



Pluralisms in gunky worlds

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Abstract

The possibility of gunk has famously been used by Schaffer (Philos Rev 119:31-76, 2010) to argue in favour of priority monism. In this paper, we present and explore different principled ways of being a priority pluralist in gunky worlds, thus weakening, if not deflecting, the gunk threat to pluralism.

Keywords Gunk · Monism · Pluralism · Middleism · Fundamentality · Priority

Priority pluralism is the view that there is more than one concrete basic entity (Schaffer (2010)). One particular version of priority pluralism —one which some philosophers would find particularly appealing (see Bernstein (2021), and Inman (2017))— is *middleism*. Middleists believe that neither the minimal level of atoms, nor the maximal level of the universe, is the fundamental one. Rather, fundamentality stands in the middle, at some mereologically intermediate and middle-sized level, i.e. that of the ordinary objects that populate our everyday life.¹

A powerful argument against priority pluralism (and hence middleism) is the argument from gunk, whereby the possibility of gunk is argued to entail that the only principled choice is to claim that the maximal level is fundamental (Brzozowski (2016); Schaffer (2010, 2018); Tallant (2013); Trogdon (2017)).

¹ More carefully, one should distinguish two versions of middleism, i.e. one pertaining to size and the other pertaining to the mereological structure. According to the former, the fundamental things have a somewhat middle size, while according to the latter, the fundamental things are mereologically intermediate, that is, neither mereological atoms, nor the ultimate, all encompassing, mereological sum. Note that strictly speaking the two are logically independent. Naturally, the sum of two mereological atoms might not be middle-sized. In what follows, we shall focus mainly on the mereological version, unless specified otherwise.

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In this paper, we present and explore different principled ways of being a pluralist in gunky worlds. They can help providing new ways to weaken if not deflect the gunk threat to pluralism. We should be clear upfront. The aim of the paper is *exploratory*: we want to explore different forms of pluralism (and to a less extent, middleism). It is not our aim to defend, let alone endorse, any particular form. Indeed, it is not our aim to defend pluralism or middleism at all. We leave it to the reader to decide for themselves whether these forms are better than their monistic alternative.

The rest of the paper is structured as follows. After formal preliminaries (§1) we first distinguish different kinds of *gunky worlds* (§2). Then, we review the gunk argument against pluralism (§3). Moreover (§4 and §5), we argue that the argument in §3 is sensitive to the distinctions in §2. Indeed, we go on to show that, once we have such distinctions in place, there are different principled ways for a pluralist to resist the gunk argument. Some such ways turn out to be versions of middleism. In the light of this, we also briefly review the literature on middleism (and in particular Bernstein (2021), and Inman (2017)), arguing that the versions we describe benefit from the arguments usually mentioned in favour of it, but also offer the resources to reply to some objections. A brief conclusion (§6) follows.

1 Formal preliminaries

In the rest of the paper we'll make use of a particular formal framework. First, we adopt classical first order plural logic with identity. Double signs such as e.g., xx stand for plural terms (variables and constants). We assume standard principles of plural logic such as the *Extensionality* and the *Plural Comprehension* principles. According to the first, sameness of membership is sufficient for identity, whereas according to the second, if there is at least an F , there is a plurality xx such that some y is a member of it iff $F(y)$. Thus, for any (satisfied) open formula $F(x)$, there is one corresponding plurality, *the* plurality of things that satisfy the formula.

We will then assume a somewhat orthodox mereological background. In particular we will take parthood (\sqsubseteq) to be a *partial order* that obeys the so-called Strong Supplementation principle.² We will not assume any fusion principle. In particular we do not assume *unrestricted composition*. Unrestricted composition is an axiom in what is known as *Classical Mereology*—that e.g., Schaffer explicitly endorses. Interestingly, models of classical mereology contain a “top element” (the universe) but need not contain “bottom” elements (atoms). It is exactly this asymmetry that Schaffer's original gunk argument exploits—as we shall see in some detail. In this paper, we set to go beyond that original argument and therefore we will consider models in which there is no such asymmetry. There are two main reasons behind our choice. First, the contemporary literature in mereology in general, and about the gunk argument in particular, has explored models in which unrestricted composition

² For an introduction to different mereological systems see Cotnoir and Varzi (2021). We will assume basic “mereological knowledge”.

fails—and we will follow suit.³ Second, unrestricted composition entails the existence of the universe, as we briefly noted. And, as we will argue, this actually conflates different notions of “gunky world” in that it renders them extensionally equivalent.

The mereological background we assumed guarantees that, when they exist, fusions are unique. Standard definitions of other mereological notions are then used. In particular:

- PROPER PARTHOOD: $x \sqsubset y \equiv x \sqsubseteq y \wedge x \neq y$
- PROPER EXTENSION: $x \sqsupset y \equiv y \sqsubset x$
- OVERLAP: $x \circ y \equiv \exists z(z \sqsubseteq x \wedge z \sqsubseteq y)$
- FUSION: $F_{\phi}z \equiv \forall x(\phi(x) \rightarrow x \sqsubseteq z) \wedge \forall y(y \sqsubseteq z \rightarrow \exists x(\phi(x) \wedge x \circ y))$
- PLURAL REMAINDER $xx = yy \ominus zz \equiv \forall x(x < xx \rightarrow x < yy \wedge \neg \exists z(z < zz \wedge x \circ z))$

The last definition is not as familiar as the other ones so it is worth to spend a few words on it. It says that the xx are the plural remainder of the zz with respect to the yy iff every member of the xx is a member of the yy that does not overlap any of the zz . Given uniqueness of fusion we can define a general fusion operator:

GENERAL	FUSION	OPERATOR:
$\sigma_x(\phi(x)) \equiv \iota z \forall x(\phi(x) \rightarrow x \sqsubseteq z) \wedge \forall y(y \sqsubseteq z \rightarrow \exists x(\phi(x) \wedge x \circ y))$		

We could then define binary fusion as:

$$\text{BINARY FUSION: } x \oplus y = \sigma z(z \sqsubseteq x \vee z \sqsubseteq y)$$

Next, we can define the universe as the sum of all concrete objects—where C is the primitive predicate of “being concrete”⁴:

$$\text{UNIVERSE: } u = \sigma x(C(x))$$

In the following we will sometimes omit the $C(x)$ conjunct. However, the reader should remember that such a restriction to concrete objects is always in place, even if not explicitly noted. Finally, we can also define a notion of singular remainder—with respect to a given plurality—as the fusion of the PLURAL REMAINDER—with respect to the same plurality. Let $PR(x)$ be the formula corresponding to the plurality defined in PLURAL REMAINDER, that is, x is a member of PLURAL REMAINDER. Then:

³ See e.g., Tallant (2013); Trogon (2017), Kitamura (2016).

⁴ This departs slightly from current literature. For instance, Schaffer (2010) actually defines C as being part of u . But if one defines u as the unrestricted mereological maximal element there is no guarantee that only concrete objects end up being part of u . We will also discuss possible worlds in which there is no universe. In such worlds, according to Schaffer’s definition there would not be any concrete entities. Hence our choice to stick with a primitive notion.

