Plenitude and derivative ontology*

Theodore Sider June 19, 2025

In what sense (if any) are some objects, such as those made of parts, "derivative"?

How should "principles of plenitude" be formulated, and how should they be extended to the social realm?

I'll begin with the second of these intertwined questions.

1. Mereological plenitude

A principle of plenitude implies the existence of a host of objects, the point being to avoid arbitrariness and worldly vagueness.[1] But to play this role, the host of objects must exhibit an appropriate host of features.

For example, suppose that, as in a memorable passage from David Lewis, the point is to enable a linguistic account of the vagueness of the borders of the Australian outback:

> The reason it's vague where the outback begins is not that there's this thing, the outback, with imprecise borders; rather there are many things, with different borders, and nobody has been fool enough to try to enforce a choice of one of them as the official referent of the word 'outback'. (Lewis, 1986, p. 212)

To play this role, the host of objects—Lewis's "many things"—must, for a start, exhibit a host of *spatial* features, so that different members of the host have different spatial boundaries.

Now, mereological plenitude, a.k.a. unrestricted composition, is seen as a paradigmatic solution to the problem of vague spatial boundaries. Yet its formulation—"any collection of things composes something"—says nothing about space.[2]

*Thanks to Jaime Castillo-Gamboa, Verónica Gómez, Ezra Rubenstein, Jonathan Schaffer, and Javah Xie for helpful discussion.

[1] On such principles see Bennett (2004); Dorr et al. (2021, Chapter 11); Fairchild (2019, 2023); Hawthorne (2006); Leslie (2011); Yablo (1987).

[2] An object x is composed of a collection S if and only if i) every member of S is part of x, and ii) every part of x has a part in common with some member of S.

This lacuna is filled by "spatial inheritance principles", which connect parthood to spatial location. If a composed object is located wherever its parts are located (roughly speaking), then members of the host are guaranteed to have appropriately varying spatial boundaries.

But these objects need to have nonspatial features as well—geological features, for example. For if they are to suffice for *the outback's* having imprecise borders, each of them must be a precisification of the term 'the outback'. So any nonspatial feature that is definitely possessed by the outback must be possessed by each member of the host.

Fans of unrestricted composition do, of course, think of their composed objects as having a rich array of nonspatial features. But we should not expect there to be simple inheritance principles for nonspatial properties, since different nonspatial properties derive from parts in different ways. Instead, I think, we should describe a certain space consisting of *all* the properties that are available to composite objects, and relegate any further questions about the truth of particular sentences of the form 'composite object a is F' to lexical semantics—to the question of which composed object is picked out by 'a', and which property in the space is picked out by 'F'.[3]

What should that space look like? I propose to construct it "from the bottom up", by assuming a certain fundamental basis underlying the host of entities, and then using that basis to characterize the space of properties available to the host. This approach will insure that the space matches the host: that the members of the host do indeed instantiate features in the space, and that no features available to members of the host are omitted. The fundamental basis I will assume consists of things without further parts—"atoms", for short—and their fundamental properties and relations. The host of objects then consists of all aggregates of atoms; and the space of properties available to them consists, roughly, of all properties that concern the fundamental properties and relations of an object's atomic parts. Whether these assumptions are overly contentious will be discussed below; but first the properties in the space must be characterized more accurately.

The space must include more than properties of the form:

> Being an object that is composed of certain atoms $a_1, \ldots$, which have such-and-such fundamental properties, and stand in thus-and-so fundamental relations.

[3] Compare Rubenstein (2024, section 4.2).

First, the space must include relations, such as:

> Being a pair of objects, the first of which is composed of atoms a and b, and the second of which is composed of atoms c and d.

Second, it must include extrinsic properties and relations, such as:

> Being an object composed of atoms a and b, such that b is five feet from some atom that has negative charge.
>
> Being a pair of objects such that a is part of the first, b is part of the second, and no atom is within five feet of b.

And third, it must include properties and relations that specify their instances' atomic parts quantificationally, rather than by name, such as:

> Being an object composed of some pair of atoms that are five feet from each other.

(Here a, b, c, and d name atoms; and negative charge and being five feet from are assumed to be fundamental properties and relations.) In general, the space should contain all properties and relations that concern the fundamental properties and relations of their instances' atomic parts, whether by name or quantificationally, whether intrinsic or relational. To that end, I will understand the space as containing, for each natural number $n \geq 1$, every n-place relation that is expressed by a predicate of the following form:

> Being $x_1, \ldots, x_n$ such that ϕ

where ϕ is a formula, containing no free variables other than $x_1, \ldots, x_n$, in a first-order infinitary language with names and predicates for all and only atoms and fundamental properties and relations of atoms (respectively), plus a predicate for parthood, and in which every quantifier is restricted to atoms.

Composite objects are guaranteed to have a range of properties and relations in this space, depending on the fundamental properties and relations of their atomic parts and of other atoms. And my working assumption is that *all* properties available to composite objects are contained in this space—not only *having such-and-such spatial boundaries*, but also *having so-and-so geological properties*, and even *being in pain*. Such properties, I will assume, are *identical to* properties in this space—properties concerning the fundamental features of atoms.

This isn't quite as contentious as it may sound. First, atoms needn't be subatomic particles. For all I've said, they might instead be points of some fundamental physical space, or strings, or even nonphysical entities. Second, "fundamental properties and relations of atoms" needn't be those of physics. For all I've said, being in pain might be a matter of fundamental mental properties and relations of atoms in the brain. Third, I'm not claiming that predicates like 'is in pain' are *synonymous* with predicates in the infinitary atom-language. And fourth, the working assumption might be seen as partially terminological, constraining the coarseness of grain of the operative notion of 'property'. Some antireductionist sensibilities may yet be offended. But what's important for present purposes isn't so much the truth of my particular assumptions, but rather to have some particular account of plenitude on the table. What I will go on to say could be modified to accommodate different working assumptions.[4]

It's often assumed that eliminating arbitrariness and vagueness demands plenitude principles with a modal dimension. There are difficult questions about how to state such principles (Fairchild, 2019, 2023), but one method is to generalize the approach we have taken so far. Define a *transworld atom function* as a function that maps each possible world to some (possibly empty) set of atoms existing in that world, and say that such a function, f, *transworld-composes* an object, x, iff for each world, w: if $f(w)$ is nonempty then $f(w)$ composes x at w, and if $f(w)$ is empty then x is not composed of any collection at w.[5] We can then state a modalized principle of unrestricted composition: *every*

[4]For example, the space of properties could be enriched. Some possible enrichments include: i) introducing quantifiers over properties in the language, and some notion of causation or law, in order to include properties of the form "plays such-and-such a causal/nomic functional role"; ii) introducing "levels" of construction of properties, as in Gómez Sánchez (2023), in order to include properties defined by their functional role *vis-a-vis* properties that aren't perfectly fundamental; iii) constructing the space in a holistic way (see section 5), to allow for properties defined by their functional role *vis-a-vis* other properties "at the same level". Despite the stance in the text, I myself suspect that each of these enrichments is indeed required, though I hold out (some) hope for a reductionist understanding of property quantifiers (Sider, 2013*b*, 2025). One might also try to somehow avoid the assumption of atomism, or the assumption that all fundamental relations pertain to mereological atoms; but those assumptions are more deeply embedded in the present approach.

[5]Not being composed of any collection could be understood as meaning not existing, or else, by necessitists, as meaning being nonconcrete. The principle might need to be modified to accommodate a temporal dimension of plenitude, depending on questions in the philosophy of time. The formulation in terms of possible worlds is metaphysically nonideal (despite being heuristically useful); see the "Fundamental Part Principle" in Dorr et al. (2021, p. 271) for a closely related principle formulated using modal operators and quantification over properties.

transworld atom function transworld-composes something. This principle implies a host of objects. And we could then describe a corresponding space of properties and relations, by incorporating world-relativization into the aforementioned account. The schematic form of predicates for properties in the space could be modifed to take the form:

> Being $x_1, \ldots, x_n$ and world w such that ϕ

where predicates in ϕ, including 'part', must now contain an additional argument place for worlds, occupied by the variable w. Thus this space will include, for example, this relation:

> Being objects x_1 and x_2, and world, w, such that for some atoms-at-w, y and z, that each have unit negative charge at w, some atom-at-w that is part of x_1 at w is five feet from y at w, and some atom-at-w that is part of x_2 at w is five feet from z at w.

