The Subtraction Arguments for Metaphysical Nihilism: compared and defended

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1. The subtraction argument, originally put forward by Thomas Baldwin (1996), is intended to establish Metaphysical Nihilism, the thesis that there could have been no concrete objects. Some modified versions of the argument have been proposed in order to avoid some difficulties faced by the original argument.

In this paper I shall concentrate on two of those versions, the so-called subtraction argument* (presented and defended in Rodriguez-Pereyra 1997, 2000, 2002), and Efird and Stoneham's recent version of the argument (Efird and Stoneham 2005). I shall defend the subtraction argument* from Alexander Paseau's (2006) objection that because a crucial premise of the subtraction argument* may have no plausibility independent from Metaphysical Nihilism, the subtraction argument* is not suasive. Although Paseau focuses on the subtraction argument*, I shall point out that Efird and Stoneham could reply to Paseau's objection in the same way. Thus there are (at least) two suasive versions of the subtraction argument that establish Metaphysical Nihilism. But are those two arguments equally good? I shall argue that the subtraction argument* is preferable to Efird and Stoneham's argument.

2. The informal version of the subtraction argument, as formulated by Baldwin, has the following premises:

(A1) There is a possible world with a finite domain of concrete objects.
(A2) These objects are, each of them, things which might not exist.
(A3) The non-existence of any one of these things does not necessitate the existence of any other such things.

How do these premises support Metaphysical Nihilism? (A1) guarantees that there is a world with a finite number of concrete objects. Focus on one such world and call it *w*. Select any concrete thing *x* in *w*. By (A2) there is a world where *x* does not exist. By (A3) one of the worlds where *x* does not exist contains only the things that exist in *w* except everything whose non-existence is implied by the non-existence of *x*. In metaphorical terms, (A2) and (A3) allow us to subtract any concrete object that exists in *w*, without adding any other such objects. So if we start with a world like *w*, with a finite number of concrete objects, we eventually reach, by repeated application of the subtraction procedure guaranteed by the second and third premises, a world in which there are no concrete objects. Therefore, there could have been no concrete objects (Baldwin 1996: 232).

But is premise (A1) true? There are reasons to doubt that it is. First, one may think that necessarily all concrete objects have some spatiotemporal parts, that necessarily if something has a spatiotemporal part then it has infinitely many, and that necessarily the spatiotemporal parts of a concrete object are concrete objects. If so it is necessary that concrete objects have infinitely many concrete parts.[1] Second, one may think that it is necessary that if something exists then sets having it as ur-element exist, and that necessarily sets whose ur-elements are concrete are themselves concrete. If either of these thoughts is true then there is no possible world having some concrete objects and only finitely many such objects. If so, (A1) is not true.[2]

Of these thoughts I accept the first and reject the second, since I reject that sets with concrete ur-elements are concrete. But since both thoughts might be acceptable to some philosophers, and I would like Metaphysical Nihilism to be acceptable to as many philosophers as possible, I shall try to reformulate the subtraction argument so that the problems posed by these thoughts can be avoided. To this end I propose to modify the subtraction argument so as to apply to concrete* objects, where a concrete* object is an object that is (a) concrete, (b) non-set-constituted, and (c) a maximal occupant of a connected spatiotemporal region.[3]

By a spatiotemporal region I mean a sum of one or more spatiotemporal points; a region is connected if and only if any points in it can be joined by a path of points in it and disconnected if and only if it is not connected. An object *x* is a maximal occupant of a connected region if and only if *x* exactly occupies a connected

[1] Note that this is not the claim that all parts of a concrete object must be concrete (which is what Rodriguez-Pereyra 1997: 163 is committed to). This claim, together with certain assumptions about what mereological sums there are and what the mark of concreteness is, is false, as pointed out by Efird and Stoneham (2005: 313, fn. 27).

[2] I am assuming, without argument, and shall continue to assume so, that spatiotemporal regions and points are not concrete.

[3] This definition of concrete* object is a modification of the definition in my 1997. In that definition I required that a concrete* object be memberless, whereas I now require that it be non-set-theoretical. For the reasons for this modification see footnote 5 below.

region and for all y all of whose parts occupy spatiotemporal regions, if x is a proper part of y, then y occupies a disconnected region (Cf. Rodriguez-Pereyra 1997: 163).[4]

By a set-constituted object I understand any object which is either a set, or a proper class, or an ordered n-tuple, or which has a set, a proper class, or an ordered n-tuple as a part. A non-set-constituted object is one that is not a set-constituted object.[5]

I shall not propose any definition of concrete objects, but I shall uncontroversially assume that it is a necessary condition of any object being concrete that it is spatiotemporal. Clearly conditions (b) and (c) are compatible with condition (a) and, provided it is necessary that abstract objects are set-constitued objects, necessarily any object satisfying (b) is also a concrete object, in which case condition (a) is redundant. But since there is virtually no consensus regarding the definition of abstract and concrete objects, I have added (a) to make sure that concrete* objects are concrete objects.