SINGULAR REMAINDER: $r = \sigma x(PR(x))$

It is now time to introduce the notion that occupies the center stage in the paper, that of *gunk*. The term “gunk” was introduced in Lewis (1991: 20). Something is *gunky* (G) iff its parts have further proper parts:

GUNK: $G(x) \equiv \forall y(y \sqsubset x \rightarrow \exists z(z \sqsubset y))$

For reasons that will be clear shortly, it is interesting to focus on gunky *worlds* rather than gunky objects. Worlds are here understood as the *totality* of concrete objects, that is, as the plurality of all concrete objects.

2 Varieties of gunky worlds

We can distinguish at least three kinds of *gunky worlds*—where gunky is defined as in §1:

GUNKY₁: A world w is gunky₁ iff there is at least one concrete gunky object at w .

GUNKY₂: A world w is gunky₂ iff every concrete object at w is a gunky object.

GUNKY₃: A world w is gunky₃ iff there is the universe at w and it is gunky.

We formulated the distinctions in such a way that, *given the formal background in §1*, every upstream entailment holds, whereas no downstream entailment does. That is to say that, abusing notation, the following hold:

- (i) GUNKY₃ \rightarrow GUNKY₂ \rightarrow GUNKY₁
- (ii) GUNKY₁ \nrightarrow GUNKY₂ \nrightarrow GUNKY₃

It is indeed a substantive and interesting question which mereological principles need to be added to our mereology to ensure the downstream entailments. Although this goes beyond the scope of the paper, we will consider some principles ourselves. It is important to provide an argument in favor of the failure of the downstream entailments in (ii). To do that, we need to be reminded of the notion of an atom. An *atom* is something that does not have proper parts:

ATOM: $A(x) \equiv \neg \exists y(y \sqsubset x)$

Consider first a world w_1 such that it contains an atom a and a gunk object g , and nothing else—Fig 1. w_1 is a GUNKY₁ world which is neither a GUNKY₂ world, nor a GUNKY₃ world.

Interestingly enough, we could tweak the model slightly and consider a world w_2 where there is the universe u , that is there is $u = a \oplus g$ —Fig 2. The existence of u does not change things when it comes to gunk: w_2 is GUNKY₁ but neither GUNKY₂ nor GUNKY₃. The reason why the worlds w_1 and w_2 are not GUNKY₃ is however slightly

different in the two cases: in the first there is no universe, in the second, there is the universe u but u is not gunky, for it has an atomic part.

We have thus shown how GUNKY₁ implies neither GUNKY₂ nor GUNKY₃. Now we show that GUNKY₂ does not imply GUNKY₃ either. Consider a world w_3 such that there are two gunky objects at w_3 , g_1 and g_2 , and nothing else, in particular no universe $u = g_1 \oplus g_2$. w_3 is GUNKY₂, and therefore GUNKY₁, but not GUNKY₃—Fig. 3. Indeed the gunky objects g_1 and g_2 in w_3 qualify as *coatoms* in the terminology of (Cotnoir and Varzi (2021): 221). A *coatom* (CoA) is something that does not have proper extensions:

$$\text{COATOM: } CoA(x) \equiv \neg\exists y(y \sqsubset x)$$

It can be proven that if the universe at a world w exists, it is the unique coatom at w ⁵:

$$\text{UNIVERSE ONLY COATOM } \exists x(x = u) \rightarrow CoA(u) \wedge \forall y(CoA(y) \rightarrow y = u)$$

The result above entails that, if there is a universe at w , then if w is GUNKY₂, it is also GUNKY₃:

$$\text{GUNKY}_2 \ \& \ \text{GUNKY}_3: \text{ If there is the universe } u \text{ at } w \text{ and } w \text{ is GUNKY}_2, \text{ then } w \text{ is GUNKY}_3.$$

Consider now the already mentioned unrestricted composition principle:

$$\text{UNRESTRICTED COMPOSITION: } \exists x(\phi(x)) \rightarrow \exists z(F_\phi z)$$

It entails the existence of the universe. Thus, the conjunction of GUNKY₂ & GUNKY₃ and unrestricted composition yields that GUNKY₂ and GUNKY₃ are extensionally equivalent. That is, GUNKY₂ ↔ GUNKY₃ becomes provable. This is the reason why we insisted that particular mereological frameworks collapse salient distinctions.

3 The gunk argument against pluralism

The Gunk Argument was first put forward in Schaffer (2010). Let us remind (briefly) the reader of the broader context. According to Schaffer, Priority Monism and Priority Pluralism are exclusive and exhaustive answers to the question of fundamental mereology⁶: which concrete objects are fundamental? We will mostly follow Schaffer’s own phrasing of the debate, if not in the letter, at least in the spirit. We need only add a new primitive predicate “ x depends on y ” ($x \triangleleft y$). It is assumed that \triangleleft

⁵ Proofs are left to the reader.

⁶ Priority Monism and Pluralism contrast with Existence Monism and Pluralism—see Schaffer (2010, 2018).

Fig. 1 A GUNKY₁ world that is neither GUNKY₂ nor GUNKY₃ —without *u*

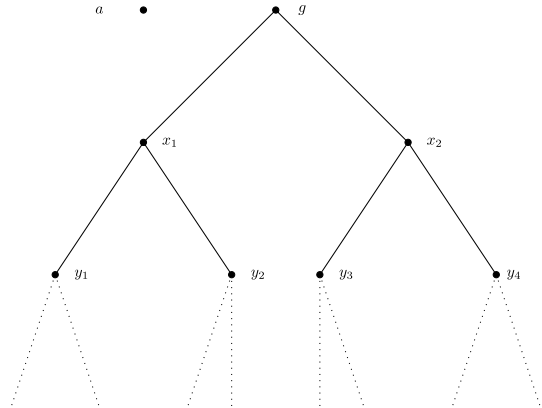
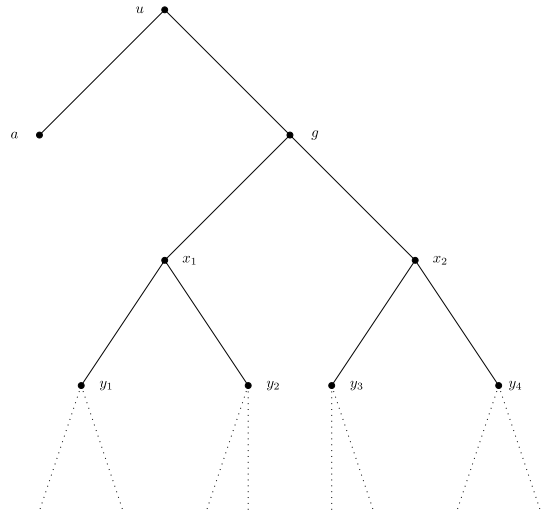


Fig. 2 A GUNKY₁ world that is neither GUNKY₂ nor GUNKY₃ —with *u*



induces a *well-founded strict partial order* over the domain of concrete objects. Then we can introduce the following:

- ABSOLUTE FUNDAMENTALITY (F)⁷: $F(x) \equiv C(x) \wedge \neg \exists y(C(y) \wedge x \triangleleft y)$
- RELATIVE FUNDAMENTALITY (i.e., “more fundamental than”, $<_F$): $x \triangleleft y \rightarrow x <_F y$
- PRIORITY MONISM: $\exists x(F(x)) \wedge \forall y(F(y) \rightarrow x = y)$
- PRIORITY PLURALISM: $\exists x \exists y(F(x) \wedge F(y) \wedge x \neq y)$

In plain English, dependence tracks relative fundamentality in that if x depends on y , x is less fundamental than y . Relatedly, absolute fundamentality boils down to

⁷ Here we mention the conjunct $C(x)$ explicitly because it simplifies the following definitions.

