Much Ado about Nothing

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1 Introduction

The point of this paper is to bring together three topics: non-existent objects, mereology, and nothing(ness). There are important inter-connections, which it is my aim to spell out, in the service of an account of the last of these.[1]

2 Non-Existent Objects

Let us start with non-existent objects. I will assume a certain view of these. I will not defend it here; this has been done elsewhere.[2] The point in what follows will be to apply it. So let me simply summarise the core points.

Some objects do not exist: fictional characters, such as Sherlock Holmes; failed objects of scientific postulation, such as the mooted planet Vulcan; God (any one that you don't believe in). Yet we can think of them, fear them, admire them, just as we can existent objects. Indeed, we may not know whether an object to which we have an intentional relation of this kind exists or not. We may even be mistaken about its existential status. The domain of objects comprises, then, both existent and non-existent objects. There is a monadic existence predicate, E, whose extension is exactly the set of existent objects; and the extension of an intentional predicate, such as 'admire', is a set of ordered pairs, the first of which exists, and the second of which may or may not. We might debate how to understand existence. In the present context, I will assume that to exist is to have the potential to enter into causal interactions.

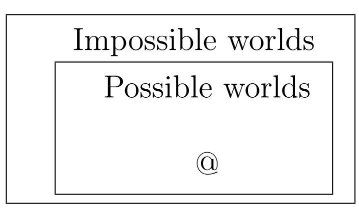
[1]Some of the following material also appears in Priest (2014), esp. 6.13, where much more is made of nothing(ness).

[2]See Priest (2005).

Next, we can quantify over the objects in any domain, whether or not they exist. Thus, if I admire Sherlock Holmes, I admire *something*; and I might want to buy *something*, only to discover that it does not exist. I write the particular and universal quantifiers as $\mathfrak{S}$ and $\mathfrak{A}$, respectively. Normally, one would write them as $\exists$ and $\forall$, but given modern logical pedagogy the temptation to read $\exists$ as 'there exists' is just too strong. Better to change the symbol for the particular quantifier (and let the universal quantifier go along for the ride). Thus, one should read $\mathfrak{S}xPx$ as 'some x is such that Px' (and $\mathfrak{A}xPx$ as 'all x are such that Px'). It is not to be read as 'there *exists* an x such that Px' — or even as 'there *is* an x such that Px', being and existence coming to much the same thing. The quantifiers work, note, in exactly the familiar fashion. In particular, $\mathfrak{S}xPx$ is true iff something in the domain of quantification satisfies Px. It is just that the domain may contain both existent and non-existent objects. If one wants to say that there *exists* something that is P, one uses the existence predicate explicitly, thus: $\mathfrak{S}x(Ex \wedge Px)$.

What, however, about the properties of non-existent objects? Consider the first woman to land on the Moon in the 20th century. Was this a woman; did she land on the Moon? A natural answer is 'yes': an object, characterised in a certain way, has those properties it is characterised as having (the Characterisation Principle). That way, however, lies triviality, since one can characterise an object in any way one likes. In particular, we can characterise an object, a, by the condition that $x = x \wedge A$, where A is arbitrary. Given the Characterisation Principle, it follows that $a = a \wedge A$, an so A.

How, then, to proceed? There is a plurality of worlds. Some of these are possible; some are impossible. The actual world, @, is one of the possible ones:



If we characterise an object in a certain way, it does indeed have the properties it is characterised as having; not necessarily at the actual world, but at some world (maybe impossible). Specifically, suppose we characterise an object as one satisfying a certain condition, Px. We can write this using an indefinite description operator, ε, so that εxPx is 'an x such that Px'. In fact, in what follows, we will be concerned only with cases in which a unique object satisfies the characterisation. In such cases, we can take the characterisation to be of the form ‘an object uniquely satisfying Px’.