As before, the host of objects described by the modalized principle of unrestricted composition are guaranteed to have a host of properties and relations at various worlds, depending on the properties and relations had by atoms at those worlds.

2. Constitutional plenitude

Questions of vagueness and arbitrariness[6] arise in the social realm as well. For example, Jaime Castillo-Gamboa (2024) considers a bank customer who is interrupted while signing a document that would otherwise bring into existence a bank account. As Castillo-Gamboa argues, it is natural to formulate some sort of principle of plenitude for social objects, so that, rather than saying that

[6]Concerns about arbitrariness might seem misplaced in the social realm, if the underlying desire is for an "objective" ontology, one that doesn't inappropriately reflect our own parochial concerns (Fairchild and Hawthorne, 2018; Fairchild, 2022). For social objects, after all, *do* reflect facts about us. However, there is a sort of objectivity that might well be insisted on, even for social ontology. Holding fixed the social facts in some community C, the description of those social facts—whether given by a member of C or by someone else—should not inappropriately reflect the parochial concerns of the person giving the description. Thus one might resist the idea that although there exist memes, there don't exist "anti-memes", expressions or pictures or other ideas that are conspicuously absent from the internet. Even if *we* don't have a word for this social phenomenon, an alternate community could, even holding fixed the relevant social facts.

(for example) there is a bank account that vaguely exists, we can say instead that there is a range of social objects such that it's indeterminate whether 'the bank account' refers to any of them.

But this plenitude principle, it would seem, must differ fundamentally from the principles of mereological plenitude discussed in the previous section. For those principles were based on the relation of parthood (for each collection of atoms, or each function from worlds to such collections, there was said to be a corresponding composite object), whereas it isn't clear that social objects like bank accounts have parts at all—at least, not physical parts. We don't ordinarily think of bank accounts as having physical locations or masses, which they would have if they were composed of physical parts.

The way forward, I think, is to develop a nonmereological conception of the "metaphysical basis" for objects like bank accounts, and then to state a principle of plenitude of the form "for every basis there exists a corresponding object".[7]

Suppose that a certain person signs a certain document, so that a bank account comes into existence. Although neither the person nor the document seem to be *parts* of the bank account, the fact that the person signed the document does seem to be a metaphysical basis for the existence of the bank account. The existence of the bank account is *constituted by* the signing of the document. (Better: the person's signing some appropriate document or other, in certain appropriate circumstances, constitutes the existence of the bank account. But let's continue to oversimplify.) I'll regiment this and other such claims as involving a relation of "constitution" between propositions: the proposition that the person signed the document constitutes the proposition that the bank account exists.

The relation of constitution will play a central role in the remainder of this paper. Here are some paradigm case of the relation to keep in mind:

> The proposition that the bank account exists is constituted by the proposition that the person signed the document.
>
> The proposition that the average USA family has 2.2 children is constituted by the proposition that the ratio of children to families in the USA is 2.2.

[7] Mereological plenitude can seen as an instance of this broad schematic form, if we think of the basis for a composite object as being the atoms that compose it, although see section 3 below.

> The proposition that there exists a vixen is constituted by the proposition that there exists a female fox.

The relation is to be metaphysically tight, truly meriting the slogan that the truth of the constituted proposition is "nothing over and above" the truth of the proposition that constitutes it. Constitution implies, I will assume, necessary equivalence. It's not a factive relation—it can hold between false propositions. (When its relata are true, I will sometimes speak of the "truth" of one proposition constituting the truth of another, or of "facts" constituting other facts.) Constitution is to be, in Ezra Rubenstein's (2024) terms, a "reductionist" rather than "generative" notion: rather than thinking of constitution in the image of causation, in which the constituting proposition "produces" a proposition that is "metaphysically distinct", the two propositions should be seen as describing the very same aspect of reality.

Even given the previous paragraph, the relation of constitution could be understood in different ways. "Groundhogs" might understand 'proposition p constitutes proposition q' as meaning that, necessarily, if q is true then q is *grounded* in p (Fine, 2012; Schaffer, 2009), so long as grounding is understood reductively rather than generatively. Members of the higher-order cabal might understand it as meaning that p and q are *identical*, in a higher-order sense.[8] And either way, there is a question of whether (inegalitarian) *quantifier variance* is part of the picture, so that part of the justification of the claim that "there is a bank account whose existence is constituted by the signing of the document" is that we adopt quantifier meanings under which such claims come out true, in our discourse about social and other constituted objects (see section 6 below).[9] I myself prefer something in the neighborhood of the higher-order approach coupled with quantifier variance; but for now, let's remain neutral about such questions. But do note that 'constituted' does *not* mean here what it means in claims like 'the statue is constituted by the lump of clay'.[10] There it stands for a relation between things, akin to parthood; here it stands for a relation between propositions.

[8] Dorr (2016). Rayo's (2013) "just-is" statements are akin.

[9] The term 'inegalitarian' is Dorr's (2014), indicating that not all of the quantifier meanings are "on a par", as they are for Hirsch (2011), but rather that one of them is distinguished in some sense, by giving the "fundamental" ontology. For defenses of inegalitarian quantifier variance see Dorr (2005); Sider (2009, 2011, sections 7.7, 9.3).

[10] See Payton (2021, Chapter 1, section 2) against understanding the relation between social objects and their bases in terms of statue-and-lump constitution.

We're after a principle of plenitude for social objects of the form "for every basis there exists a corresponding object"; and we've cashed out 'basis' in terms of a relation of propositional constitution. So one might expect a principle saying that each for each proposition about the social relations between people, there exists some social object whose existence is constituted by the truth of that proposition. But it would be better to state a more general principle, which implies a plenitude of social objects and more besides. For the principle ought to be nonvague; and the border between the social and the nonsocial is itself vague. Moreover, just as in the social realm, there are in the nonsocial realm collections of "nodes", causally related to one another, but not best theorized in terms of parthood, such as ecological systems and biological species. These collections seem analogous to social objects, and should be theorized in parallel. So to a first approximation, our principle of plenitude should say that for *every* true proposition, there exists some object whose existence is constituted by that proposition. The existence of a host of social objects will then follow as a special case, when the constituting propositions are social. (The principle should also say that distinct propositions constitute the existence of distinct objects. Nothing analogous was needed in section 1, because standard principles of mereology guarantee that distinct collections of mereological atoms compose distinct things.)

However, I would like to restrict the principle as follows:

Constitutional plenitude For every true *fundamental* proposition, there exists some object whose existence is constituted by that proposition. (And distinct fundamental propositions constitute the existence of distinct objects.)

The unrestricted principle (according to which the truth of any proposition whatsoever constitutes the existence of some object) is "impredicative", in that constituted objects might be named or quantified over in (sentences expressing) the constituting propositions. This clashes with my announced intention for constitutional plenitude to be a claim of the form "there exists a constituted entity for every *basis*". (It is also unclear whether the unrestricted principle is even consistent.[11])

[11]Threat 1: the unrestricted principle implies the existence of a one-to-one mapping from the class of all true propositions into the class of objects; if there also existed a one-to-one mapping from classes of objects to propositions, then Cantor's theorem would be violated. Threat 2: suppose there exists a proposition p to the effect that *there is nothing whose existence*

As with constitution, one might understand the notion of a fundamental proposition in different ways. My working definition: a fundamental proposition is one that can be expressed by a sentence whose quantifiers are restricted to "fundamental objects", in a first-order infinitary language with names for all and only fundamental objects, and predicates for all and only fundamental properties and relations.[12] The notion of a "fundamental object" can itself be understood in different ways; let's remain neutral for now.[13]

We now have a principle implying the existence of a host of objects. In addition to various nonsocial objects (whose existences are constituted by propositions having nothing to do with social phenomena), the host contains, I will assume, social objects like bank accounts. For the existence of a bank account can—I assume, as a working assumption—be viewed as being constituted by a proposition describing the relevant fundamental features of a certain collection of fundamental objects—the atoms, perhaps, that make up a certain person and a certain document signed by that person. There may again be concerns with this assumption—with the idea that a social object is constituted by a proposition about fundamental objects. As before, some such concerns are misplaced: I've left it open which objects are fundamental, and which properties and relations of fundamental objects are fundamental; no claims about meaning are being made; and the assumption can be taken as partially stipulative, fixing what grain "propositions" have; as before, enrichments could be proposed to my conception of the metaphysical basis of social and other constituted objects; as before, my hope is that my conclusions below could be modified to accommodate such enrichments.

