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# Illusions of Gunk

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## Abstract

The possibility of gunk has been used to argue against mereological nihilism. This paper explores two responses on the part of the microphysical mereological nihilist: (1) the *contingency defence*, which maintains that nihilism is true of the actual world; but that at other worlds, composition occurs; (2) the *impossibility defence*, which maintains that nihilism is necessary true, and so gunk worlds are impossible. The former is argued to be ultimately unstable; the latter faces the explanatorily burden of explaining the illusion that gunk is possible. It is argued that we can discharge this burden by focussing on the contingency of the *microphysicalist* aspect of microphysical mereological nihilism. The upshot is that gunk-based arguments against microphysical mereological nihilism can be resisted.

## 1 Worlds of infinite descent

People once took atoms to be physically indivisible units sitting at the most fundamental level of reality. Advances in science showed that atoms could be decomposed into further micro-particles: and on the standard model, quarks, bosons and leptons are held to be indivisible units. But just as the atoms' role was supplanted by quarks, future discoveries may reveal that the quarks decompose into yet more fundamental entities: sub-quarks. And below the sub-quarks there could lie further layers of reality. Imagine this process of discovery continuing *ad infinitum*: in such a scenario, every kind of micro-particles would be underlain by smaller entities. This would be a world of 'infinite descent': in such a scenario, there is no 'most fundamental layer' of particles.

One wonders what empirical grounds we could have for excluding such a hypothesis: but for the sake of argument, I shall assume that the actual world is not of the 'infinitely descending'

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sort.<sup>1</sup> I want to consider

- Whether infinite-descent worlds are *possible*.
- Whether their possibility would teach us anything about the nature of actual objects.

## 2 Microphysical mereological nihilism

A *mereological simple* is an object that has no proper parts. We call an entity which is not a mereological simple *mereologically complex*; and say that it is a *mereological sum* of its proper parts. Some entities, perhaps, are not only mereologically complex themselves, but are such that all their parts are mereologically complex. Such entities we call *gunk*.<sup>2</sup>

Here is a famous question due to van Inwagen (1990):

**Special Composition Question:** Under what conditions do some objects compose a further object?

One extreme answer to the special composition question is this:

**Mereological nihilism** Objects never compose any further object.

According to the mereological nihilist, *every* object is a mereological simple. A natural mereological-nihilist world-view (not the only possible one) is one where the *only* things that exist are particles at the most fundamental physical level: if quarks, leptons and bosons are physical indivisibles, then this mereological nihilist claims that the only particles that exist are quarks, leptons and bosons in the void. I call this character the *microphysical* mereological nihilist.

The microphysical mereological nihilist denies the existence of ordinary objects. For her, strictly and literally speaking, there are no tables, chairs, or human animals; nor galaxies, planets, molecules of water or oxygen atoms. This world-view has a certain spartan appeal as a

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<sup>1</sup>For discussion, see Schaffer (2003, 2004). Discussion of arguments based on infinite descent relevant to *property ontology* can be found in Lewis (1986a) and Williams (2007). I will be defending the tenability of a certain metaphysical view *on condition* that infinite descent scenario is non-actual. Such a result should be no discomfort for the naturalistic metaphysician.

<sup>2</sup>For an introduction and comprehensive overview of mereological notions, see Simons (1987). For the terminology ‘atomless gunk’ see Lewis (1990).

no-nonsense uncompromising physicalism. Those who love desert landscapes should applaud the elimination of mereological composition from the fundamental furniture of the world (along with much else). Those who worry about the ontic vagueness allegedly implied by more moderate answers to the special composition question should applaud the clean and precise answer the microphysicalist mereological nihilist offers.<sup>3</sup>

### 3 Gunk-based arguments against nihilism

Worlds of infinite descent pose a challenge to the mereological nihilism.<sup>4</sup> This is because they seem to be worlds containing *gunk*. The threat is as follows:

#### Gunk-based argument against nihilism

1. Gunk-worlds are possible.
2. Gunk-worlds are worlds where mereological nihilism is false.
3. So: mereological nihilism is false

*A fortiori*, microphysical mereological nihilism is false.

The second premise is obviously true: gunk worlds by definition contain objects that are gunky; and gunky objects have parts—contravening mereological nihilism, which claims that everything is simple (has no parts).<sup>5</sup> The first premise is more controversial. It is backed by the apparent conceivability of worlds of infinite descent, together with the claim that infinite descent worlds are worlds where each object (atom, quark, sub-quark etc) is composed of smaller micro-particles. We shall turn to whether the nihilism need grant this premise shortly.

There is an lacuna in the little argument just given. The possibility of gunk-worlds would undeniably entail that complex objects exist *at some worlds*. But should we conclude from this that mereological nihilism is false *at the actual world*—that there actually exist complex

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<sup>3</sup>For the latter see in particular Sider (2001, §4.9).

<sup>4</sup>The argument here considered is drawn from Sider (1993). Sider reiterates this challenge against the mereological nihilist in Sider (2001, §5.6). The arguments in Sider (1993) are primarily directed against the Organicism of van Inwagen (1990), but he specifically claims (in footnote 3) that his arguments refute nihilism, and directs them towards the nihilist in particular in (Sider, 2001)

<sup>5</sup>One might wonder why one could not run a parallel argument from the claim that worlds with objects composed of simples exist; backed by the apparent conceivability of such worlds. The difference between the two cases is that the nihilist has resources to *explain away* the conceivability of such worlds, and so maintain that we suffer from an *illusion of possibility*; whereas it is not clear that they have such resources in the case of gunk. More of this below.

objects? The contention would be that the gunk-based argument has a missing (and deniable) premise:

2.5. Mereological nihilism, if actually true, is necessarily true

Call the denial of (2.5) the *contingency* defence of the gunk-based argument. It contrasts with the *impossibility* defence, which rejects the first premise of the gunk based argument, claiming that gunk is impossible. The following section explores the prospects of endorsing the contingency defence. I argue the position is unstable. In my view, the nihilist should avail themselves of the impossibility defence. This gives rise to new explanatory burdens for the nihilist, which I discuss in later sections.

