

Monism

Jonathan Schaffer

University of Massachusetts-Amherst

Is reality one or many? That is, which is basic, the one whole (the world), or its many parts (e.g. some plurality of particles)? I will defend the monistic view. Reality is one. The whole is basic, its partitions derivative.

Historically, the question of whether reality is one or many has divided Parmenides and Democritus, Spinoza and Leibniz, Hegel and Russell. Plato predicted that the problem “will assuredly never cease to exist” (*Philebus* 15d), and James declared it “the most central of all philosophical problems, central because so pregnant... To believe in the one or the many, that is the classification with the maximum number of consequences” (1991: 58).

Yet today, monism is routinely dismissed as false or incoherent. These attitudes are rooted in the philosophical revolts of the early twentieth century. During the analytic revolt against the neo-Hegelians, Russell and Moore dismissed monism as clearly false.¹ During the positivistic revolt against metaphysics generally, Carnap and Ayer ridiculed the whole question as incoherent mysticism.² The issue has lain forgotten since.

If traditional metaphysics is to be revived, then the problem of the one and the many is the next step backwards.

The backwards path: In §1, I will clarify the problem. What will emerge is a question of the sparse grounds for abundant mereological structure. In §2, I will defend the monistic view. What will emerge are mereological asymmetries that render whole prior to part.

1. The Problem of the One and the Many

What does it *mean*, to ask whether reality is one or many? Most philosophers today would either read the question as asking whether exactly one entity exists, or reject the question as meaningless. No wonder monism is routinely dismissed as false or incoherent! Perhaps there is a better interpretation. On the interpretation I will offer, to ask whether reality is one or many is to ask which is basic, the one whole or its many parts.

In §1.1 I will discuss the one whole and its many parts. What will emerge here is an abundance of mereological structure. In §1.2 I will introduce the notion of basicness. The core idea is that being is grounded in a sparse elite of basic entities. In §1.3 I will pose the question of whether the whole or its parts is basic. This is the question of the sparse grounds for abundant mereological structure. Finally in §1.4 I will connect this question to the traditional problem of the one and the many. Here is the best way to understand the traditional monistic thesis that whole is prior to part.

1.1 The One Whole and its Many Parts: The Abundance of Mereological Structure

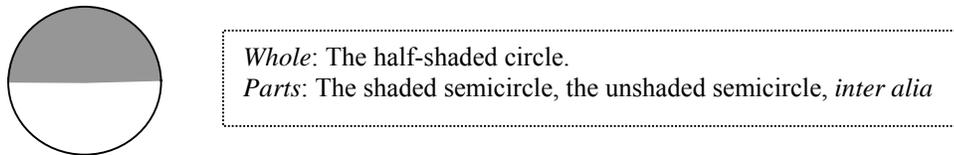
¹ Thus Russell wrote: “I share the common-sense belief that there are many separate things; I do not regard the apparent multiplicity of the world as consisting merely in phases and unreal divisions of a single indivisible Reality” (1985: 36, also 48; see also Moore 1993).

² In this vein, Ayer claimed: “The assertion that Reality is One, which it is characteristic of a monist to make and a pluralist to controvert, is nonsensical, since no empirical situation could have any bearing on its truth” (1952: 146, also 39; see also Carnap 1959: 67).

Since I am interpreting the question of whether reality is one or many as a question about the one whole and its many parts, it will prove useful to begin by clarifying these notions. The one whole is *the world*. The cosmos. The whole shebang. Nothing more—no mere *possibilia* like unicorns—and nothing less—no mere *partialia* like mountains. In classical extensional mereology (with a domain of actual, concrete objects), the one whole is the unique maximal individual referred to as “the universe” and denoted by “U”. In Lewisian possible world semantics, the one whole is the concrete individual referred to as “the actual world” and denoted by “ α ”.

The many parts are *proper parts of the world*. They are the fragments of being. In classical extensional mereology (with a domain of actual, concrete objects), the partialia are those submaximal individuals that are proper parts of U, denoted by the individual terms “x”, “y”, “z”, etc. In Lewisian possible world semantics, the many parts are the actual concrete objects that exist within α .

To illustrate, consider the following diagram:



Here the one whole is the half-shaded circle, and the many parts include the shaded and unshaded semicircles. (Here the question of one or many may be phrased as: is the half-shaded circle basic, with the semicircles just abstractions from it; or are the semicircles basic, with the circle just a construction from them?)

Now I will be making three main (though fairly minimal) assumptions about the one whole and its many parts, the first of which is:

1. The one whole exists.

That is, there is an entity that answers to the notion of the one whole. Here 1 is the thesis that the world exists.

1 might seem so obvious, as to be hardly worth stating. Not so fast! For there are those who endorse restricted principles of composition that conflict with 1.³ So arguments for 1 are needed. Here are four. First, the existence of the world seems intuitively obvious. Second, mereology needs the world. For U is needed to define complementation, where the complement of *x* is the rest of the world: U-*x*. A mereology without the world would thus be impoverished.⁴ Third, semantics needs the world. Or at least, Lewisian possible world semantics needs the world to serve as actuality. (Or at the very least, those who would reject Lewisian possible world

³ For instance, van Inwagen 1990 maintains that composition only occurs when the result constitutes *a life*, and the world is (presumably) not a biological organism. So van Inwagen’s account of when composition occurs entails that the world does not exist.

⁴ Classical extensional mereology guarantees the existence of the world by unrestricted composition over unrestricted pluralities: U is the fusion of all (actual, concrete) individuals. But unrestricted composition is not required here. For instance, on the restricted ‘brute composition’ view of Markosian 1998, the existence of U may be regarded as a brute fact (not due to any general principle of composition). Such would be tantamount to simply adding a ‘world-making’ axiom to the mereology, to the effect that there exists a unique individual such that every (actual, concrete) thing is part of it (Peter Simons 1987: 34).

semantics generally do so because of worries about reducing possible worlds, not because of worries about the existence of the actual one!) Fourth, physics needs the world. Here the program of quantum cosmology represents a direct attempt to solve for the wave function of the world.⁵ (What follows may be regarded as a fifth argument for 1, to the effect that metaphysics needs the world. For I will be arguing that (i) there are ontologically basic entities (§1.2), and (ii) only the world is qualified to serve as what is basic (§2).)

The second main assumption I will be making is:

2. The many parts exist.

That is, there are entities that answer to the notion of the many parts. Here 2 is the thesis that the world has proper parts.

As with 1, 2 might seem obvious. But as with 1, some argument is required. For there are those who endorse the pseudo-monistic view that exactly one thing exists, which conflicts with 2.⁶ So here are four arguments for 2. First, it seems intuitively obvious that you and I exist, as two parts of the world. Second, mereology needs the parts. A mereology without the many parts would have only one model, the one-atom model. The logic would thus be trivialized. Third, semantics needs the parts. Or at least, a referential semantics needs the parts to serve as the referents of terms like “you” and “I”. Fourth, physics needs the parts. Quantum mechanics speaks directly of the properties of particles and systems smaller than the universe. (Indeed, what follows may be regarded as a fifth argument for 2, to the effect that metaphysics needs the parts. For I will be arguing that (i) there are derivative entities that exist in virtue of the basic entities (§1.2), and (ii) the many parts exist in virtue of the one whole (§2).)

Now 1 and 2 together have a further controversial consequence. They imply that there are relations of proper parthood, when there are those who endorse the *mereological nihilist* view that there is no such relation.⁷ Since I have argued for both 1 and 2, I have already argued against nihilism. Indeed, I would regard the existence of proper parthood as a Moorean fact (so obvious that any valid argument otherwise should be regarded as unsound). The universe, the galaxy, the solar system, the environs of the earth, my body, my right hand, and my right pinky finger all exist, and these entities stand in a chain of proper parthood relations.