---

is constituted by p. p cannot be true, since if it were, then by the unrestricted principle, there would exist something whose existence is constituted by p, making p false. But if p isn't true, then (given what p says) there exists something whose existence is constituted by p, which contradicts the fact that constitution implies necessary equivalence. Threat 3: if there exists a conjunction p of all true propositions of the form *x exists*, then the unrestricted principle says that there exists some object, y, whose existence is constituted by p. Given the ground-theoretic understanding of 'constitutes', p would then ground the proposition that y exists, which is one of its conjuncts. To be sure, each threat relies on assumptions that might be denied.

[12] I will regard fundamental propositions as being distinct when they are expressed by logically inequivalent sentences in the infinitary language in question, given a "worldly" notion of logical inequivalence, as in Bacon (2020, sections 1–2). (Logical inequivalence of the more familiar sort can be due to the presence of distinct but co-referential names or predicates, which would yield the wrong results here.)

[13] It should not be assumed that all atomic objects are fundamental, since nonfundamental social objects might lack proper parts, at least in the ordinary sense of parthood—see below.

The next step is to formulate a description of the space of properties that can be possessed by these objects, which will guarantee that the host of objects instantiates an appropriate host of features. But here we face some obstacles.

In section 1, the space of properties available to composite objects was said to consist of properties that involve the fundamental properties and relations of the atomic parts of their instances. But the present space of properties cannot be based on parthood in this way, since we are no longer relying on parthood to characterize the host of objects.

More importantly, there is a fundamental conceptual mismatch between the earlier approach and the present context.

Earlier, I said that composite objects were guaranteed to have properties from the space I had defined, depending on the fundamental properties and relations instantiated by their atoms. But I said nothing about what *constitutes* facts about the possession of such properties—facts like this:

> Composite object *c* contains two atoms as parts, which are five feet from each other.

In particular, I did not assume that such facts are constituted by facts that don't "mention" the composite object *c* or the relation of parthood.

But according to constitutional plenitude, the very *existence* of an object in the host is constituted by facts that don't mention that object, but rather, only mention fundamental objects. (By facts that only "mention" fundamental objects, I simply mean true fundamental propositions in the sense defined above.) And if that's true, then surely facts about the instantiation of *properties* by such objects must also be constituted by facts that only mention fundamental objects. If the existence of a bank account is constituted by facts about fundamental objects, then the fact that it is a bank account, that it is owned by the signer, that it has a certain balance, and so on, must surely also be constituted by facts that only mention fundamental objects.

To provide this constitutive basis, we should look to certain higher-order properties: the properties of the propositions that constitute the entities. What constitutes a certain bank account's having the property of *being a bank account*, for example, is the fact that the proposition that constitutes that bank account has the property of having a certain form.

To illustrate this idea in concrete detail, let's pretend that each bank account is constituted by a fundamental proposition of the form *a signed d*. People and documents, we are pretending, are fundamental entities, and signing is a fundamental relation. (The point of the absurd pretense is to keep things

simple, in order to clarify the logical structure of the proposal.) Then for any entity, c, whose existence is constituted by the truth of some proposition, p_c, the proposition that c has the property of being a bank account is constituted by the proposition that p_c has the following property:

> B: being a proposition to the effect that a certain fundamental object signed a certain fundamental object.

(If we help ourselves to a higher-order language with lambda abstraction, we can symbolize B as $\lambda p.\exists x \exists y\big(\text{fund}(x) \wedge \text{fund}(y) \wedge p = \text{signed}(x,y)\big)$.[14]) If p_c does indeed have B—if p_c is indeed a proposition to the effect that some particular fundamental object signed some particular fundamental object—then c does indeed have the property of being a bank account (recall that constitution implies necessary equivalence).

The story is parallel for other properties of constituted entities. Suppose a certain fundamental object a_1 signed a certain fundamental object d_1, thus bringing into existence a bank account b_1. Thus the existence of b_1 is constituted by the truth of the proposition, p_{b_1}, that a_1 signed d_1. And suppose further that a_1 also checked a certain box on d_1, indicating that the account thereby opened was to be a checking account (rather than a savings account). For short: a_1 "checked" d_1. (Pretend that this relation of checking is also a fundamental one.) The fact that b_1 has the property of *being a checking account* is constituted by the fact that b_1's constituting proposition, p_{b_1}, has this property:

> C: being a proposition to the effect that a certain fundamental object signed a certain fundamental object, and being such that the first object checked the second.

(In symbols: $\lambda p.\exists x \exists y\big(\text{fund}(x) \wedge \text{fund}(y) \wedge \text{checked}(x,y) \wedge p = \text{signed}(x,y)\big)$.).[15]

[14] One path to entry into the literature on such languages is this: Sider (2020); then Dorr (2016); then Bacon (2024). Given a standard approach to type theory, the variables and identity signs would need to be subscripted to indicate their differing types.

[15] The property of being a bank account is a special case, in that its possession by a given entity is noncontingent. This is reflected in the fact that a proposition's possession of B concerns only that proposition's intrinsic nature (that it has the form *x signed y*), and makes no further demands on the contingent world (we may suppose that x and y's status as fundamental objects is noncontingent). A variant definition of B would build in the truth of the constituting proposition: $\lambda p.p \wedge \exists x \exists y\big(\text{fund}(x) \wedge \text{fund}(y) \wedge p = \text{signed}(x,y)\big)$. Leaving it out corresponds roughly to treating the property of being a bank account as being "unworldly" in the sense of Fine (2005).

The story is parallel for relations, such as the *co-ownership* relation that holds between bank accounts when they are owned by the same person. Suppose that a_1 went on to sign a second document d_2, thereby opening a second bank account, b_2. Thus b_2's existence is constituted by the truth of the proposition, p_{b_2}, that a_1 signed d_2. The fact that b_1 and b_2 stand in the relation of co-ownership is constituted by the fact that their constituting propositions, p_{b_1} and p_{b_2}, stand in this relation:

CO: being a pair of propositions such that the first says that a certain fundamental object signed a certain fundamental object, and the second says that the first fundamental object signed a certain possibly distinct fundamental object.

(In symbols: $\lambda pq.\exists x \exists y \exists z \big(\text{fund}(x) \wedge \text{fund}(y) \wedge \text{fund}(z) \wedge p = \text{signed}(x,y) \wedge q = \text{signed}(x,z)\big)$.)

The previous example involved a relation that holds between constituted entities; but we can tell a similar story about relations that hold between constituted and fundamental entities, such as the relation of *ownership* that holds between persons (which are fundamental objects, we are pretending) and the bank accounts that they own. The fact that a_1 stands in the relation of ownership to b_1 is constituted by the fact that a_1 bears the following relation to b_1's constituting proposition, p_{b_1}:

O: being a fundamental object and a proposition to the effect that the object signed a certain fundamental object.

(In symbols: $\lambda x\, p.\exists y \big(\text{fund}(y) \wedge p = \text{signed}(x,y)\big)$.)

In light of these examples, we can describe a space of properties and relations that are available to our host of constituted entities. Let R be any n-place relation that takes propositions in some of its argument places, and perhaps also takes objects in some of its argument places (and which takes nothing else in any of its argument places), which is "fundamental" in the sense that it can be expressed in an infinitary language like the one mentioned before (all and only fundamental objects/relations are denoted by names/predicates), and in which all quantifiers are first-order and are restricted to fundamental entities. Then there exists (I assume[16]) some n-place relation, R', that takes objects in all its argument places, which is such that for any fundamental propositions and/or

[16]One might hold that the existence of R' is constituted by the existence of R.

fundamental objects, $x_1, \ldots, x_n$, whose types are appropriate for the corresponding argument places in R, and for any $x_1', \ldots, x_n'$ such that x_i' is x_i itself if x_i is a fundamental object, and is constituted by x_i if x_i is a fundamental proposition, the proposition that $x_1, \ldots, x_n$ instantiate R constitutes the proposition that $x_1', \ldots, x_n'$ instantiate R'.[17] All properties and relations of constituted objects, both social and nonsocial, can, I assume (as a working assumption), be found in the space of properties R'.[18]

3. Derivative ontology

Now for the second of our intertwined questions.