## 4 The contingency defence

### The contingency defence

Mereological nihilism is a way of answering the special composition question. It is possible to *pose* this question in such a way that nihilist-style answers will have to vindicate (2.5). We might, for example, ask for *necessary and sufficient conditions* under which things will compose a further thing. The ‘nihilist’ answer to *this* question would be that *necessarily* objects never compose.<sup>6</sup>

Certain projects motivate interest in a ‘modally robust’ interpretation of the special composition question. For example, suppose that you find the idea of objects which have parts in more than one world intelligible.<sup>7</sup> Now perhaps the project you are interested in requires *complete* answers to the question about when objects compose. If an answer to the special composition question is to be complete for you, it should settle questions about when trans-world objects arise. If you want a special composition question that directly addresses *this* concern, you need to ask about the conditions under which *possibilia* compose a further thing. The ‘nihilist’ answer to this possibilist formulation of the special composition question will entail the necessity

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<sup>6</sup>This seems to be how van Inwagen (1990, §2) himself understands the project, and Markosian (1998) is explicit in formulating the special composition question this way. The formulation of mereological nihilism at van Inwagen (1990, §8) is explicitly non-contingent.

<sup>7</sup>This is obviously most appealing for an extreme modal realist such as Lewis (1986b).

of nihilism.<sup>8</sup>

Some will be interested in the special composition question as part of a project of asking *what it is* for composition to occur. ‘What it is’ questions, in the intended sense, are supposed to be answered by describing the *essence* or the *real definition* of the feature in question.<sup>9</sup> Real definitions have modal implications: if it is of the essence of  $X$  that it be  $F$ , then  $X$  could not have been  $\neg F$ .<sup>10</sup> The ‘nihilist’ answer to a question put forward in this spirit would say that things *essentially* never compose: and this entails that things *necessarily* never compose.

A nihilist who takes themselves to be directly engaging the special composition question as asked by Van Inwagen, or who is interested in possibilist formulations, or is pursuing an essentialist project, will grant (2.5). The gunk-based argument threatens them directly.

I think that nihilists who reject all of the above characterizations of their project should *also* grant (2.5). I now describe a conception of composition that makes an “actual world” mereological nihilism a *prima facie* tenable position: and argue that even on this view, regarding nihilism as contingently true is ultimately untenable. (Those prepared to concede this immediately can therefore skip the remainder of this section).

### **Contingent composition principles**

I envisage a theorist who finds the essentialist project unattractive; who finds talk of objects with parts in different worlds unintelligible; and who thinks that there’s not much interesting to say about the van Inwagen formulation of the special composition question in terms of necessary and sufficient conditions. They claim that the *interesting* questions in the vicinity of the special composition question will concern the status of explicitly *world-relative* principles of the general form: In world  $w$ , under what conditions do objects compose a further thing? The nihilist answers: in the actual world, things never compose.<sup>11</sup>

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<sup>8</sup>One might explore world-relative possibilist formulations: the idea being that some set of (actual and non-actual) possibilities might compose at one world, and not at another. This would require that composition be a world-indexed relation; just as some take it to be a time-indexed relation. I will not pursue this here.

<sup>9</sup>See, for example, Fine (1994), Dorr (2004).

<sup>10</sup>Van Inwagen distinguishes the special composition question (asking for the conditions under which objects compose something-or-other) from the *general composition question*; asking for the conditions under which the  $x$ s compose  $y$  (for any  $x$ s and  $y$ ). Nihilism, uniquely among the answers to the special composition question that van Inwagen considers, can provide an answer to both questions. I take it that *either* question could be thought of as the proper subject of a ‘what it is’ question.

<sup>11</sup>Markosian (1998) argues the special composition question has no interesting answer, and I presume that he would also maintain that the actual-world-relative composition question has no interesting answer either.

It is important to distinguish two theorists here: (1) one who thinks that there is *no* good answer to the “necessary and sufficient conditions” reading of the special composition question, and that in the actual world, things never compose; (2) one who thinks that, in the actual world, things never compose though they do in other possible worlds; and further, that this can be derived from the correct answer to a modally robust formulation of the special composition question, together with non-mereological facts about the actual world.<sup>12</sup> Only the first theorist is a mereological nihilist in my sense: only they take nihilism to be *the answer* to the (as they conceive it).

One who thinks of the interesting principles in the vicinity of the special composition question are world-relative, may not say any more than this. In what follows I give one elaboration of their position. Since there may be contingency theorists who would not want to endorse this particular elaboration, it is important to remember in what follows the challenge from the contingency theorist is not rebutted simply by rejecting this particular elaboration.

What I shall call the ‘laws’ conception of mereology claims the following: asking the special composition question about the actual world is just to inquire into the laws of composition that locally obtain. For this theorist, the laws of composition vary among metaphysically possible worlds just as (most of us agree) *physical* laws do: there are worlds where simples always compose, and universal composition is a law; others where it is a law that composition never occurs. One might think of the laws of composition as obtaining in a world  $w$  in a Humean way: those principles featuring in the system that optimises simplicity, strength and fit with respect to the facts about what composes what in  $w$ . Just as we hope and expect that the physical laws of the actual world have some intelligible and attractive formulation, we should hope and expect also that the compositional laws will have some intelligible and attractive formulation.<sup>13</sup> Nihilism in the context of the “laws” conception of mereological inquiry is the view that the laws of composition at the actual world forbid the existence of any compound objects.<sup>14</sup>

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<sup>12</sup>The following might be an example of (2): someone who think that things compose when they are in contact with one another, and who thought that modern science had discovered that in the actual world things were never literally in contact (forces keep them apart). Thanks to Joseph Melia, who suggested this example to me.

