

Presentist Perdurantism and Parthood

Abstract: Sometimes people want to combine Presentism with perdurance. For instance, one may want to endorse the claim that, though Presentism is true, there's still a completely natural divide between things like you that persist three-dimensionally, and entities like events that persist four-dimensionally. This paper explores whether there's an intuitive way to allow for this combination, while allowing for a very broad conception of perdurance, not giving up the spirit behind Weak Supplementation, not appealing to non-existent parts, and without fragmented reality or a pluralistic mereology. First, I'll discuss how, when we look at a sufficiently broad conception of perdurance, it's Weak Supplementation of Pluralities (though surprisingly, not just Weak Supplementation) and a Fusion Principle which each lead to incompatibility of Presentism with perdurance. Then I will raise problems for initial attempts to capture the spirit of these mereological principles with tensed or temporally relativized versions within the constraints I've described. I'll advise that anyone attempting to do this should give a mereology that ties rule application to the times at which entities are exactly present.

Trenton Merricks (1995) has argued for the direct incompatibility of Presentism, the view that only temporally present objects exist, and Existential Four-Dimensionalism, according to which at least some entities persist four-dimensionally (i.e., perdure¹). Several authors have instead offered formulations of Four-Dimensionalism that avoid this kind of direct incompatibility. I'll focus on the incompatibility of Presentism and Existential Four-Dimensionalism that arises due to modest mereological assumptions such as Weak Supplementation (or more precisely, the slightly stronger claim of Weak Supplementation of Pluralities, which says that for any collection of proper parts of an object, if the object does not fuse them then it has some part disjoint from them), or what I'll call the Fusion Principle (every composite object is such that there exist some proper parts of it - i.e., parts of it that are distinct from it² - that the composite object fuses). I will present problems for an initial attempt a Presentist perdurantist might make to capture the spirit of these two plausible mereological assumptions, while rejecting them as stated and offering tensed or relativized versions instead (and while restricting themselves to views on which no entities have nonexistent parts, and to views on which one mereology applies to enduring and perduring

entities). I'll argue that if they do this, they should ultimately adopt a mereology that ties rule application to the times or intervals at which the objects in question are exactly present.

The arguments in this paper will be relevant not just for those who endorse the surprising combination of Presentism and full-force Four-Dimensionalism, but also for any Presentist Three-Dimensionalists who endorses a common and intuitive division (argued for by Peter Simons (2014) and Kit Fine (2006)) between *continuants*, which are ordinary objects like people and atoms that may be said to exist in time, and *occurrants*, such as events, which may be said to extend through time. Any Presentist who finds it plausible that entities such as events persist four-dimensionally will, I will argue, have motivation to adopt a tensed or relativized mereology.

This paper will proceed as follows: In §1 I will present Presentism and Existential Four-Dimensionalism. In §2 I will present Merricks' direct argument for the incompatibility of these two views, and then will briefly describe some arguments that the views are compatible after all. In §3 I will shift our focus to using Weak Supplementation to generate the incompatibility, and show how it falls short of this when we slightly broaden our picture of what it takes to perdure. In §4 I will describe how Weak Supplementation of Pluralities and the Fusion Principle each produce incompatibility between Presentism and Existential Four-Dimensionalism. Finally, in §5 I will look at how a Presentist may attempt to, without endorsing nonexistent parts, use a tensed or temporally relativized mereology to endorse new versions of the mereological principles that allow for compatibility of Presentism and perdurance. I will argue that the new principles should incorporate information about the temporal locations of the entities to which they apply.

1. Presentism and Existential Four-Dimensionalism

Presentism, most generally, says that all that exists is what is temporally present. The version we will look at is restricted to material entities:

- **Materialist Presentism:** (i) The only material entities that exist are those that are temporally present; no future or past material entities exist. (ii) Only one time may be temporally present at once.³

This sort of Presentist is welcome to affirm or deny the existence of immaterial objects (which, presumably, are not temporally present), and affirm or deny the existence of non-present times. That is, Materialist Presentism is compatible with stronger forms of Presentism, but does not entail them. However, we should also distinguish Materialist Presentism from what we might call

‘Objectual Presentism’, which applies only to ordinary objects but not to material entities such as events. Henceforth I will simply use ‘Presentism’ to pick out Materialist Presentism.

We will also discuss a weakened version of Four-Dimensionalism. Roughly: according to Four-Dimensionalism, persisting material objects have distinct, temporal proper parts present at each time at which the object is present. A temporal part of an object is all of the object present at a particular time. More carefully:

- ‘ x is a *temporal part* of y at t ’ =df (i) x is a part of y ; (ii) x is present at, and contained in, t ; and (iii) for all z , if z is present at, and contained in, t , and z is a part of y , then x overlaps z .⁴

Four-Dimensionalists, then, will claim that you extend in time as you seem to extend in space. The portion of you that is present right now is not all of you, but is instead a small slice. It, in combination with many, many other slices (such as the portion of you present on your third birthday, the portion of you present at your high-school graduation, and the portion of you present during the first rainy day next summer) combine to make you up. This contrasts with Three-Dimensionalism, according to which material objects are wholly present at each time at which they are present at all.

We will be interested in Existential Four-Dimensionalism, according to which at least *some* material entity persists four-dimensionally. This view is compatible with endorsing Four-Dimensionalism, but it is also compatible with thinking that most things persist three-dimensionally but some things, such as sub-atomic particles or events or social objects, persist four-dimensionally.

Though one may attempt to endorse a conjunction of Presentism and full-force Four-Dimensionalism,⁵ there is an arguably more natural way to combine Presentism with Existential Four-Dimensionalism: one may endorse Three-Dimensionalism applied to ordinary material objects, but claim that members of some other classes of material entities, such as events, exist robustly⁶ and persist four-dimensionally. Thus, we may draw the sort of distinction that Kit Fine (2006) and Peter Simons (2014) present: we may distinguish between *continuants*, ordinary objects such as dogs, trees, atoms, and galaxies, which endure (i.e., persist three-dimensionally) through time, and *occurrents*, entities such as events and processes, which perdure through time.⁷ Or in Fine’s terms, we may distinguish between continuants that exist in time and extend in space, and occurrents which extend in time and in space. This sort of distinction is intuitive, and matches

how we talk about and seem to view these entities. When you're at a typical birthday party, you're not in the presence of the full event in the first minute, but you can hold the entirety of the birthday present in your arms as you arrive. The combination of Presentism, Three-Dimensionalism, and this distinction between ordinary objects and robustly existing events is a natural one, and the incompatibility of Presentism and Existential Four-Dimensionalism is an immediate threat to it.

2. The Argument for Direct Incompatibility

One way to argue for the incompatibility of Presentism and perdurance is to pursue incompatibility following directly from their formulations.⁸ This is how Trenton Merricks argues, telling us that Four-Dimensionalism entails that “objects which last over time have parts – temporal parts – which exist at many different times and . . . not all of their parts exist at any single time.”⁹ This is to say, if an object persists four-dimensionally, then it has some parts, x and y , such that there are disjoint times, $t1$ and $t2$, and x is contained in $t1$ and y is contained in $t2$. So at any instant at which the object is present, the object has some temporal part that is not temporally present. There is an immediate difficulty, however, if we endorse Presentism, thinking that at any time, the only material objects that exist are those that are temporally present. For if we endorse Presentism together with the view that something persists four-dimensionally, it seems we'll have to say that at some time at which the object is present, it has as a part something that is not present, and so (by Presentism) it has as a part something that does not exist. But nothing can have as a part something that does not exist. So either Presentism is false, or nothing persists four-dimensionally.

To illustrate with an example, consider the following case.

- *Ant on a Peony*: An ant crawls on a peony bud, eating the carbohydrate-rich nectar along the edges of the scales that cover the bud. The ant is a slow eater, so this event lasts at least two minutes.¹⁰



If we think events persist four-dimensionally, then the event of the ant crawling on the peony is not wholly present at any single moment. Instead, at any moment at which it is present, it has a temporal part (distinct from the whole event) that is present. If you witness the first moments of the ant crawling on the peony, you have not thereby witnessed the entirety of the ant's crawling on the peony. There are some parts of the event that aren't present in those first moments. And if Presentism is true, then the past and future are empty of material entities: the only material things that exist are those that are present at this moment. So those parts of the event, the ones that aren't

present in the first bit you're witnessing now, do not exist because they are not present. So, under the assumption that events like this are wholly material, then at any given time, not all of the event's proper parts exist. But no event can have as parts things that don't exist. So we must give up some component of our description of this case: perhaps Presentism is false, or perhaps the event does not persist four-dimensionally, or perhaps it is not wholly material, or perhaps entities can have as parts things that don't exist.