The third main assumption I will be making here is:

3. The one whole is not identical to its many parts.

Now there are those who have defended the contrary claim, that composition is identity.⁸ Of course they do not hold that the whole is identical to any one of the many parts, taken individually. Rather they hold that (i) the notion of identity can be extended beyond the standard

⁵ In this vein, Eakins and Jaroszkiwicz note: “Top-down approaches to quantum cosmology consider the universe as a single quantum system with a unique state evolving according to a given set of laws or conditions” (2003: 2).

⁶ Thus Horgan and Potrč 2000 hold that all that exists is one seamless, partless ‘blobject’. I call this sort of view ‘pseudo-monistic’ for reasons given in §1.4.

⁷ Such nihilism is introduced in van Inwagen 1990, and defended in Dorr 2001 and Rosen and Dorr 2002.

⁸ The view that composition is identity is defended in Baxter 1988 and 1999. Lewis 1991, Armstrong 1997, and Sider *manuscript* defend ‘weak composition-as-identity’, but (labels notwithstanding) this is the view that composition is *not* identity, but merely analogous to it in some respects. That view entails 3.

one-one conception, so as to relate an individual to a plurality, such that (ii) the whole is identical to all of the many parts, taken collectively. For the identity theorist, on the most inclusive sense of ‘we’, we are the world.

Here are two arguments against identity. First, the whole and its parts differ *structurally*. Pluralities have a privileged structure in terms of their individuals. For instance, the semicircles are structured into a pair of distinct semicircular shapes.⁹ But (given mereological extensionality) fusions lack such privileged structure. The circle is just as much the fusion of its two semicircles, as it is the fusion of its four quadrants, and its continuum-many points.

Second, the whole and its parts differ *numerically*. As Lewis writes: “What’s true of the many is not exactly what’s true of the one. After all they are many while it is one” (1991: 87). So, assuming that the extended many-one conception of identity retains some analogue of Leibniz’s law of the indiscernibility of identicals, the one whole cannot be identical to its many parts.

What emerges from 1-3 is *the abundance of mereological structure*, in the sense of a structure of non-identical but supervenient entities. For:

4. The many parts supervene on the one whole.

What 4 says is that there can be no difference in the many parts, without some difference in the one whole. For instance, there can be no difference in the semicircles, without some difference in the circle. More precisely, there are no two indiscernible worlds (where w_1 and w_2 are indiscernible iff they are intrinsic duplicates) that are partwise-discernible (where w_1 and w_2 are partwise-discernible iff there is no bijection f from the set of proper parts of w_1 to the set of proper parts of w_2 , such that (i) for all x in the set of proper parts of w_1 , x and $f(x)$ are intrinsic duplicates, and (ii) for all n -tuples $\langle x_1, \dots, x_n \rangle$ of members of the set of proper parts of w_1 , $\langle x_1, \dots, x_n \rangle$ are in spatiotemporal relation R iff $\langle f(x_1), \dots, f(x_n) \rangle$ are in R).

The reason why there are no two worlds that are indiscernible but partwise-discernible is that partwise-discernibility entails discernibility. In general, the property of having so-many parts, with such-and-such intrinsic properties, in thus-and-so spatiotemporal relations, is a *relational intrinsic* property of the whole.¹⁰ So if w_1 and w_2 are partwise-discernible, then there will be some intrinsic property that one has and the other lacks concerning such discernible part(s), and so w_1 and w_2 will be discernible. Fix the world, and all else is fixed.¹¹

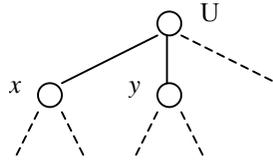
This concludes my discussion of the one whole and the many parts. What emerges is a mereological hierarchy of actual, concrete objects, with the following features: a maximal

⁹ As Sider (*manuscript*: §3) points out, the ‘set-like structure’ of pluralities is crucial to the theoretical role of the plural quantifiers in standing in for sets (e.g. in the definition of the ancestral relation), interpreting second-order logic, and comparing the cardinalities of pluralities too big to form sets.

¹⁰ The existence of relational intrinsic properties is pointed out in Humberstone 1996. For instance, I have the relational intrinsic properties of having longer legs than arms. In general, wholes have relational intrinsic properties corresponding to intrinsic relations amongst their parts.

¹¹ Note that this argument is not reversible, and so cannot establish that the one whole supervenes on its many parts. That said, it is tempting to think that the supervenience relation is symmetric here. For instance, it seems that there can be no difference in the circle, without some difference in the semicircles. Thus Armstrong suggests: “The mereological whole supervenes upon its parts, but equally the parts supervene upon the whole” (1997: 12). And in a related vein, Lewis claims: “Given a prior commitment to cats, say, a commitment to cat-fusions is not a *further* commitment... Take them together or take them separately, the cats are the same portion of Reality either way” (1991: 8). See §2.2 for further discussion.

element, and a supervenient plurality of submaximal elements (non-identical to the maximal element). So the mereological hierarchy has at least the following structure:



The circle and its semicircles (one whole with two proper parts) represents a minimal model of this structure. No doubt there is far more mereological structure to the world. What I am assuming is only that there is at least this much.

1.2 What is Basic: The Sparse Ground of Being

Since I am interpreting the question of whether reality is one or many as a question about whether the one whole or its many parts is basic, it remains to clarify the notion of basicness. The notion of basicness is part of a *hierarchical view of reality*. Here the basic forms the sparse structure of being, while the derivative forms the abundant superstructure. The derivative is dependent on, grounded in, and existent in virtue of, the basic. The basic is (as it were) all God would need to create. It is what Campbell speaks of as “the ontic constitution of the cosmos” (1990: 24-5).

Such a notion of basicness is natural and useful. It has classical roots in Aristotle’s notion of *priority in nature*, and has branched into the contemporary program of *sparse ontology*, in a way that has proven fruitful in understanding properties, reduction, and physicalism, *inter alia*.¹²

Now I will be making three main assumptions about basicness, the first of which is:

5. There is a relation of ontological dependence.

Ontological dependence is a *synchronic metaphysical* relation. It has two crucial features. First, it is an *ordering relation*. That is, it is irreflexive, asymmetric, and transitive, and thus induces a strict partial ordering over the domain of entities. It forms the great chain of being.

The second crucial feature of ontological dependence is that it *entails supervenience*. There can be no differences in what is dependent, without some differences in what it depends on. More precisely, there are no two indiscernible dependent entities (where x_1 and x_2 are indiscernible iff they are intrinsic duplicates) that are dependee-discernible (where x_1 and x_2 are dependee-discernible iff there is no bijection f from the set of entities x_1 depends on, to the set of entities x_2 depends on, such that (i) for all y in the set of what x_1 depends on, y and $f(y)$ are intrinsic duplicates, and (ii) for all n -tuples $\langle y_1, \dots, y_n \rangle$ of members of the set of what x_1 depends on, $\langle y_1, \dots, y_n \rangle$ are in spatiotemporal relation R iff $\langle f(y_1), \dots, f(y_n) \rangle$ are in R).¹³

¹² For application of sparse ontology to properties see Armstrong 1978, Lewis 1983, and Campbell 1990, *inter alia*. For application to physicalism (*inter alia*) see Lewis 1983. Thus Loewer characterizes physicalism as follows: “the fundamental properties and facts are physical and everything else obtains *in virtue of them*” (2001: 39).

¹³ Ontological dependence does *not*, however, entail analyzability or inferability. That is, if x is ontologically dependent on y , then it does not follow that the concept of being x can be analyzed in terms of the concept of being y , nor does it follow that our knowledge concerning x must be inferred from our knowledge concerning y . In this vein, Aristotle distinguishes priority in (i) time, (ii) nature, (iii) definition, and (iv) knowledge (*Metaphysics Z*). The ontological order of things in nature need not match the order of concepts in our definitions, nor the order of answers in our knowledge.