<sup>13</sup>Compare Cameron (2006). I personally think that the Humean understanding of “laws of mereology” is the most attractive, since it introduces no new metaphysical commitments. An Armstrongian treatment of “laws of mereology”, by contrast, would seem to demand that we construe mereological relations as universals, to be the relata of higher-order synchronic “necessitation” relations. This conception of mereological relations may be found independently objectionable. No doubt there are other options to be explored.

<sup>14</sup>One should not confuse ‘contingent nihilism’ in my sense with the thesis that at some worlds, only simples

I cannot see anything *incoherent* in general with the thesis that the answer to the special composition question is a contingent matter; nor with the ‘laws’ elaboration of this view.<sup>15</sup> However, I think that there are special difficulties with a view that tries to combine contingent composition with a mereological nihilism about the actual world.

### **The error-theoretic commitments of nihilism**

In this section I sketch an argument that nihilism about the actual world ‘globalizes’ to nihilism about every world. The argument turns on the success of a famous argument due to Kripke goes through; and aims to establish that nihilism is true at all worlds *considered counterfactually*. Later, I will consider the rejoinder that this is a pyrrhic victory, and that we should really be considering whether nihilism is true at all worlds *considered counterfactually*.

Microphysical mereological nihilism is naturally understood to have *error-theoretic* consequences for ordinary discourse. Since there are no macroscopic objects—no chairs, tables, dogs or cats—on a literal reading “I am sitting at a table”; “there is a dog next to the cat” and the like cannot be true.

One might attempt to sweeten the pill by claiming that, though on the ontologically serious, heavyweight readings of those sentences, they are untrue, there is available a lightweight reading of the same sentences on which they express genuine truths. A proposal that draws on van Inwagen (1990) suggests that the lightweight, ontologically non-committal reading of “there is a cat next to a dot’ is: “there are atoms arranged dog-wise, next to some atoms arranged cat-wise”.<sup>16</sup> An alternative is to go fictionalist: the non-committal reading might then

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exist. This latter is probably true on almost every approach to composition. Take a world which has only one object in it. Then the letter of nihilism is true in such a world, even if one endorses a strong *universalism* more generally. Likewise, suppose that what it is for objects to compose is for them all to touch one another. A world where no objects contact each other would be one where no composite objects exist, because of contingent happenstance.

What should one say about the one-object world from the perspective of ‘laws-based’ contingent composition? Should it be counted a world where contingent nihilism holds, or one where contingent universalism holds? The question parallels those we can ask about what laws obtaining at worlds consisting of a single particle moving at constant velocity through a void forever. A realist approach to laws will hold that there are several such worlds, differentiated from each other by the law-making facts that obtain (which ground determinately correct answers to the questions such as: what would happen were the particle to be impacted by an external force). A Humean account of laws will probably hold that it is indeterminate which laws hold at such a world (since there are multiple optimally good systems of laws fitting the behaviour of the universe). A Humean about laws of mereological will presumably say the same about one-object worlds.

<sup>15</sup>Sider dismisses certain views of composition out of hand on the grounds that they entail this result. See Sider (2001, p.122). For detailed discussion of possible objections to contingent composition, together with robust defence of something like the laws-based conception described here, see Cameron (2006).

<sup>16</sup>van Inwagen (1990) himself thinks that the atoms arranged dog-wise genuinely compose a dog, in virtue of



be: “According to the fiction that composition occurs (and the atoms are arranged just as they actually are), there is a dog standing next to the cat”.<sup>17</sup> There’s plenty to say about the nature and status of these putative lightweight readings; but for now I will focus on the straightforward heavyweight reading.

Microphysicalist mereological nihilism gives rise to an error-theory, in the first instance, concerning obviously existentially committing claims such as those above. It is far less obvious what the status of sentences such as “possibly, there is a dog standing next to the cat” will be. For this claim appears to make *no* commitment to the actual existence of macroscopic objects such as dogs and cats. However, there are reasons for thinking that the error-theoretic results will generalize to these cases.

The absence of (actual) cats and dogs means that our usual meaning-fixing practices will misfire. For example, the pointing that accompanied the introduction of the word ‘cat’ did not single out an object falling under an appropriate natural kind, but only some particles arranged cat-wise. But if the meaning-fixing practices misfire in such a serious way, plausibly the word introduced will suffer the analogue of reference failure. If meaning-fixing practices do not succeed in associating an intension with “cat”, then “possibly, cats exists” will be just as false as “cats exist”. (I take it that this sort of idea is at the heart of Kripke’s case that “there could have been unicorns” is false.)

What is being appealed to here is a schematic principle we might call ‘globalization’:

**GLOBALIZATION** If  $F$  fails to apply to anything in the actual world, then  $F$  has no intension.

There are clearly counter-instances to GLOBALIZATION. For example, the predicate ‘is not a world-mate of a cow’ has no actual instances, but has a perfectly determinate intension. Likewise, one might claim ‘is not located in space-time’ has possible instances, but no actual ones.<sup>18</sup> The obvious reason for the failure of the principle in such cases is that the predicates are compound expressions, and their intensions are determined compositionally from the intensions of their parts. There may be more interesting counter-instances, which do not take the compositional form. For example, suppose that no helicopter had ever been made. Nevertheless, one

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participating in a life.

<sup>17</sup>Compare Dorr and Rosen (2002).

<sup>18</sup>Hartry Field is one who thinks that abstract objects do not exist, but might have done.

could plausibly introduce the term ‘helicopter’, with the same intension as it actually has, on the basis of a description of the *functional role* of helicopters: something counts as a helicopter, in any world, if it satisfies that functional role.