Merricks' general argument, in premise/conclusion form, is as follows:

For The Direct Incompatibility of Presentism and Existential Four-Dimensionalism

1. Necessarily, if an object persists four-dimensionally, then for any time, the object has some parts that are not present at that time.
2. Necessarily, if Presentism is true, then at any time, any parts of an object not present at that time do not exist.
3. Necessarily, no object can have non-existent parts.
4. So, necessarily, if Presentism is true, no object persists four-dimensionally.¹¹

There are two main responses that have been given to this argument. The first involves a rejection of premise (3), done two different ways. For the first, we can look to what Mark Hinchliff calls 'Unrestricted Presentism' (which he presents in contrast with what he calls 'Serious Presentism'). Unrestricted Presentism is Presentism in conjunction with the claim that non-existent entities can have properties and stand in relations.¹² Sally Haslanger (2003) also rejects Premise (3). Haslanger takes Merricks' argument as an instance of the general problem of cross-time relations, noting that it is a threat only if we take the relations to require the existence of their relata. Haslanger says: "Although some have claimed that one cannot have as a part something that does not exist... this intuition is biased against the presentist. If a presentist has the resources to account for cross-temporal relations, there does not seem to be any special reason to balk at cross-temporal relations between parts".¹³ This is not to say that Haslanger endorses a claim that there are nonexistent things or that nonexistent things have properties, but rather, that when we say "x is the great-great-granddaughter of y and z", there's a reading of *is the great-great-granddaughter of* that doesn't require that y and z exist. One way of doing that is to endorse a view like Unrestricted Presentism, but there are other options as well.¹⁴ If we do opt for a view on which nonexistent entities can stand in parthood relations, Paul Hovda (2013) describes how we can work this out in a tensed or relativized mereology, with his TM2.¹⁵ He emphasizes that on

this view, though there are changes to what exists, the mereological structure of perduring entities does not change over time.

One may push back on the rejection of premise (3), by claiming that mereological axioms (like those we'll cover shortly) are special because they don't merely require that things stand in relations (such as *supplements* or *helps compose*), but they also actually build in a requirement of existence, and the existence requirement matters. But if you don't find that compelling, one may read my project in §5 simply as a discussion of ways of finding versions of our axioms that are not existence-entailing, as a way of pursuing Haslanger's response without requiring something like Hinchliff's Unrestricted Presentism or Hovda's non-existent parts in his TM2. I am not arguing against Hinchliff or Hovda, just looking to explore an alternative.

A second response to the argument involves rejecting premise (1). Merricks tells us that Existential Four-Dimensionalism's incompatibility with Presentism "is not a product of some revisable or tangential feature of perdurance, but rather follows from the very nature of perdurance – the claim that not all the parts of an object which lasts over time exist at a single time."¹⁶ This claim, however, has received pushback. Lawrence Lombard (1999) and Berit Brogaard (2000) note that one can take an object to persist four-dimensionally while claiming that at any time, the totality of the parts of the object that exist are the parts of the object present at that time.¹⁷ The rough thought is this: Existential Four-Dimensionalism commits us to the claim that some object persists by having temporary parts. And the proper parts at any given time are not enough to fuse to make the whole object. But this is not yet enough to commit us to the claim that at any given time at which just some of the object is present, it must also be true of the object that it has parts in addition to those that are currently present.

These responses, from Hinchliff, Hovda, Haslanger, Lombard, and Brogaard, are two ways one may try to resist the incompatibility Merricks presents. There are other responses as well, such as adopting a fragmentalist ontology (see Iaquinto, 2019). In what follows (and still, I think, in line with the spirit of Merricks' argument), I'll focus on incompatibility that arises slightly less directly, from the addition of some mereological principles. I'll attempt to focus on the most modest mereological principles that will produce the problem (setting my argument apart from some formulations of the problem in terms of weightier mereological principles). Thus, I'll show that the issue isn't with our formulation of perdurance (and so isn't avoided by rejecting premise (1) above). So I'll take myself to be describing a way to supplement the rejections of (1) above, providing an alternative to rejections of premise (3).

3. Weak Supplementation

Intuitively, the incompatibility between Presentism and perdurance arises due to a lack of supplementation. In particular, one may point to Weak Supplementation as the culprit, to the extent that one may assume, if positing perdurance in a Presentist setting, they must simply give up anything resembling Weak Supplementation. To begin, I'll talk about how that principle generates problems, and then describe the limits of the problems it generates.

Weak Supplementation says, roughly, that if you have just some of something, there must be some more to it beyond what you've already got. More precisely:

- **Weak Supplementation:** For any entities, x and y , if x is a proper part of y , then there exists a z such that z is a part of y and there is nothing that is part of both x and z .

So if I have a puppy by the tail, and the tail is not the whole puppy, then there must be some more to the puppy beyond what makes up the tail. Though there have been some recent arguments against Weak Supplementation,¹⁸ it is overwhelmingly plausible and widely accepted. Some philosophers¹⁹ even take it to be analytic: they take the principle to follow from the very meaning of what it is to be a *part*.

3.1. How Weak Supplementation Is Troublesome

The problem Weak Supplementation causes for combining Presentism and perdurance is immediate. Consider again the event of the ant crawling on the peony. According to Four-Dimensionalism, in the first moment of the event there is a temporal part of the event wholly contained at that time. That temporal part is distinct from the whole event, and (according to the notion of 'temporal part' defined in §1) every bit of the event that is present at that time mereologically overlaps the temporal part. According to Presentism, this means if the event is wholly material, no parts of the event disjoint from its initial temporal part exist at all at that first moment. But according to Weak Supplementation, since the temporal part is a proper part of the event, there must exist some part of the event that is disjoint from the temporal part. Put more intuitively: since we've got just some of the event (the current temporal part), there must exist some more to the event, to help supplement the bits we've already got in making up the whole

event. In premise/conclusion form, and restricted to material entities, we can present the argument as follows:²⁰

The Weak Supplementation Argument:

1. Necessarily, if a material entity, x , persists four-dimensionally, then there is a time, t , at which x has a proper temporal part, y , and every part of x present at t has a part in common with y .
2. Necessarily, if Presentism is true, then at any time, t , if t is present then every material entity that exists is present at t .
3. Necessarily, if y is a proper part of x , then there exists some z such that z is part of x and disjoint from y .
4. So, necessarily, if some material entity, x , persists four-dimensionally, then there is some time, t , such that x is present at t and some material y exists which is part of x and which is not present at t . (From (1) and (3))
5. So, necessarily, if Presentism is true then no material entity persists four-dimensionally.

This argument has some degree of success. It shows that, restricted to material objects, we can't claim anything persists four-dimensionally (in the temporal parts -involving sense described in §1) in a Presentist world if we endorse Weak Supplementation.

3.2. How Weak Supplementation Is Not That Troublesome

Weak Supplementation's ability to generate difficulty for the combination of Presentism and perdurance depends on the claim that perduring entities have proper temporal parts at each time at which they are present. Again, intuitively, the temporal part of an entity at a time is *all of the entity* that's present at that time. It is a single, proper part of the entity that mereologically contains everything else that makes up the entity that's contained within that time. This sort of proper part is what guarantees that if we want any disjoint, material parts to supplement it, those supplementing parts can't be present at that time.

Merricks, Parsons, and I have each presented pictures of perdurance that do not actually require an entity to have temporal parts. For instance, Merricks (1999, p. 431) has us imagine that everything is made up of four-dimensionally persisting cells which have temporal parts, but that the larger objects that the cells make up do not have any additional, intermediate parts. So for instance, if you are made of such cells (and thereby of temporal parts of such cells), you do not

have fusions of those cells (or fusions of temporal parts of such cells), such as hands or feet or eyes (or temporal parts of hands, or of feet, or of eyes), as proper parts. And at this moment you also don't have as a proper part a fusion of all of the current temporal parts of each of the cells that's a part of you – such a fusion, which if it were to exist would be your current temporal part – is exactly the sort of intermediate part you don't have. So the composites of multiple cells do not have proper temporal parts, though parts of them have proper temporal parts. And yet, it seems, persisting objects of this sort do persist four-dimensionally.