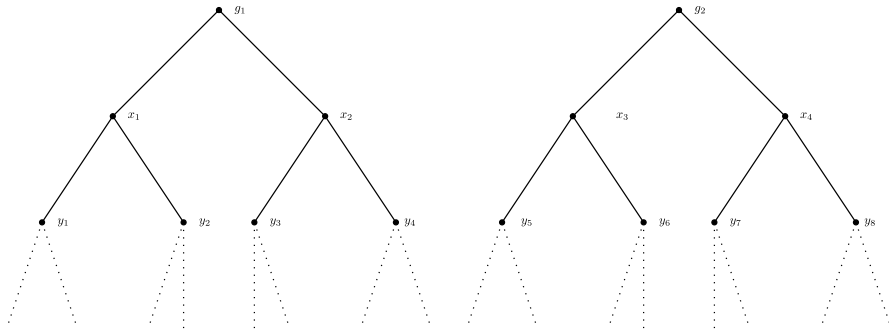


Fig. 3 A GUNKY₂ world that is not GUNKY₃

independence.⁸ Priority Monism is the view that the universe is the only fundamental concrete object, whereas Priority Pluralism is the view that there are at least two distinct concrete fundamental objects. Schaffer claims that these are *exhaustive* and *exclusive* answers to the question of fundamental mereology because he takes every answer to such question to be constrained by the conjunction of the following:

$$\begin{aligned} \text{COVERING: } & \sigma x(F(x)) = u \\ \text{NO OVERLAP: } & F(x) \wedge F(y) \wedge x \neq y \rightarrow \neg x \circ y \end{aligned}$$

Schaffer calls the conjunction of COVERING (The fusion of fundamental things is the universe) and NO OVERLAP (No two fundamental things overlap), the *Tiling Constraint*.⁹ It follows from the Tiling Constraint that if the universe is fundamental nothing else is. Indeed, PRIORITY MONISM turns out to be equivalent to $F(u)$. Conversely, if something distinct from the universe is fundamental, then the universe is not fundamental. We are now ready to review the argument.

The argument, in a nutshell, is the following. Suppose that gunky worlds are possible. The pluralist owes us an account of which objects are fundamental at those worlds. And all the options are problematic. Here they are¹⁰

NO FUNDAMENTALIA: Gunky worlds do not have any fundamental objects. Indeed, they display infinite non well-founded chains of dependence tracking only relative fundamentality.

DISJUNCTIVISM: One can hold a disjunctive answer to the question of fundamental mereology. That is: Pluralism holds at “atomistic worlds”—more on this notion shortly—whereas Monism holds at gunky worlds.

INTERMEDIATE: A particular subset of composite objects is fundamental at gunky worlds, rather than the sole universe. Note that this represents exactly

⁸ Note that ABSOLUTE FUNDAMENTALITY is a *definition*, whereas RELATIVE FUNDAMENTALITY is only a (tracking) principle. Thus it falls short of providing a *definition* of the notion of relative fundamentality.

⁹ For some reservation on the Tiling Constraint see Leunberger (2022).

¹⁰ These are the options originally surveyed e.g., in Schaffer (2010). Brzozowski (2016) envisage another option, namely to maintain that every object is fundamental in gunky worlds. This will run afoul of the NO OVERLAP: conjunct of the *Tiling Constraint*. Here, we will focus on Schaffer’s original options.

a version of *middleism* as we introduced it in §1—at least in its *mereological variant*.

The problem with No FUNDAMENTALIA is that it runs afoul of the well-foundedness of Δ .DISJUNCTIVISM is, to use Schaffer's own phrase, *objectionably disunified*:

At the very least, it seems a cost of this disjunctive treatment (one not incurred by Monism) that it cannot give a unified treatment of gunky and atomistic scenarios Schaffer (2010: 63).

Finally, INTERMEDIATE seems to be vulnerable to an *arbitrariness* objection. Let us quote Schaffer again:

Finally, the pluralist might reject Atomism, maintaining that what is basic is mereologically intermediate. But this seems objectionably arbitrary, especially in cases where there is no natural joint in the mereological structure ((Schaffer, 2010): 63).

Brzozowski (2016) makes the same point with respect to INTERMEDIATE:

However, such a view appears to be highly unattractive as it both seems wholly arbitrary that one intermediate level of the compositional hierarchy rather than another would be fundamental and once the pluralist accepts that some composite objects are fundamental and their parts derived, it's hard to see why or how they would resist moving all the way up the compositional hierarchy to a monist metaphysics ((Brzozowski, 2016): 62).

In the light of the above, Schaffer concludes that pluralists need to be Atomists. That is,

PLURALISM-ATOMISM: If Pluralism is true, then Atomism is true—Schaffer (2010: 64).

where Atomism is the claim that all fundamental objects are atomic:

ATOMISM: $\forall x(F(x) \rightarrow A(x))$

Schaffer takes the possibility of gunk to refute Pluralism because he maintains that if Atomism is true, it is necessarily true. And the discussion above shows that it is at least possibly false, for it is false at gunky worlds.

For the sake of argument we conceded well-foundedness, so we will not take issue with No FUNDAMENTALIA. By contrast, we will discuss DISJUNCTIVISM and INTERMEDIATE both in more general terms, and in particular gunky scenarios. For reasons that will be obvious in due course, we'll start from the latter.

4 How to be a pluralist in gunky worlds

The distinction between different gunky worlds we drew in §2 is absent from the literature—even though Schaffer himself is aware there are different kinds of gunky worlds. We want to investigate how this impacts the gunk argument we just discussed. In this and the next section we will argue that (i) it provides a new twist on DISJUNCTIVISM; (ii) it undermines PLURALISM-ATOMISM, (iii) it opens up the viability of virtually unexplored strategies available to the pluralist to resist the *arbitrariness* objection, and (iv) relatedly, suggests a more nuanced attitude towards INTERMEDIATE. The discussion will also reveal some shortcomings of Monism that went unnoticed. As we said already, the main aim of the paper is exploratory. We don't want to defend Pluralism. Nor do we want to criticize Monism. We are going to suggest different ways in which one can be a pluralist in (different) gunky worlds. We are *not* claiming that these ways are in the end better than the monistic alternative. This, we believe, should be assessed on independent grounds. What we are claiming however is that, contrary to widespread agreement, there are neglected strategies that the pluralist can pursue to account for the fundamental mereological structure of gunky worlds.