Is there a world with only finitely many concrete* objects? It seems so. At least its existence is not ruled out by the considerations above. For although whenever there are any concrete* objects, there are concrete objects, even if set-theoretical

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[4] The clause 'all of whose parts occupy spatiotemporal regions' was not in the original definition. I have added it because I think it plausible that the following theses are true: (a) it is necessary that some non-spatiotemporal abstract objects exist, (b) sums of abstract and concrete objects are abstract objects, (c) such sums occupy the regions occupied by their concrete parts, and (d) unrestricted composition is necessarily true. If (a)-(d) are indeed true, then omitting the clause in question would mean that there could be no maximal occupants of connected regions and therefore that there could be no concrete* objects.

[5] I am aware that ordered n-tuples are usually taken to be unordered sets, but I have wanted to be as neutral as possible in my definition of a non-set-constituted object. So the definition should be read as possibly redundant rather than as implying that ordered n-tuples are not sets. Similarly, the definition should not be taken to suggest any particular relation of constitution between sets and proper classes: even if in my technical sense of the term a proper class is a *set-constituted* object this is simply because a proper class is a proper class and being a proper class is sufficient for being a set-constituted object. I need a term to include the empty set plus all those objects which have members plus all those objects which have the empty set or membered entities as parts and I have found no better term than *set-constituted object*. In my previous definition of concrete* object I required that concrete* objects be memberless, not non-set-constituted objects (Rodriguez-Pereyra 1997: 163). The idea was to rule out sets being concrete* objects, thereby ensuring the possibility of a world with only finitely many concrete* objects. But the requirement that concrete* objects be memberless cannot do what it was intended to do. To see this assume that sets with concrete ur-elements are themselves concrete. Assume also, what is eminently plausible, that sums of concrete objects are concrete objects. Finally assume, what is not wildly implausible, that sets with concrete ur-elements are spatiotemporally located where and when the ur-elements are. Consider two concrete objects a and b such that a+b is a maximal occupant of a connected region. The region occupied by $\{a\}+\{b\}$ is the region occupied by a+b. But then $\{a\}+\{b\}$ is a concrete memberless maximal occupant of a connected region. And so are $\{\{a\}\}+\{\{b\}\}$, $\{\{\{a\}\}\}+\{\{\{b\}\}\}$, and so on. But then, in general, there is no possible world with only a finite number of memberless maximal occupants of connected regions. But the new definition of concrete object*, according to which a concrete* object is a non-set-constituted object, avoids this difficulty because such things as $\{a\}+\{b\}$ are set-constituted objects and therefore they are not concrete* objects.

objects with concrete ur-elements are themselves concrete, no set-theoretical object is a concrete* object.

And even if concrete objects have necessarily infinitely many concrete parts, concrete* objects have no concrete* proper parts, for no spatiotemporal object that is a proper part of a concrete* object is itself a maximal occupant of a connected region, and therefore no proper part of a concrete* object is a concrete* object.

With the notion of a concrete* object on board, one may then run the subtraction argument*, which has the following premises:

(A1*) There is a possible world with a finite domain of concrete* objects and in which every concrete object is a (proper or improper) part of a concrete* object.[6]
(A2*) These concrete* objects are, each of them, things which might not exist.
(A3*) The non-existence of any one of these things does not necessitate the existence of any other such things.

We then start from a possible world w_1, accessible from the actual world, with a finite domain of concrete* objects and where every concrete object is a part of a concrete* object and then, after picking any of its concrete* objects x_1, we remove it completely, i.e. we remove w_1 and *all its parts*, and pass to a possible world w_2 exactly like w_1 except that x_1 has been removed completely. We repeat this procedure until we arrive at a world where there are no concrete* objects. That world will not contain any concrete objects. For the subtraction process does not add any objects to the worlds that are the result of subtracting concrete* objects from other worlds. And since that world will not contain any of the concrete* objects, or its parts, of the original world w_1, it will not contain any concrete objects.[7]

[6] Originally premise (A1*) of the original subtraction argument* was just the first conjunct of the present premise (A1*). I have added 'and in which every concrete object is a (proper or improper) part of a concrete* object' because if there are worlds in which some concrete objects are not part of a concrete* object, subtracting all the concrete* objects will not give a world in which there are no concrete objects. What would a world where some concrete objects are not parts of concrete* objects be like? One example would be worlds with concrete* objects coexisting with infinitely many occupied connected regions such that each one of them is a proper part of some of the others. Another example would be worlds with concrete* objects coexisting with scattered objects all of whose parts are scattered (that is, worlds which consist of concrete* objects plus what Hoffmann (2011: 50) calls 'scattered worlds'). Yet another example would be worlds which consist of concrete* objects plus what Hoffmann (2011: 49) calls 'Horsten worlds'.

[7] Note that I do not claim, as I did in my 1997 paper, that a world where there are no concrete* objects is a world where there are no concrete objects. This assumption was refuted by Hoffmann (2011). But

Efird and Stoneham avoid the problem arising from concrete objects having infinitely many concrete parts by defining a concrete object as an object that (a) exists at a location in space-time, (b) has some intrinsic qualities, and (c) has a natural boundary (2005: 314). The key condition here is (c), and it is intended to allow for the possibility of worlds with finitely many concrete objects, since not all parts of concrete objects have natural boundaries. They leave the notion of a natural boundary as an undefined primitive (2005: 315). In any case, as we shall see in section 6, (c) presents some problems whose possible solution is unclear.

