A SUDDEN COLLAPSE TO NIHILISM

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According to Composition is Identity, a whole is literally identical to the plurality of its parts. According to Mereological Nihilism, nothing has proper parts. In this note it is argued that Composition is Identity can be shown to entail Mereological Nihilism in a much more simple and direct way than the one recently proposed by Claudio Calosi.

Keywords: Composition, Identity, Mereological Nihilism

I. INTRODUCTION

Composition is Identity ('CII') is the thesis according to which, for every entity *x* and plurality of entities *Y*, if *x* is the mereological fusion of the *Y*, then *x* is *literally* identical to the *Y*:[1]

(CII) $\forall x \forall Y(xFuY \rightarrow x = Y)$

where the notion of fusion can be defined, as it is customary, as follows:

(F1) $zFuX =_{df} \forall x(Xx \rightarrow x < z) \wedge \forall w\left(w < z \rightarrow \exists x\big(Xx \wedge O(x,w)\big)\right)$

Claudio Calosi (2016a) has presented an ingenious argument to the effect that CII entails *Mereological Nihilism* (or '*Nihilism*' for short), defined as the thesis that everything is a mereological *atom*, that is, an entity without proper parts (or, alternatively, an entity that has only itself as a part):

(A) $A(x) =_{df} \forall y(y < x \rightarrow y = x)$

(CN) $\forall x A(x)$

Following Sider (2014), Calosi takes CII to entail the *Collapse Principle* (or '*Collapse*' for short), according to which, if an entity *x* fuses a plurality of entities *X*, then something is a part of *x* if, and only if, it is one of the *X*:

(CP) $\forall X \forall x\big(xFuX \rightarrow \forall y(Xy \leftrightarrow y < x)\big)$;

[1] In this note I will follow Calosi's (2016a) notation, so that, for instance, '*x*', '*y*', …, '*z*' stand for singular variables, '*X*', '*Y*', ..., '*Z*' stand for plural ones, '*Xy*' abbreviates '*y* is one of the *X*', '<' and '≪' express parthood and proper parthood, respectively, '$xFuY$' stands for '*x* fuses the *Y*', and '*O*(*z*,*y*)' stands for '*z* overlaps with *y*' (that is, '*z* has a part in common with *y*').

As he argues, *Collapse* entails the *Duplication Principle* (or '*Duplication*' for short), according to which each y of the X that an x fuses is a duplicate of x. In turn, *Duplication* entails a claim that is equivalent to *Nihilism*, namely that only *improper atomic pluralities* have fusions, where an *improper plurality* is 'a plurality that contains just one element' and an *improper atomic plurality* is 'a plurality that contains just one element that is furthermore a mereological atom' (Calosi 2016a: 223-4).

The aim of this note is to argue that *Collapse*, and so CII, entails *Nihilism* in a much more simple and direct way than the one presented by Calosi.

II. TWO DIRECT ARGUMENTS FOR NIHILISM

For every x, let a plurality of entities be *the improper plurality of* x if, and only if, it is the plurality of things that are identical to x. By the definition of fusion, it follows that every entity is the fusion of its improper plurality. If this is the case, however, *Nihilism* follows directly from *Collapse* without the need of *Duplication*:

> *The argument from improper pluralities*:
> *Proof*. Consider an entity x and its improper plurality X. By the definition of fusion, x fuses the X. By *Collapse*, every part of x is one of the X. Therefore, every part of x is identical to x. There is, thus, no y such that y is a part of x and different from x. x has thus no proper parts. By generalization, nothing has proper parts. QED[2]

The idea that, for every x, x fuses its improper plurality doesn't appear to be uncommon in the literature on composition.[3] However, appealing to improper pluralities and their fusions isn't necessary to move from *Collapse* to *Nihilism* without *Duplication*. In fact, *Nihilism* can also be

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[2] Calosi (2016b) discusses an argument according to which *Nihilism* can be derived without the need of *Collapse* and directly from CII and *Plural Covering*

(PC) $\quad \forall x \forall y (y < x \rightarrow \exists W (xFuW \wedge Wy))$

Proof. Assume y is part of x. Then, by PC, there is a plurality W that x fuses and such that y is one of the W. By CII x is identical to W. Therefore, by Leibniz's law, y is one of the x, and thus identical to x. x has thus no proper parts. QED However, as Calosi (2016b) himself remarks, even if expressions like 'y is one of x' (with both x and y singular) are allowed, the argument uses a strong version of Leibniz's law that is controversial in the debate on CII (see also below: section II and, in particular, footnote 5).