That said, there are those who would reject ontological dependence as mysterious.¹⁴ So here what is needed is an explicit account. There are three main accounts to consider. The first account (my preferred account) holds that ontological dependence is merely *supervenience plus an asymmetry-maker*.¹⁵ For concrete objects, the natural asymmetry-maker is the proper parthood relation.¹⁶ Supervenience plus proper parthood can play the role of ontological dependence: it is an ordering relation (since proper parthood is irreflexive, asymmetric, and transitive), and it entails supervenience (trivially). The great chain of being is the mereological hierarchy.

But note that I do not say whether *the direction* of mereological asymmetry runs up from part-to-whole, or down from whole-to-part. *That is the question!*

The second account of ontological dependence holds that x is ontologically dependent on y iff y could exist without x , but x could not exist without y . This second account has the advantage of an Aristotelian pedigree. But it had two main disadvantages. First, it presupposes that there is a fact of the matter as to whether one entity could exist without another. Advocates of Lewisian counterpart theory will reject this presupposition. Second, this second account does not seem strong enough to entail supervenience. Or at least, it is not obvious why the fact that (i) y could exist without x , but x could not exist without y , should entail (ii) x cannot differ, without a difference in $\{z: z \text{ could exist without } x, \text{ but } x \text{ could not exist without } z\}$.

The third account of ontological dependence is *primitivism*. This third account has the advantage of explaining supervenience.¹⁷ But it has the disadvantage of ontological inflation of a particularly problematic kind, for primitive ontological dependence is a form of necessary connection. Thus Bricker objects: “Primitive ontological determination is dark and mysterious, and primitive modality, to boot” (*forthcoming*).

In what follows I will remain neutral on how best to account for ontological dependence. As indicated, my preference is for the first account (supervenience plus asymmetry). But this will not matter for what follows. Indeed, even if all three of these accounts were to fail, I would fall back on the claim that ontological dependence is a natural and useful notion, which one should recognize even if one cannot give an explicit account of it.¹⁸

The second main assumption involved in the notion of basicness is:

¹⁴ In this vein, Thomson decries both ontological and epistemological priority as “dark notions”. Though she does immediately allow that “we have *some* grip on what [these notions] are” (1999: 306).

¹⁵ Here I follow Bricker, who understands ontological dependence as supervenience plus fundamentality, and concludes that “Nothing more is needed to justify the ‘in virtue of’ locution” (*forthcoming*).

¹⁶ It would be ideal to have a general account of asymmetry-making here, which could be applied to concrete objects via mereology, and which could be applied, for instance, to set-theoretic abstracta via founding, so that \emptyset would count as prior to $\{\emptyset\}$. I do not have a general account on offer, though the mereological asymmetries discussed in §2 may be regarded as a step in that direction. I will return to a comparison of the mereological and set-theoretic asymmetries in §2.4.

¹⁷ In a related vein, Kim suggests: “It seems likely that mereological supervenience represents a metaphysically fundamental, *sui generis* form of dependence” (1993: 166). He then adds:

But supervenience itself is not an explanatory relation. It is not a “deep” metaphysical relation; rather, it is a “surface” relation that reports a pattern of property covariation, suggesting the presence of an interesting dependency relation that might explain it. (1993: 167)

¹⁸ This fallback position would place ontological dependence in the same boat as many other respectable notions. For instance, causation (diachronic dependence) is a natural and useful notion, which one should recognize even though no one has ever succeeded in providing an account.

6. There are ontologically basic entities.

Ontological basicness can be defined via ontological dependence: something is ontologically basic iff there is nothing it depends on. Basicness is ontological independence.

6 exceeds 5 in supposing that chains of ontological dependence are lower-bounded. Relations of ontological dependence cannot run without limit.¹⁹ But one might wonder what justifies this supposition—why not allow for an endless chain of dependent entities?²⁰ So an argument for 6 is needed. The main argument for 6 is the metaphysical intuition that being requires an *ultimate ground*. Without ontologically basic entities, being would be infinitely deferred, never achieved.

By way of analogy, consider the parable of all God would need to do. Without ontologically basic entities, there would be no sense to such a parable. What would God need to do, to create a baseless world?

As further analogy, consider the status of being a criminal, in relation to the temporal order. Suppose that one has the status of being a criminal at time t if one had the status of being a criminal at some prior $t-$ (once a criminal, always a criminal), and suppose the time series is not lower-bounded. It would be absurd to suppose that one could be a criminal at t by being a criminal at $t-1$, that one could be a criminal at $t-1$ by being a criminal at $t-2$, that one could be a criminal at $t-2$ by being a criminal at $t-3$, *ad infinitum*, without ever actually committing a crime! The status of being a criminal at t must be grounded by the actual commitment of some crime at or before t . Existence seems to operate on criminal principles.²¹

The third main assumption involved in the notion of basicness is:

7. The ontologically basic entities are minimally complete, metaphysically general, and empirically specifiable.

¹⁹ Strictly speaking, 6 is compatible with a ‘half-based scenario’ in which some chains of ontological priority are lower-bounded but others run without limit. To rule this out, 6 may be strengthened to 6’: For all posterior entities x , there is a y such that y is basic and y is prior to x . The arguments offered below for 6 are equally arguments for 6’. In the main text I will not explicitly consider the half-based scenario further.

²⁰ Indeed, one might argue that an endless chain of dependence should be allowed, because there can be an endless chain of decomposition. But this presupposes that it is the whole that depends on its parts. Why assume *that*? I will return to the issue of endless decomposition in §2.4.

²¹ Of course not all orderings require lower bounds. It would be ideal to have a general account of which orderings require lower bounds. Here is a suggestion. Where the relevant status is *transferred through* the order, a lower bound is required for the transferences to get underway. But where the relevant status is *emergent from* the order, no lower bound is required. This may explain disputes over whether a lower bound is required in the epistemological and temporal orders. For the epistemological order (or at least the order of warrant), the *foundationalist* views warrant as transferred and thus requires basic warrant, while *coherentists* and *infinetists* view warrant as emergent and deny the need for basic warrant. For the temporal order (where Kant announced an antinomy), perhaps those who view the temporal series *dynamically*, with presentness continually transferred forwards, would require a first moment to get things rolling; while perhaps those who view the temporal series *statically*, from the standpoint of eternity, would deny the need for a first moment. On this suggestion, the ontological order will be the sort of order that requires a lower bound, given that the dependent exists *in virtue of* what it depends on.

The ontologically basic entities are minimally complete iff they fully characterize reality, without redundancy.²² That is, if S is the set of ontologically basic entities, then (i) there can be no difference in the world, without a difference in the members of S , and (ii) there is no set of entities S^- such that (a) $S \subset S^-$, and (b) there can be no difference in the world, without a difference in the members of S^- . The *completeness* of the ontologically basic entities follows from the fact that ontological dependence entails supervenience, and the definition of the ontologically basic in terms of ontological independence. If the basic entities were not complete, they would fail to subvene the derivative. The reason for thinking that the ontologically basic entities are *minimally* complete comes from Occam's Razor. Positing redundancy is positing entities without necessity. It is to imagine God repeating himself when creating the world.

The ontologically basic entities are metaphysically general iff they have a form that fits all possibilities. The form of an inventory is its most general features, and a form fits all possibilities iff these features exist at all worlds.²³ To illustrate, suppose that the world contains exactly 17 electrons. Then it will not do to say that the sparse base has the form of some 17-electron inventory, or some finite-electron inventory, or even some inventory of electrons. Rather (for all that has been said so far, at least), the sparse base would be better described as having the form of an inventory of ultimate particles, whose quantity and qualities are left open to empirical inquiry. The reason for thinking that the ontologically basic entities are metaphysically general is that the basic is supposed to serve as the ground of being. The ways the basic entities could be, then, just are the ways the world could be. In other words, if there are ways the world could be, that are not ways the base could be, then there would be a failure of generality.