But not everything is clear with premises (A3) and (A3*). Paseau (2002) has distinguished the two following readings of (A3*) and has claimed that on neither reading is the subtraction argument* valid (where *o* ranges over any concrete* objects and *x* over the concrete* objects mentioned in the first premise of the subtraction argument*):

(α) $\forall x \forall o \exists w[\neg(x \text{ exists in } w) \wedge \neg(o \text{ exists in } w)]$

(β) $\exists w \forall x[\neg(x \text{ exists in } w)]$

According to (α) the non-existence of any of the *x*s does not necessitate the existence of any other such things in the sense that there is no concrete* object that exists in every possible world in which any of the *x*s does not exist. According to (β) the non-existence of any of the *x*s does not necessitate the existence of any other such things in the sense that it does not necessitate that there is even one of the *x*s. Clearly, when (A3*) is interpreted in either of these two ways the subtraction argument* is not valid. But neither (α) nor (β) constitute the intended reading of (A3*), as should be clear from the reasoning behind the subtraction argument. (α) and (β) are permissible interpretations of (A3*) as stated, but they are not plausible interpretations of that premise given the argumentative context in which it appears. The intended reading of (A3*) can be semi-formally parsed as follows (where '*x*' ranges over the objects mentioned in premise (A1*)):

all one needs to prove Metaphysical Nihilism is that at the end of the subtraction process there is a world where there are no concrete objects.

(γ) $\forall w \forall x$[x exists in $w \rightarrow$ {$\exists w$*($\neg$(x exists in w*)) $\rightarrow \exists w$**(w** and w differ only in that in w** neither x nor its parts exist)}].[8]

Although in a more recent paper Paseau admits that when its third premise is understood as (γ) the subtraction argument* is valid, he argues that (γ) cannot be a permissible interpretation of (A3*). Thus Paseau concludes that there are two subtraction arguments*: the original and invalid one (where the third premise is interpreted as either (α) or (β)) and the new and valid one (where the third premise is interpreted as (γ)) (Paseau 2006: 149, 150-51).

I shall argue against these claims in section 3. Although Paseau made his objection against the subtraction argument*, Efird and Stoneham, to avoid Paseau's charge of invalidity, also interpret the third premise in a way similar – but by no means equivalent – to (γ):

(B) $\forall w \forall x$[x exists in $w \rightarrow \exists w$*{$\neg$(x exists in w*) $\wedge \forall y$(y exists in w* $\rightarrow y$ exists in w)}].[9]

One notable feature of (B) is that, as Efird and Stoneham point out (2005: 309, footnote 17), it makes premise (A2) redundant. For (A1) and (B) are sufficient to entail Metaphysical Nihilism. I shall touch upon the significance of this in section 3. For now the important point is that the subtraction argument*, when its third premise is interpreted as (γ), and Efird and Stoneham's version of the subtraction argument, with (A1) and (B) as premises, are valid.

3. Paseau argues that (γ) is not a permissible interpretation of (A3*). In effect he argues that any permissible interpretation of (A3*) must have a negated universal, or equivalently an existential quantifier, as its leading world quantifier. Paseau says that (A3*) has the form:

[8] This is not exactly the way Paseau parses (γ) (2006: 148), nor is it exactly the way I parsed (A3*) in my 2002: 172. But I think it is the most accurate way to capture the intended reading of (A3*). Furthermore, Paseau seems to have understood (γ) in the way I am parsing it now and his objections to the way he parsed (γ) are applicable to the way I am parsing it now. I shall therefore proceed as if Paseau had in mind (γ) as I have parsed it here.

[9] To maintain the unity of vocabulary between (γ) and (B) I have made some slight alterations in the original formulation of (B) as it appears in Efird and Stoneham 2005: 309. These changes do not alter its content but facilitate the comparison of (γ) and (B).

Not-[A necessitates B]

If we interpret necessitation in the standard way in terms of possible worlds, we obtain that (A3*) has the form:

Not-[$\forall w$(A holds at $w \rightarrow$ B holds at w)]

Thus Paseau concludes that any permissible interpretation of (A3*) must have a negated universal or, equivalently, an existential quantifier as its leading world quantifier. But the leading world quantifier of (γ) is universal. He concludes that (γ) cannot be a permissible interpretation of (A3*) (2006: 150).

But (γ) is a permissible interpretation of (A3*). To explain why, let me start by noting and explaining an apparent discrepancy between (A3*) and (γ). This is that while in (γ) the subtractability of any of the *x*s is made to depend on there being a world in which *x* does not exist, nothing like this is mentioned in (A3*). The reason of this apparent discrepancy is that if one reads (A3*) as entailing the contingency of the *x*s then (A2*) becomes redundant. Indeed reading (A3*) as (α) or (β), Paseau's proposed permissible readings, makes (A2*) redundant, since both (α) and (β) entail that the *x*s are contingent. This means, by the way, that although (α) and (β) are permissible readings of (A3*), they are not plausible ones, since (A3*) was put forward as part of an argument in which (A2*) was supposed to play its role non-redundantly. Thus an interpretation of the argument that reads (A3*) as (α) or (β) neglects to take into consideration the context of the premise.

