[7]

(ii) w is a fusion of the members of X iff:

$\forall y(y{\prec}$The Members of X $\rightarrow y{<}w) \wedge \forall y(y{<}w{\rightarrow}\exists z(z{\prec}$The Members of X $\wedge Oyz))$.

Depending on our choice of X, Collapse might well entail that there is no plurality of members of X for the relevant instance of "The Members of X" in (ii) to refer to. But "the fusion of the members of" in **(SDP)** is intended

[6] In saying "for some material objects", I intend to be quantifying singularly over objects. More carefully, given Collapse, it is possible that: $\exists x_1,...,\exists x_n((x_1 \neq ... \neq x_n) \wedge \sim \exists yy\forall z(z{\prec}yy{\leftrightarrow}z{=}x_1 \vee,...,\vee z{=}x_n))$.

[7] Here, 'Oyz' symbolizes "y overlaps z".

to be read in accordance to (i). Therefore, no instance of **(SDP)** contains any plural terms, so **(SDP)** remains unaffected by Collapse.

It is important to keep in mind that merely pointing out that **(SDP)** is in some way inadequate does not help the friend of strong composition as identity. What she needs is an adequate replacement for **(PDP)** that is also consistent with the possibility of strongly emergent properties. If **(SDP)** is in some way inadequate, what this shows at most is that **(SDP)** is not the principle she needs.

Perhaps **(SDP)** is not the only principle that captures the intuition that a full description of the parts is a full description of the whole. For instance, consider the following principle:

> **Individual Duplication Principle (IDP):** If x_1 is a duplicate of y_1,..., x_n is a duplicate of y_n, and for every perfectly natural relation R and any choice of j,...,k between 1 and n inclusive, R(x_j,...,x_k) iff R(y_j,...,y_k), the fusion of x_1,...,x_n is a duplicate of the fusion of y_1,...,y_n.[8]

While this principle contains no plural terms, and so it does not obviously suffer from the same problems as **(PDP)**, it is also inconsistent with the possibility of strongly emergent properties.

Everyone in the debate agrees that the possibility of emergent properties entails at least the possibility of a pair of non-duplicates such that the set of atomic parts of one is nevertheless a set duplicate of the set of atomic parts of the other. And, if this is possible, surely it is possible that the set of atomic parts of one of them is finite. Thus, let us consider such a pair, Arnie and Bertie, and let us stipulate that the set of atomic parts of Arnie has only two members, a1 and a2. Since the set of atomic parts of Arnie is a set duplicate of the set of atomic parts of Bertie, it follows that some naturalness isomorphism f has the former as domain and the

[8]Here, "the fusion of x_1,...,x_n" should be understood as denoting, if anything, a z such that x_1 is a part of z,...,x_n is of z, and for every part y of z, either y overlaps x_1,..., or y overlaps x_n

latter as range. Let 'b1' name f(a1), and 'b2' name f(a2). Since f preserves perfectly natural relations, it follows that:

(3) a1 is a duplicate of b1, a2 is a duplicate of b2, and for every perfectly natural relation R, R(a1,a2) iff R(b1,b2), R(a2,a1) iff R(b2,b1), and yet Arnie has F but Bertie does not.

And this is clearly a counterexample to **(IDP)**. Thus, **(IDP)** has no advantages over **(SDP)** from the point of view of the friend of strong composition as identity.[9]

In conclusion, the friend of strong composition as identity should accept either **(SDP)** or **(IDP)** because, given Collapse, she has no better way of saying exactly what she wants to say. Unless she finds another way of doing so, merely refusing to accept **(SDP)** and **(IDP)** on the grounds that she does not identify objects with sets is not an option. For, if she cannot formulate such a principle, that means her view lacks the resources to express an intuition that led her to adopt that very view in the first place. This is a bad dialectical situation to find oneself in.

Thus, the friend of strong composition as identity has limited options. First, she could provide a principle that both captures the intuition that a full description of the parts is a full description of the whole and is consistent with the possibility of strongly emergent properties. Although I have no argument that there is no such principle, it seems that any principle that adequately captures this intuition will rule out this possibility. Second, she could deny that we can distinguish between levels of decomposition. I argued that **(PDP)** does not express the intuition that a full description of the parts is a full description of the whole because this intuition distinguishes

[9]Someone could argue that, unlike **(IDP)**, **(SDP)** carries a commitment to sets. This may be true, but the friend of strong composition as identity is already committed to sets. As Sider (2007) has shown, Collapse prevents her from giving an interpretation of English sentences containing plural expressions, as well as an interpretation of monadic second-order logic, in terms of plural quantification.

between levels of decomposition. If we can have no such intuition, there is no reason to saddle her with either **(SDP)** or **(IDP)**. Again, this does not seem promising. Finally, she could accept either principle, and deny the possibility of strongly emergent properties.[10] I leave it to the reader to determine how plausible this last option is.

References

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[10]She could also deny that strong composition as identity entails Collapse, but then she cannot help herself to Sider's response to McDaniel's argument.