Certain objects—composite objects, for example—are often said to be "derivative". But the notion of a derivative object can be understood in different ways, depending on how "robustly" the existence of derivative objects is conceived.

On a strict conception of derivative ontology, an object is derivative only if its existence is, to put it vaguely, no more robust than that of the average family. In Rubenstein's terms, derivative objects must be metaphysically explained in a reductive way. In my terms, every proposition about a derivative object must be

[17] There are some similarities here to Epstein (2015, chapter 6), but also differences. My relation of constitution is tighter than that of grounding since it implies necessary biconditionals; I'm not appealing to anything like Epstein's notion of anchoring; and most importantly, Epstein isn't trying to provide a basis for social facts in terms that only mention more fundamental entities. There are also some similarities to Fine (1982). Suppose a is a fundamental object that has a fundamental property F. Fine's object "a qua F" can be seen as an object, c, whose existence is constituted, in my sense, by the proposition that $a_1, \ldots, a_n$ stand in R. (But whereas Fine would say that a qua F instantiates the very property F, I would say that c instantiates various corresponding properties F', such as the property corresponding to this property of propositions: *being a proposition to the effect that* $a_1, \ldots, a_n$ *stand in* R, *and which is true*.)

[18] The propositions that are doing the constituting here—the propositions of the form $x_1, \ldots, x_n$ instantiate R—do not name or quantify over any individuals other than fundamental objects. They do name higher-order entities, namely, any fundamental propositions amongst $x_1, \ldots, x_n$, and also R itself. But those higher-order entities can be expressed using sentences/lambda-abstracts whose only quantifiers are first-order quantifiers restricted to fundamental objects. Thus the claim that, e.g., "the proposition that b_1 is a bank account is constituted by the proposition that p_{b_1} instantiates B" does not violate our desired picture, which is that facts about bank accounts are constituted by facts that only "mention" fundamental objects. (Whether this remains the case given the enrichments mentioned in note 4 is an interesting question.)

constituted by a fundamental proposition.[19] (Talk of propositions being "about" entities can be understood in different ways, depending on one's views about propositional grain.)

On a more permissive conception, objects can be derivative simply because they stand in a certain kind of *relation* to fundamental objects, even if their existence must be construed more robustly, so that some facts about them are not constituted by fundamental propositions. For example, objects that stand in the relation of *being composed of* to fundamental objects are often called derivative simply on that basis. (Rubenstein would call such objects generatively explained.)

The clearest example of a defender of a permissive conception is Karen Bennett (2017).[20] On her view, derivative entities are those that stand in one of several *building relations* to other entities. Building relations include, in addition to composition, the relation of constitution in the statue-and-clay sense, set-formation, realization (C-fibers firing realizes pain), and even causation. On Bennett's view, there is no One Metaphysical Thing that all building relations have in common.[21] Rather, the relations all count as building relations because they share certain family resemblances.

Given her classification of causation as a building relation (so that even some subatomic particles count as being derivative), Bennett's conception of derivative objects is perhaps the most permissive on offer. But many others classify sets, for example, as derivative, despite not regarding them as fundamental entities. In my view, this marks an implicit acceptance of the permissive conception.

For suppose one initially thinks that there are only a finite number of fundamental entities, and that there are only a finite number of fundamental properties and relations, all of which relate fundamental entities and are physical in nature. (And suppose that one does not recognize any fundamental higher-order facts.) But then suppose that one comes to believe in the existence of sets. This represents a dramatic shift in outlook, in a way that coming to believe in

[19]Fine's (2009) notion of an unreal object and Rosen's (2010, p. 112) notion of a nonfundamental object are structurally similar, but they use grounding where I use constitution. Depending on how grounding is understood, this difference is important. See note 24 below.

[20]I also locate Schaffer (2009) near the permissive end of the continuum, although his monism (2010) complicates the picture. Fine (2009) seems nearer to the strict end.

[21]Compare Koslicki (2015); Wilson (2014) on grounding.

the average family or bank accounts would not.[22] In a very real sense, one is no longer a physicalist. There is now more to one's world than the physical world. (Coming to recognize the average family does *not* count as recognizing "more in the world" in this sense. Adding sets to one's ontology is more like adding God than adding the average family.) As a result, difficult questions about epistemology now loom. The crux is that one now recognizes, in an intuitive sense, *more facts* than before.[23] As a measure of this, consider that, on a natural way of understanding the language for the old view, the set of truths in that language is Turing-computable, whereas this is no longer true after the introduction of a predicate for set membership and the acceptance of standard set theory.[24]

This point does not assume "ontological realism". An ontological antirealist like Eli Hirsch (2011) says that one and the same facts can be given different ontological descriptions. For example, the very same facts could be described using the sentence 'there exists a chair' (in English), or the sentence 'there does not exist a chair, but there do exist some atoms that are "arranged chairwise"' (in a different language in which quantifiers have different meanings). Even Hirsch ought to agree that the two theories described in the previous paragraph (one asserting the existence of finitely many objects, the other asserting the existence of sets) do *not* describe the same facts.[25] The difference between those theories isn't, in the first instance, about ontology, but rather about the "richness" of the world they describe. To paraphrase "Kreisel's dictum", the problem is not the existence of mathematical objects but the constitution of mathematical propositions.[26] (To see this from another angle: an ontological

[22] I don't mean to suggest that bank accounts and other social objects lack distinctive causal powers. An account of the causal structure of the world that omitted social causal structure would be impoverished.

[23] According to Rayo (2013), all propositions about pure sets are identical to the proposition that everything is self-identical. On the face of it, the view described in the text requires flatly rejecting such a coarse-grained conception of propositions; but my preference is actually to not rest weight on the correct view about grain, but rather to somehow understand this sense of "more facts" in a grain-neutral way.

[24] In my view, the case of sets is the one in which the concept of ground is most overextended. If all facts about sets are said to be grounded in facts that don't mention sets, we've gotten very far away from what I thought was the core notion of ground, namely, one in which a grounded proposition is "nothing over and above" the propositions that ground it.

[25] In fact Hirsch *does* say something like this (2005, section IV).

[26] "The problem is not the existence of mathematical objects, but the objectivity of mathematical statements."—attributed to Georg Kreisel by Dummett (1978, p. xxviii).

antirealist might hold that the second theory could be equivalently described nonontically, in higher-order terms.[27] So long as the first theory is first-order, the theories remain inequivalent.)

The question of how to use 'derivative object' is terminological, as is the question of how to use the connected term 'fundamental object' (= "nonderivative object"). (I have been writing as if all parties to this dispute use 'fundamental object' in the same way; but that is misleading.) My own preference would be to use the terms in the strict sense, since calling sets, for example, "derivative" understates the vast differences between them and entities like the average family or bank accounts. But in any case, there are plenty of nonterminological issues in the vicinity, such as the question of whether derivativeness in the permissive sense can play the role commonly associated with 'derivative' (see section 6). And there are also questions about whether certain particular facts are constituted by certain particular other facts; one such question will be taken up in the next section.

4. Constituted wholes

Composite material objects are "derivative" in the permissive sense, simply because they are composite. But are they derivative in the strict sense?

To insure that the question is not terminological, let's formulate it without using the term 'fundamental object'. First choose a certain collection of "A-objects", which will serve as our constitutional basis for composite material objects. A-objects might be spacetime points, or subatomic particles, or strings—we can be neutral. ('A' is meant to suggest 'atomic'; but since different notions of parthood will be in play in what follows, I don't want to *define* A-objects in mereological terms.) Then let an A-proposition be one that can be expressed by a sentence whose quantifiers are restricted to A-objects, in an infinitary first-order language with names for all and only A-objects, and predicates for

[27] See Linnebo and Rayo (2012). Elsewhere Linnebo (2018) claims that sentences about pure sets "make no substantial demands on the world", which might appear incompatible with my claim that the two theories are inequivalent. But Linnebo employs higher-order resources, which I take to be "metaphysically committing"—i.e., requiring distinctive facts—even if they are not ontologically committing. Also, he accepts a sort of indefinite extensibility which clashes, to my mind, with the assumptions about fundamentality that I am effectively presupposing: it is unclear how the facts stated using his interpretational modal operators (Linnebo, 2018, section 3.5) are underwritten by fundamental facts. My guess is that Linnebo would simply reject my sort of talk about fundamentality.

all and only fundamental properties and relations of A-objects. Our question is then: *are all propositions about composite objects constituted by A-propositions?* For short: are composite objects "A-constituted"?