(γ) is, on the contrary, a charitable interpretation of (A3*), given its context. But that it is a charitable interpretation does not mean that it is a permissible interpretation. And some might doubt that it is a permissible interpretation simply because the contingency of the *xs* is not guaranteed by (γ). But this is not a good reason to think that (γ) is not a permissible interpretation of (A3*). Sometimes we say things of the form 'P's being the case does not necessitate that Q is the case', without thereby incurring commitment to P's being possible but, on the contrary, meaning that if P's being the case is possible, then P's being the case does not make Q be the case as well. For instance some believe that truths having truthmakers does not entail that there are facts. Such people might express this thought by saying ‘That truths have truthmakers does not necessitate the existence of facts’. But clearly not every one who says this commits himself to the possibility that truths have truthmakers. Some might profess not to know whether truthmakers are metaphysically possible. Clearly what they mean when they say that truths having truthmakers does not necessitate the existence of facts is not that there is a possible world with truthmakers but without facts but rather that if there is a world with truthmakers then there is a world with truthmakers but without facts.

Thus the apparent discrepancy between (γ) and (A3*) with respect to the contingency of the *x*s does not stop (γ) being a permissible interpretation of (A3*). But it has not yet been shown that (γ) is a permissible interpretation of (A3*), since for all that has been said, the sense of (A3*) might be captured by (δ) or (ε), neither of which are capable, together with (A1*) and (A2*), of delivering the conclusion that there is a world where nothing concrete exists:

(δ) $\forall x \forall o[\exists w(\neg(x \text{ exists in } w)) \rightarrow \exists w^*(\neg(x \text{ exists in } w^*) \wedge \neg(o \text{ exists in } w^*))]$

(ε) $\forall x[\exists w(\neg(x \text{ exists in } w)) \rightarrow \exists w^* \forall x(\neg(x \text{ exists in } w^*))]$

What does (γ) say? It says that if the *x*s are contingent, then one can subtract any one *x*, without having to add anything, from every world in which any of them exist. What we need to see is that sometimes people say things of the form ‘it is not the case that A necessitates B’ meaning something like what (γ) means. To see this imagine that there is a room with some number of people in it and some people outside it and circumstances are such that no more than one person can leave the room at any one time and no more than one person can enter the room at any one time, and although it is possible for one person to leave the room simultaneously with another person entering the room, in no circumstance does the fact that someone leaves the room require that some other person enters the room. This situation can be naturally (partially) described by means of the phrase ‘anyone’s leaving the room does not necessitate anyone’s entering the room’. And clearly in this case this means neither that it is possible that all the people who were in the room at the beginning have left the room at some time (this reading would be analogous to Paseau’s (β)), nor that the leaving of the room by any person forces no particular person outside the room to enter into it (this reading would be analogous to Paseau's (α)). What it means is simply that at any time, any of the persons in the room at the beginning can leave the room without any one else entering the room. But if this is what 'anyone's leaving the room does not necessitate anyone's entering the room' can mean, then (A3*) can be interpreted as meaning what it was intended to mean.

Thus I think (γ) is a permissible interpretation of (A3*). But what I want to emphasise is that even if Paseau were right that (γ) is not a permissible interpretation of (A3*), it would not follow from this that there is a new subtraction argument*, which is valid and whose third premise must be interpreted as (γ), and an old and original subtraction argument*, which is invalid and whose third premise must be interpreted as either (α) or (β). On the contrary, since (γ) was the intended interpretation of the original subtraction argument*, all that would follow if Paseau were right that (γ) is not a permissible interpretation of (A3*) is that in the original informal formulation of the argument its third premise was not properly expressed. So either there is only one subtraction argument*, which is the valid old and original subtraction argument*, or there are two subtraction arguments*, the old and valid one in which (A3*) is interpreted as (γ), and the new and invalid one, in which (A3*) is interpreted as either (α) or (β).

Can one argue that (B) is a permissible interpretation of (A3)? Yes, and on similar considerations to those that base my claim that (γ) is a permissible interpretation of (A3*), although in the case of (B) the case is simpler because there is no apparent discrepancy between (B) and (A3) with respect to the contingency of the *x*s. However, although (B) is a permissible interpretation of (A3), it is not a plausible one. For given the argumentative context in which (A3) appears it is implausible to interpret it in any way that makes any of the other two premises redundant. So when we formalise the subtraction argument with only (A1) and (B) as premises what we are doing is to propose a new subtraction argument.

This is not, of course, an objection against Efird and Stoneham's argument, nor is it an objection against their proposing such an argument, for what matters is to find (at least) one version of an argument that establishes Metaphysical Nihilism. And indeed they seem unconcerned with the fact that (B) makes (A2) redundant. But I find their lack of concern odd, for they seem to think that part of the advantage of (B) over (γ) is that it captures Baldwin's original intentions (2005: 309), but the fact that (B) makes (A2) redundant is (fallible but strong) evidence that (B) is not what Baldwin originally meant.[10]

4. The idea or intuition behind (γ) and (B) is that necessarily if there are some concrete or concrete* objects then there could have been fewer concrete or concrete* objects. One objection to this is that that idea or intuition presupposes that there is a world with no concrete or concrete* objects. For only if one believes that there is an empty world will one have reason to believe that necessarily if there are some concrete or concrete* objects then there could have been fewer of them. Thus no one who is not previously committed to the existence of a world with no concrete or concrete* objects would be moved by (γ) or (B) to accept Metaphysical Nihilism. This is, in a nutshell and extended to apply to (B), Paseau's objection against (γ) in his 2006's article. To meet this objection one needs to show that there are reasons to accept (γ), (B), or the intuition behind them.