Given that we play our paraconsistent cards right, for *any* condition, Px, this is going to be satisfied at *some* world.[3] If @ is one such, the description denotes an object that satisfies the condition there. If not, we select some other world where it is satisfied, and some object that satisfies it there. The description denotes that. Hence, we know that if $\mathfrak{S}xPx$ is true at @, so is $P(\varepsilon xPx)$, that is $\mathfrak{S}xPx \vdash P(\varepsilon xPx)$. (Call this the *Description Inference*.) But if not, $P(\varepsilon xPx)$ is true at at least some world. Thus, consider the description εx(x is the first woman to land on the Moon in the 20th century). Let us use ‘Selene’ as a shorthand for this. Then we can think about Selene, realise that Selene is non-existent, etc. Moreover, Selene does indeed have the properties of being female and of landing on the Moon — but not at the actual world. (No existent woman was on the Moon in the 20th century; and no non-existent woman either: to be on the Moon involves causally interacting with it, and therefore to exist.) Selene has those properties at a (presumably possible) world where NASA decided to put a woman on one of its Moon flights.

3 Mereology

So much for non-existent objects. Now let us turn to the subject of mereology. Many things have parts. Cars have wheels and engine blocks; people have hands and feet; countries have states or counties. Mereology is the investigation of the part/whole relation. In normal parlance, we would not normally think of the whole as a part of itself. But it does not harm to think of it as so — as a limiting case. Parts in the usual sense are *proper* parts.

Standard mereology may be articulated as a theory in first-order logic. Details can be found in Varzi (2009). Here I just give an informal exposition of the relevant parts of the theory.[4] There is one non-logical predicate, a binary relation, $<$. $x < y$ is understood as: x is a *proper part* of y. A standard assumption (that I will not challenge here) is that $<$ is transitive and anti-symmetric:

- $(x < y \land y < z) \to x < z$
- $x < y \to \neg y < x$

Parthood in general, $\leq$, can be defined in the obvious way. $x \leq y$ is: $x < y \lor x = y$. A fundamental relation in mereology is that of *overlap*. Two

[3] Not necessarily, *nota bene*, by something that exists at that world.

[4] The exposition uses some set-theoretic apparatus, but ‘$x \in \Sigma$’ can simply be replaced by $A(x)$, where $\Sigma = \{x : A(x)\}$.

things overlap if they have a part in common. Writing $\circ$ for overlap, we may define $x \circ y$ as : $\mathfrak{S}z(z \leq x \wedge z \leq y)$. Clearly, every object overlaps itself and all of its proper parts.

Next topic: mereological summation, or fusion. Some things when fused together make a single whole. Thus, your car is the fusion of all its parts, and you are the fusion of all yours. If Σ is a set of objects, I will write their fusion as $\oplus\Sigma$. The *Principle of Composition* tells us that for appropriate Σ, the members of Σ have a fusion:

(1) $\mathfrak{S}y\mathfrak{A}x(x \circ y \leftrightarrow \mathfrak{S}z \in \Sigma\ x \circ z)$

(Something overlaps the fusion of a set just if it overlaps some member.) If we define $\oplus\Sigma$ as $\varepsilon y\mathfrak{A}x(x \circ y \leftrightarrow \mathfrak{S}z \in \Sigma\ x \circ z)$, then by the Description Inference, we have:

(2) $\mathfrak{A}x(x \circ \oplus\Sigma \leftrightarrow \mathfrak{S}z \in \Sigma\ x \circ z)$

Mereological identity conditions can be given in various ways. A simple way in the present context is as follows. If two objects are distinct, it is natural to assume that some object overlaps at least one of them, but not the other. In other words, two objects are the same if everything that overlaps one, overlaps the other: $\mathfrak{A}x((x \circ y \leftrightarrow x \circ z) \rightarrow y = z)$. From this it follows immediately that the mereological sum of any set with one is unique.