Parsons (2007) presents two notions of perdurance, one of which does not require temporal parts: “A thing perdures iff it persists, and no part of it is wholly temporally located at two, disjoint times.” This would correctly categorize the entities in Merricks' 1999 case, but would also (as Parsons notes) treat temporally extended simples – i.e., extended entities with no temporal or spatial proper parts – as perduring. In Kleinschmidt (2017) I give a somewhat complicated account of perdurance that is completely temporal-parts -free. I motivate the account with a variant of Merricks' case, where no objects have proper temporal parts (so we can't even say things perdure by being made up of persisting smaller things with temporal parts). E.g., imagine a combination of a van Inwagenesque ontology with a spacetime-worm view of persistence: the only objects are instantaneous simples and four-dimensional, extended living beings. On this view, you aren't wholly present right now (because you are a spacetime worm), nor do you (or any of your persisting parts) have any temporal parts that are present right now. The only parts of you entirely present right now are point-sized, instantaneous simples. And you persist in virtue of having a succession of clusters of these temporary parts. The upshot is that even though these persisting objects do not have as wide a variety of parts as typically four-dimensionally persisting objects, because these objects are fusions of distinct, smaller parts located within each of the times at which they are present, they are doing what it takes to perdure. That is to say, it doesn't seem that *temporal* parts are necessary for perdurance, but rather that persisting four-dimensionally merely requires persisting entirely via being made of a succession of distinct *temporary* parts.

If you agree that perdurance does not require the possession of proper temporal parts, you may endorse an amended version of Existential Four-Dimensionalism:

- **Existential Four-Dimensionalism***: there exists at least one material entity that persists in virtue of having proper *temporary* parts present at each time at which it is ever present.²¹

Here is the feature of this account that is relevant for our discussion of Weak Supplementation, Presentism, and perdurance: perdurance via *temporary* parts rather than via *temporal* parts does

not require that at any time a perduring object is present, it has a proper part that mereologically overlaps every other part of it that is present at that time. And that was the requirement that, in combination with Weak Supplementation, produced a conflict with Presentism.

For instance, consider a case where a spacetime worm is present at exactly 2 times, and has as its only proper parts 5 different instantaneous simples at each time at which it is present. The worm persists in virtue of being a fusion of the 10 temporary parts, with no intermediate proper parts. On my account, it perdures. At each time, Presentism says the simple parts at the other time don't exist. And Weak Supplementation doesn't require that any such non-present parts exist. It just requires that, for any one of the simples, some disjoint proper part of the object exists – and any one of the other 4 currently-present simples satisfies that.²² So Weak Supplementation will not require the existence of parts not present now, i.e., parts that Presentism entails do not exist. Weak Supplementation, Presentism, and Existential Four-Dimensionalism* are compatible.

So, Weak Supplementation produces incompatibility of Presentism with persisting via having proper temporal parts. But it is not enough to establish that perdurance without temporal parts is incompatible with Presentism.

4. Weak Supplementation of Pluralities and Fusion

We don't have to look far for a principle to do that extra work. We want something that says: if what we have of an object at a time doesn't make up the whole thing, there must exist some more of the object. Weak Supplementation doesn't quite do that, but there are two other extremely plausible mereological principles that do. Either one of these will be sufficient to produce the Presentism/perdurance incompatibility, if we also assume that, in cases of perdurance, what we have of an object at a time doesn't make up the whole thing. That is:

- **Not Enough Parts Principle:** Necessarily, if x perdures through interval T , then at any proper subinterval of T , t , x is not a fusion of any collection of proper parts of x that are wholly present within t .

This principle should be extremely intuitive; if an object persists in virtue of having a succession of temporary parts, and is a fusion of all of its temporary parts, then not all of its temporary parts will be contained within any instant (or interval) that is just some of the time the object persists through.²³ And given that any possible perduring entity has this feature, cases of Presentist

perdurance come into immediate conflict with two plausible mereological principles, discussed in each of the next two subsections.

4.1. Weak Supplementation of Pluralities

In §3.2 we saw how entities can perdure in a Presentist world without violating Weak Supplementation, in cases where they lack proper temporal parts but are made up out of a succession of proper temporary parts. Still, even in cases like these, it is very intuitive that if the only objects that exist are the temporally present ones, perduring entities violate some kind of required supplementation: what's there (then) isn't enough to make up the whole object, so more of the object must exist.

- **Weak Supplementation of Pluralities:** Necessarily, for any x s and y , if each of the x s is a proper part of y , but y is not a fusion of the x s, then there exists a z such that z is a part of y , and z has no parts in common with any of the x s.²⁴

That is, if you have some proper parts of an object, but the object isn't made up entirely of them, then there must be another part of the object that is separate from the parts you've already got.

In cases of Presentist perdurance, whether the object has temporal parts or not, Weak Supplementation of Pluralities seems to be violated. Consider again our event of the ant crawling on the peony. At the first moment of the event, we have a collection of proper parts of the event that are wholly present at that time. But those parts of the event are not enough to make up the whole event. So, by Weak Supplementation of Pluralities, at least one other part of the event must exist and supplement the currently present parts of the event in making the whole event up. But according to Presentism, the only parts of the event that exist are those that are temporally present. So the argument goes:

The Weak Supplementation of Pluralities Argument:

1. Necessarily, if a material entity, x , persists four-dimensionally, then there is a time, t , at which x is present and x is not a fusion of all of the proper parts of x that are wholly present at t .
2. Necessarily, if Presentism is true, then at any time, t , if t is present then every material entity that exists is present at t .

3. Necessarily, for any material x s and y , if each of the x s is a proper part of y , but y is not a fusion of the x s, then there exists a material z such that z is a part of y , and z has no parts in common with any of the x s.
4. So, necessarily, if some material entity, x , persists four-dimensionally, then there is some time, t , such that x is present at t and some material y exists which is part of x and which is not present at t . (From (1) and (3))
5. So, necessarily, if Presentism is true then no material entity persists four-dimensionally.

Note that premise (1) is our Not Enough Parts Principle (allowing t to be an interval), and premise (3) is our Weak Supplementation of Pluralities, restricted to material entities. This argument avoids the kind of vulnerability of premise (1) of Merricks' original argument, and also avoids the worries facing the Weak Supplementation Argument.

In the next subsection, I'll show how we can produce an argument that does the same work via appeal to a non-equivalent but similar principle.

4.2. Fusion

The second principle is about *fusion*, and says roughly that if something is composite, then there is some collection of things distinct from it that it is a fusion of. That is:

- **Fusion Principle:** Necessarily, for any entities, x and y , if x is a proper part of y , then there exist some z s such that each of the z s is a proper part of y and y is a fusion of the z s.²⁵

So, for instance, if we know the puppy has some parts that are distinct from it (i.e., it's not an extended simple), then we know there must be some collection of things, each distinct from the pup, that together make up the puppy. Another way to think of it is this: one may find it plausible²⁶ that any composite is a fusion of *all* of its proper parts – it mereologically contains them, and they each contribute to making it up. If you like that principle then you should also accept the Fusion Principle, above, which is a weaker claim that follows from it. For if you think that any composite is a fusion of all of its proper parts, then you'll think that for any composite (which, by definition, has proper parts) there is a collection of proper parts of it that it's a fusion of. Finally, the Fusion Principle (as well as the stronger principle just described) will follow immediately from our typical definition of 'fusion':

- ‘*x fuses the ys*’ =df each of the *ys* is a part of *x*, and *x* has no part disjoint from each of the *ys*

If an object is composite, then the collection of all of its proper parts will satisfy both conditions in the definition above: each will be part of the composite, and the composite will have no part disjoint from them. So there will be some collection of proper parts (namely, the collection of all of them) that the composite fuses.