Paseau argues that (γ) may have no plausibility independent of the existence of an empty world (2006: 154), in which case the subtraction argument* will fail to move those who are open-minded or agnostic about whether there is an empty world. Paseau does not establish, nor does he attempt to establish, that (γ) can be given no plausibility independent of the existence of an empty world. All he does is to show that certain ways of arguing for (γ) are unsuccessful and then he issues metaphysical nihilists the challenge of trying to give independent reasons to accept (γ). In this section I shall argue that there are such reasons to accept (γ).

Paseau speaks indistinctly of a suasive argument having to convince someone who is agnostic about its conclusion and someone who is open-minded about its conclusion. I think the right thing is to demand of a suasive argument that it be capable of convincing someone who is open-minded about its conclusion. This is because agnosticism is compatible with dogmatism: there can be dogmatic agnostics. And suasive arguments need not convince dogmatic agnostics.

So a suasive argument must be capable of convincing someone who is open-minded about its conclusion, where a person is open-minded about a certain claim X if and only if as far as he knows he is not committed to any opinion as to whether X

[10] Although for reasons not having to do with the fact that it makes (A2) redundant, Efird and Stoneham think that (B) might be a replacement of (A3) (Efird and Stoneham 2005: 309, fn. 18). This does not worry them, but for the reasons given above I think it should.

and is willing to examine reasons for and against X and also willing to let his judgment about X to be rationally influenced by such reasons. What I am going to argue in this section is that independent reasons can be given in favour of (γ), reasons that should move anyone who is open-minded about whether there is an empty world. But Paseau's challenge to metaphysical nihilists is to provide reasons for (γ), not for the other premises of the subtraction argument*. So what I am going to do here is to provide reasons for (γ) that should move anyone who is open-minded about the possibility of an empty world and who accepts the other premises of the subtraction argument*.

Let us say that a contingent concretum* x is subtractable from a world w if and only if x exists in w and there is a possible world w^* such that x does not exist in w^* and w^* and w differ only in that in w^* neither x nor its parts exist. Since the world mentioned in (A1*) has been arbitrarily chosen, its concreta* can be assumed to be no relevantly different from any other contingent concreta* and, with this assumption, (γ) entails that every contingent concretum* is subtractable from any world in which it exists.[11] Let us say that a world has the *subtraction property* when all of its contingent concreta* are subtractable from it. Thus (γ) entails that every world with contingent concreta* has the subtraction property.

Paseau agrees that it is plausible that many-concreta* worlds have the subtraction property (2006: 152). If this is indeed possible, and I think it is, one might use it as a reason for (γ). How could this be done? One could argue that maintaining that many-concreta* worlds have the subtraction property without accepting (γ) puts one in a position to have to explain something that cannot be explained. One principle to implement this strategy might be (P1):

(P1) If one thinks that a principle is true in most cases, but might have some exceptions, one incurs the burden of explaining why these cases might be exceptional.

Paseau rejects this principle because, he says, it rules out some cases in which one is exercising due intellectual caution. He exemplifies this point with a case of someone who has reliably observed the voting behaviour of British women except the Scots.

[11] So (γ) entails that every contingent concretum* is subtractable in Efird and Stoneham's sense (2005: 322). Note that (γ) entails that every contingent concretum* is subtractable from any world in which it exists by requiring that every contingent concretum* is *individually* subtractable from any world in which it exists.

Such a person might have good reason to believe that British women vote Labour, the possible exception being Scots.

I agree that (P1) rules out cases of due intellectual caution, but not for the reasons Paseau gives. It is simply an exercise of intellectual caution to think that some principle that is not evidently universally true might have some exceptions. But one thing is to think that what is not evidently universally true might have some exceptions and another is to believe of some cases that they might be exceptions to the observed rule. In this latter case one does incur the burden of explaining why these cases might be exceptional. Thus the following principle does not rule out cases of due intellectual caution:

(P2) If one thinks that a principle is true in most types of cases, but believes of some types of cases that they might be exceptions to the principle, one incurs the burden of explaining why these types of cases might be exceptional.[12]

Clearly (P2) is relevant to Paseau's case of the political preferences of British women. But (P2) does not rule out cases of due intellectual caution, because *due* intellectual caution is caution where there is a reason to be cautious. So if one is rational in thinking that a certain case might be an exception to the general case one should have a reason why this *might* be the case, in which case one is in a position to explain why it might be exceptional. And there are lots of reasons why Scottish women might be an exception to the observed rule. After all there are differences of culture, education, political history and general political situation which are known to influence the voting behaviour of people – not to mention the fact that in Scotland there is a party, the Scottish National Party, that is not politically active in the rest of Britain.

Thus I take it that the demand imposed on explanations by (P2) is minimal: to explain why certain cases might be exceptional all one is required to do is to provide some reason why they might be. Such a reason will typically be a reason that the potentially exceptional types of cases are not relevantly similar to the other ones. This suggests the following, more specific, principle:

[12] Note that this principle (P2) has nothing to do with Paseau's principle (P2) (Paseau 2006: 153).