This paper's approach to the distinction between permissive and strict conceptions of derivative ontology was oblique: our discussion of plenitude and its extension to the social realm is what led us to the notion of constitution, and thus to the means to articulate the present question. But even those who aren't sympathetic to plenitude can still understand the notion of constitution, and thus can engage with the question.

In section 1, I was *not* assuming that composite entities are A-constituted (which is why I helped myself to facts about composite objects and their parts without giving a constitutive basis for them); and as we'll see in section 6, much (though not all) of the literature on composition effectively presupposes that such objects are not A-constituted. However, an A-constitutional view is possible. For suppose we accept the principle of constitutional plenitude from section 2 and the accompanying space of properties and relations from that section, when 'fundamental object' is interpreted to mean 'A-object'. In the resulting host of objects and space of properties and relations, there are many candidates to play the role of composed objects and the relation of parthood.

The simplest candidates for being composite objects are objects whose existences are constituted by the mere existence of their parts. More exactly: call y a "bare composite object" if for some A-objects $z_1,\ldots$, the proposition that y exists is constituted by the proposition that $z_1,\ldots$ exist; let "bare atomic parthood" be the relation such that for any bare composite object, y, whose existence is constituted by the existence of $z_1,\ldots$, and for any A-object, x, the proposition that x is a bare atomic part of y is constituted by the proposition that $x = z_1$ or $x = z_2$ or …; and where x and y are either A-objects or bare composite objects, call x a "bare part" of y iff every A-object that is either identical to or a bare atomic part of x is either identical to or a bare atomic part of y. Now, bare composites and bare parthood are a bad fit with ordinary talk and belief about composite objects. For example, bare composite objects have their bare atomic parts necessarily.[28] But there are much better candidates,

[28]Let x be any atom that is a bare part of some bare composite object y. Since y is composite, there exist some $z_1,\ldots$ such that the proposition that y exists is constituted by the proposition that $z_1,\ldots$ exist. Then by the definition of bare parthood, the proposition that x is a bare part of y is constituted by the proposition that $x = z_1$ or …. So, since constitution implies necessary equivalence: (*) necessarily, x is a bare part of y if and only if $x = z_1$ or …. Since x is actually a bare part of y, by (*), $x = z_1$ or …. Suppose without loss of generality that $x = z_1$. Then by the

which can be described using the following two-part scheme.

First, let a *unique* relation be a plural relation that cannot be instantiated by more than one plurality of A-objects in any possible world, but where this plurality may vary from world to world. If the proposition that *some A-objects stand in R* is a true A-proposition, then, given constitutional plenitude, there exists some object, y_R, whose existence is constituted by this proposition.[29] And the accompanying space of properties and relations contains a relation of "atomic R-parthood", such that for any A-object, x, the proposition that x is an atomic R-part of y_R is constituted by the proposition that x is one of some A-objects that stand in R. Intuitively: y_R is one particular candidate composite object, and atomic R-parthood is one particular candidate relation of atomic parthood, which is tied to the object y_R. The atomic R-parts of y_R in any possible world are the A-objects that stand in R in that world.

A bare composite object, y, whose existence is constituted by the existence of the A-objects $a_1, \ldots$, is a special case of this first part of the scheme, since we can let R in the scheme be the relation $R_{a_1,\ldots}$ of *being A-objects xx such that for all z, z is one of xx if and only if* $z = a_1$ *or* $\ldots$. But other sorts of constituted objects—ones that are less rigidly tied to their "parts"—also fit the scheme. For example, consider the relation R_s of *being arranged Socrates-wise*: the relation that holds, in any world, of the plurality of A-objects that, according to our ordinary conception, compose Socrates in that world. Any A-objects that are arranged Socrates-wise must presumably be "arranged person-wise" (though the converse isn't true: the A-atoms that are "arranged Plato-wise" are arranged personwise but not Socrates-wise). Constitutional plenitude implies the existence of an entity, y_{R_s}, whose atomic R_s-parts in any possible world are those A-objects that stand in R_s. This object, y_{R_s}, can be taken to be Socrates. It fits our ordinary conception of a person: its atomic R_s-parts must necessarily be A-objects arranged person-wise, but it has different atomic R_s-parts in different possible worlds.[30] If we choose a different unique relation, say, the relation, R_p, of being arranged Plato-wise, then we arrive at a different object, y_{R_p}, whose existence is constituted by the proposition that some A-objects stand in R_p,

necessity of identity, necessarily $x = z_1$. So by (*), necessarily, x is a bare part of y.

[29] Officially, the language introduced above for stating fundamental propositions didn't allow plural quantifiers or predicates, but it (arguably) can define them, since it's infinitary.

[30] Plenitude also implies the existence of objects constituted by more rigid relations, such as the relation had by a plurality only if its members are exactly certain specified A-objects $a_1, \ldots$, which are arranged statue-wise (compare Fine's (1999) rigid embodiments).

and whose atomic R_p-parts, in any world, are those A-objects that stand in R_p in that world. This object y_{R_p} we may take to be Plato. Each person, y_i, can be seen as corresponding to some unique relation R_i in this way.

The first part of the scheme shows how to introduce one particular candidate object, and an atomic parthood relation that is tied to that object. In the second part of the scheme we show how to introduce an entire collection of candidate objects, and a candidate relation of full parthood—not just atomic parthood—that applies throughout the collection. Let a "candidate mereology" be a property, P, of unique relations. Define a "P-object" as an object, y, such that for some plural relation, R, that has P, y's existence is constituted by the proposition that some A-objects stand in R; call an A-object x an "atomic P-part" of a P-object y iff x is an atomic R-part of y for some plural relation R that has P; and finally, for any x and y that are either A-objects or P-objects, call x a "P-part" of y iff any A-object that is either identical to or an atomic P-part of x is either identical to or an atomic P-part of y.

Each candidate mereology, P, determines a collection of candidate composite objects (the P-objects) and a candidate relation of parthood (the relation of P-parthood). Most candidate mereologies do not fit our ordinary conception of composite objects and parthood. One poorly fitting candidate mereology is that of bare composites and parthood (choosing P to be the property that is had by all and only relations of the form *being A-objects xx such that for all z, z is one of xx if and only if $z = a_1$ or …*, for some A-objects $a_1, \ldots$), but for most others, the fit is much worse. However, insofar as there is any such thing as our ordinary conception, some candidate mereology (vaguely specified, no doubt) will fit it. (That's not to say that we can simply or easily specify which candidate this is. As in section 1, its specification should be relegated to lexical semantics.) Thus where P is this candidate mereology, one could regard ordinary composite objects as being the P-objects, and regard the ordinary relation of parthood as being the relation of P-parthood.

5. Holistic constitutional ontology[31]

In section 2 I was assuming that the existences of distinct constituted entities are always constituted by distinct propositions. But there are arguably cases in which a single proposition can constitute the existence of multiple entities, without their metaphysical bases being further localizable.

[31]This section is a bit of a digression, and may be skipped without loss.