Finally, a quick note on how Weak Supplementation (WS), Weak Supplementation of Pluralities (WSP), and the Fusion Principle (FP) come apart: the Fusion Principle neither entails nor is entailed by WS. To see this, note that the Fusion Principle, but not WS, will be satisfied in any case where *x* is a fusion of a single proper part, *y*. Further, WS does not entail the Fusion Principle; for instance, suppose *fusion* is primitive, and some *x* has as proper parts *y* and *z*, but is not a fusion of *y* and *z* (suppose nothing is), though it *is* a fusion of itself together with *y* and *z*. WS will be satisfied but the Fusion Principle (and also WSP) will not. How WSP and the Fusion Principle come apart is more complicated. WSP looks at some proper parts of an object that don’t fuse to make it, and says there must be a disjoint additional part. It doesn’t say that the object must fuse them together. So, if we can have ever-larger collections of proper parts without a fusion of them, WSP will be satisfied and FP will not. From the other direction, FP says simply that if you’ve got some proper parts of an object, the object must be a fusion of some proper parts or other. It doesn’t say anything about which parts must be disjoint from which others. If we take *fusion* as primitive, this will be satisfied in any decompositionally plenitudinous case²⁷ where we think *x* fuses some proper parts, the *ys*, but also has an additional proper part, *z*, and does not fuse the *ys* and the *zs* together (suppose nothing does). These are all very strange cases. But then, the principles under discussion are incredibly plausible, so cases where any of them are violated are guaranteed to be strange.

Still, though not equivalent in all systems, these principles, and especially WSP and the Fusion Principle, are very similar. I’ll continue to discuss both going forward, but if thinking of these issues in terms of one seems more perspicuous than the other, then I invite you to focus there.

Here is the basic idea of the argument from the Fusion Principle to the incompatibility of Presentism and perdurance. Take our event of the ant crawling on the peony again. The Not Enough Parts principle tells us that the event isn’t the fusion of all the proper parts of the event that are wholly present at that first time – and that’s intuitive, not enough of the event is then to make the whole event up. And Presentism tells us that, when *t1* is present, the proper parts of the

event wholly present then are the only ones that exist. But the Fusion Principle tells us there must exist *some* collection of proper parts that the event is a fusion of. Since it can't just be the ones present at *t1*, there must be some that aren't present at *t1*. And since the event is wholly material, each of its parts will be, too. So, contrary to Presentism, there must be some non-present, material proper part of the event after all.

The formal argument expressing this will be exactly like the Weak Supplementation of Pluralities Argument, except that premise (3) will be replaced with a version of the Fusion Principle restricted to material objects.

So: Both the Fusion Principle and Weak Supplementation of Pluralities are very plausible. And any possible case of a perduring entity (even one without temporal parts) in a Presentist world will violate both of them, given Not Enough Parts.

5. Attempting Tensing or Relativizing

Here's where we are now: we want to give an account of perdurants (with temporal parts or without them) within a Presentist framework. I've highlighted two mereological principles that raise challenges for this, so our next task is to see whether we can capture the spirit of these principles in a Presentist-friendly way. Hovda (2013) gives a way to do this (and, in fact, tells us how to capture a mereology with Extensionality and Unrestricted Composition) while appealing to nonexistent parts (i.e., claiming that entities can have as parts nonexistent objects). Here, I'll examine the prospects of attempting to capture the spirit of WSP and FP without nonexistent parts. I want to emphasize: I am not claiming that the project may be successful. Instead, I'll simply present how some initial steps in pursuing the project may go.

The basic incompatibility argument is that, in a Presentist world, if a material entity perdures then at some time there's just some of the entity and there's nothing beyond that bit to supplement it to make the whole entity. The natural response for the Presentist to give, of course, is: there *will be*, or *there was*. There might not be any supplementing parts *now*, but those parts *did* or *will exist*. So, for instance, the event of the ant crawling on the peony is no problem, because though there *is* only some of it, it *has had* parts that have no parts in common with its current temporal part, and it *will have* further parts, likewise disjoint from the ant-crawling-now.

So the Presentist who appeals to tense or relativizing will reject one or more of Weak Supplementation, Weak Supplementation of Pluralities, and the Fusion Principle as I have

formulated them, but they may attempt to give tensed or relativized versions to capture the same intuitions that support those principles. In the rest of this section I will examine some tensed or relativized versions of those axioms, and I'll raise problems for each of the options. I'll argue that the problems for revised versions of Weak Supplementation suggest we should give up that principle, but the problems for revised versions of WSP and of the Fusion Principle guide us to further revisions that may be promising for the proponent of this strategy.

5.1. Re-examining Weak Supplementation

Earlier, we noted that one can use Weak Supplementation to establish the incompatibility of Presentism and perdurance, for theorists who think that Presentist perdurance involves temporal parts. Suppose you fall into that group. Before we even begin to explore the principles from §4, you may wonder, as an initial step, whether we can avoid the perdurance/Presentist incompatibility generated by Weak Supplementation in particular if we endorse a tensed or relativized version of that principle.

Here is a temporally relativized version of Weak Supplementation that we might hope captures the same intuitions that motivate the original version of the principle.²⁸

- **Relativized Weak Supplementation (RWS):** For any objects, x and y , if there exists a time, $t1$, at which x is a proper part of y , then there exists a time, $t2$, at which y has a part that has (at that time²⁹) no parts in common with x .

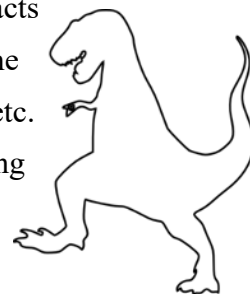
And a tensed version of this principle might look like this:

- **Tensed Weak Supplementation (TWS):** For any objects, x and y , if it was, is, or will be that x is at that time a proper part of y , then it was, is, or will be that y has a part that then³⁰ has no parts in common with x .

In what follows I'll focus on the tensed version of the principle, but my claims will apply to the relativized version as well.

The new version of Weak Supplementation will get the right results with respect to Ant on a Peony: that event does not violate Tensed Weak Supplementation, and so is not ruled out. This accords with our intuitions. Ant on a Peony seems relevantly dissimilar from the paradigm sort of case that Weak Supplementation (and any tensed or relativized version of it) is expected to rule out. For an example of such a case, consider:

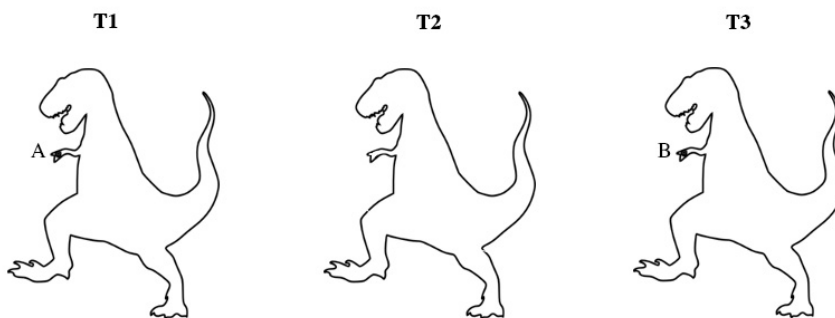
- *The T-Rex*: There is a T-Rex (or at least, something that looks and acts like one; she's large, runs around, etc.) who is unusual in that she doesn't have proper parts corresponding to teeth, claws, legs, a torso, etc. (Though she *looks* as if she does, is the same size and shape as something that does, and is made of as much matter as something that does.) In fact, she has no proper parts, save one (and its parts): a tiny fleck of green scale on the tip of what would be a left forepaw if she had forepaws.³¹



Perhaps in this case the T-Rex endures, and has the same proper part at each time. Or instead, perhaps the T-Rex and fleck of scale each perdure, and the T-Rex has the persisting fleck of green scale as a four-dimensional part and has no parts disjoint from it. Either way, the T-Rex has the scale as a proper part, and has no parts disjoint from that part. The fleck of green scale does not seem to be enough to make up the T-Rex, but the dinosaur has no parts completely separate from it to supplement it. This is exactly the sort of thing Weak Supplementation (tensed or relativized or not) should rule out, and both Weak Supplementation and Tensed Weak Supplementation get the right results in this case.

However, there is a similar case that is more challenging:

- *The Long-Lived T-Rex*: Suppose that we have a T-Rex (or something that looks and acts just like one) exactly as in the original T-Rex case, except that this T-Rex persists for years. Further, she's a trooper, and can persist through the loss of her proper part. She doesn't even notice when the bit of scale falls away. Much later, she gains a new proper part – a new small fleck of scale, distinct from the first.