4.1 Gunky₁ worlds and pluralism₁

Let us start with GUNKY₁ worlds. Indeed, we can start looking at Fig. 1/2. Upon inspection, there seems to be an obvious choice for the pluralist in such a world. That is, the pluralist should take $\{a, g\}$ as the plurality of fundamental objects. This entails that e.g., sometimes—the direction of dependence and relative fundamentality goes from parts to whole—e.g., from a and g to u —and sometimes from whole to parts—e.g., from g to $x_1, x_2, (\dots), y_4, (\dots)$. This is not, on its own, a problem. Indeed Schaffer himself allows for wholes that depend on their parts—see Schaffer (2010: 44).¹¹ Clearly, this is but an example. The pluralist should generalize from it, and maintain the following:

PLURALISM₁: In any world w that is GUNKY₁ but not GUNKY_{2/3} the pluralist should countenance the following as the plurality of fundamental objects: the plurality S containing *all* the atoms at w , and their plural mereological remainder with respect to the plurality of concrete objects.¹²

Nothing in our mereology guarantees that there is the *singular* remainder.¹³ Whether there is such a singular remainder makes a difference with respect to the Tiling

¹¹ This has generated some discussion in the literature. See e.g., Benocci (2017), Calosi (2020), Steinberg (2015), and Schaffer (2018).

¹² Note that the existence of the plural remainder is guaranteed by the assumption that there is at least a gunky object and Plural Comprehension.

¹³ In effect, without any fusion axiom neither the universe nor the singular remainder are guaranteed to exist. We will shortly discuss some principles that would entail their existence.

Constraint. If there is no singular remainder the No OVERLAP condition fails.¹⁴ By contrast, if there is a singular remainder that condition is indeed met. In both cases the COVERING condition turns out to be satisfied.

Given the violation of the No OVERLAP, Schaffer himself would arguably find the proposal objectionable. And so would anyone who imposes the Tiling Constraint as a condition of adequacy on all views. That being said, recent literature has challenged, either explicitly or implicitly, the Tiling Constraint. For example, Leunberger (2020: 2662) argues that the two conditions that make up the *Tiling Constraint* are motivated by different and independent notions of fundamentality, namely that *fundamentalia* are independent and that *fundamentalia* are the things everything else depend on. These two notions need not coincide. In effect, they can also diverge. Another example can be found in Calosi (2017), where it is argued that submergence is metaphysically possible. Arguably if both submergent and emergent properties are possible the Tiling Constraint would need to go. In the spirit of broadening Schaffer's original setting, we will also consider scenarios that violate the Tiling Constraint, albeit flagging it whenever they do.

Naturally, if one were to endorse UNRESTRICTED COMPOSITION then the singular remainder would be guaranteed to exist. Pluralists could then replace the plural remainder with the singular remainder in their chosen fundamental plurality so as to satisfy the No OVERLAP constraint. The endorsement of UNRESTRICTED COMPOSITION would rule out some of the models we shall discuss. In particular, it will rule out *junky* models and models with *more than one co-atom*. These models are exactly the ones that would spell trouble for the monist because, as we will argue, there is no universe in such models. Interestingly enough, there is a composition principle that is weaker than UNRESTRICTED COMPOSITION that would guarantee the existence of the singular remainder, and would not rule those models out. This is a plural counterpart, so to speak, of Contoir and Varzi (2021)'s REMINDER. Let us call it REMINDER*. In order to formulate it precisely, we first need to define the notion of the *xx*'s being a sub-plurality of the *yy*, defined as follows:

$$\text{SUB-PLURALITY: } \forall x(x < xx \rightarrow < yy)$$

Then REMINDER* would be:

$$\text{REMAINDER}^3: \neg xx < yy \rightarrow \exists w \forall z(z \sqsubseteq w \leftrightarrow z < yy \wedge \neg z \circ xx)$$

—where $\neg x \circ xx \equiv \forall y(y < xx \rightarrow \neg x \circ y)$. In plain English and very roughly, REMINDER* dictates that if something is not a subplurality of a given plurality, there is a singular mereological remainder (with respect to that plurality). This principle might give the pluralist both (i) the possibility to satisfy the No OVERLAP constraint and (ii) the possibility to retain mereological models without the universe—the ones the monist cannot account for.

¹⁴ In effect, every time there is only the plural remainder but not the singular remainder, there is no guarantee that the No OVERLAP constraint is satisfied.

PLURALISM₁ entails, in GUNKY₁ worlds, that at least one fundamental object is mereologically intermediate.

We are now going to argue that PLURALISM₁ does not fall prey to the objections of arbitrariness and disunity that Schaffer moves against pluralism. This is because what PLURALISM₁ recognizes as fundamental is not a mereologically arbitrary level of reality. Quite the opposite, the intermediate objects that are thus recognized as fundamental partly constitute—to use Schaffer’s own terminology—a “natural joint in the mereological structure” of the relevant world. What about the other “objection”, DISJUNCTIVISM? Well, this can be avoided too. Indeed, PLURALISM₁ is a more general strategy than ATOMISM, in that it has ATOMISM as a special case. To see this consider the following ATOMICITY axiom, to the point that everything is ultimately made up of atoms:

$$\text{ATOMICITY: } \forall x \exists y (A(y) \wedge y \sqsubseteq x)$$

In the presence of ATOMICITY one can prove that ATOMISM and PLURALISM₁ are equivalent:

$$\text{PLURALISM}_1\text{-ATOMISM: } \text{ATOMICITY} \rightarrow (\text{PLURALISM}_1 \leftrightarrow \text{ATOMISM})$$

This is important. It shows that pluralists are free to endorse PLURALISM₁ rather than ATOMISM. If the world is atomistic in the sense that it is a model of ATOMICITY, PLURALISM₁ boils down to ATOMISM. But if the world in question is not such a world, ATOMISM is not available. By contrast, PLURALISM₁ is. Schaffer writes:

As a second option, the pluralist might go disjunctive, maintaining Atomism as a thesis about what is fundamental at the actual world, while upholding a different—and perhaps even monistic—view of what is fundamental at gunky and *mixed worlds* ((Schaffer, 2010): 62–63, italics added).

We read this as Schaffer recognizing—albeit implicitly—a distinction between GUNKY₁ worlds (his “mixed” worlds) and GUNKY₃ worlds. But, as we argued, there is no need for the pluralist to go disjunctive if the choice is between atomistic and GUNKY₁ worlds. She can stick to PLURALISM₁.¹⁵ Furthermore, the argument above also undermines PLURALISM-ATOMISM.