(P2*) If one thinks that a principle is true in most types of cases, but believes of some types of cases that they might be exceptions to the principle, one incurs in the burden of showing why these types of cases might not be relevantly similar to the other ones.[13]

What (P2*) requires is that one be in a position to show why the potentially exceptional cases are not relevantly similar to the ones for which the principle is true. Since voting behaviour is influenced by education, culture and political landscape, the burden is easily met in the case of Scottish women, since one can explain why they might be relevantly dissimilar to the other British women by pointing out that they differ or might differ from other British women in respect of culture, education and the political landscape in which they act.

Now according to premise (A1*) of the subtraction argument* there is a possible world with a finite number of concreta*. If so there must be some worlds which have the smallest domains of concreta*, that is, there must be some worlds which have at least one concretum* and no worlds have fewer concreta* than they have. So anyone who accepts (A1*) should accept the following:

(1*) There is a world with the minimum possible number of concreta*.

The following principle is also plausible and there is no reason why those who are open-minded about whether there is an empty world should not accept it:

(2*) If there is a possible world consisting of just *n* concreta* then there is a world consisting of those *n* concreta* plus an additional concretum*.

Now if one accepts (1*) and (2*) but suspends judgment with respect to there being an empty world one has to meet the kind of explanatory demand imposed by (P2*). For if there is a non-empty world with the minimum possible number of concreta*, and for each world with a number of concreta* there is a world containing those concreta* plus an additional one, then most types of worlds have the subtraction property.

[13] (P2*) is similar to, but not the same as, Paseau's (P3) (2006: 153).

Thus given the plausibility of (2*) it seems that those who are open-minded about the empty world ought to explain why some worlds with a certain number of concreta*, which might lack the subtraction property, are relevantly different from worlds with a higher number of concreta*, which have the subtraction property. How can this be done?

One way to do it would be to argue that there might be *n* necessarily existent concreta*, and so worlds with just *n* concreta* are relevantly different from worlds with more concreta* in that the number of things existing in the former is the number of necessarily existent concreta*, while this is not true of worlds with more concreta*. But this route is not available to our open-minded person, since this is someone who accepts premise (A2*) of the subtraction argument*, and therefore believes that there are no necessarily existent concreta*.

Without resorting to necessarily existent concreta* the only other way seems to be to find a number *n* such that there might be some relevant difference between worlds with *n* concreta* and worlds with more concreta*, and such that that difference accounts for the fact that while worlds with more than *n* concreta* have the subtraction property worlds with just *n* concreta* might lack it. But if there is any chance of this to succeed then it is plausible to think that the number *n* in question is 1. This seems to accord with Paseau, since he says it is plausible to believe that there are one-concretum* worlds but he seems open-minded about whether there is an empty world. Indeed Paseau says that ‘having just one entity as opposed to having more than one seems to be a highly relevant distinction for whether we can subtract something from a world and still be left with a world’ (p. 154). Why is this a relevant difference? Paseau does not say, but there seems to be no relevant difference between one-concretum* worlds and two-concreta* worlds which is independent from the fact that there might be no empty world. For the difference in question must explain why one-concretum* worlds might lack the subtraction property while two-concreta* worlds have it. And no credible explanation can be given which makes no reference to the fact that subtracting its concretum* from a one-concretum* world results in an empty world, while this is not true of two-concreta* worlds (saying that the number 1, or one-concretum* worlds themselves, have magical or special properties that prevent subtraction from one-concretum* worlds would not be a credible explanation).

Paseau seems aware of this, but he draws from it the conclusion that the subtraction argument* cannot be suasive. This is what he says:

> For what it is worth, my own intuitions on the question of whether one can subtract its only concretum* from a one-concretum* world are none other than my intuitions about whether there is an empty world. If that is true more generally, the new subtraction argument cannot be suasive. It will lack the capacity to sway anyone who is agnostic about whether one-concretum* worlds have the subtraction property. The reason is that a subtraction premise [i.e. a premise like (γ)] will have no source of plausibility independent of the existence of an empty world, or at least no source that does not itself directly motivate the existence of an empty world. (2006: 154)

Paseau thinks that the subtraction argument* cannot be suasive because no one would accept that one-concretum* worlds are relevantly similar to two-concreta* worlds for reasons independent from there being an empty world. But one-concretum* and two-concreta* worlds are similar, and for reasons independent from there being an empty world: they contain at least one concretum*; they contain finitely many concreta*; they contain contingent concreta*; they contain less than three concreta*; they form part of series of worlds containing concreta* in which every member of the series has one more concretum* than the preceding one; if well chosen, the set of concreta* in the one-concretum* world is a subset of the set of concreta* in the two-concreta* world. And so on.