We now come to the main question to be addressed. I said that every appropriate set has a fusion. But what does 'appropriate' mean here? For a start, there is near-universal consensus that Σ must be non-empty. For parts to fuse, there must be some of them. Beyond that, there is a debate in standard mereology between those who think that any non-empty collection of objects has a sum (unrestricted, or general, composition), and those who think that not all do (restricted, or special, composition).[5] There must be some kind of coherence between objects for them to fuse. If $\Delta = \{$the Buddha's left ear-lobe, the rings of Saturn, the Empire State Building$\}$, then Δ hardly seems to fuse into a coherent whole.

Who is right? From a noneist perspective, both sides can be right!—in a way. Like all noun phrases, '$\oplus\Sigma$' ('the whole constituted by fusing exactly the members of Σ') refers to something—at least if the set Σ is definable (i.e., specifiable with a noun phrase). After all, we can think about it, consider whether or not it exists, and so on. In other words, for any non-empty set, Σ, $\mathfrak{S}z\ z = \oplus\Sigma$. There is no guarantee that it does what one might think it

[5]Lewis (1991) is a general compositionalist. Van Inwagen (1990) is a special compositionalist. An extreme example of the special compositionalist is the mereological nihilist, such as Unger (1979), who holds that no sets fuse.

does, though: that it has exactly the parts in Σ: $\mathfrak{A}x(x \circ \oplus\Sigma \leftrightarrow \mathfrak{S}z \in \Sigma\ x \circ z)$. For that we need the truth of (1), and there is no guarantee that this holds. When Σ is Δ, this seems somewhat implausible.

It is frequently objected to noneism that it has a “bloated ontology”. In more prosaic (and less inflammatory) terms, it requires us to accept more objects to exist, or subsist, than are required by necessity. One issue here is what, exactly, necessity requires, and in particular whether there is a workable account of intentionality without non-existent objects. However, the objection is not a very good one anyway. Objects that do not exist, do not exist; they are not; they are not part of one's ontology. (Recall the Greek meaning of the root: *ontos* = being.) They have, as Meinong put it, *Nichtsein*, non-being. I suspect that the objection gets it pull from confusing Meinong (and noneism), with the pre-‘On Denoting’ views of Russell, who did give all objects some kind of being: subsistence, if not existence. Be that as it may, it is frequently objected to general compositionalists that they, too, have “bloated ontology” of strange objects such as $\oplus\Delta$. The reply is the same. Such objects are purely objects of thought. They have no being, and so are not part of an ontology.

In sum then, for any non-empty (definable) set, Σ, there is an object $\oplus\Sigma$. This has exactly the parts which are members of Σ, but maybe not at the actual world. It has them at some worlds—maybe impossible worlds. For these to include the actual world, (1) has to hold there. This does not answer the question as to which Σs it does hold for. The natural idea is that it will hold if the members of Σ are not a disparate collection, that is, Σ does not have some members which fail to “cohere” with others. How to flesh out this idea is not at all obvious. However, we do not need to settle the matter here.[6] We may leave it at this point, and turn to the third subject on our agenda: nothing(ness).

4 Nothing(ness)

‘No’ words and phrases are frequently used as quantifier phrases. When Alice says that she can see no one on the road, she means that for no person, x, can she see x on the road. But ‘nothing’, can also be a noun phrase. We may say that Hegel and Heidegger both wrote about nothing. Here, the word is not a quantifier phrase. This does not mean that for no x did Hegel and Heidegger write about x. It is a noun-phrase. We can say that they said different things about *it*. *It* is also that out of which the Abrahamic God is supposed to have created the world. It is nothing (noun phrase) that will

[6]Some interesting possibilities are discussed in Hudson (2006).

concern us now. And by nothing, I mean *absolutely nothing*: the absence of every thing. To avoid confusion with the quantifier, I will write this in boldface, thus: **nothing**. Without boldfacing, the word is the quantifier.

Nothing is an object. We can, for example, think about it. (What things were like before God created the world.) Heidegger, indeed, claimed that one can have a direct phenomenological experience of **nothing**:[7]

> Does such an attachment, in which man is brought before the nothing itself, occur in human existence?
>
> This can and does occur, although rarely and only for a moment, in the fundamental mood of anxiety (*Angst*)...
>
> Anxiety reveals the nothing.