If the Long-Lived T-Rex and its parts endure, there is a fleck of green scale that is wholly present at some times, and then ceases being a part of our dinosaur. Then, a second fleck of green scale is wholly present and part of our dinosaur. At each time, the fleck of green scale does not seem to be enough to make up the T-Rex: the T-Rex seems to be relevantly similar to the original T-Rex

at every time, in clear violation of our supplementation intuitions. However, TWS will be satisfied. Because for any proper part of the T-Rex (the first part it has, or the second) there was, is, or will be a disjoint part of the T-Rex (namely, the other bit of scale) that the T-Rex had, has, or will have as a part. So, the principle is unable to rule out the case on supplementation grounds, and is therefore unable to capture our supplementation intuitions.³²

TWS will also be satisfied if the T-Rex perdures, assuming there is no fusion of the two flecks of scale. Perhaps this is enough to satisfy the spirit of Weak Supplementation itself, but it is not enough to satisfy the general supplementation intuitions that I take to underlie Weak Supplementation. That is, I take the intuitive motivation of Weak Supplementation to be that, when you have just some of something, and what you've got isn't enough to make up the whole thing, there must be some more to it beyond what you've already got. And in this case, the two flecks of scale (one had at each of two different times) aren't enough to make up the entire, perduring dinosaur. So there must be some more to it. Weak Supplementation (as well as the tensed version of it) is not enough to capture this supplementation intuition with respect to this case. So, though this case is not an instance of TWS getting the wrong result (at least, with respect to what WS would have predicted), it does seem to be an instance of TWS failing to capture the relevant motivating supplementation intuitions, and reason for us to endorse something else.³³

Here is the upshot of this subsection. WS generates problems for a theorist who thinks perdurance involving temporal parts can happen in a Presentist world (as with cases like Ant on a Peony). TWS gives the right results in those cases. However, it fails to give the right results in any case where something endures and violates WS at multiple times, though in virtue of having distinct proper parts across times. So if you think perdurance involving temporal parts is compatible with Presentism, and that there can be enduring material objects and the same mereology should apply to those, you should not endorse WS, and TWS will not be sufficient to produce the right results for you. You'll need a different (perhaps additional) axiom. Finally, even if you don't think there can be enduring objects, a similar case involving perduring objects should be ruled out on supplementation grounds, and TWS is not able to do this for us. So either way, we should look for a different principle that entails that Long-Lived T-Rex is impossible.

5.2. Re-Examining Weak Supplementation of Pluralities and the Fusion Principle

In this subsection, I will present and evaluate initial attempts at tensed and temporally relativized versions of WSP and of the Fusion Principle, raise a problem for them involving enduring entities.

As we saw in §4.1, WSP generates even more problems for the compatibility of perdurance and Presentism than WS does. So, can we avoid the problems generated by WSP by rejecting it and endorsing a tensed or relativized version of it instead?

Here is a temporally relativized version of Weak Supplementation of Pluralities:

- ***Relativized Weak Supplementation of Pluralities (RWSP)***: For any objects, the x s and y , and time, $t1$, if at $t1$ the x s are proper parts of y but y is not at $t1$ a fusion of the x s, then there exists a $t2$ such that at that time y has a part that at no time has parts in common with any of the x s.

And here is a tensed version of Weak Supplementation of Pluralities:

- ***Tensed Weak Supplementation of Pluralities (TWSP)***: Always, for any objects, the x s and y , if it was, is or will be that the x s are at that time proper parts of y but y is not then a fusion of the x s, then it was, is, or will be that y has a part that at no time has parts in common with any of the x s.^{34,35}

As before, I'll go on to talk just about the tensed version, though all of my worries will also apply to the temporally relativized version.

In §4.2 we saw that the Fusion Principle also causes trouble for Presentist perdurance. Regardless of whether one endorses WSP in any form (tensed, relativized, or neither), and regardless of whether they accept WS (perhaps thinking Presentist perdurance can only happen without temporal parts) or reject it, the Fusion Principle is incredibly plausible. Can a theorist avoid the problems for Presentist perdurance the Fusion Principle raises, by endorsing a tensed or relativized version of it, along the lines of the following?

- ***Relativized Fusion Principle (RFP)***: For any entities, x and y , if there exists a time, $t1$, at which x is a proper part of y , then there exist some z s and some time, $t2$, such that each of the z s is at some time a proper part of y and y is at $t2$ a fusion of the z s.

Note that for this principle to give plausible results for perdurers in a Presentist world, and without appealing to having of non-existent parts, we will need it to be the case that it's true that "y is a fusion of the x s" even if there is no time at which each of the x s exists and is currently part of y .

Here is a tensed version (and again, I'll focus on the tensed version in the following discussion):

- ***Tensed Fusion Principle (TFP)***: Always, for any entities, x and y , if x was, is, or will be a proper part of y , then there was, is, or will be some z s such that each of the z s was, is, or will be a proper part of y and y was, is, or will be a fusion of the z s.

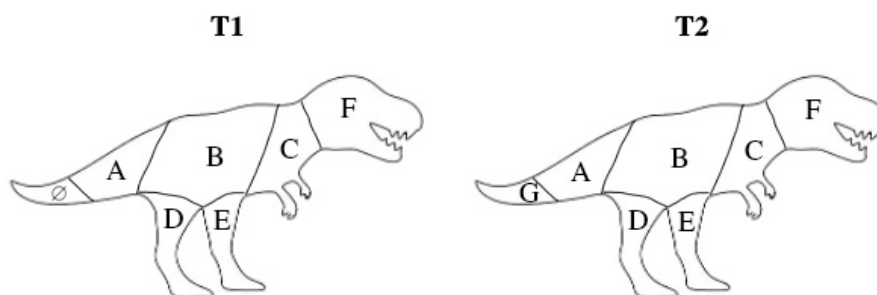
This principle also requires that the claim “ y is a fusion of the z s” is true even if there’s no time at which each of the x s exists and is currently part of z . TFP appeals to what it is for something to be a fusion of some things, and so one of the tasks facing our Presentist is to give an account of what that means. I won’t be able to dive into questions of what our options are for that, but I will say this: if we want to avoid depending on non-existent parts in our account of cross-temporal fusion, then fusion will not, at bottom, be the familiar relation between some object and some other objects. Instead, cross-temporal fusion facts will be made true by how an object relates to some other current objects, along with some facts about what was and will be the case. Put more intuitively, what something is a fusion of will be determined by what is part of it, along with truths about what was and what will be parts of it. I think this can be worked out, and will proceed on that rather significant assumption, but the claim that it can’t be is one way opponents may push against the Presentist perdurance picture.³⁶

The above four principles all are compatible with the Ant on a Peony case. For instance, consider the tensed versions. Consider any collection of the proper parts of the event at some time. The TWSP requires that there was, is, or will be some proper part of the event that is always disjoint from the members of that collection. And there will be, if we assume that the event perdures partly due to having at least some distinct, temporary parts across each time at which it is present. TFP, on the other hand, requires that, since the event has some proper parts, there was, is, or will be some things that are (then) each proper parts of the event, and the event is then a fusion of them. Again, if we think the event just is the fusion of all of the things that were, are, or will be its temporary parts (perhaps even along with some enduring parts), this principle will be satisfied. Note also that none of the above involved appeal to *temporal* parts of the event, just *temporary* parts of the event. So the principles will similarly be compatible with cases of Presentist perdurance that lack any temporal parts, and just involve temporary parts.

So far, so good for the Presentist perdurance theorist. However, the principles face a challenge (which I’ll sketch an answer to in §5.3). If the Presentist perdurantist also thinks that enduring entities are possible, and they want a single mereology to govern enduring and perduring material entities, they face an apparent dilemma: their principles (at least as stated above) either

fail to get the right results with respect to what can happen at a time, or they fail to get the right results about perdurers across times. Here's the relevant case:

- *The Incomplete T-Rex*: Suppose we have an enduring T-Rex (or something that looks and acts just like one) which, just as with the other T-Rexes we've discussed, is, at $t1$, not a fusion of the proper parts she has at t . And in this case, she has many proper parts – enough to make most of her up. Then, at $t2$, the T-Rex gains new parts and is the fusion of those and the old parts (which, like our T-Rex, have endured).