The ontologically basic entities, finally, are empirically specifiable iff they have a content informed by scientific inquiry. The content of an inventory is its most particular features, and the content is empirically informed iff these features are discoverable by actual science. The reason for thinking that the ontologically basic entities are empirically specifiable is the assumption of a form of scientific realism, on which the content of our best scientific theories provides evidence for the sparse grounds of being. Science reads the book of nature.²⁴

7 exceeds 6 in supposing that the ontologically basic entities have certain features. To determine whether the great chain of being snakes upwards from the parts, or dangles from the whole, is to determine whether the one whole or its many parts has these features. Here is the litmus test for what is basic.

Putting 4 and the notion of minimal completeness in 7 together yields:

8. The one whole is minimally complete.

²² As Lewis says of the sparse properties, "there are only just enough of them to characterize things completely and without redundancy" (1986: 60). The natural generalization is provided by Varzi: "A good inventory must be complete: everything in the domain of quantification must show up somewhere. But a good inventory must also avoid redundancies: nothing should show up more than once" (2000: 4).

²³ Thus Armstrong offers a sparse ontology whose most general feature is an inventory of *atomic states of affairs*, with a form such as: $\{Fa, Gb, Rac, \dots\}$. He assures generality by constructing other possible worlds via combinations of particulars and properties abstracted therefrom, such that: "[A]ll combinations of simple particulars, properties and relations that respect the form of atomic states-of-affairs constitute the possibilities for first-order states-of-affairs." (1997: 160; see also Armstrong 1989)

²⁴ Here Armstrong says: "What properties and relations there are is to be decided by total science, that is, by the sum total of all enquiries into the nature of things" (1978: 8). In a related vein, Lewis writes: "What physics has undertaken, ... is an inventory of the *sparse* properties of this-worldly things" (1986: 60).

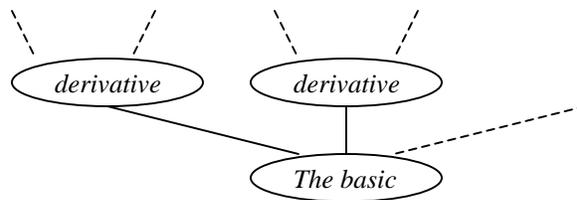
Indeed, the one whole seems tailored for minimal completeness. Recall from 7 that minimal completeness requires that the set S of basic entities satisfy two conditions: (i) there can be no difference in the world, without a difference in the members of S , and (ii) there is no set of entities S^- such that (a) $S \subset S^-$, and (b) there can be no difference in the world, without a difference in the members of S^- . Plugging in U , (i) becomes: there can be no difference in the world, without a difference of the world. This is guaranteed by 4. Condition (ii) is trivially satisfied because the only proper subset of $\{U\}$ is \emptyset . All God would need to do, would be to create the world.

Now 7 and 8 have the following corollary:

9. The one whole and its many parts cannot both be basic.

If the one whole and its many parts were both basic, then the basic entities would fail to be *minimally* complete, since the set of basic entities would have a complete proper subset $\{U\}$. Once God has created the world, He can rest.

This concludes my discussion of the notion of basicness. What emerges is an ontological hierarchy, with a sparse elite of minimally complete, metaphysical general, and empirically specifiable basic entities, and an abundant horde of derivative entities. So the ontological hierarchy has at least the following structure:



1.3 The Basis for Mereology: The Sparse Ground for Abundant Mereological Structure

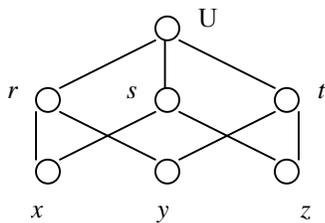
It is now possible to interpret the question of whether the one whole or its many parts is basic. Here is *the question of sparse mereology*. It is the question of the sparse basis for abundant mereological structure. It is the question of what God would need to do, to create the mereological hierarchy of actual, concrete objects.

The question of sparse mereology is complicated by *the question of category*. The question of category is the question of which ontological types the sparse entities belong to. For instance, the nominalist says that what is basic are concrete objects, the hylomorphist holds that the basic includes both universals and the substrates in which they inhere, and the trope theorist maintains that what is basic are property tokens.²⁵

Here it will prove useful to start with the nominalistic supposition that the basic entities are concrete objects, and generalize from there. So given nominalism, where the basic entities are concrete objects, the question of sparse mereology becomes: *which concrete objects provide the basis for the mereological hierarchy?*

To illustrate, consider the three-atom model of classical extensional mereology:

²⁵ For further discussion of the question of category, and some further possible answers, see Armstrong 1978 and 1997, Lewis 1983 and 2003, Campbell 1990, and Bricker *forthcoming*.



| <u>Classical mereological structure</u> | |
|---|-------------|
| <i>Universe:</i> | $U = x+y+z$ |
| <i>Molecules:</i> | $r = x+y$ |
| | $s = x+z$ |
| | $t = y+z$ |
| <i>Atoms:</i> | x, y, z |

Here there are seven concrete objects ($2^n - 1$ for $n=3$ atoms). Given nominalism, what is in question is which of these seven objects provide the basis for the remainder.²⁶

Here are the two most interesting candidates: (i) the one whole: U ; and (ii) the many atoms: x , y , and z . On candidate (i), the one whole is basic. On candidate (ii), the ultimate (atomic) parts are basic. Though there are other candidates to consider involving intermediate (molecular) parts, including (iii) r and z , and (iv) r and t . (Some candidates, though, are disqualified, including (v) U and x , and (vi) x and y . Candidate (v) fails minimality, by $\mathcal{9}$ —as does any candidate including U plus any selection of the remaining six entities. Candidate (vi) presumably fails completeness—as do candidates like x and z , and t .)

Leaving the classical three-atom model behind, here are the two most interesting nominalistic candidates for the basis for the actual mereological hierarchy: (i) the world; and (ii) its many particles.

Lifting the nominalistic supposition now, suppose instead that the basic entities include both universals and the substrates in which they inhere, as per hylomorphism. Then where the nominalist invokes a particular object, the hylomorphist should invoke the various universal-object inferences. For instance, supposing that U instantiates the sparse properties F and G (and no more), then where the nominalist invokes U , the hylomorphicist should invoke FU and GU .

So where the two most interesting nominalistic bases for the actual mereological hierarchy were: (i) the world, and (ii) its many particles, their hylomorphic counterparts will be: (i*) the universal-substrate complexes involving the world, and (ii*) the universal-substrate complexes involving its many particles.²⁷

Now suppose instead that the basic entities are property tokens, as per trope theory. Then where the nominalistic invokes a particular object, the trope theorist should invoke the various compresent tropes that bundle into said object.²⁸ For instance, supposing that U is the bundle of

²⁶ Point of clarification: I am not assuming the full strength of classical extensional mereology. As indicated in §1, all I am (still) assuming is that (i) there is a maximal node: U , and (ii) there are a plurality of submaximal nodes. The classical model in the main text is purely illustrative.

²⁷ Strictly speaking, the hylomorphic approach (and the trope-theoretic approach) allows for a ‘compromise scenario’ in which what is basic is the one whole and some portion of its properties, plus the many parts and some distinct portion of their properties. For instance, in a world with only two atoms x and y , and only the properties Color and Mass, there would be no redundancy involved in supposing that what is basic is Color: U , Mass: x , and Mass: y . That said, the arguments for monism in §2 will equally serve as arguments against the compromise scenario, so I will not consider this scenario any further in the main text.