Clearly the onus of proof is on those who say that one-concretum* and two-concreta* worlds are not relevantly similar. But the only relevant difference that would account for the fact that only one-concretum* worlds might lack the subtraction property would be that there might be no empty world. But if, as we are assuming with Paseau, there are one-concretum* worlds, then the fact that there might be no empty world *is* the fact that one-concretum* worlds might lack the subtraction property. But that one-concretum* worlds might lack the subtraction property is no relevant difference when it comes to explaining why one-concretum* worlds, unlike two-concreta* worlds, might lack the subtraction property.[14]

[14] Geraldine Coggins raises a similar point to Paseau's, and it seems she would suggest that the relevant difference between one-concretum* worlds and two-concreta* worlds is that 'the nature of possibility or of what a possible world is seems to depend or be closely related to the question of whether or not [one-concretum* worlds have the subtraction property]' (Coggins 2010: 131). But this would be because for Coggins the possibility of an empty world has implications for the nature of possible

So if (P2*) is a constraint of rationality, one ought to abandon either (1*) or (2*), or else accept (γ). But the open-minded person we had in mind was someone who accepted premise (A1*) of the subtraction argument*, and therefore he is committed to (1*). And (2*) is a very plausible principle. Thus the rational thing to do would be to embrace (γ).

5. I have been assuming that the relevant open-minded person knows that one-concretum* worlds are possible. But this assumption might be questioned. For someone might be open-minded about whether there is an empty world because he is open-minded about whether there must be something without knowing whether this might be the case because there must be at least one concretum*, or because there must be at least seven concreta*, or because there must be at least seven million concreta*, and so on. This would be a person who is not only open minded about whether there is an empty possible world but who for every n, where $n > 0$, he is open-minded about whether there is a world with just n concreta* because it might be that there must be more than n concreta*. He might say that most worlds have the subtraction property but that some might lack it because they are such that they might contain the minimum possible number of concreta*.

This person escapes the explanatory pressures imposed by (P2*). For although he believes that there might be some exceptions to a rule that obtains in most types of cases, he believes of no particular types of cases that they might be the exceptions. But it can be argued that there must be a world with just one concretum*. For the following principle is plausible:

(3*) If x and y are two concreta* existing in a certain world w, then there is a world w^* which differs from w only in that it includes a concrete thing z, which does not exist in w, and which connects x and y in w^*.

This principle is plausible since it is plausible that necessarily every two concreta* could have been joined together by means of some extra concrete object. That z connects x and y means that although the region occupied by $x+y$ is not connected, the

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worlds (Coggins 2010: 26–56). But, if so, one-concretum* and two-concreta* worlds would not differ for reasons independent from there being an empty world.

region occupied by $x+y+z$ is. Thus in w^* x and y and z are not concreta* but merely parts of a concretum*.

What is important about (3*) is that it shows that one can always make one concretum* out of two, in the sense that every two concreta*, in any possible world, are not concreta* but parts of a third concretum* in another possible world. Thus (3*) entails that for every world with more than one concretum* there is a world with exactly n–1 concreta*. Thus if there is a possible world with a finite number of concreta*, as (A1*) states, then there is a world with just one concretum*.

Thus given the initial credibility of (3*), unless the relevantly open-minded person has a positive reason to reject it, he ought to believe that there are worlds with just one-concretum*. But then he ought to have a reason why one-concretum* worlds might be different from worlds with many-concreta*, a reason that is independent from the fact that there might be an empty world. And this, I have argued, cannot be done. If so, given (P2*), (1*) and (2*), he ought to accept (γ).

6. Since the relevantly open-minded person ought to accept (γ), given the validity of the subtraction argument* the relevantly open-minded person ought to accept the conclusion of the subtraction argument*. Clearly the same kind of defence can be adopted by Efird and Stoneham to defend their argument from Paseau's objection (except that it is not clear how they could modify the argument in the previous section that there must be a world with just one concretum* to make it an argument that there must be a world with just one concrete object). So both arguments are valid and there seem to be reasons to believe in their premises. Metaphysical Nihilism is in good shape.

Given this parity between the arguments the issue is, then, which argument is better. I think the subtraction argument* is better than Efird and Stoneham' argument. I shall first consider their objections to the subtraction argument* and then explain my misgivings about their argument.

What do they find problematic with the subtraction argument*? Their main point seems to be that (γ) entails the existence of a world with a single concrete object, and so it does not allow for the existence of symbiotic objects, i.e. pairs of objects such that if one goes out of existence so does the other.[15] But they think such objects should not be ruled out. Why? They think there are clear examples of such objects, namely mereological fusions of concrete objects (Efird and Stoneham 2005: 309).

But this objection leaves the subtraction argument* unscathed. First, what (γ) entails is not a world with a single concrete object but a world with a single concrete* object, since it is concrete* objects that (γ) talks about. And we have seen in section 5 that it can be argued, without presupposing (γ), that there is such a world. Some people might find repugnant the idea that there could have been just one concrete object (for instance those who believe that every concrete object must have concrete proper parts). But all the subtraction argument* commits one to is the idea that there could have been just one concrete* object. And this is not repugnant.

Second, (γ) and the subtraction argument* are consistent with symbiotic objects such as mereological fusions of concrete objects. For a mereological fusion of concrete objects is either a concrete, non-set-constituted, maximal occupant of a connected spatiotemporal region, or it is not. If it is, then it is a concrete* object and so it is consistent with (γ) that its non-existence entails that of its parts, which although concrete are not concrete*. If it is not, then it is not a concrete* object and so (γ) does not require that its non-existence does not entail that of any other object.