However, there are predicates for which the relevant instances of GLOBALIZATION seem more reasonable. Putative terms for natural kinds are the most familiar cases: ‘unicorn’, ‘water’, ‘cat’, ‘dog’ and so forth. What makes globalization seem compelling in such cases, is the thought that actual-world interaction with things falling under the predicate, or actual-world satisfiers of descriptions associated with the predicate, are required in order to fix a intension for these predicate. This is a very general, and plausible thought. To the extent that we find counter-instances to globalization, it is because we can see exactly why actual world interaction or satisfiers are not needed: in the case of compound predicates, because the intension is determined compositionally; in the case of artifactual kinds, because there are (arguably) *necessary* characteristics which we can use to get a descriptive fix on any possible instance of the artifactual kind.<sup>19</sup>

Granted that the globalization principles hold for ‘cat’ and ‘dog’, the mereological nihilist is going to have to disclaim even the *possibility* of dogs and cats.<sup>20</sup> One could, of course, move to a lightweight reading of ‘possibly, there are cats’, where it only requires the possibility of particles arranging themselves cat-wise. But of course, in this lightweight sense there are actual cats! On neither the lightweight nor the heavyweight reading do we get “there are no cats, but there might have been cats” coming out true.<sup>22</sup>

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<sup>19</sup>The possibility of ‘fool’s unicorns’ undermines this in the case of natural kinds such as ‘unicorn’. For example, talking of other-worldly horse-like, horned creatures will not work, for in other worlds horses and cows might be horse-like and horned; but they are (determinately) not unicorns.

It *may* be possible to use more sophisticated methods to get a descriptive introduction to work. For example, suppose we were to describe some particular possible sequence of DNA that ‘codes for’ horse-like horned creatures. Perhaps we could introduce ‘unicorn’ as referring to the kind of creature which would have that DNA sequence. Clearly however, ‘unicorn’ was not introduced in anything like this fashion, and so even if there are exceptions to the globalization principle even for some such natural-kind terms, the instance involving ‘unicorn’ itself looks safe.

<sup>20</sup>This seems a problem for defences of mereological nihilism that try to appeal to *counterfactual* locutions to provide true surrogates for ordinary talk. Cian Dorr, in various places,<sup>21</sup> suggests that the truth lying behind an ordinary assertion of ‘there are cats’ can be expressed as follows: *were composition to happen, but particles to be arranged just as they actually are, then there would be cats*. But for this to be true on a standard theory of counterfactuals, ‘cats’ would have to have a non-trivial intension.

<sup>22</sup>The most promising way of responding to the above points, it seems to me, is to attempt to use the following descriptive fix for “cat” (performed while pointing at particles arranged cat-wise): “‘cat’ is to name the possible kind of entity, of which the fusion of *those* particles would be an instance, were those particles to compose anything at all.” But notice that this descriptive fix makes absolutely essential use of the mereological vocabulary; and so if this is to work, the microphysical mereological nihilist will have to get some independent fix on mereological

## The instability of contingent nihilism

The microphysical mereological nihilist, I think, is committed to rejecting the following claim: *there are no cats, but there might have been cats*. This claim is reminiscent of a claim that the *contingent nihilist* must assert: *there are no compound objects, but there might have been*.

I think the broadly Kripkean reasoning that debars commitment from the first principle, generalizes to prevent the contingent nihilist from committing themselves to the latter. To make this case, we need to defend the relevant globalization conditionals, not with paradigmatically *natural* kinds, but what one might call *metaphysical* predicates such as ‘is a proper part of’. The *prima facie* case is relatively straightforward. For the mereological nihilist, all the usual ostensive characterizations of ‘proper part’ fail: when we give paradigmatic examples such as ‘my hand is a proper part of my body’, we speak falsely. Likewise, there is no way to get a descriptive fix on *actual world* instances of the relation: there are no such instances to be had.

IF we are to reject the relevant globalization conditional perhaps we should look to the kind of exceptions that may arise for artifactual kinds. Plausibly in such cases we can exploit putative necessary truths about, say, helicopters, in order to fix the intension of ‘is a helicopter’. Given appropriate answers to the special composition question, something similar might be proposed.<sup>23</sup> But it is part of the *contingent nihilist’s* position that the most likely source of such necessary truths—the special composition question—has no substantive answer.

There are, of course, many other routes one might explore. But none of them seem promising. For example, one might characterize the proper parthood relation as something that contains between large and smaller *possibilia* when they are co-located. But co-location without parthood seems eminently possible to me (this is discussed further below). Further, there may be possible worlds where alien perfectly natural relations obtain between larger and smaller objects iff the location of the first is a super-region of the second. This sort of relation does not thereby qualify as a parthood relation, simply by (in this sense) playing the parthood role.<sup>24</sup>

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vocabulary. I contend that this is impossible, and argue for this claim in the next subsection.

<sup>23</sup>Earlier, I mentioned non-nihilist views which still had actual world contain only microphysical simples. One such view entailed that, necessarily, things composed only when they were in contact; and then appealed to the (putative) empirical truth that in the actual world, nothing touches anything else. If this were the correct view, then perhaps we could fix the content of ‘proper part’ by description: by describing the algebraic structure of the parthood relation, and saying that, in any world, the relation obtains only when things are in contact.

<sup>24</sup>Consider the case of the word ‘identical to’, within the nihilistic world. As with parthood, our ordinary introduction of identity talk misfires, since we’re inclined to point to exemplars that don’t actually exist. However,

The situation therefore seems exactly parallel to the case of ‘cat’ and ‘dog’. There, we failed to find a reading (lightweight or heavyweight) on which ‘there are dogs’ is contingently false. Here, even for one initially sympathetic to contingent nihilism, there is no reading (lightweight or heavyweight) of ‘there are objects with proper parts’ which is contingently false.

I have argued, first, that for broadly Kripkean reasons, in the sense in which the microphysical mereological nihilist denies the existence of cats and dogs, she also denies their possibility. And, second, the same considerations mean that she not only denies the actual obtaining of proper parthood relations, but also the possibility of their obtaining. The above considerations, I believe, to shift the burden to one who would endorse microphysical mereological nihilism under the contingency conception.