One does not have to share Heidegger's gothic pessimism, to agree that one can have a phenomenological experience of **nothing**. All you have to do is think about it. This does not, of course, entail that **nothing** exists. One can have direct phenomenological acquaintance with non-existent objects. Indeed, **nothing** does not exist since, presumably, it is impossible for it to enter into causal interactions with things.

Of more importance is that **nothing** is a contradictory object. Since it is an object, it is something.[8] But it is the *absence* of all things too; so **nothing** is nothing. It is no thing, no object. Here, Heidegger got it exactly right:[9]

> What is the nothing? Our very first approach to the question has something unusual about it. In our asking we posit the nothing in advance as something that 'is' such and such; we posit it as a being. But that is exactly what it is distinguished from. Interrogating the nothing — asking what, and how it, the nothing, is — turns what is interrogated into its opposite. The question deprives itself of its own object.

Nothing, then, is a most strange, contradictory, thing. It both is and is not an object; it both is and is not something. How to make sense of this?

[7] Heidegger (1977), p. 102 f.

[8] Philosophers often wonder why there is something rather than nothing. However, even if there were nothing—even if everything would be entirely absent—there would be something, namely **nothing**.

[9] Heidegger (1977), p. 98f.

5 The Empty Fusion

Let us return to mereology. What could nothingness be? An obvious answer is that it is the fusion of the empty set, $\oplus\emptyset$. **Nothing** is what you get when you fuse no things. There is nothing in the empty set, so **nothing** is absolute absence: the absence of all objects, as one would expect. As an object, $\oplus\emptyset$ is just as as good as $\oplus\Sigma$ for any other Σ. To ensure that it really does satisfy its defining condition, we have to take the empty set to be one of those for which we can apply the schema (1). But this does not seem problematic. The members of the empty set are not a disparate collection; it has no members which fail to cohere with others—whatever that means. The members are all as intimately connected as one might wish!

It is not clear to me why standard mereology is not normally formulated in this way. It is certainly technically unproblematic. It can be formulated as in Bunt (1985), the fusion of the empty set making the collection of all the parts of an object a Boolean algebra.[10] And the thought that the fusion of the empty set is the null object has been made by a few intrepid spirits.[11] There is, in fact, an interesting little bit history here. No less a person than Carnap suggested that one should accept a null object (though hardly in a way that a noneist might care for):[12]

> It is possible ... to count among the things also the null thing ... characterised as that thing which is part of every thing. Let us take 'a_0' as the name for the null thing ... 'a_0' seems a natural and convenient choice as descriptum for those descriptions which do not satisfy the uniqueness condition.

There is a certain irony here. Some years earlier, Carnap famously castigated Heidegger for his obscurantism, citing his ruminations on **nothing**:[13]

> The construction of sentence (1) ['We seek the Nothing'[14]] is simply based on the mistake of employing the word 'nothing' as a noun, because in ordinary language it is customary to use it in this form in order to construct negative existential statements. ...

[10]Such a possibility is also noted in Roeper (1997), p. 253; Forrest (2002), p. 81; and Arntzenius (2012), p. 136.

[11]For example, Martin (1965) and Bunge (1966)

[12]Carnap (1947), pp. 36-37.

[13]Carnap (1932), pp. 70f of the English translation.

[14]This translation already makes the sentence sound strange. A better translation is simply: we seek **nothing**. German capitalises all nouns, and often puts a definite article before abstract nouns, where English has none. Possibly, Heidegger chooses to use the article to distinguish the noun from the quantifier ('nichts').

> [E]ven if it were admissible to use ‘nothing’ as a name or description of an entity, still the existence of this entity would be denied by its very definition, whereas sentence (3) [‘The Nothing exists only ...’] goes on to affirm its existence.