Intuitively, the T-Rex is misbehaving at $t1$. Intuitions that support Weak Supplementation of Pluralities (in whatever form we present it) push us to say that, at $t1$, the proper parts of the T-Rex aren't sufficiently supplemented. But TWSP will be satisfied, because there *will* be a later part that is disjoint from all of the proper parts present at $t1$. Similarly, the intuitions that support the Fusion Principle will be in conflict with what the T-Rex is doing at $t1$; the T-Rex has some proper parts, but even though the T-Rex is wholly there then, it isn't a fusion of any of its proper parts then! But TFP is satisfied with the case, because there *will* be a collection of proper parts that the T-Rex will be a fusion of. So, with respect to both principles, the intuitions underlying those principles are violated with respect to these enduring entities – we want to say that enduring entities can't behave in these ways. And the revised principles we've presented cannot give us that result.

I believe, however, that this particular kind of worry can be addressed.

5.3. Next Steps

In this final section, I'll provide a sketch of what I think the next steps should be for a Presentist who wants a mixed ontology of perdurers and endurers, governed by a single mereology, and without appeal to non-existent parts. I will not claim that this kind of picture will be successful, or even give the details of how we might formulate the revised versions of the tensed principles. And I won't attempt to suggest this view can address all of the natural objections it will face; you

might opt to read my wish list as a *reductio* against this kind of picture. The details of these next steps, including what kinds of translations or reductions we may attempt, how all of this relates to debates about temporal span operators, and what the implications of my suggested mereology are (especially for whether we want a fusion-first mereology, and for whether locations of wholes can be derived from locations of proper parts) will have to be left for a future project. But for now, here is a description of roughly where I recommend heading next and why.

I think there's a way we can revise the principles to get around the difficulties from section 5.2. I'll start by considering the temporally-relativized principles, which one can adopt if they wish,³⁷ and which at the very least can be helpful heuristically. But the revised versions of even just the relativized principles will be messy, so here's a lead-in that will make them more intuitive. We can generate the general kind of problem from section 5.2 with any case where we imagine what an intuitive violation of WSP or the Fusion Principle will look like at a time, and have an enduring entity do that at one time, but satisfy the WSP or Fusion Principle in virtue of what it does at other times. The issue is that for enduring things, which are wholly present at each time, we want them to be following the supplementation and fusion intuitions at each time, since we have *the whole thing* then. For perduring things, we want to say the rules can be satisfied across times (which is what gives us the possibility of motivating the compatibility of Presentism and perdurance) because the whole thing stretches across time. So it looks like our principles could do work for both enduring entities and perduring ones if we're able to tie the span of what can satisfy the principles to the temporal size of the objects and where that places them in time. And that's what the reformulations will attempt to do.

Here is another way to think of this. The puzzles we're facing arise from having an ontology that includes things that are present in different ways through time (some being wholly present at an instant, some extending across large temporal regions – where we can translate that into Presentist-friendly terms entirely via appeal to shapes³⁸ and distances from the present, rather than via quantification over intervals or non-present times and entities). There is precedent for mereology facing complications when things get locatively complicated: mereology is frequently singly or doubly relativized to regions to handle cases of multilocation in space.³⁹ The guiding idea with these is that, when something is completely in two different places at once, perhaps differing in its mereological features across the regions, we aren't just interested in what parts the thing has anywhere, we're interested in what parts it has *within each region at which it's located*. When looking at a fusion in one place, we don't just want to know if its proper parts are supplemented by additional parts somewhere-or-other, we want to know if it's properly

supplemented within where the fusion is *there*. Similarly, when looking at a currently present enduring entity, we don't want to just know whether it *will* have additional proper parts sometime in the future or *had* some in the past, we want to know if it has enough supplementing parts *now*. And a perduring entity, with a temporally larger shape, has more room for supplementing parts. So in that case, we may well want to know if it *will be* or *was* the case that it has additional, supplementing parts. But more important still, we want to know if it has those parts within the times (or within the distance from the present) at which the thing is/was/will be located.

Using singly-relativized mereologies as a guide, and relativizing them to times (and noting that I am not yet trying to avoid appeal to non-present times or parts), we may present this revision of our relativized version of WSP:

- ***Relativized Weak Supplementation of Pluralities – Revised (RWSP-R)***: For any objects, the *x*s and *y*, and time, *t1*, at which *y* is wholly and exactly present, and additional times, the *ts*, within *t1*, if each of the *x*s is a proper part of *y* at one of the *ts*, and *y* is not at *t1* a fusion of the *x*s, then there exists a *t2* within *t1* such that at that time *y* has a part, *z*, that at no time within *t1* has parts in common with any of the *x*s.⁴⁰

This just says that if we've got a thing wholly present at some time or interval, and it has some parts within that time but isn't then completely made of those parts, then it must also have some supplementing, disjoint part within the interval at which it's located.

And here is the revised relativized version of the Fusion Principle:

- ***Relativized Fusion Principle – Revised (RFP-R)***: Necessarily, for any entities, *x* and *y*, and time, *t2*, if *y* is wholly and exactly at *t2*, if there exists a time, *t1*, within *t2* and at which *x* is a proper part of *y*, then there exist some *zs* and some times, the *ts*, within *t2*, such that each of the *zs* is at one of the *ts* a proper part of *y* and *y* is at *t2* a fusion of the *zs*.

This just says that if a thing is wholly present at some time or interval, and it has a proper part within that time, then there's some collection of proper parts that it has within the time or interval it's at, that it's a fusion of.

So, when the whole object is located only at a temporally large region, each of the above principles will allow the features satisfying the requirements of the principles to span that temporally large region. When the whole object is located at temporally small regions, each of the above principles will require that the objects satisfy those principles within each of those temporally smaller regions. This should give us intuitive results for enduring entities, while

providing enough flexibility for Presentism and perdurance's compatibility – at least, barring other objections! Of course, there are hard questions about what it means for an entity to be wholly and exactly present at an extended temporal interval within a Presentist framework, and it will be up to any theorists adopting this kind of picture to make choices about the sort of account they would like to give there.

A final crucial step to take, if we would like to capture real change, and also avoid appealing to non-existent parts, will be translating the above principles into tensed language with no quantification over times or objects outside the scope of the tense operators. Immediately here we run into some complications, and I will simply sketch how things should go, leaving the details for a future project.

Here is one rough path to beginning to build tensed versions of our principles. Consider any time some object is even just partly present. Right then, there should be a fact about the temporal size of that object -- not how long it happens to persist, but the actual temporal length of the shape of the object. (We can put this in presentist-friendly terms of tensed facts about the object that are true at various distances from the present. However we understand the “temporal borders” of the object, we will want to avoid commitment to non-present times, and we must certainly avoid commitment to those times being occupied.) Once we have these facts, we should be able to specify an interval corresponding, intuitively, to the temporal print of the object's temporal location. And what we want to say with our principles is that, any time it's true that some object exists and has a proper part, within that object's temporal print (i.e., within the right distance in the past or future directions to give us the object's temporal shape) it's also true that there are times at which the object has additional parts standing in the right relations to it.

Diving into how my appeal to intervals relates to worries about use of “span operators” and how we may try to make all of this ultimately about shape facts along with facts about what were/are/will be slices, will take us too far afield of the central points of this paper (and the issues are being discussed in detail elsewhere⁴¹). But I will note that independent of anything about perdurance or mereology, the Presentist will need ways to translate sentences relevantly similar to the mereological claims I want us to turn into innocent, tensed principles. For instance, just as we want to give a translation of claims that some entity, *x*, has parts with certain features within its temporal location, we may want to give innocent, tensed translations of claims like, “Sometime within Maren's third year, Maren's sibling Kira was born.” Or “I've been working nonstop for the last hour on this paper”. Each of these ordinary sentences points us to an interval (or some

collection of distances from the present) and talks about what's true some or all of the time within that interval. If the Presentist can innocently translate these sentences, they'll be able to handle translating my mereological principles.