### **That this result is not a pyrrhic victory**

I expect the following reaction to the above argument: that if it goes through at all, it is a merely ‘verbal’ or ‘shallow’ victory for the necessity of mereological nihilism. After all, Kripke concedes there can be creatures in other worlds that look like horses with horns, that the inhabitants, using language just as we do, truly call ‘unicorns’. Isn’t the claim that unicorns are impossible merely ‘verbal’, with the important point being that *there can be things that play the unicorn role*? Analogously, one might accept the points made above, while thinking that in other possible worlds there are relations between big things and smaller things, that the inhabitants truly call ‘composition’.<sup>25</sup> It is tempting to think that the existence of worlds where some such relations *play the composition role* is enough to capture the thought that nihilism is contingently true.<sup>26</sup> The purpose of this section is to make the case that the parallel does not go through: in an important sense, these other-worldly relations *do not* ‘play the composition role’.

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in this case, unlike the proper parthood relation, there are actual-world exemplars at the microphysical level that could in principle be picked out descriptively; and there are presumably necessary truths about the identity relation (e.g. Leibniz’s law) that we could in principle use to get descriptive fix that applies to any possible instance of the relation. This is not of course to give a full story about how one might pick out the identity relation in a nihilist world, but it does show that there are many more resources available there, than in the case of proper parthood. Thanks to Joseph Melia for pressing me on this.

<sup>25</sup>We should be able to describe such worlds just using quantification over objects and relations, and predicates of spatio-temporal location. And even the nihilist can truly speak of these.

<sup>26</sup>In the terminology of Chalmers (2002), Kripke at most establishes that there are no unicorns at any world *when we consider those worlds counterfactually*. But unicorns do exist at those same worlds *when we consider them as actual*. In Chalmers’ preferred terminology: the claim would be that non-nihilistic worlds are 1-possible even if they are 2-impossible. I doubt whether 1-possibility is all that significant, for the reasons sketched below.

Let us consider again the reason why the Kripkean unicorn result looks ‘shallow’. The other-worldly creatures *do absolutely everything that we could wish unicorns do*. A similar point goes through for Putnamian worlds where XYZ plays the watery role: XYZ discharges all the descriptive and theoretical roles there, that H<sub>2</sub>O plays here.

But there are a range of cases where this line of thought lapses. Consider a number of cases:

- Someone defends Humeanism about causation in the actual world, but allows that there are perfectly natural external relations at other worlds that relate *e* to *f* if and only if *f* stands to *e* in an appropriate relation of counterfactual dependence.<sup>27</sup>
- Someone defends physicalism about qualia, but allows that there is a world where a perfectly natural property *C* is instantiated by all and only things that are conscious.<sup>28</sup>
- Someone rejects the Lewisian analysis of possibility in terms of truth at concrete space-times, but holds that there are possible situations where there exists a plenitude of isolated space times, such that everything that is possibly true holds at some such space time.

In the dispute over the analysis of causality, *which* explanatory tasks are to be played by the relation of causation is part of what is at stake. The anti-Humean might take causal relations to *explain* counterfactual dependency; obviously, the Humean who identifies causation with counterfactual dependency cannot agree.

Sometimes, the believer in more parsimonious metaphysics may concede that the objects and relations her opponent believes in *would* afford additional explanatory power, were they to exist. She might think that the overall simplicity of her view is adequate compensation for its deficit in explanatory power in this respect. Alternatively, she will simply reject her opponent’s claim that explanatory work can be done by the additional ontology. This sort of Humean will profess to fail to understand how the mere obtaining, say, of a higher-order relation between the universals *F* and *G* could make it the case that whenever *x* is *F*, this will be followed by *x* being *G*.<sup>29</sup> Likewise, it would be perverse for one endorsing physicalism about qualia to think that there was something about “what it’s like” that *would* be explained, if only we could bring ourselves to believe in non-physical qualia.<sup>30</sup> I shall assume, in what follows, that part of what

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<sup>27</sup>Armstrong argues that the actual world meets this description in Armstrong (1983). Lewis argues that such worlds are merely possible in xx.

<sup>28</sup>Chalmers (1996) thinks that the actual world meets such a description. Stalnaker works within a framework that takes them to be merely possible in (2002).

<sup>29</sup>This, I take it, is what makes the debate around the ‘inference problem’ for Realists about causal laws so significant (van Fraassen, 1989, p.96).

<sup>30</sup>This is one of the things that Lewis (1988) is pushing when he presses the knowledge argument against *dualists* about conscious experience, as well as materialists.

has been argued for, in arguing for the truth of these parsimonious metaphysics for the *actual* world, is that the extra metaphysical resources would be explanatorily idle: all the explanatory tasks that can be done, are already achieved within the parsimonious setting.

The Humean, the physicalist about qualia, and the disbeliever in genuine modal realism, but they can concede that there are possible situations where the objects, properties, relations are arranged just as their opponent believes they *actually are*. But it would be crazy for either party to think these are worlds were the opponent ‘gets it right’. For the anti-Humean, for example, did not merely want a suitable arrangement of higher-order relations: she wanted those relations to *directly explanatory* counterfactual dependence. But the facts about counterfactual dependence in that world are presumably explained in the same way as facts about counterfactual dependence are done: the extra ontology at the world is explanatorily idle.