Carnap, in his turn, was criticised by Geach for advocating an object that ‘exists nowhere and nowhen’.[15] From a noneist perspective, Geach's criticism is, in fact, a term of endorsement. Of course $\oplus\emptyset$ does not exist—as I have already noted. Yet is a perfectly good object; and one, indeed, that has the properties one would expect.

6 Mereology with the Empty Fusion

But how best to formulate mereology with the empty fusion? Let us write $\mathbf{n}$ for $\oplus\emptyset$. We may now proceed much as before. As in set-theory, each object has two improper parts: itself and $\mathbf{n}$. $x < y$ still means that x is a proper part of y. We require that:

- $\neg\mathbf{n} < x$
- $\neg x < \mathbf{n}$

Nothing is not a proper part of anything, and itself has no proper parts.

$x \leq y$ is defined exactly as before. It follows that $\mathbf{n} \leq \mathbf{n}$. ‘$x$ is a part of y (in the most general sense)’, $x \leq_n y$, can be defined in the obvious way, as: $x = \mathbf{n} \vee x \leq y$. So for any y, $\mathbf{n} \leq_n y$. The empty fusion is a part of everything, as Carnap averred.

Overlap is also defined exactly as before: $x \circ y$ is $\mathfrak{S}z(z \leq x \wedge z \leq y)$. It follows that $\mathbf{n} \circ \mathbf{n}$ (since $\mathbf{n} \leq \mathbf{n}$). Note that it would not be appropriate to replace ‘$\leq$’ with ‘$\leq_n$’, since it would then follow that all thing overlap with each other. (In the same way, one does not say that two sets overlap just because the empty set is a subset of each.) Fusion, too, is defined as before. So for appropriate Σ (including $\emptyset$): $\mathfrak{A}x(x \circ \oplus\Sigma \leftrightarrow \mathfrak{S}y(y \in \Sigma \wedge x \circ y))$. Note that the definition of $\oplus$ does not involve $\mathbf{n}$, so our definition of $\mathbf{n}$ is not circular.

Now for the fireworks. Since $\neg\mathfrak{S}y\, y \in \emptyset$, it follows from the definition of $\mathbf{n}$ that that $\mathfrak{A}x\neg x \circ \mathbf{n}$. Hence, $\neg\mathbf{n} \circ \mathbf{n}$. By definition of $\circ$, $\mathfrak{A}z(\neg z \leq \mathbf{n})$, so $\neg\mathbf{n} \leq \mathbf{n}$. By now, it is clear that the theory is inconsistent. The underlying

[15] Geach (1949), p. 522.

logic must therefore be a paraconsistent logic. It does not matter much which one: the amount of logic we are using is pretty minimal.[16]

Let us continue. Since $\neg\mathbf{n} \leq \mathbf{n}$ it follows that $\neg\mathbf{n} < \mathbf{n} \wedge \mathbf{n} \neq \mathbf{n}$. So $\mathbf{n} \neq \mathbf{n}$. But $x = \mathbf{n} \vee x \neq \mathbf{n}$. Reasoning by cases, and using the substitutivey of identicals: $x \neq \mathbf{n}$. Hence $\neg\mathfrak{S}x\, x = \mathbf{n}$. But of course, $\mathfrak{S}x\, x = \mathbf{n}$. (That is a logical truth.) To be an object is to be something. So what we have seen is that **nothing** both is and is not an object. This is exactly what one should expect, as we have already seen—and as both Carnap and Heidegger agreed!

Of course, some will take the fact that we have ended up with contradictions as a sign that the formalisation is incorrect. (And there are consistent formulations of mereology with the empty fusion, e.g., that of Bunt (1985), which I have already noted.[17]) Personally, I don't see it that way. The approach I have laid out is simple and natural. Its coherence can be demonstrated by a simple model, which I spell out in a technical appendix to this paper. And the inconsistency of the theory of **nothing** is exactly what one should expect, given its nature.