4.2 Gunky₂ worlds and pluralism₂

Let us consider GUNKY₂ worlds next—GUNKY₂ worlds that are not GUNKY₃ that is. In this case as well, just by looking at Fig. 3, there seems to be an obvious choice when it comes to identifying a fundamental level of reality. The pluralist should take the plurality of fundamental objects to be $\{g_1, g_2\}$. Indeed, pluralism seems to be the

¹⁵ In effect, one may insist that, according to our best descriptions of the world, it seems that it is at most a GUNKY₁ world. Our best descriptions of the world—the best physical theories of the world—do in fact all contain, at least at first sight, concrete atoms, namely spacetime points.

only choice for the fundamental structure of the world depicted in Fig. 3. There simply is no universe there. Note that this is just one part of the story. Sure, Monism has no chance in the world depicted in Fig. 3, but the pluralist needs to provide us with a general, non arbitrary choice for the fundamental objects of the world. Generalizing from the example above we can suggest the following:

PLURALISM₂: In any world w that is GUNKY₂ but not GUNKY₃ the pluralist should countenance the following as the plurality of fundamental objects: the plurality S containing *all* the coatoms at w , and their plural mereological remainder.

Once again, this does not seem vulnerable to the *arbitrariness* objection. It explicitly recognizes joints in the mereological structure of GUNKY₂ worlds. That said, we will come back to whether it is a version of INTERMEDIATE in the next section.

What about GUNKY₂ worlds that have no coatoms? Then PLURALISM₂ delivers that every concrete object is fundamental—massively violating the No Overlap condition of the Tiling Constraint. It also entails that the tracking principle RELATIVE FUNDAMENTALITY is violated. Two things should be then noted. First, the strategy that we are going to discuss next would work also in worlds that are GUNKY₂. Second, note that this is really not the kind of world that the monist can use in an argument against pluralism. If there are *no* coatoms, there is no universe. And monists cannot account for such worlds. Indeed, in such worlds pluralism is the *only* option available.

One might push some sort of disunity objection in that PLURALISM₂, PLURALISM₁, concerns certain kinds of worlds and not others. At this particular juncture, we may as well grant that. We will return to this issue in full generality in §5. The point *here* is that the objection looses its bite once one recognizes that GUNKY₂ worlds that are not GUNKY₃ cannot be accounted for at all in monistic terms. In other words, a priority monist who raises the disunity objection against PLURALISM₂ is arguably prone to a *tu quoque* reply. PLURALISM₂ is needed only if there are worlds that are GUNKY₂ but not GUNKY₃. And if there are such worlds, priority monism is bound to be false at those worlds—there, the universe u simply does not exist. Hence, if there are such worlds, the priority monist is bound to a form of disjunctivism as well: priority monism is true at some worlds but not at others—more on this in §5.

The consideration of worlds that are GUNKY₂ but not GUNKY₃ has two further consequences which are worth noting here. First, the Tiling Constraint needs to be revisited, not only when it comes to the No Overlap Condition. The COVERING conjunct explicitly mentions the universe u . We concur with Brzozowski (2016) here: the Tiling Constraint seems to be a particular way to cash out the old Lewisian adagio that the fundamentalia should be *minimally complete*.¹⁶ Here is a suggestion that we do not have the space to discuss. First, allow \triangleleft to be plural. Then claim that the world depends on the fundamental objects $\mathcal{ff} = \{f_1, (\dots), f_n\}$ ¹⁷

¹⁶ See Lewis (1986: 60).

¹⁷ It should be noted that coatoms need not be disjoint. If so, the No Overlap conjunct of the Tiling Constraint should be revisited as well. One may want to add a the minimality requirement to COMPLETENESS. Such requirement can be spelled out in different ways depending on the details about \triangleleft .

COMPLETENESS: $ff \triangleleft w$

Second, it also highlights a shortcoming of Monism that went unnoticed. It has been pointed out numerous times that Monism is incompatible with worlds without a universe. But the literature has focused only on one type of such worlds, namely JUNKY worlds, where junk is defines as:

JUNK: $J(x) \equiv \forall y(y \sqsupseteq x \rightarrow \exists z(z \sqsupset y))$

At first, one may think that the monist could take a page off the pluralist book and distinguish different kinds of junky worlds¹⁸:

JUNKY₁: A world w is junky₁ iff there is at least a junky object at w .

JUNKY₂: A world w is junky₂ iff every object at w is junky.¹⁹

Similarly to the gunky case, JUNKY₂ entails JUNKY₁ but the converse does not hold. The monist might then think that, at least for the weaker variant, monism is safe. That hope is, unfortunately for the monist, unfounded. For the existence of a single junky object entails that there is no universe. Recall that something is junky iff its extensions have further proper extensions. Suppose there is a single junky object j at w . And suppose, for reductio, there is the universe u at w . Then, u counts as an extension of j . By definition of junky, u has a proper extension. But such proper extension cannot be a proper part of u , so u fails to qualify as the universe. Contradiction.²⁰

And that is not the end of it. Arguments against the possibility of JUNK are not enough to let monists off the hook. They should also argue against the possibility of worlds where there are at least two coatoms. This is because UNIVERSE ONLY COATOM entails that, if there are two coatoms, there is no universe. To be fair, Schaffer endorses classical mereology, which features unrestricted composition among its axioms. And this, as we saw, entails that GUNKY₂ and GUNKY₃ are equivalent, which brings us to our last case.

4.3 GunkY₃ worlds and pluralism₃

The final case is that of a GUNKY₃ world, namely a world in which the universe u itself is gunky.²¹ Admittedly, this is the harder case for pluralists. Yet, not all hope is lost. In particular, we want to sketch a positive proposal that, suitably developed, could be a case of INTERMEDIATE—and thus counts as a variant of middleism—that faces neither the arbitrariness nor the disunity objection.

¹⁸ For the possibility of junky objects that are not worlds see Giberman (2015).

¹⁹ Clearly, there is no parallel JUNKY₃ option.

²⁰ Thanks to an anonymous referee for pushing us on this point.

²¹ This is arguably what most monists had in mind when considering the possibility of gunk. Brzozowski (2016) is explicit in this respect.