So those otherworldly bits of ontology do *not* do not *play the explanatory role* that true-believers think that causation, consciousness or possibilities play. In this sense, the additional bits of junk do not *deserve the name* ‘causation’, ‘consciousness’ or ‘possibility’.<sup>31</sup>

I contend that if mereological nihilism is true of the actual world, the same situation arises with *almost everything*. No otherworldly macroscopic object will *deserve the name* ‘dog’, ‘person’ or ‘mountain’ if nihilism is true at the actual world. Part of arguing for microphysical mereological nihilist will be to make the case that the explanatory role normally assigned to macroscopic entities is discharged by simples-arranged dog-wise, simples-arranged-person-wise, simples-arranged mountain-wise, and so on. And as before, at worlds containing macroscopic objects alongside the simples-arranged-person-wise, the latter still discharge all the relevant explanatory roles. It looks like the microphysical mereological nihilist *should* regard the macroscopic objects that exist at some worlds as just more explanatorily idle ontological junk, undeserving of titles such as ‘cat’. And *a fortiori*, the multigrade relation that in such worlds holds between the simples-arranged-person-wise does not play the explanatory role that the *non-nihilist* takes to be characteristic of the composition relation. So it is undeserving of the name ‘composition’.<sup>32</sup>

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<sup>31</sup>It is quite a different question whether or not agents in those possible situations would end up referring to these relations with the word ‘causation’. Getting a name is one thing: deserving it another.

<sup>32</sup>This argument is, I think, particular to the nihilist answer to a world-relative special composition question. Contrast the organicist van Inwagen (1990). One explanatory role for composition is in explaining how certain big objects (myself) can be partially co-located with little objects (e.g. quarks). So in a world where chair-like objects

There seemed a lacuna in the gunk-based argument against nihilism: if nihilism was merely contingently true, then the conclusion did not follow from the premises. On various projects, the *point* of asking the special composition question would be frustrated by a merely contingent answer. But asking world-relative special composition questions also seems a coherent project; and so the argument threatens to lapse in such settings.

However, there is reason to think that nihilism ‘globalizes’: that if nihilism is true at the actual world, then it is true at all worlds (at least considered counterfactually). And I have just argued that this is no verbal victory: if one is justified in believing nihilism holds of the actual world, one should take it to be true at all worlds both in letter and in spirit.

## 5 The impossibility defence

### The burdens incurred by rejecting the possibility of gunk

If contingent nihilism is uninteresting or unstable, then all *interesting* forms of mereological nihilism face a valid gunk-based argument. The remaining question is whether the nihilist must accept the premises. The only reasonable option she has is to reject the first premise: the possibility of gunk. Why shouldn’t she do this? After all, if the gunk-argument is valid, then so is one moving from nihilism (the denial of its conclusion) to the *impossibility of gunk* (denial of its first premise).<sup>33</sup>

Sider writes:

I find the possibility of gunk so compelling that I am willing to reject any theory that rules it out. (Sider, 1993)

But why should the nihilist follow Sider in breaking the stand-off in this way? I take it that Sider is expressing more than personal preferences here: that he is suggesting a *conceivability* argument for the possibility of gunk:

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are co-located with quarks, there a parallel an explanatory burden of explaining co-location. A relation can deserve the name ‘composition’ by discharging this function.

<sup>33</sup>It might be thought that with (2.5) in place, the mere *possibility* of nihilism allows us to run this argument. But in fact, I chose to formulate and defend (2.5) in terms of the *actual* truth of nihilism, not its truth at some possible world. This is because the idea that nihilism is contingently *false* does not seem susceptible to either of the worries I had about the claim that nihilism was contingently *true*. Thanks to Scott Shalkowski for discussion here.

- (1a) A world of infinite descent is conceivable;<sup>34</sup>
- (1b) A world of infinite descent is possible;
- (1c) A world of infinite descent is a gunk-world;
- (1) Therefore: some gunk-world is possible.

I take it that all parties will agree to the first premise of *this* argument.

Thinking about things this way helps explain why the gunk-based argument is so much more impressive than the an argument, identical in form and equally valid, that starts from the premise that a world containing complex objects is possible. Such an argument immediately strikes one as question-begging, whereas there seems to be ‘more to’ the gunk-based version. The relevant difference is that in the *latter* case, the nihilist has an obvious way of explaining *why* we find the (putatively) impossible scenario conceivable. For each description of a non-gunky world, the nihilist can provide a nihilist surrogate simply by eliminating any complex objects from the description. In the case of the actual world, the nihilist will say that micro-particles arranged chair-wise are enough to give us the illusion of genuine chairs. Just so, when we claim to be conceiving of talking donkeys, she will claim that we are merely imagining a scenario where there are micro-particles arranged talking-donkey-wise.

No such simple ‘explaining away’ is available in the case of the conceivable gunk-worlds. For eliminating all complex objects in a gunk-world is just to eliminate *all objects whatsoever*: and there is nothing left to explain the *illusion* that the world could be set up that way. This I take to be the heart of the challenge that the gunk-based argument generates for the nihilist.

I suggest we should accept the following principle:

**Illusions** If scenario *w* is conceivable, then either it is possible, or there is some genuinely possible world *w'* that is generating the *illusion* that *w* is possible.<sup>35</sup>

Granted this, then in rejecting the first premise of the argument, the nihilist must either reject (1c) (that the infinite descent world is gunky) or reject the move from (1a) to (1b) and incur the burden of *explaining the illusion that infinite descent worlds are possible*.

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<sup>34</sup>I intend this to be read in the sense that Chalmers (2002) terms *positive conceivability*: scenarios which we can (to speak loosely) ‘imagine being the case’. This is to be distinguished from *negative conceivability*, which means only that no incoherence follows from the postulation of such a world.

<sup>35</sup>This might need refinement in some of the ways canvassed in Chalmers (2002): the notion of conceivability, for example, might need to be what he calls *ideal, primary, positive* conceivability.



## Non-microphysicalist mereological nihilisms

In the remainder of this paper I undertake to show how the microphysical mereological nihilist can accommodate the illusion of gunk.<sup>36</sup> I contend that though the *mereological nihilist* aspect of microphysicalist mereological nihilism must be taken to be a necessary truth, the *microphysicalist* aspect is not.<sup>37</sup> The microphysical mereological atomist is committed to the claim that in the actual world, only quarks, bosons and leptons (say) exist, instantiating fundamental microphysical properties such as (say) spin, charge and charm. But she is free to think that worlds featuring non-physical *exotica* are possible. I recommend she claim that it is one (or some) of these non-microphysical nihilist world that are generating the illusion that gunk is possible.