Efird and Stoneham make other points against (γ). For instance that it is overly complicated. They think the argument can be simplified if one replaces (γ) by (B) (2005: 308-9). I do not think this objection has much weight, but in any case I shall argue below that (B) has serious problems, and these problems more than compensate for whatever advantage (B) gets from being simpler than (γ).

A more substantive point they make is that by restricting the application of the argument to concrete* objects, it is no longer possible to appeal to unphilosophical intuition to support the premises of the argument. Yet they do not argue for this substantive unobvious claim. But the only philosophical concept in the definition of concrete* object is that of a concrete object, a concept about which they think one can have unphilosophical intuitions.[16]

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[15] Strictly speaking what they have in mind is not (γ) but (R-P), which is their formalisation of the intended reading of (A3*). But I suppose they would probably have made the same objection to (γ).

[16] Furthermore, why should we appeal to unphilosophical intuition when we are dealing with a philosophical argument? Should it also be uneducated, uninformed intuition? Presumably it must be educated, informed intuition. But then why should it not be informed by philosophical ideas? I cannot

So the subtraction argument* has not been undermined by Efird and Stoneham’s objections. I think, however, that their argument presents some serious problems, which arise from their conception of a concrete object.

Efird and Stoneham’s original definition of a concrete object makes it necessary that concrete objects have natural boundaries (2005: 314). This makes it impossible that there be only one concrete object that takes up the whole of space. To avoid this unwanted conclusion Efird and Stoneham have reformulated their definition of a concrete object by requiring of such objects only that if they have boundaries, they have natural boundaries (2009: 134). But this definition is still lacking, for then any extended concrete object will have infinitely many concrete objects as parts. Consider Efird and Stoneham’ own example of a white card with a red circle in the middle (2005: 313). For any segment of the circumference of the circle there will be infinitely many parts of the circle which have that segment as a boundary and no other segment of the circumference as boundary. Those parts are located in space and time, they have intrinsic qualities and they have a natural boundary. So they must count as concrete objects according to their revised definition.

I guess the solution is to require of concrete objects that if they have any boundaries, they have only natural ones.[17] But I doubt that this solution is entirely satisfactory. Think of a mountain, say Mount Olympus. Since Efird and Stoneham put a lot of emphasis on unphilosophical intuitions about the kind of object Metaphysical Nihilism is supposed to be about, surely they would want to count Mount Olympus as a concrete object.[18] Mount Olympus has some natural boundaries, but are all of its boundaries natural? Surely there is some boundary which delimits the base of Olympus from the rest of the part of the Earth on which it rests, but there seems to be no natural one. And this is not a problem about mountains not having precise boundaries. Indeed they do not have precise boundaries. But the problem here is not that they are not precise but that not all of them are natural: no way of making the boundary between Olympus and its base precise would make it a natural boundary (Cf. Efird and Stoneham 2005: 315).

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enter into this large methodological debate here, but I want to register my doubts about Efird and Stoneham’s apparent assumption that philosophical ideas are better grounded on unphilosophical intuition.

[17] Or to think of boundaries as complete, so that nothing is a boundary unless it delimits the totality of the object of which it is a boundary.

[18] They count clouds as concrete objects (2005: 315), but counting clouds but not mountains as concrete would be rather peculiar.

It is not clear to me that this problem is not solvable, although at present I do not see what the solution is. One possible solution would be to say that mountains are not concrete. But it seems to me that whatever the intension of the concept of a concrete object, its extension must include mountains. Of course one could, by modifying the definition again, accommodate the case of Mount Olympus so that mountains count as concrete. But, and this is admittedly an *ad homines* point, I suspect that by modifying it further Efird and Stoneham might make the definition of concrete objects such that 'it is no longer possible to appeal to unphilosophical intuition to support the premises of the argument'.

Furthermore the notion of a natural boundary, which is left undefined, does not seem to be totally clear. Is a boundary natural when the things occupying the two sides of the boundary have different natural properties or belong to different kinds? Efird and Stoneham think not, for they think there is a natural boundary between the legs and top of a table when they are made from different pieces of wood. But they think that there must be some significant difference in kind between the things on the two sides of a boundary for this to be natural (Efird and Stoneham 2005: 315). But what a 'significant' difference is must be clarified.

The notion of a concrete* object is, on the other hand, much clearer than the notion of a concrete object defined in terms of natural boundaries. Thus I think that it is better to work with the notion of a concrete* object, about which it is possible to have clear (though perhaps not unphilosophical) ideas that support the premises of the argument: it is clear that Mount Olympus is not a concrete* object.

The subtraction argument* has not been undermined by Efird and Stoneham's objections. Their argument presents some serious problems which, although not perhaps unsolvable, it is as yet unclear how they could be solved. This makes the subtraction argument*, for the time being at least, preferable to their argument. But whatever argument is best (if indeed one is better than the other), these are valid and persuasive arguments that establish Metaphysical Nihilism.[19]

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[19] Thanks to Bill Brewer, Michael Clark, Ghislain Guigon, David Liggins, Alex Paseau, Matthew Soteriou, Ezequiel Zerbudis and audiences in Belfast, Buenos Aires, Cambridge, Geneva, Manchester, Mexico City, Nancy, Nottingham, Oxford and Warwick, where versions of this paper were presented.

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