The proposal has different steps. First, consider a condition φ such that φ -wholes—by which we simply mean composite objects that satisfy φ —are more fundamental than their parts. One could then define the following notion:

MAXIMAL φ -WHOLE: $M\varphi(x) \equiv \varphi(x) \wedge \neg\exists y(\varphi(y) \wedge y \sqsubset x)$

A maximal φ -whole is a φ -whole that does not have any proper φ -extension. Nothing precludes the possibility that the universe is not a φ -whole, which immediately entails that the universe is not φ . One possibility for the pluralist is then to take the fundamentalia to be the plurality of maximal φ -wholes. This first step might not be enough. This is because there is no guarantee that the maximal φ -wholes respect the Tiling Constraint. As we saw, some have argued that the Tiling Constraint is problematic as a constraint on fundamentality, so one could simply discard it. We ourselves pointed to some (allegedly) required modifications.²² However we will not push for this here. What we want to do is actually to provide different ways to meet the constraint. Recall that the Tiling Constraint is the conjunction of COVERING,²³ and NO OVERLAP. Let us start with COVERING for it is easier to deal with. In effect, the strategy here is simply to implement something we already discussed for PLURALISM₁, namely, to ensure COVERING via remainders. This yields:

PLURALISM'₃: In a world w that is GUNKY₃ the pluralist should countenance the following as the plurality of fundamental objects: the plurality containing all the maximal φ -wholes at w , for some relevant φ , and their plural remainder with respect to the plurality of concrete objects,²⁴

PLURALISM'₃ takes care of COVERING but clearly does not address NO OVERLAP. The easiest way to address that is to modify it slightly as follows:

PLURALISM''₃: In a world w that is GUNKY₃ the pluralist should countenance the following as the plurality of fundamental objects: the plurality containing all the *disjoint* maximal φ -wholes at w , for some relevant φ , and their *singular* mereological remainder.

Indeed, there is another modification that will do, namely:

PLURALISM'''₃: In a world w that is GUNKY₃ the pluralist should countenance the following as the plurality of fundamental objects: the plurality containing all the *disjoint* maximal φ -wholes at w , for some relevant φ , the mereological sum of overlapping maximal φ -wholes, and their singular mereological remainder.

²² See e.g., Calosi (2017) and Leunberger (2020).

²³ Or COMPLETENESS we will omit this complication in what follows.

²⁴ It should be noted that all versions of Pluralism that mention φ -wholes are *schematic* and might deliver different verdicts for different φ -s.

Two things. First, as we noted time and time again, in the absence of any fusion principle there is no guarantee that the singular remainder exists, so that its existence should be enforced by an axiom. We suggested some ourselves. If this is taken to be too much of a price, then the No OVERLAP conjunct of the Tiling Constraint needs to be either weakened or dropped. Second, in general, PLURALISM₃'' and PLURALISM₃''' will contain different elements in the “mereological remainder”.

Everything is now ready for our final step. This directly connects the versions of PLURALISM₃ we have been discussing so far with mereological structure. The point is best appreciated by recalling a technical detail about atomistic mereologies.

It is well known that if one adds ATOMICITY to any mereology, one gets the atomistic variant of such mereology. Atomistic mereologies allow for significant simplifications of mereological axioms and theorems. We are in particular interested in Extensionality here. In the presence of ATOMICITY, Extensionality can be simplified so as to claim that if x and y share the same *atomic parts*, then $x = y$:

$$\text{ATOMISTIC EXTENSIONALITY: } \forall x \forall y (\forall z (A(z) \rightarrow (z \sqsubseteq x \leftrightarrow z \sqsubseteq y)) \rightarrow x = y)$$

As e.g. Varzi (2016) notices, there is a literature about whether one can find an atomless counterpart of ATOMIC EXTENSIONALITY.²⁵ In very general terms, this would be the claim that, for φ -composites, i.e., entities that are fusions of φ -ers, sharing all the same φ (proper) parts is sufficient for identity. Indeed the φ -ers would constitute a *base* in the topological sense.²⁶

$$\varphi\text{-EXTENSIONALITY: } \forall x \forall y (\forall z (\varphi(z) \rightarrow (z \sqsubseteq x \leftrightarrow z \sqsubseteq y)) \rightarrow x = y)$$

As Varzi (2016) writes:

In special cases there is no difficulty in providing a positive answer [to what the φ -ers are]. For example, in the (...) model consisting of the open regular subsets of the real line, the open intervals with rational end points form a base in the relevant sense ((Varzi, 2016): §3.4).

Suppose now it is possible to find a base of φ -ers in a world w that is GUNKY₃. We submit that then, in general, the pluralist should simply endorse the following:

PLURALISM₃''': In any world that is GUNKY₃ and admits of a base \mathcal{B} in the sense specified above, that is a plurality of φ -ers such that φ -EXTENSIONALITY is true of those φ -ers, then the pluralist should countenance \mathcal{B} as the plurality of fundamental objects.

²⁵ See e.g. Simons (1987), and Engel and Yoes (1996).

²⁶ A base \mathcal{B} for a topological space (S, \mathcal{O}) is a subset of the open subsets of \mathcal{O} such that, every open subset in \mathcal{O} can be written as a union of subsets in \mathcal{B} . Note that the formulation of φ -EXTENSIONALITY is implicitly restricted to φ -composites. We left this specification implicit because making it explicit would result in a much more cumbersome formulation of the principle.

The suggestion here is that there might be cases in which the plurality of maximal φ -wholes that are relevant for $\text{PLURALISM}'_3$ - $\text{PLURALISM}''_3$ do constitute a (topological) base \mathcal{B} , in the sense that is relevant for $\text{PLURALISM}''''_3$.

Now, nothing guarantees that bases as we have characterized them are *unique*. In other words, it might turn out that different φ -s single out different bases. What should the pluralist say in this case? We can think of different viable options that should be assessed independently:

Singular Egalitarianism: First, pluralists can stick to the claim that there is a *single* notion of fundamentality, and different conditions φ single out different bases that have all equal claim to provide fundamental objects. In other words, according to this proposal one should simply learn to live with the fact that fundamental bases are not unique. Note that this calls for a modification, once again, of the Tiling Constraint—insofar as objects in different bases will (massively) overlap.

Plural Egalitarianism: Second, pluralists may want to distinguish different notions of fundamentality, and be “pluralist” about *them*. In particular, they can claim, notions of fundamentality should be relativized to different φ -s. In such a way one particular plurality of objects, the φ_1 wholes that comprise the φ_1 -basis, are fundamental₁, whereas the φ_2 objects are fundamental₂, and so on. There is no privileged notion of fundamentality. Pluralism about fundamentality is nothing new, and is explicitly endorsed—albeit on different grounds—in e.g., Bennett (2017) and Calosi (2020) to mention a few.²⁷

Privileged Base: Third, pluralists can argue that among all the conditions φ that deliver different bases, only one is *metaphysically* privileged in that it is the only one that tracks the unique substantive notion of fundamentality. The metaphysical privilege of φ then singles out a unique, metaphysically privileged basis.

Intersection: Finally, pluralists could simply take as fundamental the intersection of all the bases and their plural (or singular, should there be one) remainder.

Let us be upfront. We do not claim that this list is exhaustive. Perhaps there are other better options out there we did not list. And, given our aim, we are not claiming that there is a clear front-runner in the options we did list—though we have our sympathies.