One way this might occur is for there to exist multiple constituted objects, each of whose existence is constituted by a single proposition about some particular fundamental objects. For example, perhaps a single proposition about the fundamental objects that underly Sir Arthur Conan Doyle's creative work constitutes the existence of Sherlock Holmes and also constitutes the existence of Watson.[32]

Another way this might occur is for a general proposition to the effect that there exist multiple constituted objects of a certain sort to be constituted by a general proposition to the effect that there exists an array of fundamental objects of a certain sort. This second mode of "holistic constitution" differs from the first in that it implies that permuting fundamental objects amongst qualitative roles (which is possible only given "haecceitism" for fundamental objects) would not result in a permutation of constituted objects amongst qualitative roles.[33]

As an example of the second—"structural"—form of holistic constitution, consider wavefunction realism, or, as I prefer to call it, "high-dimensionalism".[34] According to (one version of[35]) this view, fundamental reality consists of a wave function undulating in an unimaginably high-dimensional space, plus a single fundamental object—a "marvelous particle"—moving within that space. Given this view, there do not fundamentally exist any three dimensional entities—not even those that one normally considers to be physically fundamental, like quarks or photons or points of three-dimensional space. Such objects must somehow be regarded as nonfundamental. However, they are not made up of parts of the high-dimensional ontology. Their basis in high-dimensional reality is constitutional, not mereological. But particular three-dimensional entities are not constituted by particular propositions about high-dimensional reality. Rather, the high-dimensional facts constitute facts about three-dimensional entities in a holistic way. The entire history of the wavefunction plus marvelous particle constitutes a certain entire three-dimensional history, namely, that specification (if any) of how many three-dimensional particles exist, and what their three-dimensional spatial trajectories over time are like, that func-

[32]Compare Fine (1994, section 7) on "reciprocal essence".

[33]Hybrids are also possible: a single proposition about particular things might constitute a general proposition about multiple things; and a single general proposition might constitute several propositions about the existence of particular things.

[34]See Albert (1996); Ney (2021).

[35]The version that corresponds to the de Broglie/Bohm pilot-wave solution to the measurement problem.

tionally matches (in a certain way) the high-dimensional history (see Albert (1996) and Sider (2024) for details). The holistic constitution here is of the second, structural sort because all that matters about the fundamental history in determining which three-dimensional history it constitutes is the global, structural match between those histories. Thus the propositions describing constituted three-dimensional histories are purely general: *there exist* such-and-such three-dimensional fundamental objects with so-and-so three-dimensional trajectories.

Structural constitution raises a number of interesting questions; I have space only to scratch the surface.

First, it isn't just the three-dimensional *entities* that are "structurally constituted"; their three-dimensional *features*—namely, their spatial features—are also structurally constituted. It is only because of global features of the high-dimensional history that it can be thought of as constituting the existence of *spatial* entities at all. Thus if we consider a possible world that is just like the actual world in its schematic pattern of high-dimensional fundamental features, but in which the particular fundamental features in that pattern have been permuted—wavefunction properties and geometric properties of the points of the high-dimensional space have swapped roles, say (which is possible only given "quidditism" for fundamental fundamental object-properties)—this too would make no difference to the three-dimensional history that would be constituted. In particular, it wouldn't result in any sort of permutation of the three-dimensional properties instantiated by the three-dimensional entities. Thus the constituted propositions should be seen as being purely general concerning properties as well as entities—as having the form: there exist such-and-such entities, and thus-and-so properties, which play the following roles ….

Second, high-dimensionalism arguably calls for dropping neutrality on the question of quantifier variance. There is no guarantee that a given high-dimensional history can only constitute the existence of a single low-dimensional history. Since the constitution of low-dimensional reality has to do with a sort of structural match between the fundamental high-dimensional history and a low-dimensional description, some high-dimensional histories might constitute both a three-dimensional history and a one-dimensional history (say). But in such a case, rather than saying that there somehow exist two noninteracting low-dimensional worlds, it would surely be better to say that the "worlds" exist under distinct nonfundamental quantifier-meanings. A single high-dimensional history, described using the *fundamental* quantifier-meanings, constitutes facts

about there existing$_1$ three-dimensional entities, and also facts about there existing$_2$ one-dimensional entities.

Finally, parthood can no longer be understood as it was in section 4, since fundamental objects (the marvelous particle, points in the high-dimensional space) are no longer parts of ordinary composite objects (like tables and chairs). How might it be understood instead? Actually, a more basic question is how to incorporate any derivative objects at all beyond three-dimensional particles (whether objects like tables and chairs or objects like bank accounts). I see two main approaches. The first is to regard such derivative entities, and the relations that structure them, as already being included in the holistic ontology described above. If the fundamental truth about some possible world constitutes the truth of some ramsey sentence "there exist constituted individuals $x_1, x_2, \ldots$ and constituted properties $P_1, P_2, \ldots$ such that ϕ", one of the constituted properties P_i—a two-place property—might count as being the relation of parthood because of the structural features attributed to it by ϕ; one of the objects x_j would then count as part of one of the other objects x_k if ϕ implies that $P_i(x_j, x_k)$. The second is to treat the holistically constituted objects and properties described by the scheme above as being "relatively fundamental", so to speak—fundamental within the constituted realm—and then to somehow layer an even more derivative ontology on top of them.

6. Upshots

Contemporary thinking about composite objects and parthood has proceeded, in large part, without addressing the question of whether composite objects are strictly derivative. Once we attend to that prior question, the status quo must change.

Suppose first that composite objects are *not* strictly derivative. According to the most natural view of this sort, neither propositions saying that a given composite object exists, nor propositions of the form *object x is part of composite object y*, are constituted by "atomic propositions"—i.e., A-propositions in the sense of section 4, where A-objects are defined as atoms. Thus parthood must apparently be a fundamental relation.[36]

[36]This is the conception of composite entities I was opposing in Sider (2013*a*). (Perhaps Fine's (2010) "operationalism" meshes better with the view that the existence of composite objects is derivative in the stronger sense.)

This first conception of composites—which strikes me as underwriting the older part of the literature, the part centered on Lewis's *On the Plurality of Worlds* and Peter van Inwagen's *Material Beings*—calls for a radically contingent view of parthood. Although the status quo generally assumes that things can have parts contingently (an assumption built into the modal version of mereological plenitude), few accept Ross Cameron's (2007) view that it is contingent whether a given collection of atoms composes some further object, even holding fixed their relevant features. Indeed, Cameron's view seems to be regarded as a bit nutty. Yet that view is the natural one to take, given this first conception of composite objects. Contingency in whether some atoms compose a further object—that is, contingency in whether there exists some object y (whose existence isn't constituted by anything else) to which the atoms bear the fundamental relation of parthood—should be no more remarkable than contingency in whether, for a given collection of atoms arranged on the perimeter of a circle with radius 1 meter, there exists some further atom located at the center of the circle, to which each of the original atoms bears the fundamental relation *being one meter from*. Indeed, it would be surprising if such facts about the existence of composite objects *weren't* contingent, given the vague but widely-held conviction that there is contingency wherever there is no "constitutive barrier".

And even more contingency is called for. Suppose atom a is part of composite object c. Plenty of people think that this fact can be contingent for the reason that c might have had different atoms as parts. But no one (so far as I know) has held that this can be contingent for a different reason: that the direction of the parthood relation might have been reversed, so that c was part of a (and indeed that c was atomic). But if atoms and composite objects are part of a single ontologically co-equal domain, in which facts about no objects constitute the existence of any other objects, and in which objects enter into fundamental relations of parthood, this further sort of contingency might as well also be recognized, since there is no constitutive barrier to it. Any defender of this first conception who is averse to necessary truths about the pattern of instantiation of fundamental relations should view parthood as a modal free-for-all.

Defenders of this first conception will insist on calling composite objects "derivative" simply because they have proper parts. But 'derivative' in this sense—the permissive sense—cannot be assumed to have its usual import. For example, Bennett (2017, section 8.2.2) and Jonathan Schaffer (2015) have argued that Ockham's razor ought to be replaced by a principle saying that it

is only *fundamental* entities that are not to be multiplied without necessity.[37] But if composite objects' status as nonfundamental—i.e., derivative—amounts merely to their standing in a certain fundamental relation—parthood—to other objects, then Ockham's razor ought still to encompass them, no less than objects that stand in fundamental spatial or temporal relations to other objects.

This first conception may also face a variant of the argument from vagueness/arbitrariness.[38] For its defender will surely think that *some* derivative entities are derivative in the strict sense, such as the average family, or laps, or bank accounts, and may not be comfortable with a vague or arbitrary boundary between strictly derivative entities and entities that are merely permissively derivative; but it is hard to see what sharp and nonarbitrary boundary there could be.

Suppose, on the other hand, that composite objects *are* strictly derivative. That is, suppose that, for some suitable choice of "A-objects" (section 4), every proposition about a composite object—including the proposition that it exists—is constituted by an A-proposition. Other changes in the status quo would then be called for.

First, the possibility of "gunk"[39] would no longer be open. The approach to strictly derivative composite objects outlined in section 4 implies atomism: for each candidate mereology, P, the relation of P-parthood is atomic over the P-objects.