[3] The idea that every entity fuses its improper plurality (in this sense) appears to be endorsed, for example, by van Inwagen (1990), McDaniel (2010), Yi (1999), and Calosi himself (2016a), to name a few. Notice that van Inwagen (1990) and, following him, McDaniel (2010) *define Nihilism* as the thesis that the only pluralities that compose something are improper pluralities: 'Here is a precise statement of Nihilism: '($\exists y$ the xs compose y) if and only if there is only one of the xs' (van Inwagen 1990: 73); 'Compositional Nihilism: Necessarily, some objects, the xs compose y just in case there is exactly one of the xs and it is identical to y' (McDaniel 2010: 98).

proved to follow from *Collapse* by the principle of *Weak Company*, according to which, if *y* is a proper part of *x*, then there is some proper part *z* of *x* that is different from *y*

(WC) $\forall x \forall y \big(y \ll x \rightarrow \exists z(z \ll x \wedge z \neq y)\big)$

The argument from Weak Company:
Proof. Suppose *y* is a proper part of *x*. *x* fuses the plurality *W* of things that are either *x* or *y*. By *Collapse*, every part of *x* is identical to one of the *W*. Therefore, every part of *x* is identical to either *x* or *y*. It follows, thus, that there is no *z*, such that *z* is a proper part of *x* and different from *y*, thus contradicting *Weak Company*. Therefore, there is no *y* that is a proper part of *x*. By generalization, nothing has proper parts, and so *Nihilism* is true. QED

Weak Company is a weaker principle than *Weak Supplementation*

(WS) $\forall x \forall y \Big(y \ll x \rightarrow \exists z\big(z < x \wedge {\sim} O(z, y)\big)\Big)$

and strikes one as central to any plausible notion of parthood.[4] Therefore, even if *Weak Company* turned out not to follow from CII alone without using improper pluralities, CII-theorists would still seem to be independently committed to it. As I will argue in what follows, however, it appears to be possible to provide also improper pluralities sceptics with a direct, *Duplication*-free route from CII alone to *Nihilism*, as *Weak Company* can be proved to follow from CII without the need to appeal to improper pluralities.

III. WEAK COMPANY WITHOUT IMPROPER PLURALITIES

By defining the notion of mereological fusion as holding between an entity and a *plurality* of entities, (F1) appears to make it impossible to express the idea that an entity *z* fuses a *single* entity *y* without treating *y* as a '*de facto* improper plurality', as we might say. In fact, in order to say (or prove) that *x* fuses *y* in the sense of (F1), one seems to be obliged to allow the second argument place of 'is one of' to admit also of singular terms so as to make it possible to claim that each *one of y* is part of *x* and each part of *x* overlaps *one of y*. In this case, *y* would nevertheless share with its improper plurality its characterizing feature, that is: being such that each one of the entities it 'contains' are identical to *y*. It seems, however, that possible sceptics about *de jure* improper pluralities in Calosi's narrow sense are also likely to be sceptics about *de facto* improper pluralities in this broader sense.[5]

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[4] On *Weak Supplementation* see Varzi (2016: section 3.1).

[5] Interestingly, the way Sider (2007: 60) proves *Weak Supplementation* from (a stronger variant of) CII appears to treat *y* as a *de facto* improper plurality in this sense. In fact, right before proving *Weak Supplementation*, while arguing for the reflexivity of parthood from 'superstrong composition as identity', Sider (2007) first infers from his definition of composition (equivalent to our F1) that if *x* composes *x*, then *x* is part of *x*, and then comments in a footnote: 'I assume

One way in which those wishing to ban (both *de jure* and *de facto*) improper pluralities from their mereology could maintain the highly intuitive idea that an entity can be the fusion of a single entity[6] is to take the notion of fusion as capable *by definition* of holding between singular entities. For instance, a more neutral definition of fusion that is not implicitly biased towards improper pluralities in this sense appears to be the one saying that (i) while the standard definition of fusion holds for (proper) *pluralities* of entities, (ii) for every *singular* entity *y*, *z* fuses *y*, if and only if, *y* is a part of *z* and every part of *z* overlaps *y*:

(F2) $$zFuX =_{df} \forall x(Xx \rightarrow x < z) \wedge \forall w\Big(w < z \rightarrow \exists x\big(Xx \wedge O(x,w)\big)\Big)$$

$$zFuy =_{df} y < z \ \wedge \forall w\big(w < z \wedge O(y,w)\big)$$

Notice that (F2) appears to not only be plausible and intuitive on its own, but also perfectly in keeping with (F1). In fact, if *y* is part of *z* and such that it overlaps every part of *z*, then, by (F1), *z* clearly fuses the improper plurality of *y*, and thus (by treating *y* as a *de facto* improper plurality) *y* itself.