There is, however, an additional challenge of how to talk innocently (i.e., without quantifying outside the scope of tense operators over non-existent objects or times) about things standing in relations across times (me admiring my late grandmother, for instance). We face this difficulty if we have an account of *fusion* involving temporally extended individuals as ever requiring a listing of all of the things the whole is a fusion of. Importantly, as I noted in §5.2, I suggest having a mereology that does not consider fusion to be a relation between a thing and a bunch of things that also are within the domain of our quantifiers. Instead, we best understand “*x* is a fusion of the *y*s” to be about *x*, whatever parts it has right now, and also the collection of tensed facts about what it was, is, and will be the case that *x* has as parts. Extremely roughly, and letting *then* be when *x* is exactly present, we may say that, always, if *x* is *then* a fusion of the *y*s, then *sometime* within *then*, *y*₁ is part of *x*, and *sometime* within *then*, ... *y*_{*n*} is part of *x*. And never within *then* does *x* have a part that *then* has a part in common with *y*₁, or ... *y*_{*n*}. This was extremely rough and not yet sufficiently Presentist-friendly. The project of how to write this out properly with operators, as well as how to account for the operators in a way Presentists will like, is, again, something to be taken up at another time.

Finally, I'll note that if we can make this work, we will have a picture on which perdurers are genuinely dynamic. Tense helps us capture real change for enduring objects, and distinct parts had across distinct times (even if those parts don't all exist at once) can help us capture a kind of “change” for perduring entities. But perduring entities in a tensed, Presentist world seem to get both, because they change with respect to what existent parts they have. I think this may be a good result, if we want a picture with enduring things and perduring events. Intuitively, events don't change in the same ways that things do, but we still sometimes talk of them changing (moving from place to place, gaining momentum, etc). Perhaps we will want to say that events don't *really* change with respect to properties that are simply derived from their proper temporal parts (as we may want to say the same about any perduring entities). But on the kind of picture sketched above, events will really change with respect to which parts they have – even if they don't change with respect to which parts they are composed of, because the relation between having parts and fusing parts will not be as direct as it typically is taken to be. This will be genuine change, and change directly linked to it may also be genuine change for events. That puts events in a kind of middle category for change, which fits my intuitions.

So, we've seen that it is Weak Supplementation of Pluralities and the Fusion Principle that most effectively generate incompatibility of Presentism and perdurance. And we've seen that, if we attempt to respond to that incompatibility by giving tensed or relativized versions of the principles, we face difficulties in making the principles get intuitive results for both perdurers and endurers. It is my recommendation that if a theorist would like to avoid these difficulties, they should further revise their principles in a way that ties rule application to the temporal regions at which the objects are wholly or exactly located. Of course, I have not answered all (or even many!) of the hard questions facing such a theorist, but I hope to have added a small bit to their picture.⁴²

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¹ I'm including events among the kinds of entities that may be taken to perdure. If, like Lawrence Lombard (1999, p. 255) you are inclined to say that events do not perdure but rather *occur*, please read my use of 'perdurance' as broad enough to include this. I'm interested only in the mereological features of entities and how the having of those features relates to times.

² For our purposes it would work just as well to define proper parthood as asymmetric parthood following Cotnoir 2010, saying ' x is a *proper part* of y ' =df x is part of y and y is not part of x . Here I'll take proper parthood to be parthood with distinctness, but please substitute as you prefer.

³ This second condition has been included to rule out forms of "Presentism" on which every time counts as equally present. It also rules out forms of Presentism on which there is an extended present, with multiple times within that extended interval each counting as equally present. (On such a view, during some of the times within that interval, earlier or later times will count as being co-present.) The arguments in this paper can be extended to cover forms of Presentism that allow for an extended present, though this requires some small modifications.

⁴ This is almost exactly the definition given in Sider 2001. I have made only the following changes: (i) I'm remaining neutral on whether t is extended or instantaneous, and (ii) I have replaced talk of existence-at-times with talk of presence at and containment in times, to avoid any confusion that this may require a denial of Eternalism.

⁵ See Sider (2001), Haslanger (2003), and Hovda (2013) for examples of philosophers who have claimed that this combination is coherent, and Lombard (1999) and Brogaard (2000) for arguments for its truth.

⁶ By "exist robustly" I mean simply that they aren't reducible to enduring things. For a view to the contrary, see Pryor (1962, p. 10): "what looks like talk about events is really at bottom talk about things, and what looks like talk about changes in events is really just slightly more complicated talk about changes in things." The views I'm developing in this paper are a fit for thinking that events are perduring things wholly composed of (enduring or perduring) things, but my picture won't be needed for views like Pryor's on which events are not really perduring individuals.

⁷ Note that Simons does not endorse a combination of Three-Dimensionalism and Existential Four-Dimensionalism at the fundamental level: he thinks we ought to take occurrents as the basic constituents of reality, and derive everything else.

⁸ Mark Heller (1993) also argues for tension between Four-Dimensionalism and Presentism, arguing that the four-dimensionalist must appeal to a temporally neutral sense of existence. I believe this argument depends on the claim that something cannot have a property now unless it exists now, which seems to be taken to require being present in its entirety now. Jiri Benovsky (2009) argues

against the combination of Presentism and perdurance, first by arguing we can't capture real change with perdurance, then by arguing that there is no good way to make sense of non-existent parts, but the Presentist perdurantist would need them to distinguish the whole from its only existing parts. Finally, Jonathan Tallant (2018) also argues for the incompatibility of Presentism with perdurance, claiming that the identity of a fusion depends on its parts (which thus all need to exist). These are all a bit different but very closely related to what I'll focus on here.

⁹ Merricks (1995), pp. 524-525.

¹⁰ Ants crawl on peony buds to consume the nectar peonies produce. It is clear how the ant benefits from this arrangement, but there does not seem to be universal agreement about whether peonies also benefit. The myth that peony buds need ants in order to bloom has been thoroughly disproven. But there may be other benefits; for instance it seems that in addition to consuming nectar, ants also attack caterpillars and other insects that would otherwise pose a threat to the peonies.

¹¹ Merricks (1995), p. 525. We'll take talk of objects and parts in the argument to be restricted to material entities.

¹² Presented and discussed in Hinchliff (Unpublished), Hinchliff (1996), and Markosian (2004).

¹³ Haslanger 2003, p. 325.

¹⁴ Ernâni Magalhães (2011) argues that this strategy has promise and needn't commit us to nonexistent parts; he describes how we can appeal to causal, resemblance, and succession relations in our account of composition of spacetime worms, rather than typical parthood (p. 515). I'll be taking a different approach here, but I take my goals to be in line with his even if my strategy is different. (If we want to say this is not a view on which the entity has nonexistent parts, even colloquially, we may interpret this as a rejection of pr. 1.)

¹⁵ Hovda (2013), pp. 267-276.

¹⁶ Merricks (1995), p. 526.

¹⁷ Lombard (1999) puts this in terms of different forms of existence, saying that a four-dimensionally persisting entity can exist at a time, t , in the sense of having a temporal part existing entirely at t , without this entailing that it also then has as parts some things that exist entirely at other times.

¹⁸ See, for instance, Effingham and Robson (2007), Gilmore (2009), and Kleinschmidt (2011).

¹⁹ See, for instance, Simons (1987) and Kleinschmidt (2019), and discussion in the introduction of Kleinschmidt 2014.

²⁰ Tassoni (unpublished) discusses a more general version of this argument, and argues against appealing to immaterial parts to supplement temporal parts of four-dimensionally persisting objects.

²¹ This, of course, a rough version of Existential Four-Dimensionalism, and gives a similarly rough picture of what's required for perdurance. For something more precise, we may look to the account of Four-Dimensionalism I offered in Kleinschmidt (2017):

- **Four-Dimensionalism:** Necessarily, for any persisting object, x , (i) every interval x persists through contains a part of x , and (ii) for any way of decomposing the fusion of intervals x fills into subintervals, the T s, such that for each member of the T s there is a part of x that is contained within it, there is some collection of objects, the y s, such that (a) each of the y s is contained within some member of the T s, (b) each of the T s has at least one of the y s contained within it, and (c) x is a fusion of the y s.

Notice that this account does not invoke an *in virtue of* relation, which I have used in the main text primarily to help hand-wave in the intuitive direction of the more complicated account directly above. But none of the differences between this account and the account in the main text will make a difference for my argument.