Before moving on, let us provide two examples and an illustration. Schaffer (2010) suggests that wholes that are *integrated* or even *maximally entangled* are more fundamental than their parts. Suppose one agrees with such a claim, and also endorses the claim that the universe itself is neither integrated nor maximally

²⁷ One may indeed subscribe to a strong notion of fundamentality according to which *fundamental bases* need to be unique. And this would count against what we label *Singular Egalitarianism* and *Plural Egalitarianism*. Uniqueness of fundamental basis is surely appealing but also controversial. In effect, recent works discuss and even defend different conceptions of fundamentality that allow—if not require—a multiplicity of fundamental bases. These works include—but are not limited to—Bennett (2017), Tahko (2018), Calosi (2021), and Bacon (2019).

entangled.²⁸ Then one could identify the plurality of fundamentalia as the plurality of maximal φ -wholes, and their (plural) mereological remainder where $\varphi =$ “being integrated” or “being maximally entangled”. Figure 4 depicts one such world w —objects o_i united by lines are maximal φ -wholes:

According to the suggestion at hand, in such a world w , the pluralist should countenance the following as the plurality of fundamentalia: $\mathcal{f}\mathcal{f} = \{o_1 \oplus o_2, o_4 \oplus o_5 \oplus o_6, o_3, o_7\}$. Now one needs only imagine that objects $o_i < \mathcal{f}\mathcal{f}$ are gunky.

Importantly, the fact that we developed PLURALISM₃ with a particular reference to GUNKY₃ worlds does not mean that it cannot be used in other kinds of worlds. In effect, given the logical implications between the different kinds of gunky worlds we distinguished, one can see that PLURALISM₃ might—at the end of the day—be applicable in every admissible gunky world. Not only. PLURALISM₃ might even be taken as the most general pluralist strategy, for pluralists can endorse it also in completely atomistic worlds. In effect, in the presence of ATOMICITY, the plurality of atoms constitutes a *basis* \mathcal{B} that also respects the very letter of the Tiling Constraint.

Notice that PLURALISM₃ is,²⁹ in GUNKY₃ worlds, a form of INTERMEDIATE. The question becomes: is PLURALISM₃ capable of avoiding both the *arbitrariness* and DISJUNCTIVISM objections? Prospects seem good. As far as *arbitrariness* goes, one can claim that PLURALISM₃ is not, in fact, arbitrary. It does recognize objective joints in the mereological structure of the alleged GUNKY₃ world. This is particularly clear in the case in which φ -wholes constitute a (topological) base. Indeed, in those cases, φ -EXTENSIONALITY delivers *sufficient conditions for the identity of composite objects* in terms of their mereological structure. As for DISJUNCTIVISM, one should note that, in general, in the presence of ATOMICITY, $\varphi(x) \equiv A(x)$. As we said, the atoms would be a relevant base \mathcal{B} at w .³⁰

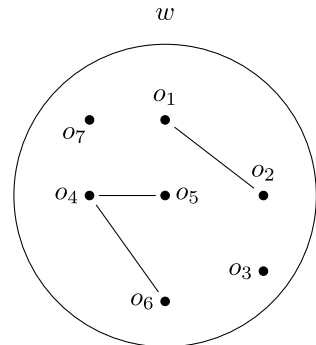
The fact that atoms constitute a base, does not prevent non atomic pluralities to qualify as bases as well. Thus, one might argue, even in atomistic worlds, what PLURALISM₃ delivers is a choice between the four options above rather than ATOMISM. However, in atomistic worlds, one could make a case for a specific option, namely, *Privileged Base*. And that privileged base would turn out to be exactly the one that satisfies ATOMISM. The argument would go as follows. One of the guiding thoughts of pluralism—at least in its original motivation—is that parts are more fundamental than wholes. Now, let \mathcal{B}_1 and \mathcal{B}_2 be two different bases. Say that \mathcal{B}_2 is *more refined* than \mathcal{B}_1 iff for every object x in \mathcal{B}_1 there are objects xx in \mathcal{B}_2 such that x is the fusion of the xx . And then, say that a base \mathcal{B} is *maximally refined* iff there is no base that is more refined than it. In line with the original thought about parts being more fundamental than wholes we might insist that should there be a maximally refined base, only this base should count as fundamental. In other words, the maximally refined base—should there be one—is *metaphysically privileged* exactly as *Privileged Base*

²⁸ Clearly Schaffer believes that the universe *is* indeed integrated and maximally entangled. But there are reasons to be skeptical—see e.g., Calosi (2014).

²⁹ By this we mean one given variant between PLURALISM₃'-PLURALISM₃''''.

³⁰ To be precise, one would need to modify our definitions slightly for we took φ to entail mereological complexity.

Fig. 4 World with Maximal φ -wholes



requires. And clearly, the *atomic base*, i.e., the base whose elements are all atoms, is *maximally refined*. This would give us ATOMISM.³¹

To be fair, it might very well be that the existence and nature of \mathcal{B} will depend on contingent features of the relevant gunky world. Thus, in GUNKY₁ and GUNKY₂ worlds that are not GUNKY₃ it might be that PLURALISM₁ and PLURALISM₂ are still the best options. So, in the end, perhaps pluralists need to tolerate some measure of DISJUNCTIVISM. But, as we saw, there is a variety of gunky worlds. Why couldn't we tolerate a variety of corresponding pluralisms? In effect, we will argue in the next section that everyone probably needs to learn to be some sort of a disjunctivist.

Now, as a (paradigmatic) form of INTERMEDIATE, PLURALISM₃ is also a version of middleism, insofar as it neither places fundamentality at the minimal mereological level of atoms, nor at the maximal level of the cosmos, but at some mereologically intermediate level. As such, it is arguably capable to harvest advantages of middleism. For example, unlike views that place fundamentality at the minimal or maximal level, PLURALISM₃ is compatible with the possibility of the world being both gunky and junky, i.e. such that in it everything *has* and *is* (a) proper part. (Bernstein (2021, 1074)). In such a world, the fundamental middle level would provide a metaphysical foundation for both infinitely descending and infinitely ascending chains of parts and wholes. The same holds for coatomistic worlds, i.e., worlds where there are distinct coatoms.³²

³¹ We readily admit this is a fascinating suggestion that however needs further elaboration—for example, one might ask whether the argument could be generalized in cases where only claims of “relative refinement” are available and there are no maximally refined bases.