7 Conclusion

Let me conclude by summarising the main points of the paper. Some objects do not exist. Yet they can, amongst other things, be the targets of intentional acts. If one is characterised in a certain way, it will have its characterising properties at some worlds. One of these is the actual world if, at it, something satisfies the characterisation. Every collection of objects has a mereological fusion. This will satisfy its defining characterisation if its members are not a disparate bunch. The members of the empty set, in particular, have such a fusion. The fusion of the members of the empty set is **nothing**. This is something, but since it is the absence of everything, it is nothing too.

Nothing has always been a notion that philosophers have found puzzling.[18] For a start, it appears to be contradictory (even when one does not confuse a quantifier with a noun-phrase). The solution to that bit of the puzzle is to accept the appearances at face value. The techniques of noneism, mereology, and paraconsistency show exactly how.[19]

[16]For the sake of definiteness, we may take it to be the relevant logic BX. See Priest (2002), Sec. 6.7. This contains the Principle of Excluded Middle, which we will need in a moment.

[17]In this, contradiction is avoided by defining overlap differently. $x \circ y$ is $\mathfrak{S}z(x \neq \mathbf{n} \wedge z \leq_n x \wedge z \leq_n y)$. It then no longer follows that $\mathbf{n} \circ \mathbf{n}$ or that $\neg\mathbf{n} \leq \mathbf{n}$.

[18]For a review of the discussions, see Sorensen (2012).

[19]Versions of this paper were given in the first half of 2013 at Ohio State University, Cambridge University, the University of Barcelona, and Melbourne University. Thanks go

8 Technical Appendix

In this appendix I spell out a simple interpretation of the mereological theory of **nothing**. Essentially, it is the four-valued Boolean algebra:

$$
\begin{array}{ccccc}
 & & \top & & \\
 & \nearrow & & \nwarrow & \\
a & & & & b \\
 & \nwarrow & & \nearrow & \\
 & & \bot & &
\end{array}
$$

where everything is classical, except that the bottom element is both self-idential and non-self-identical. The construction obviously extends to an arbitrary Boolean algebra.

To keep things simple, I set this up as a first-order interpretation for the paraconsistent logic LP.[20] The domain of the interpretation is $\{\top, a, b, \bot\}$. I will use the elements as their own names; and if I say that an open sentence is true in the interpretation, this means that it is true for all values of the variables.

The constant **n** denotes $\bot$. The interpretations of the two predicates are as follows. ($+$ indicates membership of the extension; $-$, membership of the anti-extension; and $\pm$, both.)

$<$	$\top$	a	b	$\bot$
$\top$	$-$	$-$	$-$	$-$
a	$+$	$-$	$-$	$-$
b	$+$	$-$	$-$	$-$
$\bot$	$-$	$-$	$-$	$-$

$=$	$\top$	a	b	$\bot$
$\top$	$+$	$-$	$-$	$-$
a	$-$	$+$	$-$	$-$
b	$-$	$-$	$+$	$-$
$\bot$	$-$	$-$	$-$	$\pm$

Clearly, $\neg\bot < x$ and $\neg x < \bot$ are both true, and so is $\bot = \bot \wedge \neg \bot = \bot$.

Computing the interpretations of $\leq$ and $\circ$, we obtain the following:

$\leq$	$\top$	a	b	$\bot$
$\top$	$+$	$-$	$-$	$-$
a	$+$	$+$	$-$	$-$
b	$+$	$-$	$+$	$-$
$\bot$	$-$	$-$	$-$	$\pm$

$\circ$	$\top$	a	b	$\bot$
$\top$	$+$	$+$	$+$	$-$
a	$+$	$+$	$-$	$-$
b	$+$	$-$	$+$	$-$
$\bot$	$-$	$-$	$-$	$\pm$

We can see that $\bot \leq \bot \wedge \neg \bot \leq \bot$ and $\bot \circ \bot \wedge \neg \bot \circ \bot$.

The denotations of the fusion terms are specified as follows.

to members of the audiences for their comments. Thanks also go to an anonymous referee for the *Australasian Journal of Logic*.