²² We can give a similar response with Merricks' case where you are wholly decomposable into your cells (and also into the collection of their temporal parts), but you do not have any intermediate proper parts (such as fusions of cells, or non-cell fusions of the temporal parts of cells). Right now, you and your cells (which, like you, are extended in time) are partly present at this time. The only proper parts of you are *wholly* present at this time are a bunch of temporal parts of your cells (and perhaps any proper parts they have). Take any one of your proper parts that's present (in whole or in part) right now. For any such proper part, there is going to be some other part of you that is wholly present right now and that is disjoint from the initial proper part. For the only proper parts of you that are at least partly present right now are your cells (which are partly present) and a bunch of current temporal parts of your cells (which are wholly present). And for any one of these, there is some current temporal part of a cell of yours that doesn't have any parts in common with it. So for any part of you that we can pick out now (i.e., any part of you that the Presentist will think exists now), Weak Supplementation is satisfied via appeal to supplementing parts that are wholly present right now. However, because Merricks' case involves some entities, namely the cells themselves, persisting via having proper temporal parts, we can raise the original Weak Supplementation argument in relation to those. To escape the Weak Supplementation argument entirely, we need a case of Presentist perdurance that does not involve anything persisting via having proper temporal parts.

²³ A complication: the Not Enough Parts Principle faces counterexamples with multilocated, perduring objects. If you perdure through spacetime region $r1$ spanning $t1-t3$, and you also perdure through (spatially disjoint from $r1$) spacetime region $r2$, spanning from $t1-t2$, then you perdure through $t1-t3$ while being a fusion of parts contained within a proper subinterval of that interval. I happen to think cases of multilocation are analytically impossible, but of course there's disagreement on that issue. So if you think there can be cases like these, I'm happy for the Not Enough Parts Principle to be restricted to cases not involving multilocation of perduring entities.

²⁴ See my (2019) for arguments that anyone who endorses Weak Supplementation should also endorse Weak Supplementation of Pluralities.

²⁵ I take this principle to capture just one component of what Tallant (2018) is expressing when he says that "the parts of an object must exist in their entirety in order for the whole to do so" (p.2218). And part of what Jiri Benovsky (2009) is expressing when he says "[the whole person] is supposed to be an aggregate of his temporal parts" (p. 298).

²⁶ One way to deny this is to think *mereological making* corresponds more closely to van Inwagen's (1987) notion of *composition*. Another way is to endorse something like Decompositional Plenitude, presented and discussed in Kleinschmidt (Unpublished).

²⁷ For more on compositionally plenitudinous cases, see Kleinschmidt (unpublished).

²⁸ Relativization to regions for multilocation purposes will work differently. For instance, see, e.g., Hudson (2001), Gilmore (2009) and Kleinschmidt (2011).

²⁹ I'm saying 'at that time' instead of 'at any time' in RWS for the same reason I will use 'then' instead of 'always' in TWS (see next note).

³⁰ I'm saying 'then' rather than 'always' because with 'always', the case would face this counterexample: Suppose there is a blob. The blob has a smaller part, Spot. Spot then becomes detached from the blob, and is no longer part of it. At a later time, Spot rejoins the object and supplements the blob in making the larger object up. (Put in whatever accompanying logistics you need to make it plausible that at the later time, Spot does not resume being part of the blob. Perhaps, for instance, it is no longer functionally interacting with the blob as it was before.) Intuitively, this case does not violate WS intuitions. But, though at the later time the large object has the blob as a proper part, it has no parts that have *always* been disjoint from the blob. If we were to write TWS with 'always' where I've put 'then', TWS would classify this case as impossible on the basis of violating supplementation. And that would be the wrong result.

³¹ This case is from Kleinschmidt (2019).

³² Note that, if you think unrestricted composition is necessary, TWS may be able to rule out the case when it is applied to the fusion of the two flecks of scale, as (i) the T-Rex won't be a fusion of them (at least intuitively), and (ii) the T-Rex will not have any parts disjoint from them. I believe that, even if this solution gets the right results, it gets them for the wrong reasons; intuitively, the T-Rex should be ruled out because there's a lack of proper supplementation at each time the T-Rex is wholly present. TWS is unable to capture that intuition. For more details on failures of Unrestricted Composition to help supplementation principles capture our supplementation intuitions, see Kleinschmidt (2019) §4.

³³ For more on cases like this as motivation to move from WS to WSP, see Kleinschmidt (2019).

³⁴ The consequent of a slightly stronger version of this principle says: then it was, is, or will be that *y* has some parts, the *z*s, that have no parts in common with any of the *x*s at any times, and which did, do, or will together with the *x*s fuse to make *y*.

³⁵ Here is a puzzle involving enduring entities that causes trouble for TWSP (and RWSP) but not for TFP (nor RFP). Suppose that we posit enduring entities and don't endorse Presentism. If we take the time mentioned in TWSP to be any interval we choose, then TWSP will be false in cases involving enduring non-simple entities such as, perhaps, some actually past T-Rexes. For there will be some *x*s, for instance all of the parts of a T-Rex at *t*1, and some *y*s, all the new parts the T-Rex gains by *t*2, which together do not fuse to make the T-Rex. But there are no additional parts of the T-Rex which, together with those *x*s and *y*s, fuse to make the T-Rex.

I'm leaving this puzzle out of the main text because I will be focusing on puzzles involving enduring entities that cause trouble for new versions of both WSP and FP. And those puzzles, as with this one, should be solved by the revised versions of the principles of the sort I will recommend in section 5.3.

³⁶ Here is an additional difficulty both principles face: though the principles require that there were/are/will be some entities that are proper parts of the object, and the object fuses those entities, neither principle requires that the entities, even if they're all co-present with the fusion, are proper parts of the fusion *when* they're fused by it. This can be used to produce an objection to TFP and RFP. For instance, consider:

- *The Shrinking Troublemaker*: There's an enduring, large red sphere, with an orange core. It turns out, though the core is a proper part of the sphere, there are no other proper parts of the sphere. Over time, the sphere slowly shrinks, but the changes are small and it persists through them. (Make the orange core as large as you'd like, to make it seem intuitive that the sphere can persist through the change.) In the end, the sphere just is the orange core.

Note that, if we do think that, at first, the sphere and core are distinct, and later they are identical, then the tensed and relativized Fusion Principles will be satisfied even though there's no time at which the sphere is a fusion of its proper parts. Intuitively, we want to say the case is impossible, in part because it violates intuitions supporting the Fusion Principle. But the tensed/relativized versions of the fusion principle will not give us that result.

If we want to deny the identity and distinctness claims, we can give a variant of the case that avoids those commitments. Imagine that instead of an orange core as its only proper part, the sphere instead has exactly two proper parts, each an orange core-hemisphere. Imagine also that there is no fusion of the hemispheres, at least until the sphere shrinks down enough to become their fusion. This case is more like the cases in the main text, though the main text cases raise problems for a wider range of principles.

³⁷ I don't recommend endorsing my relativized versions. They don't avoid quantification over non-present parts or times, and if we're appealing to non-present parts, I think we should opt for Hovda's TM2, and appeal to non-existent parts. Hovda's mereology does not face the worries mine does, because on his picture, both endurers and perdurers have all of their parts now, even though which of the perdurer's parts exist will change. So his principles can all be satisfied by the parts things have now (even if those parts aren't present / don't exist). My system, because I want to allow for genuine change with respect to which parts perdurers have, will require our mereological rules to look at what parts objects *will* or *did* have. And once we do this, it will open up the possibility of looking at parts endurers *will* and *did* have, and allowing those to help endurers satisfy rule requirements too (when intuitively, that shouldn't be allowed). This is why my system will require an additional tool to make our rules more responsive to the differences between endurers and perdurers.

³⁸ When I talk about temporal shape of an entity, I don't just mean how long it persists; for instance, endurers can persist for a long time while having zero extension in the temporal dimension in terms of their shape.

³⁹ See Hudson (2001, ch. 2) for singly region-relativized mereology, and Gilmore (2009) for doubly region-relativized mereology.

⁴⁰ As with so many of these principles, if we add multilocation in space on top of this, we will need additional relativizing to deal with the complications.

⁴¹ See, for instance, Sider (2001, p. 27), and Ingram and Tallant (2018, section 6.4) and (2020).

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