²⁸ Here I am assuming that the trope theorist constructs objects out of compresence classes of tropes. See Williams 1953 and Campbell 1990 for further explanation here. Though this is assumption is not needed

the worldwide tropes t_1 , t_2 , and t_3 , then where the nominalist invokes U, the trope theorist should invoke t_1 , t_2 , and t_3 .

So where the two most interesting nominalistic bases for the actual mereological hierarchy were: (i) the world, and (ii) its many particles, their trope-theoretic counterparts will be: (i**) the worldwide tropes that bundle into the world, (ii**) the point-sized tropes that bundle into the particles.

Generalizing, an answer to the question of category must either (i) take objects to be the sole basic entities (as per nominalism), (ii) take objects to be among the many basic entities (hylomorphism being a representative example), or (iii) take objects to be among the derivative entities (trope theory being a representative example).²⁹ In cases (i) and (ii) there will be objects among the basic entities. In case (iii) there will be *object-makers* among the basic entities. Taking objects to be the trivial case of object-makers yields:

10. Object-makers are among the basic entities.

Now combining 10 with 6 and 9 yields:

11. Either (i) the world-makers are basic, or (ii) the parts-makers are basic, but not both.

Here is the question of whether the one whole or its many parts is basic.

So here are the two most interesting answers to the question of sparse mereology, on various conceptions of the basic category(s):

| Category(s) | Monistic census | Pluralistic census (atomistic) |
|---------------------------|---|---|
| Concrete objects | U (the world) | x, y, z, \dots (the particles) |
| Universals and substrates | The universal-substrate complexes involving the world | The universal-substrate complexes involving the particles |
| Tropes | The worldwide tropes | The point-sized tropes |

Of course a variety of molecular pluralistic censuses should also be considered.

What emerges are two relatively independent questions for sparse ontology. First, there is the familiar question of category, concerning which types the sparse entities belong to. Second, there is *the question of census*, concerning which tokens of the selected types the sparse entities include. A sparse ontology must answer the questions of category and census vis-à-vis reality. A sparse mereology must answer the question of category and census, vis-à-vis the mereological portion of reality.

The dispute over whether the one whole or its many parts is basic is a census dispute. It is not a dispute over what exists. Both sides agree that the one whole and its many parts exist (as per 1 and 2). It is not a category dispute. Both sides may remain neutral on what categories are basic,

here—for however the trope theorist constructs objects, the trope theorist should substitute her construction in for the nominalist’s object.

²⁹ Here I am taking it as a condition of adequacy on any ontology that it recognizes the existence of objects. All that is in question is whether objects are basic or derivative. This follows from 1 and also from 2, since these assumptions concern the existence of specific objects.

modifying their main thesis accordingly (as per the preceding table). It is rather a dispute over which are the basic tokens of the basic categories, from which all else is derivative.

The dispute over whether the one whole or its many parts is basic (the census dispute) thus deserves equal billing with the dispute over universals (the category dispute). Both are mandatory questions for sparse ontology.

1.4 Monism and Pluralism: Interpreting the Traditional Dispute

It remains to argue that the classic question of whether reality is one or many is best interpreted as the question of whether the one whole or its many parts is basic. Here are three arguments supporting this interpretation. First, it fits the core monistic theme that *whole is prior to part*. Thus Plotinus describes a hierarchy of being emanating down from the One:

There exists, thus, a life, as it were, of huge extension, a total in which each several part differs from its next, all making a self-continuous whole under a law of discrimination by which the various forms of things arise with no effacement of any prior in its secondary. (*Enneads* V.2.11; see also O'Meara 1996)

Here Bradley speaks of the world (in idealistic terms) as a one containing an implicit many:

Our conclusion, so far, will be this, that the Absolute is one system, and that its contents are nothing but sentient experience. It will hence be a single and all-inclusive experience, which embraces every partial diversity in concord. (1994: 141)

And Joad reckons the priority of the whole to be the characteristic feature of neo-Hegelian monism:

The whole emphasized by monistic philosophers are, therefore, logically prior to their parts. They are there, as it were, to begin with, and being there, proceed to express themselves in parts whose natures they pervade and determine. (1957: 420)

Bringing this together, Clayton speaks of “the classic philosophical idea that ‘the whole is prior to the parts,’ a position shared by most idealists, by Neoplatonists, and by most of the Eastern Vedanta traditions” (2004, pp. 7-8).

Second, this interpretation fits the monistic claim that *there is only one substance*. The traditional notion of a substance is *an independent existence*.³⁰ In this traditional sense, only the basic objects are substances. Other objects (derivative objects) may exist, but would be insubstantial. A monism of one substance (one basic object) and many insubstantial objects (many derivative objects) fits the Spinozistic view, at least as interpreted by Curley 1969: “For Curley’s Spinoza, to say that there is only one substance is to say that there is only one thing that doesn’t depend on anything else for its existence; and that is *all* that is said” (Bennett 1991: 53). Further, such a monism fits how the contemporary monist Monius describes his view: “The world is the only independent particular, all other particulars are dependent on it” (2004: 5-6).

³⁰ This notion traces back to Aristotle’s conception of the basic entities as the independent existences (§1.2), and his identification of these with substances. This is explicit in the Cartesian definition of substance: “By *substance*, we can understand nothing other than a thing which exists in such a way as to depend on no other thing for its existence” (Principles of Philosophy 1.51). It is generally recognized that Spinoza operates with the Cartesian definition of substance. See Hoffman and Rosenkrantz 1997 for further discussion of the traditional notion of substance.

Third, this interpretation fits the monistic claim that *reality is one*. The basic objects form the joints of nature, and thus provide the units for an objective census of reality. As Frege points out, counting depends on unit: “While looking at one and the same external phenomenon, I can say with equal truth both ‘It is a copse’ and ‘It is five trees’”, or both ‘Here are four companies’ and ‘Here are 500 men’” (1953: 59). One might combine Frege’s insight with sparse ontology to defend a privileged count. The idea is that *basic object* is the concept God counts by. Indeed, any other counting policy will involve double-counting. For if derivative objects get counted, or both basics and derivatives get counted, then one will be counting the same portion of reality many times over. Thus Varzi says: “an inventory of the world... is closely related to a count policy... So we may think of an inventory as sorting out the items in our domain of discourse” (2000: 2-3).

Putting this together:

12. The monist holds that whole is prior to part, one substance exists, and reality is one.

In contrast:

13. The pluralist holds that part is prior to whole, many substances exist, and reality is many.

The case for my interpretation of the monism-pluralism dispute as a dispute over sparse mereology is that the interpretation fits 12 and 13.

But there is a rival interpretation to consider. The rival interpretation (which is the received interpretation nowadays) is that monism, if it is meaningful at all, is the thesis that there exists exactly one entity. So I should explain why my interpretation is better. Here are three reasons. First, the rival interpretation is *unfaithful*. It does not fit 12, since it cannot accommodate the core monistic theme that the whole is prior to the part. That claim *presupposes* the existence of the many parts, for the whole to be prior to.³¹ Second, the rival interpretation is *uncharitable*. It renders monism obviously false. Thus Hoffman and Rosenkrantz remark:

Monism has an additional very serious disadvantage: it is inconsistent with something that appears to be an evident datum of experience, namely, that there is a plurality of things. We shall assume that a plurality of material things exists, and hence that monism is false. (1997: 78)

This ‘serious disadvantage’ is only a disadvantage of ‘monism’ under the rival interpretation. On my interpretation, the monist agrees that there are a plurality of things. She merely adds that they are all derivative from the One. Third, the rival interpretation is *anachronistic*. No traditional monist, to my knowledge, ever endorsed the thesis that exactly one entity exists, in the precise form that the rival interpretation supposes: $(\exists x)(\forall y) x=y$. (This is partly because traditional monism disappeared before quantificational logic was fully developed.)