[20]See Priest (2002).

- If $\Sigma \neq \emptyset$ and $\bot \notin \Sigma$, $\oplus\Sigma$ is $Lub(\Sigma)$ (the least upper bound of Σ). [Case 1]

- If $\Sigma \neq \emptyset$ and $\bot \in \Sigma$:

  - if $\Sigma = \{\bot\}$, then $\oplus\Sigma$ is $\bot$ [Case 2a]
  - otherwise, $\oplus\Sigma$ is arbitrary [Case 2b]

- If $\Sigma = \emptyset$, $\oplus\Sigma$ is $\bot$ (of course) [Case 3]

Since there is no conditional in the language, we cannot verify (2) exactly, but we can show that the two sides of the biconditional have exactly the same truth values—which would suffice for the truth of the universally quantified biconditional if one were in the language. There is one exception. There is no value for $\oplus\Sigma$ which can do this in the Case 2b. This is not, then, a model of general composition.

Let us prove these facts. We are concerned with the biconditional: $x \circ \oplus\Sigma \leftrightarrow \mathfrak{S}z \in \Sigma\, x \circ z$.

Consider an instance of the Case 1, Σ is $\{\top, a\}$. The biconditional comes to this: $x \circ \top \leftrightarrow (x \circ \top \vee x \circ a)$. If x is $\bot$, both sides are just false. Otherwise, both sides are just true. The other instances of this case are the same.

In the Case 2a, the biconditional reduces to: $x \circ \bot \leftrightarrow x \circ \bot$. The result in this case is trivial.

Now consider an instance of Case 2b, Σ is $\{\bot, a\}$. The biconditional reduces to this: $x \circ s \leftrightarrow (x \circ \bot \vee x \circ a)$. Since $\bot \circ \bot$, and $a \circ a$, $\bot \circ s$ and $a \circ s$. There is no s for which this is true. The other instances of this case are similar.

Finally, and crucially, Case 3. Take the standard definition of the empty set: $\emptyset = \{x : x \neq x\}$. Then the biconditional reduces to: $x \circ \bot \leftrightarrow \mathfrak{S}z(z \neq z \wedge x \circ z)$. If x has any value other than $\bot$, the left hand side is just false, as is the right hand side. For the only z that could make the first conjunct true is $\bot$, and this does not make the second conjunct true. If, on the other hand, x is $\bot$, the left hand side is true and false. The right hand side is true (take $\bot$ for z). But it is also false, that is, its negation is true, since this is equivalent to $\mathfrak{A}z(z = z \vee \neg x \circ z)$, which is a logical truth.

There is a variation on the model which is worth noting. We change the entry for $\langle \bot, \top \rangle$ for $<$ from $-$ to $\pm$, so that $\bot$ both is and is not a proper part of $\top$, thus:

$<$	$\top$	a	b	$\bot$
$\top$	$-$	$-$	$-$	$-$
a	$+$	$-$	$-$	$-$
b	$+$	$-$	$-$	$-$
$\bot$	$-$	$-$	$-$	$\pm$

This does the same to the corresponding entries in the tables for $\leq$ and $\circ$. Since the connectives are monotonic, everything true/false before remains so. The arguments that the fusions have the appropriate properties also go through, except in the instance in Case 1 where $\Sigma = \{a, b\}$. ($\bot$ overlaps $\top$, but neither of a and b.) But now, in Case 2b if $\top \in \Sigma$, we can define $\oplus\Sigma$ as $\top$, and the argument goes through. For example, if Σ is $\{\bot, a, \top\}$, the biconditional is $x \circ \top \leftrightarrow (x \circ \bot \vee x \circ a \vee x \circ \top)$. If x is a, b, or $\top$, both sides are true only. If x is $\bot$, both sides are both true and false, as is easily checked. We can think of $\oplus\{\bot, a, b, \top\}$ as the opposite of **nothing**—namely **everything**.

We see, then, that the mereological theory of **nothing** is a very well behaved theory.

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