The main burden in what follows, therefore, is to find one or more non-microphysicalist worlds containing only simples, that can be plausibly held responsible for the illusion of gunk.

## Emergence nihilism

The first non-microphysical nihilism that I consider is *emergence nihilism*. It involves *exotica* in the form of an abundance of simple objects, many of which are partially *co-located* with each other. The world, according to this nihilist, may contain table, chair and dog shaped and sized simples; and the table-like simples may share their location with four leg-shaped simples and a tabletop-shaped simple, as well as with many micro-particles.

To describe the actual world as the emergence-nihilist takes it to be, start by describing the actual world as a non-nihilist takes it to be. There is my body, which has arms and legs as parts, which in turn have respectively fingers and toes as parts. Ultimately, we have micro-particles such as quarks: the ultimate, simple parts of the body. Now excise from this description any mereological relations. There is my body, located in a certain place. In subregions of this place are arms and legs. In the respective sub-subregions we find fingers and toes. At the smallest

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<sup>36</sup>Strictly, I will argue that *either* infinite descent worlds are non-gunky, or they are gunky and the illusion that they are possible can be explained away.

<sup>37</sup>Thus Lewis (1983):

Materialism is meant to be a contingent thesis, a merit of our world that not all other worlds share. Two worlds can indeed differ without differing physically, if at least one of them is a world where Materialism is false. For instance, our Materialistic world differs from a nonmaterialistic worlds that is physically just like ours but that also contains physically epiphenomenal spirits.

sub-region at which objects are located we find quarks.

The emergence-nihilist takes this as a *complete* description of a possible world, at least insofar as the description of objects goes.<sup>38</sup> This is a world where every object is mereologically simple (no part-whole relations are mentioned in the complete description of this world). It is also a world where *mere* co-location of objects takes place.

Even if the actual world is not as the emergence-nihilist describes it, do we have any reason to think it impossible? One might insist that co-location of objects is always impossible (despite the apparent conceivability of ghosts and ectoplasm). Perhaps you think that co-location of *physical* objects is impossible (despite the fact that many find the idea that the statue and clay are co-located conceivable).<sup>39</sup> Perhaps you think that co-located *simples* are impossible (despite the fact that some claim to conceive—even endorse as actual— co-location of a simple Mind with the human body). Perhaps the most plausible way of resisting, however, is to insist that *mere* co-location is mysterious. Endorsing Leibniz-law arguments for the statue and the clay or a person and their body is often followed by postulating a *constitution-relation* holding between them.<sup>40</sup> And one might think that co-location without either whole-part relations or constitution relation is deeply mysterious.

I think the nihilist is perfectly entitled to stand her ground at this point. Conceivability arguments for gunk have been thrown at her all evening: now it is her turn. I find the idea of physical objects co-locating perfectly coherent. As I move my two hands around, I can conceive of them passing through one another.<sup>41</sup> I can conceive small things passing through my hand. I can conceive of small things remaining within my hand, and remaining in the same relative

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<sup>38</sup>We have yet to describe the properties those objects have, and any laws that govern their behaviour.

<sup>39</sup>Some take the statue and clay to be mereologically related (Thomson, 1998), on which view this is not a good precedent for me to invoke; but this is far from orthodoxy.

<sup>40</sup>Though I do not see that the reasons for postulating a constitution relation give us reason to think that it obtains *of necessity*. The kind of work we might want a constitution relation to do might be (a) to formulate law-like generalizations that make it less mysterious why the statue and clay should be so alike physically (have the same mass and shape, for example, and to move around the world together.(b) to allow us to formulate laws capturing the way physical bodies ‘compete for space’ in the world (Wiggins, 1968) (relevant laws forbidding interpenetration allow *exceptions* only in cases where one thing composes or constitutes another. (c) it allows the formulation of supervenience principles: e.g. the possession of aesthetic properties *or the existence of some constituted object possessing such-and-such aesthetic properties* supervenes on possessing such-and-such microphysical properties. Without the second clause, statue-lump-of-clay pairs would provide simple counterexamples to such supervenience, since they share microphysical properties but one possesses aesthetic properties the other fails to have. Thanks to Nikk Effingham and Ross Cameron for discussion.

<sup>41</sup>Perhaps this could only happen if they were not *physical bodies*, if it is definitive of physical bodies that they resist interpenetration. So be it: the world which I am conceiving may not contain physical bodies in this sense.

location as I move around the world. I can conceive of a swarm of small things that remain co-located with my hand as I wave it around. I take it that such scenarios are incompatible with actual laws of nature: but if they are being claimed to be impossible, I want to see positive arguments and an explanation of the illusion of possibility that I am suffering.

Let us continue, therefore, to describe the world as the emergence-nihilist takes it to be. The next question concerns what and where (natural) *properties* are instantiated.

The emergence-nihilist's version of the actual world will contain simples corresponding to quarks, leptons and bosons. Presumably they will instantiate the familiar microphysical properties. What of the larger simples: those shaped like atoms, molecules, dogs and cats? One option is to deny that these larger entities have anything except locational properties. They would then automatically gain certain *extrinsic* properties such as *being co-located with two up and one down quarks, appropriately bonded*. And perhaps the emergence-nihilist should put this extrinsic property forward as a candidate for what 'is a proton' expresses in the mouths of the inhabitants of the emergence-nihilism world.