Actually, the situation is a little more complex, since the schema in section 4 isn't the only possible one for locating candidate composite objects within the host of constituted objects. For instance, given a monistic approach utilizing just one A-object, one might introduce a collection of objects whose existences are constituted by facts about that one A-object, and a parthood relation under which these constituted objects are parts of the one A-object; and I see no immediate reason why this relation would need to be atomistic.[40]

[37] Schaffer's (2010) own view is that it is the entire universe rather than atoms that are fundamental. My claim about this view is parallel: unless atoms' existence is constituted by facts about the universe, recognizing them still counts against parsimony, their status as "nonfundamental" nonwithstanding. (Although I have mostly been assuming in this paper that atoms are fundamental objects, most of my claims could be rephrased to accommodate other views about fundamental ontology, including monism.)

[38] See Lewis (1986, pp. 212–13); Sider (1997, 2001, Chapter 4, section 9).

[39] And also "junk" (Bohn, 2009), assuming that quantifiers over atoms are not indefinitely extensible.

[40] What I have in mind is that the constituting facts concern the possession of higher-order properties by the one A-object, as in Sider (2008). This sort of monism differs from Schaffer's

This doesn't strike me as the sort of gunk-hypothesis whose possibility has usually been entertained, although I don't see a sharp way to delineate the class of such hypotheses. But I do think that the picture that many people had in mind—certainly, the one that I myself had in mind, in Sider (1993) and Sider (2001, chapter 5, section 6)—is that of a fundamental relation of parthood descending infinitely along a series of objects whose existences are not understood constitutionally.[41]

Second, there is, according to the status quo—and also according to our ordinary conception—a big metaphysical difference between objects containing material atoms as parts, such as molecule and mountains, on one hand, and social objects, such as bank accounts, on the other. The former are *material objects*, since they contain material atoms as parts. And they genuinely (if derivatively) have spatial locations, masses, and the like, via the spatial locations and masses of their atomic parts. The latter, on the other hand, are thought to have a quite different metaphysical status: they aren't material objects; they aren't made up of material atoms; and they don't have physical properties like spatial location or mass, at least not in anything like the sense in which people, planets, and mountains do. But none of these differences obtain given this second conception of composite objects, because the relationship that holds between a mountain, m, and the material atoms xx that compose it, on one hand, and the relationship that holds between a bank account, b, and the material atoms yy that compose the person and document involved in the signing that constitutes the existence of b, on the other, are exactly parallel. As we saw in section 4, on this second conception, the existence of a composite object like a mountain is constituted by a proposition that there exist atoms that stand in a certain ("unique") relation; and in any possible world, the parts of that mountain are whatever atoms stand in that relation in that world. But the existence of a bank account is also constituted by the fact that there exist atoms standing in a certain relation (a relation that implies that some of the atoms are arranged personwise, other of the atoms are arranged documentwise, and the former atoms "sign" the latter atoms). And we can also introduce a notion of "B-parthood" under

sort (2010), since as I read him, Schaffer understands derivativeness in the permissive sense.

[41]Another way that the possibility of gunk would remain open is if facts about composites needn't be constituted by facts about some fixed collection of A-objects, but rather must merely be constituted by facts about their proper parts, which in turn are constituted by facts about those objects' proper arts, and so on. But this is a quite different view from the one currently under consideration, since it denies the need for a fundamental level: a set of objects whose perfectly fundamental properties and relations form a basis for all facts.

which atoms standing in such relationships count as B-parts of the resulting bank account. We don't ordinarily think of B-parthood as being parthood, or of bank accounts as being located where their B-parts are located. But these differences are superficial: the underlying metaphysics of B-parthood and its associated sense of "spatial location" is exactly parallel to the metaphysics of the kind of parthood and spatial location exemplified by ordinary composite objects.

Third, this second conception leads to a different approach to plenitude.

As we saw in section 5, in certain cases of holistic constitution there is pressure to adopt (inegalitarian) quantifier variance: the view that the meanings of quantifiers used to describe constituted entities are distinct from—and less fundamental than—the meanings of quantifiers used to describe fundamental entities. But I think that quantifier variance should be adopted even for non-holistically constituted objects, because that enables the best justification for those objects existing at all.

Why think that whenever certain A-objects stand in a certain relation, this fact constitutes the existence of *some further object*? The best answer, I think, is that this reflects a linguistic decision we have made. Of all the available quantifier-meanings, we have singled out one of them to be meant by our quantifiers, under which it is true to say that such entities exist, and indeed, under which such sentences express the very same propositions as sentences that only mention A-objects.

Imagine beginning life speaking a language in which one can quantify over A-objects but not over any further entities. It might be useful, in certain cases, to introduce expanded uses of quantifiers. One might, for instance, decide to use the sentence "there exists a hydrogen nucleus" to mean that some proton is bonded in a certain way to some electron (supposing that electrons and protons are A-objects). There is of course no question of whether it is really true that there exists a hydrogen nucleus, given that some proton is bonded to some electron, since that is all it means to say that there exists a hydrogen nucleus. Now, this one-off semantic decision does not constitute the introduction of a new meaning for quantifiers, since no meanings have yet been assigned to sentences of other logical forms that quantify over hydrogen nuclei. But it would seem that a richer set of semantic decisions *could* be made, which would together constitute the introduction of a new meaning for quantifiers, under which one can now quantify and name nuclei without expressing any propositions beyond those originally expressed. And assuming that propositional identity suffices for constitution, one can then speak, in this new language, of propositions

about nuclei being constituted by propositions about A-objects. This general procedure can then be repeated for further expansions of quantifiers, not only to further composite objects beyond nuclei, but also to objects that aren't normally construed as composite, such as bank accounts. I don't mean to suggest that there are no questions at all about this procedure.[42] But it strikes me as the most defensible conception of constituted objects.

Now, we began our discussion with ontological plenitude, and its promise to avoid arbitrariness and worldly vagueness. But arbitrariness in what exists in one amongst a range of *nonfundamental* senses is unproblematic. It does not reflect arbitrariness in the world itself, but rather arbitrariness in our decision to adopt one quantifier-meaning rather than another from this range.[43] (Arbitrariness in what exists in a fundamental sense would indeed be problematic, but a fundamental ontology of particles—or points in spacetime, or points in a high-dimensional space—would not be arbitrary.)

Thus if composite (and social) objects are constituted objects, and if constituted objects exist in some nonfundamental sense drawn from a range of available senses—if, for short, such objects are *variantly constituted*—then ontological plenitude recedes in importance, since it isn't needed to avoid arbitrariness.[44] Nor, arguably, is it needed to avoid worldly vagueness, since vagueness in what there is could be seen as semantic vagueness over nonfundamental quantifier meanings.[45]

Similarly, the methodology by which the ontology of composite objects (though mostly not of social objects) has generally been investigated fits uneasily with the idea that such objects are variantly constituted. As Hirsch pointed out long ago, that methodology has not been the methodology of ordinary language philosophy—a study of how the language of composites is used—but instead has been more "theoretical", seeking a "simple" or "nonarbitrary" answer, which integrates with theorizing in other domains.[46] This methodology makes most sense if the quantifiers in the language in which the debate is conducted are

[42] There are, in particular, questions about whether the newly introduced meanings really would count as quantifier meanings. See, especially, Dorr (2014) (and see Sider (2023) for a reply). But the bar for "really" counting as quantifier meanings should not be set too high since, after all, we are, by hypothesis, speaking merely of derivative objects.

[43] Compare Hirsch (2002*a*, section V); Rubenstein (2024, section 4.2).

[44] Principles of plenitude for quantifier-meanings (as in section 5) are perhaps demanded to avoid arbitrariness, but these will be special cases of plenitude principles for meanings generally.

[45] See Hirsch (2002*b*, pp. 65–6). But this is too quick; a more detailed discussion is needed.

[46] See, for example, Hirsch (2002*a*).

understood in the fundamental sense. But it makes little sense if the meanings of those quantifiers are nonfundamental, and are drawn from a larger range of meanings in a way that reflects the usage of quantifiers in the linguistic community. The investigation of the ontology of variantly constituted objects should move in Hirsch's direction.