Of course, the proper way to settle the interpretative issue is by close readings of the relevant texts. Here one should return to Parmenides, Plotinus, Spinoza, Hegel, Bradley, Royce, and other major monists to consider whether they are best read as *priority-monists* (as I am

³¹ Here the reader is encouraged to review the Plotinus, Bradley, and Joad quotations from the start of this section, and note Plotinus saying that “each several part differs from its next,” Bradley referring to “every partial diversity,” and Joad describing monistic wholes as expressing themselves “in parts.”

suggesting) or as *existence-monists* (as the received view has it). Of course, any monist who holds that the whole is prior to the part can only be a priority-monist.³²

(Perhaps close readings of the central texts will reveal both strands of thought interwoven into the monistic tradition. If so, then I would suggest that priority-monism is the strand of the monistic tradition dispute worth reviving. Or perhaps close readings of the central texts will reveal that many traditional monists have been existence-monists after all. If so, I would still recommend the question of whether the one whole or its many parts is basic, as an intrinsically interesting metaphysical question in its own right.)

This concludes my clarification of the problem of the one and the many. What emerges is a question of the sparse grounds for abundant mereological structure. This question involves certain assumptions about mereology (1-3) and sparse ontology (4-6). I think these assumptions are reasonable; or at least, I have given arguments for them. But the reader who remains unconvinced is welcome to regard what follows as a conditional argument, of the form: *if* these assumptions are correct, then the program of sparse ontology (tracing from Aristotle and Plotinus, through to Armstrong and Lewis) culminates in the monistic vision of the One.

2. Why Reality is One

So, is reality one or many? As clarified in §1, this is a question about whether the one whole or its many parts is basic, where the basic is minimally complete, metaphysically general, and empirically specifiable. So to answer the question, it will suffice to determine whether the one whole or its many parts has such features. For that is what it takes to be basic.

In §2.1 I will consider the opinion of commonsense, and in §2.2 I will report the verdict of science. Here I will suggest that commonsense and contemporary physics converge on the monistic picture of a single underlying unity, whose divisions are arbitrary approximations. In §2.3 I will consider the implications of the world's heterogeneity, and in §2.4 I will consider the implications of the possibility of gunk. Here the monist will face the question of how a diverse many can derive from one whole, and the pluralist will face the question of what to say if there are no ultimate parts. What will emerge from all these varying lines of argument are two underlying mereological asymmetries that render the one whole uniquely qualified to be basic.

2.1 Commonsense: the Arbitrariness of Parts

It will prove useful to begin with Russell's argument that commonsense favors pluralism, since it is the source of the contemporary dismissal of monism as obviously false. So Russell proclaims:

I share the common-sense belief that there are many separate things; I do not regard the apparent multiplicity of the world as consisting merely in phases and unreal divisions of a single indivisible Reality. (1985: 36)

³² I'm no historian, and so claim no expertise here. But my sense is that virtually all major monists have been priority-monists, operating with something like the traditional Aristotelian conception of ontological priority. This is why traditional monists tend to speak of 'degrees of reality'—by which they do not intend to deny the obvious truth that existence is all-or-nothing, but merely to express the sensible thesis (common to Plato and Aristotle, Plotinus and Bradley, and also Armstrong and Lewis) that not all existent entities are equal. To be 'fully real' is to be basic, and to be 'less than fully real' is just to be derivative to varying degrees. So what monists often say is that the One is real to the fullest degree (basic), while the many are less than fully real (derivative). Thus Candlish summarizes Bradley's metaphysics as: "reality itself admits of degrees, a phenomenon being the less real the more it is just a fragmentary aspect of the whole" (2002: §6). This is priority-monism.

Overall, Russell frames the debate as between a commonsensical empiricist ‘pluralism’, and a wild-eyed rationalist ‘monism’ on which exactly one thing exists: “The empirical person would naturally say, there are many things. The monistic philosopher attempts to show that there are not. I should propose to refute his *a priori* arguments” (1985: 48). Here is the birth story of analytic philosophy, and what has sounded like the death knell for monism.

But analytic philosophy was born in sin. For Russell’s argument is based on a misinterpretation. Monism is not the doctrine that exactly one thing exists, but rather the doctrine that the one whole is basic (§1.4). Thus the monist *agrees* with Russell’s ‘empirical person’ that there are many things, merely adding that the many are derivative from the one.³³ There is, quite simply, no disagreement here. There is no argument against monism properly understood. Monism deserves revival.

As to the opinion of commonsense, I would report:

14. Commonsense holds that the one whole and its many parts both exist.

That is, commonsense accepts the conjunction of 1 and 2 (which were argued for partly on intuitive grounds: §1.1). Both the monist and the pluralist agree with commonsense in this regard. Again, the dispute is not over what exists, but rather over what is basic.

That said, one might still argue that commonsense endorses the basicness of the parts. Thus consider the grains of sand in the heap. Here it seems that the grains are prior—the heap exists in virtue of the grains. Or consider the tiles in the mosaic. Here it seems that the tiles are prior—the mosaic is just an arrangement of tiles. Or consider the individuals in a community. Here it seems that the individuals are prior—the community is just a grouping of individuals. In all these cases, it seems that part is prior to whole. Thus Leibniz maintains that, in general, “a composite is nothing else than a collection or *aggregatum* of simple substances” (1960: 455).

But also consider some gerrymandered division of the circle. Here it seems that the circle is prior—the gerrymandering is just an arbitrary partition of the circle. Or consider the organs of the organism. Here it seems that the organism is prior—the organ is just a functionally defined portion of the organism. Or consider the myriad details of the percept. Here it seems that the percept is prior—the detail is just a particular of the perceptual gestalt. In these latter cases, it seems that whole is prior to part.³⁴

³³ Thus Bradley writes: “The plurality then sinks to become merely an integral aspect in a substantial unity” (1994: 138). This is not the denial of plurality, but merely the denial of the *substantiality* (independence, basicness) of said plurality. Indeed, there was already something amiss in Russell’s ‘monism’ when he spoke of ‘unreal divisions’ of the One. For that is an incoherent attribution—either the divisions are real, or there are no such divisions. Some of Russell’s confusion may arise from the fact that Bradley uses ‘real’ as a technical term, where “to be real is to be an individual substance (in the sense commonly found in Descartes, Leibniz and Spinoza)” (Candlish 2002: §6). So for Bradley, to speak of ‘unreal divisions’ of the One is not to deny the existence of the many (as Russell seems to suppose), but merely to classify the many as dependent fragments of the world-substance.

³⁴ Thus Aristotle offers the following intuitive judgments on whether whole or part is prior:
In some cases it is clear that the formula of the parts is present in that of the whole, while in others it is clear that it is not. Thus the formula of the circle does not contain that of its segments, whereas the formula of a syllable does contain that of its letters. Yet a circle is divided into its segments just as a syllable is divided into its letters. Further, if the parts are prior to the whole, then since an acute angle is part of a right angle, and since a finger is part of a man, the acute angle will be prior to the right angle, and the finger to the man. But the reverse appears to be the case;

Generalizing, it seems that commonsense endorses the priority of the parts in cases of mere aggregation and arrangement, and the priority of the whole in cases of arbitrary decompositions, functionally integrated systems, and mental unities.³⁵ So I would report:

15. Commonsense holds that integrated wholes are prior to arbitrary portions thereof.

(Of course the principled way to identify the basic is still to identify what is minimally complete, metaphysically general, and empirically informed. Here I am only trying to articulate the opinion of commonsense.)