For our purposes, however, it will be better to develop emergence-nihilism in a different way. Let us agree that the quark-simples instantiate intrinsic natural properties (spin, charm, mass, etc). There is nothing to stop the bigger simples—proton-simples and neutron-simples, say— instantiating intrinsic natural properties as well. Let us suppose they do: call these properties proton-hood and neutron-hood respectively. Going up the scale, perhaps the big simple that is located where I think my right-hand is instantiates a perfectly natural (alien) property. This property may deserve the name *hand-hood*.<sup>42</sup>

The world as the emergence-nihilist describes it appears to contain a lot of ontological junk.<sup>43</sup> Her world may be extravagant in comparison to the microphysicalist nihilist: but at least hers is 'ontological junk' that gives the appearance of *order*. We can develop this thought further. There are regularities in the emergence-nihilist's world that we can pick out and formulate: for example, wherever you find three entities each instantiating appropriate quark-level

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<sup>42</sup>In my (Williams, 2007) I appeal to *emergent* universals at an analogous stage. Ontologically emergent properties may be defined as those that *mereologically complex* entities instantiate, that do not supervene on the properties instantiated by the parts of those entities. The properties I am here describing are not emergent properties in this sense: though instantiated at a macro-level, they are of course only ever possessed by simples. One might call the properties invoked here 'pseudo-emergent'.

<sup>43</sup>On the upside, at least she doesn't need to deny the existence of hands, chairs, tables and people, as the microphysicalist mereological nihilist does.

properties and bonded together, there will be, co-located with them, a bigger entity instantiating proton-hood. Indeed, the emergence-nihilist can argue that these regularities are *nomologically necessary*, by the lights of the laws obtaining in that world. For example, on a Humean view of what it takes to be a law of nature, exceptionless regularities of this kind will suffice to make it the link between specific constellations of quark-level properties and proton-hood into a law of nature. On a Armstrongian realist account, there would need to be higher-level universals linking quark-level properties to proton-level ones; but there seems no in-principle obstacle to there being worlds where such law-making states of affairs obtain, backing synchronic cross-layer laws.<sup>44</sup>

Let us note that the emergence-nihilist can comfortably account for the world of infinite descent. On her view, there genuinely are infinitely many layers of smaller and smaller particles: it is just that each layer consists of simple objects, held in nomological relations to higher and lower levels. The world of infinite descent is not a gunk world: she rejects (1c) in the conceivability argument for the possibility of gunk.

One might respond by building into the description of the world of infinite descent that composition relations hold between protons, quarks and sub-quarks, etc. No matter: though what the emergence nihilist provides does not then count as a world of infinite descent, the existence of such a ‘pseudo infinite descent’ world can still account for the illusion that such worlds are possible: we should then reject the move from (1a) (the conceivability of infinite descent) to (1b) (the possibility of infinite descent). Either way, the gunk-based argument against emergence-nihilism will fail. This kind of nihilist can deny that gunk is possible while accommodating the *illusion* that gunk is possible.

The failure of the gunk-based argument against emergence-nihilism means that the argument also fails against microphysical nihilism. There is no reason why the microphysical mereological nihilism should not regard the worlds the emergence-nihilist describes actual as non-actual but possible. To be sure, microphysicalism fails radically at such worlds; but that is no objection to it as a *mere possibility* for a microphysical mereological nihilist who takes the standard line

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<sup>44</sup>Maybe there are no strict regularities available at more macroscopic levels. If that’s a worry, then we might cut off the flow of bigger simples at a level where regularities can still plausibly be formulated: at the level of organic chemistry, for example. Some of the attractions of the emergence-nihilists view will then diminish, but the possibility of this kind of world will still serve the narrow purposes of this paper, in allowing for nihilistic illusions of gunk.

that microphysicalism is a contingent thesis.

## 6 Conclusion

Once one has seen the basic pattern of resistance to the gunk-based argument, there are many ways of filling in the details. The essential thing is to see that so long as the microphysicalist nihilist regards *microphysicalism* as contingent, she need not deny the possibility of nihilist worlds containing exotica. And unlike worlds where microphysical nihilism is true, worlds where other forms of nihilism hold *can* accommodate something that at least ‘saves the appearances’ of infinite descent, and so suffices to account for the conceivability of infinite descent. The nihilist can in good conscience reject the first premise of the gunk-based argument.

I think that appeal to emergence-nihilism worlds as metaphysical possibilities is a particularly attractive option here. I see no reason to doubt the possibility of mere co-location; and can even imagine the emergence nihilist’s world-view finding defenders. But if one had qualms about particular features of the emergence-nihilist’s position, various other options are open. A different kind of nihilist world is that of the Spinozian ‘absolutist’, who maintains that there the actual world contains one big simple. The key to defending this as a metaphysical possibility is to explain how simples could be *inhomogenous* (e.g. *being chair-like in location R, and table-like in region R*). But philosophers have explored the idea of taking *irreducible distribution properties* as primitive elements of one’s metaphysic.<sup>45</sup> Instead of possible co-location and emergence-nihilism, then, one could appeal to primitive distributional properties and the possibility of absolutist-worlds where a simple the size of space-time itself instantiates a distributional property depicting an infinitely descending series of smaller and smaller particles.<sup>46</sup>

Perhaps there are further forms of (non-microphysical) mereological nihilism compatible with the appearance of infinite descent; the microphysical mereological nihilist need only main-

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<sup>45</sup>For extended discussion of distributional properties, see Parsons (2004). Parsons (2000) argues that appeal to primitive distributional properties are the best way to make sense of endurantism within an eternalist metaphysic. Parsons (2003) discusses the ‘monist’ or ‘absolutist’ word-view, arguing that it is possible but non-actual.

<sup>46</sup>Just as the microphysicalist mereological nihilist may appeal to ‘fictions of composition’ to explain the assertibility of ordinary talk, so the absolutist can appeal to ‘fictions of division’ to explain correctness conditions.

Fictions of division may be useful to the microphysical nihilist too. If the micro-particles that she believes exist turn out to be larger than point-sized, fictions of division will enable her to ‘talk the talk’ with those who believe that objects divide *arbitrarily* into parts.

tain that one among them describes a possible way the world could be. This possibility will then allow one to explain the illusion that gunk is possible while denying the possibility of gunk. I have urged that the world of emergence-nihilist already achieves this end. I conclude, therefore, that there is no good gunk-based argument against microphysical mereological nihilism.

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