Once the notion of fusion is thus extended, the definition of CII must also be extended as to cover the case in which an entity *x* fuses a single entity *y*:

(CII*) $$\forall x \forall y \forall Y\big((xFuY \rightarrow x = Y) \wedge (xFuy \rightarrow x = y)\big)$$

Notice that *Nihilism* can*not* be proved from the second conjunct of (CII*) alone (in a way that would be parallel to the argument from improper pluralities). To appreciate this, consider that *Collapse* is proved by Sider (2014) and Calosi (2016a) as following from *Plural Covering*

(PC) $$\forall x \forall y\big(y < x \rightarrow \exists W(xFuW \wedge Wy)\big)$$ [7,8]

However, the corresponding 'singular' version of *Plural Covering* cannot be invoked here as requiring the use of (*de facto*) improper pluralities:

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that '*x*' is an allowable substitution for 'the *X*s' [*in the definition of fusion*] (if not, just substitute '*x*, *x*', and then infer by the principle of absorption […] that *x*, *x* = *x*) and that *x* is one of *x* […]' (Sider 2007: 60, footnote 25). However, the same assumption appears to be necessary to also argue, as Sider does, that from his definition of fusion it follows that, since *x* is part of *y*, and every part of *y* overlaps *x*, then *y* is composed of *x*.

[6] Every entity is at least a fusion of itself. Notice, however, that the idea that every entity that is fused by an entity is identical to it appears to require the validity of *Weak Supplementation*.

[7] *Plural Covering* can be proved from (F1) as follows: Suppose *y* is part of *x* and consider the plurality *W* of the things that are identical to either *x* or *y*. *y* is one of the *W* and, by (F1), *x* fuses *W*. Therefore, there is at least a plurality that *x* fuses and that contains *y*. QED

[8] *Proof of Collapse from Plural Covering*. Suppose *x* fuses the *X*. By the definition of fusion it follows that each of the *X* is part of *x*. Suppose, then, that *y* is a part of *x*. By *Plural Covering*, there is a plurality *W* such that *x* fuses *W* and *y* is one of the *W*. By CII and the symmetry and transitivity of identity, *W* is identical to *X*. Therefore, by (a plausible version of) Leibniz's law, *y* is one of *X*. QED

(PC*) $\forall x \forall y \big(y < x \to \exists w (xFuw \wedge wy)\big)$

Therefore, the most we can get in this case seems to be the principle obtained by (PC*) by substituting the 'one of' relation in (PC*) with *parthood*:

(PC**) $\forall x \forall y \big(y < x \to \exists w (xFuw \wedge y < w)\big)$

(PC**) follows directly by the fact that (by F2) every entity fuses itself. Clearly, however, nothing untoward appears to follow from (PC**). Similarly, the closest we can get from CII* to a singular version of *Collapse* seems to be the following principle:

(CP*) $\forall x \forall y (xFuy \to \forall z (z < x \leftrightarrow z < y)$

which follows from the fact that, by CII*, if *x* fuses *y*, then *x* is identical to *y* and so (by Leibniz's law) every part of *x* is also a part of *y* and vice versa. However, even this version of *Collapse* doesn't seem to have any undesirable consequence.

Given (F2), *Weak Supplementation* (and thus the weaker *Weak Company*) can be proved to follow from CII* without the need to use improper pluralities:

Proof. Suppose that *y* is a proper part of *x* and that every part of *x* overlaps *y*. By (F2), *x* is the fusion of *y*. By CII* *x* is identical to *y*. Therefore, *y* is not a *proper* part of *x*. *Contradiction*! Therefore, for every *y* and *x*, if *y* is a proper part of *x*, there is some part of *x* that doesn't overlap *y*. QED

We can thus conclude that, independently from what one may think about (both *de jure* and *de facto*) improper pluralities and their fusions, the path from *Collapse* to *Nihilism*—and, thus, from CII to *Nihilism*—appears to be much shorter and more direct than Calosi (2016a) suggested.[9]

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