References

Albert, David Z (1996). "Elementary Quantum Metaphysics." In James T. Cushing, Arthur Fine and Sheldon Goldstein (eds.), *Bohmian Mechanics and Quantum Theory: An Appraisal*, 277–84. Dordrecht: Kluwer Academic Publishers.

Bacon, Andrew (2020). "Logical Combinatorialism." *Philosophical Review* 129: 537–89.

— (2024). *A Philosophical Introduction to Higher-order Logics*. New York: Routledge.

Bennett, Karen (2004). "Spatio-Temporal Coincidence and the Grounding Problem." *Philosophical Studies* 118: 339–71.

— (2017). *Making Things Up*. Oxford: Oxford University Press.

Bohn, Einar Duenger (2009). "Must there Be a Top Level?" *Philosophical Quarterly* 59: 193–201.

Cameron, Ross P. (2007). "The Contingency of Composition." *Philosophical Studies* 136: 99–121.

Castillo-Gamboa, Jaime (2024). "Vagueness and Social Ontology." Manuscript.

Chalmers, David J., David Manley and Ryan Wasserman (2009). *Metametaphysics*. Ed. David J. Chalmers, David Manley and Ryan Wasserman. Oxford: Oxford University Press.

Dorr, Cian (2005). "What We Disagree About When We Disagree About Ontology." In Mark Eli Kalderon (ed.), *Fictionalism in Metaphysics*, 234–86. Oxford: Oxford University Press.

— (2014). "Quantifier Variance and the Collapse Theorems." *The Monist* 97: 503–70.

— (2016). "To Be F is to Be G." *Philosophical Perspectives* 30: 39–134.

Dorr, Cian, John Hawthorne and Juhani Yli-Vakkuri (2021). *The Bounds of Possibility: Puzzles of Modal Variation*. Oxford: Oxford University Press.

Dummett, Michael (1978). *Truth and Other Enigmas*. Cambridge, MA: Harvard University Press.

Epstein, Brian (2015). *The Ant Trap: Rebuilding the Foundations of the Social Sciences*. Oxford University Press.

Fairchild, Maegan (2019). "The Barest Flutter of the Smallest Leaf: Understanding Material Plenitude." *Philosophical Review* 128(2): 143–178.

— (2022). "Arbitrariness and the Long Road to Permissivism." *Noûs* 56(3): 619–638.

— (2023). "Plenitude, Coincidence, and Humility." *Philosophical Perspectives* 36(1): 59–77.

Fairchild, Maegan and John Hawthorne (2018). "Against Conservatism in Metaphysics." *Royal Institute of Philosophy Supplement* 82: 45–75.

Fine, Kit (1982). "Acts, Events and Things." In Werner Leinfellner, Eric Kraemer and Jeffrey Schank (eds.), *Language and Ontology: Proceedings of the Sixth International Wittgenstein Symposium*, 97–105. Vienna: Holder-Pichler-Tempsky.

— (1994). "Senses of Essence." In Walter Sinnott-Armstrong (ed.), *Modality, Morality, and Belief*, 53–73. New York: Cambridge University Press.

— (1999). "Things and Their Parts." In Peter French and Howard K. Wettstein (eds.), *Midwest Studies in Philosophy XXIII: New Directions in Philosophy*, 61–74. Oxford: Blackwell.

— (2005). "Necessity and Non-Existence." In *Modality and Tense*, 321–55. New York: Oxford University Press.

— (2009). "The Question of Ontology." In Chalmers et al. (2009), 157–77.

— (2010). "Towards a Theory of Part." *Journal of Philosophy* 107: 559–89.

— (2012). "Guide to Ground." In Fabrice Correia and Benjamin Schnieder (eds.), *Metaphysical Grounding: Understanding the Structure of Reality*, 37–80. Cambridge: Cambridge University Press.

Gómez Sánchez, Verónica (2023). "Naturalness by Law." *Noûs* 57: 100–127.

Haslanger, Sally and Roxanne Marie Kurtz (2006). *Persistence: Contemporary Readings*. Ed. Sally Haslanger and Roxanne Marie Kurtz. Cambridge, MA: MIT Press.

Hawthorne, John (2006). "Plenitude, Convention, and Ontology." In *Metaphysical Essays*, 53–70. Oxford: Oxford University Press.

Hirsch, Eli (2002*a*). "Against Revisionary Ontology." *Philosophical Topics* 30: 103–27. Reprinted in Hirsch 2011: 96–123.

— (2002*b*). "Quantifier Variance and Realism." *Philosophical Issues* 12: 51–73. Reprinted in Hirsch 2011: 68–95.

— (2005). "Physical-Object Ontology, Verbal Disputes, and Common Sense." *Philosophy and Phenomenological Research* 70: 67–97. Reprinted in Hirsch 2011: 144–77.

— (2011). *Quantifier Variance and Realism: Essays in Metaontology*. New York: Oxford University Press.

Koslicki, Kathrin (2015). "The Coarse-Grainedness of Grounding." In Karen Bennett and Dean W. Zimmerman (eds.), *Oxford Studies in Metaphysics*, volume 9, 306–44. Oxford: Oxford University Press.

Leslie, Sarah-Jane (2011). "Essence, Plenitude, and Paradox." *Philosophical Perspectives* 25(1): 277–296.

Lewis, David (1986). *On the Plurality of Worlds*. Oxford: Blackwell.

Linnebo, Øystein (2018). *Thin Objects: An Abstractionist Account*. Oxford: Oxford University Press.

Linnebo, Øystein and Agustín Rayo (2012). "Hierarchies Ontological and Ideological." *Mind* 121(482): 269–308.

Ney, Alyssa (2021). *The World in the Wave Function: A Metaphysics for Quantum Physics*. New York, NY, USA: Oxford University Press.

Payton, Dee (2021). *How to Be Social*. Ph.D. thesis, Rutgers University.

Rayo, Agustín (2013). *The Construction of Logical Space*. Oxford: Oxford University Press.

Rosen, Gideon (2010). "Metaphysical Dependence: Grounding and Reduction." In Bob Hale and Aviv Hoffmann (eds.), *Modality: Metaphysics, Logic, and Epistemology*, 109–36. Oxford: Oxford University Press.

Rubenstein, Ezra (2024). "Two Approaches to Metaphysical Explanation." *Noûs* 58: 1107–36.

Schaffer, Jonathan (2009). "On What Grounds What." In Chalmers et al. (2009), 347–83.

— (2010). "Monism: The Priority of the Whole." *Philosophical Review* 119: 31–76.

— (2015). "What Not to Multiply Without Necessity." *Australasian Journal of Philosophy* 93: 644–64.

Sider, Theodore (1993). "Van Inwagen and the Possibility of Gunk." *Analysis* 53: 285–9.

— (1997). "Four-Dimensionalism." *Philosophical Review* 106: 197–231. Reprinted in Haslanger and Kurtz 2006: 55–87.

— (2001). *Four-Dimensionalism*. Oxford: Clarendon Press.

— (2008). "Monism and Statespace Structure." In Robin Le Poidevin (ed.), *Being: Developments in Contemporary Metaphysics*, 129–50. Cambridge: Cambridge University Press.

— (2009). "Ontological Realism." In Chalmers et al. (2009), 384–423.

— (2011). *Writing the Book of the World*. Oxford: Clarendon Press.

— (2013*a*). "Against Parthood." In Karen Bennett and Dean W. Zimmerman (eds.), *Oxford Studies in Metaphysics*, volume 8, 237–93. Oxford: Oxford University Press.

— (2013*b*). "Reply to Jonathan Schaffer." *Analysis* 73: 760–70.

— (2020). "Crash Course on Higher-Order Logic." `http://tedsider.org/teaching/higher_order_20/higher_order_crash_course.pdf`.

— (2023). "The New Collapse Argument against Quantifier Variance." *The Monist* 106: 342–61.

— (2024). "3D in High-D." *Journal of Philosophy* 121: 305–34.

— (2025). "Higher-order Metametaphysics." *Disputatio* Forthcoming.

van Inwagen, Peter (1990). *Material Beings*. Ithaca, NY: Cornell University Press.

Wilson, Jessica M. (2014). "No Work for a Theory of Grounding." *Inquiry* 57: 535–79.

Yablo, Stephen (1987). "Identity, Essence, and Indiscernibility." *Journal of Philosophy* 84: 293–314.