Now the sort of parts that commonsense is mainly concerned with are the sorts of things that Aristotle regarded as individual substances (e.g., people and horses), and the sorts of things that Austin classified as moderate-sized specimens of dry goods (e.g., tables and chairs). Here commonsense recognizes, on reflection, that the boundaries of such things are arbitrary—the sorts of macroscopic parts that commonsense is mainly concerned with are all like clouds, blurry at the edges.³⁶ There is no single privileged way to decompose the world into people, horses, tables, chairs, and their ilk.³⁷ As Campbell notes in a related context: “There seem to be no natural lines along which Nature admits of partition” (1990: 139). So I would report:

16. Commonsense recognizes that the many parts are arbitrary portions of the world.

Moreover, commonsense seems to regard the one whole as an integrated unity. In this vein, Blanshard maintains:

We are convinced that [Russell’s atomistic conclusion] will not stand. Our conviction is essentially that of the plain man. Intuitions may be of small weight in philosophy, but...the ‘invincible surmise’ of most thoughtful minds [is] that the world is not in the final account a rag-bag of loose ends... (1973: 180)

As James notes, virtually all pre-twentieth century philosophers have respected such intuitions:

Whether materialistically or spiritually minded, philosophers have always aimed at cleaning up the litter with which the world apparently is filled. They have substituted economical and orderly conceptions for the first sensible tangle; and whether these were morally elevated or only intellectually neat, they were at any rate always aesthetically pure and definite, and aimed at ascribing to the world something clean and intellectual in the way of inner structure. (1987: 650)

for the former are defined in terms of the latter, and are posterior also in independent existence. (*Metaphysics* Z10.1034.b24)

³⁵ Perhaps this explains the historical affinity between monism and idealism. In this vein, Joad notes: “We entertain our ideas, we form our plans as wholes... The wholes of monistic philosophy are in this respect like mental wholes” (1957: 420). Though of course the monist need not be an idealist—the point is rather that the idealist is likely to be a monist.

³⁶ This is what Unger 1980 speaks of as ‘the problem of the many’. As Lewis explains:

There are always outlying particles, questionably parts of the thing, not definitely included and not definitely not included. So there are always many aggregates, differing by a little bit here and a little bit there, with equal claim to be the thing. (1999: 165)

³⁷ Nor is any precision in the parts gained by leaving commonsense and turning to the microparts that physics is concerned with: §2.2. But in this section I am only concerned with the opinion of commonsense.

So I would further report:

17. Commonsense holds that the one whole is an integrated unity.

From 15-17, it follows that:

18. Commonsense holds that the one whole is prior to its many parts.

By way of confirmation of 18, consider the following passage from James:

A certain abstract monism, a certain emotional response to the character of oneness, as if it were a feature of the world not coordinate with its manyness, but vastly more excellent and eminent, is so prevalent in educated circles that we might almost call it part of philosophic common sense. (1991: 59)

Here one might consider that monism has long been the ascendant position in metaphysics. As Joad notes: “During the last century Monistic Idealism commanded a larger measure of agreement among philosophers than has been accorded to any other philosophy since the Middle Ages” (1957: 428). One might also consider that many of the world’s religions have a monistic character.³⁸ So the overall drift of intuitions across cultures and ages seems to favor the monist.

Having suggested that commonsense leans to monism as per 18, I must hasten to add that it should not count for much. Perhaps it lends monism the methodological virtue of *conservatism*. Perhaps this counts for something. But it is at best a minor and methodological virtue.

In this regard, there is a puzzling step in Russell’s argument at the start of this section. Russell claims that the issue is empirical, and then invokes what the empirical person would ‘naturally say’. But why does it matter what the empirical person would ‘naturally say’? Empirical issues should be settled by empirical inquiry. Commonsense—what Einstein called ‘the collection of prejudices acquired by age eighteen’—has little business here.

This concludes my discussion of commonsense. What emerges is that the contemporary dismissal of monism is due to a misinterpretation, that commonsense actually leans towards the priority of the whole, and that it matters little either way.

2.2 Physics: The Entangled Universe

What does matter to the question of what is basic is the empirical information. Here it might seem that the empirical information favors pluralism, insofar as physics purports to tell the complete causal story of the world in terms of microparticles. Thus Oppenheim and Putnam speak of a hierarchy of *scientific levels*, where “any thing of any level except the lowest must possess a decomposition into things belonging to the next lower level,” and on which “there must be a unique lowest level,” which they label “Elementary Particles” (1991: 409). As Kim summarizes:

³⁸ Indeed, as James point out, monism is a nearly universal feature of religious experiences:

Mystical states in general assert a pretty distinct theoretic drift. It is possible to give the outcome of the majority of them in terms that point in definite philosophical directions. One of these directions is optimism, and the other is monism. (1958: 319)

So those who view religious experiences as evidentiary should regard this as further argument for monism. I will not discuss this argument further in the main text.

The bottom level is usually thought to consist of elementary particles, or whatever our best physics is going to tell us are the basic bits of matter out of which all material things are composed. As we go up the ladder, we successively encounter atoms, molecules, cells, larger living organisms, and so on. The ordering relation that generates the hierarchical structure is the mereological (part-whole) relation: entities belonging to a given level, except those at the very bottom, have an exhaustive decomposition, without remainder, into entities belonging to the lower levels. (1998: 15)

If there is a good argument for pluralism, it is not the argument from commonsense (§2.1), but rather the argument from science offered here.

That said, there is a gap in the argument that science favors pluralism. For it is a mistake to associate the levels hierarchy with the mereological hierarchy. As Hüttemann and Papineau advocate, one can affirm the doctrine of *levels physicalism* on which “any putatively non-physical entity is identical to, or at least metaphysically supervenient on, physical entities,” while denying the doctrine of *part-whole physicalism* on which “macroscopic physical entities are asymmetrically determined by their microscopic physical parts and the microscopic laws that apply to these parts” (2005: 34) As Kim himself came to acknowledge, the levels structure (understood as ordered by realization relations) turns out to be completely orthogonal to the mereological structure, since “a second-order property and its realizers are at the same level in the micro-macro hierarchy; they are properties of the very same objects” (1998: 82). So the monist can allow that physics may well tell the complete causal story of the world in terms of microparticles. What the monist will hope for is that this physical causal story is best told in terms of the system comprising all the particles, rather than in terms of the particles themselves. So what is at issue here is not the success of physics. It is whether the physics is holistic or local.

Quantum mechanics gives the monist the holism she had hoped for. To begin with, quantum mechanics allows for *entangled systems*. An entangled system is one whose state vector is not factorizable into tensor products of the state vectors of its components:

$$\Psi_{\text{system}} \neq \Psi_{\text{component1}} \otimes \Psi_{\text{component2}} \otimes \Psi_{\text{component3}} \otimes \dots$$

What this inequality means is that the quantum state of an entangled system contains information over and above that of the quantum states of the components.

Such entanglement can be illustrated via the Einstein, Podolsky, and Rosen (EPR) thought experiment, in which two spin- $\frac{1}{2}$ particles are produced in the state with zero total spin:

$$[\Psi_{\text{EPR}}] = 1/\sqrt{2} ([\uparrow]_1 \otimes [\downarrow]_2 - [\downarrow]_1 \otimes [\uparrow]_2)$$

The particles are then fired off in different directions. The spooky result is that no matter how far apart the particles fly, a spin measurement on one immediately sets the spin state of the other to the opposite. This is a consequence of the total spin being zero. It renders the particles as-if-telepathic. So:

19. Quantum mechanics holds that there are entangled systems.

Further, there is reason to believe that the whole world forms one vast entangled system. The long road to this conclusion begins with the observation that the world begins with the Big Bang, where everything interacts.³⁹ This suffices for entanglement, as Schrödinger explains:

When two systems... enter into temporary physical interactions due to known forces between them, and when after a time of mutual influence the systems separate again, then they can no longer be described in the same way as before, viz. by endowing each of them with a representative of its own. I would not call that *one* but rather *the* characteristic trait of quantum mechanics, the one that enforces its entire departure from classical lines of thought. By the interaction the two representatives [the quantum states] have become entangled. (1935: 555)