³² A referee for this journal has suggested to us an interesting argument in support of monism in gunky₃ scenarios that starts from our considerations about scenarios that are gunky₁ and gunky₂. For the sake of illustration let us focus on the former case. Consider the world w in figure 1. There, according to PLURALISM₁ the following objects are fundamental: a and g . Now consider a world w^* that contains only a perfect duplicate g^* of g . w^* is GUNKY₃. Now, isn't there some pressure—the monists asks—to say that g^* is fundamental at w^* once we have conceded that g is fundamental at w ? But clearly g^* is the universe at w^* , so we end up with monism. This is surely an interesting argument that deserves an independent scrutiny. But a few things can be said here already. First, as we explicitly claim in the main text, it is not our aim to argue that our pluralist strategies are better than monism—only that they are available. Second, suppose one endorses the argument. Then there seem to be parallel arguments in support of pluralism. Here

Moreover, PLURALISM_3 offers the resources to deflect possible or actual objections against other forms of middleism. For example, Bernstein (2021, 1075) mentions the arbitrariness problem, according to which, roughly, the choice of a particular intermediate level vis-à-vis other intermediate levels or maximum or minimum levels is arbitrary. The problem takes two forms. In its metaphysical form, it is the problem of offering a metaphysical ground for the fact that the given intermediate level is fundamental. In its epistemic form, it is the problem of offering evidence that the particular intermediate level picked out among many other candidate intermediate levels is indeed fundamental. While in defense of other versions of middleism it can only be said that such versions aren't worse off than their competitors (Bernstein 2021, 1076), PLURALISM_3 offers elements to answer both questions. In particular, to the metaphysical question, a PLURALIST_3 can reply that what makes the intermediate level fundamental is the entities at such level to satisfy φ -EXTENSIONALITY. φ -EXTENSIONALITY also provides an epistemic criterion to identify the right intermediate level and hence to reply to the epistemic form of the problem. Just focus on the relevant φ . That is to say, φ would provide both (partial) metaphysical and epistemic grounds for fundamentality.

5 Disjunctivism and intermediate, again

As the reader surely recalls, Schaffer (2010) recognizes three pluralist strategies for gunky worlds, namely NO FUNDAMENTALIA, DISJUNCTIVISM and INTERMEDIATE. We conceded well-foundedness, so NO FUNDAMENTALIA is not an option. It is interesting to note that, beside some particular details about particular strategies we have already discussed, the analysis carried in the paper also shoulders new *general* insights about the other two alternatives. Let us start with DISJUNCTIVISM.

It should be recognized that, in the light of recent developments in the literature, it seems that we should make peace and learn to live with some measure of disjunctivism. This is because there seems to be a growing consensus that there are metaphysically possible worlds that pluralists cannot account for—e.g., worlds with only one concrete object—and metaphysically possible worlds that monists cannot account for—these include, as we saw, worlds that are junky or that have distinct coatoms.

That said, it is the sheer possibility of different versions of pluralism that might raise some *disjunctivist* worries. We saw the seeds of this worry in the previous sections already. Let us elaborate. According to the worry at hand, pluralists need to be disjunctivists in that they cannot offer a unified account of the fundamental

Footnote 32 (continued)

is a quick one. Consider a world w with only two atoms a_1 and a_2 . w is by assumption a “mereologically nihilist” world. In such a world, the only plausible plurality of fundamental objects is a_1 and a_2 . Now consider a world w^* in which there are two perfect duplicates of a_1 and a_2 , a_1^* and a_2^* respectively, their mereological sum y and nothing else. Clearly y is the universe at w^* . Now, isn't there some pressure—the pluralist asks—to say that a_1^* and a_2^* are fundamental at w^* once we have conceded that a_1 and a_2 are fundamental at w ? But, if so, we end up with pluralism. Thanks to an anonymous referee.

mereological structure in every admissible world (roughly speaking, a world is admissible for the monist insofar as it contains the universe, and admissible for the pluralist insofar as it contains more than one object). In effect, they have to endorse different versions of pluralism in different kinds of gunky worlds, such as PLURALISM₁ in GUNKY₁ worlds and as PLURALISM₂ in GUNKY₂ worlds—or so the thought goes. Two things should be said in response. First of all, as we saw, PLURALISM₃ might even be taken as the most general pluralist strategy, for pluralists can endorse it also in completely atomistic worlds—admittedly the fate of PLURALISM₃ depends on contingent (mereological) features of gunky worlds. Second, different versions of disjunctivism can be distinguished. According to the first version, a disjunctivist is someone that endorses monism in some admissible worlds, and pluralism in other admissible worlds. Let us refer to this variant as *Disjunctive Thesis*. *Disjunctive Thesis* is actually at the bottom of the *original* disjunctivist charge leveled by Schaffer and echoed by Brzozowski. According to a second version, a disjunctivist is someone that endorses different versions of the same thesis in different admissible worlds. For the sake of illustration, this would be a pluralist that e.g., endorses PLURALISM₁ in worlds that are GUNKY₁, but PLURALISM₂ in worlds that are GUNKY₂. Let us refer to this as *Disjunctive Variants*. It should be noted that our pluralist would be at most a disjunctivist according to *Disjunctive Variants* but not according to *Disjunctive Thesis*—which, recall, was the original complaint.

Let us move on to INTERMEDIATE then. Interestingly, PLURALISM₁ and PLURALISM₂ suggest a more nuanced attitude towards INTERMEDIATE. Consider PLURALISM₂ first. There is surely a sense in which the plurality of fundamental coatoms contain intermediate objects: these coatoms are neither mereologically minimal, nor mereologically maximal. After all, they all fall short to qualify as the universe. But they are mereologically maximal in another interesting sense. They are not proper parts of anything. And now consider PLURALISM₁. The plurality of fundamental concrete objects surely contains a gunky object. If this gunky object is a coatom, it is mereologically intermediate in the sense in which it is not the universe, but it is maximal in the sense that there is no proper extension of it, exactly as we discussed in the case of PLURALISM₂. This happens exactly in Fig. 1. Still, a GUNKY₁ world could contain a gunky object which is a proper part of the universe, exactly as in Fig. 2. In this case the gunky object is mereologically intermediate in both senses. Apart from gunky objects, the plurality of fundamental things might contain atoms, which are surely mereologically minimal. All this suggests that there are versions of Pluralism that are not fully blown versions of INTERMEDIATE, even in gunky worlds.

6 Conclusion

To sum up, we have distinguished different kinds of gunky worlds and suggested various pluralistic strategies to account for their fundamental mereological structure. As we have seen, there are various such strategies. As we pointed out in the introduction, the main aim of this paper is *exploratory* in that it literally *explores* different ways to be a pluralist in gunky worlds that were, for various reasons, neglected. These explorations also led us to distinguish e.g., versions of disjunctivism that

were related but different to the ones that were in the original gunk argument. After the dust settles, one may still think that the monist has the upper hand for she can deliver a *Tiling-Constraint-satisfying*, and *unified-in-all-classical-models* approach, just by saying that the universe is fundamental. By contrast, the pluralist might (i) either hope that in every gunky world a *base* is definable, or (ii) hold on to different versions of pluralism in different gunky worlds. And even if this is not the original disjunctivist complaint—recall that such complaint was that one could be pluralist in atomistic worlds but *needed* to be monist in gunky ones—it is a complaint nonetheless. We leave it to the readers to decide for themselves. Whatever the final verdict, we contend, the arguments in the paper still show that there are more choice-points, more resources, more principled possibilities that are available to pluralists. Once we broaden our horizons, we could actually engage in new substantive conversations, and explore interesting metaphysical landscapes that our self-imposed blinkers did not allow us to see.³³

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Conflict of interest The authors declare they have no Conflict of interest

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