The world then evolves via the wave equation,⁴⁰ which preserves entanglement. More precisely, the initial singularity is virtually certain (with measure 1) to produce an entangled universe, and the Schrödinger dynamics are virtually certain (with measure 1) to preserve entanglement as the universe evolves. Thus Gribbin writes:

If everything that ever interacted in the Big Bang maintains its connection with everything it interacted with, then every particle in every star and galaxy that we can see “knows” about the existence of every other particle. (1984: 230-1)

There is a shorter road to an entangled universe (pointed out to me by Frank Arntzenius), which begins only with the supposition that there is a wave-function of the universe. If quantum mechanics is to be a complete theory, this must exist.⁴¹ If so, then it is virtually certain that the wave-function of the universe will be entangled, since measure 1 of all wave-functions are entangled. So unless there is a collapse mechanism, or some other evolution that tends towards disentanglement, one should expect universal entanglement. Thus it seems virtually certain that:

20. Quantum mechanics holds that the quantum state of the one whole is entangled.

It remains to show that entangled quantum systems are holistic in the way that the monist had hoped. Really, this is not controversial. The EPR system, for instance, contains information that the total spin of the system is zero. This is information over and above that of the quantum

³⁹ It is controversial whether the Big Bang is to be treated as *physically real*, or as a mere *boundary condition*, a hole in spacetime. If the Big Bang is a mere boundary, then the assumption I need is that all causal horizons vanish as one moves towards the boundary. Indeed, even if there are non-vanishing causal horizons, this would generate a view that is pluralist in letter but not in spirit, in which there are several vast entangled systems—several bubble universes—that never interact. It would still be the case that everything we see around us, everything in our bubble, is one entangled system.

⁴⁰ It is controversial whether the evolution of the world is always via the Schrödinger dynamics (*unitarity*), or whether there is a separate dynamics of wave-function collapse. Though even if there are collapses, such as on the Ghirardi, Rimini, and Weber 1986 proposal, such collapses will be instantaneous. Systems will immediately re-entangle until the next instant of collapse. The measure of history over which any given particle is unentangled will be: 0.

⁴¹ Thus Hartle writes, concerning the central question of quantum cosmology:

The universe has a quantum state. What is it?... To ask this question is to assume that the universe is a quantum mechanical system. We perhaps have little direct evidence of peculiarly quantum mechanical phenomena on large and even familiar scales, but there is no evidence that the phenomena that we do see cannot be described in quantum mechanical terms and explained by quantum mechanical laws... If this framework applies to the whole thing, there must be a quantum state of the universe. (2003: 615)

states of the two component particles. There are two main ways to think about the component particles here. One view is that they have no quantum states at all.⁴² An alternative view is that the particles have what are called *mixed states*—in this case the mixed states of $1/\sqrt{2} [|\uparrow\rangle + 1/\sqrt{2} [|\downarrow\rangle]$. But either way there is information about the whole—in this case, that the total spin state is zero—which would be lost if one tried to derive the whole from the parts.⁴³

What emerges is that, with entangled systems, *mereological supervenience fails*. The properties of entangled wholes do not supervene on the intrinsic properties of and spatiotemporal relations among their parts. Here Esfeld notes:

In the case of entanglement, it is only the description of the whole in terms of a pure state, such as the singlet state, which completely determines the local properties of the parts and their relations... Therefore, quantum physics exhibits a substantial holism. (1999: 26)

In a similar vein, Maudlin concludes:

The physical state of a complex whole cannot always be reduced to those of its parts, or to those of its parts together with their spatiotemporal relations, even when the parts inhabit distinct regions of space... The result of the most intensive scientific investigations in history is a theory that contains an ineliminable holism. (1998: 56)

Parsons explicitly draws the connection to what is basic:

The elements of a non-separable quantum system don't seem to exist independently. Therefore, they are not substances, and if you buy into an ontology of substances, then they are not part of the fundamental ontology of the world. (*manuscript*: 16)

The point is that no pluralistic census will be complete. For there will be information about the one whole, contained in the correlation coefficients of its wave-function, which cannot be derived from the intrinsic properties of and spatiotemporal relations among whatever particles or subsystems the pluralist might take as basic. Thus:

21. Quantum mechanics holds that entangled systems are basic, and their subcomponents derivative.

Putting 18-21 together yields:

22. Quantum mechanics holds that the one whole is basic, and its many parts derivative.

In this vein, Gribbin writes:

Particles that were together in an interaction remain in some sense parts of a single system, which responds together to further interactions. Virtually everything we see and touch and feel is made up of collections of particles that have been involved in interactions with other particles right back through time, to the Big Bang... Indeed, the

⁴² On this issue Grangier maintains: “the correct conclusion is that a subpart of the [entangled two-particle] system has no quantum state, while the overall system (the pair) certainly has one” (2003: 1).

⁴³ See Arnzenius *manuscript* for a detailed discussion and defense of this point.

particles that make up my body once jostled in close proximity and interacted with the particles that now make up your body. We are as much parts of a single system as the two photons flying out of the heart of the Aspect experiment (1984: 229)

The Big Bang is just an EPR set-up, with a few more particles. The universe is just one explosion. We are but shards of the primordial atom.

The pluralist's best reply may be to posit new fundamental external relations alongside the spatiotemporal relations: *entanglement relations*. These would say which particles are entangled with which, and what the coefficients are that determine, e.g., whether there is correlation or anti-correlation. Given that there are two sorts of fundamental external relations—distances and entanglements—the derivability of whole from part would be regained. All the information in the entangled system would indeed be derivable from the intrinsic properties of and fundamental external relations among of the parts.⁴⁴

But the pluralistic reply seems unmotivated (save by anti-monistic prejudice). Indeed, here are three arguments against shunting entanglement into new external relations, in ascending strength. First, the reply is *inflationary*, insofar as it posits new basic relations. The monistic line is more economical. Second, the reply is *revisionary*, insofar as the usual physical formalism renders entanglement as a property of the whole system—the coefficients are encoded in Ψ_{system} —rather than a relation between its subcomponents. The most natural reading of the physics is still monistic, even if a pluralistic reading can be forced. Third, the reply is *unstable*, since in quantum field theory at least, where for instance 'particle number' features as an operator, there are states of the overall system that are superposed between definite numbers of particles. So it is unclear what the pluralist's new external relations are even supposed to hold *between*, in cases when the number operator on the system has a non-whole number expectation value.

The pluralist might also reply by evincing a general skepticism towards quantum physics. But keep in mind that I am assuming a form of scientific realism, on which the basic is empirically specifiable, as per 6. Our best evidence to date, though fallible, still favors the monist. Or at least, I would conclude that the philosopher who would read her ontology off of our best science should thereby embrace what Bohm and Hiley 1993 call 'the undivided universe.'

In any case, quantum entanglement serves as an example of *emergence*, where mereological supervenience fails. That is, entangled systems are examples of systems in which the properties of the whole do not supervene on the intrinsic properties of and spatiotemporal relations among their parts. As Hüttemann notes: "Here we have a clear-cut case of emergence, because we can see why a microexplanation is not merely hard to come by, but impossible to achieve" (2005: 117). Never mind that the empirical information supports an entangled universe. Surely it is at least *possible* that the world is emergent. Then it is at least possible that the whole is basic. But then pluralism cannot be metaphysically general, for it cannot fit this possibility. There is a way the world could be, that is over and above the way that the particles can be.

Here a first mereological asymmetry comes to light: *the asymmetry of supervenience*. The asymmetry is that the many parts supervene on the one whole (as per 4), but the one whole need not supervene on the many parts. The possibility of emergence shows that the intrinsic properties of the one whole can differ, without any difference in the intrinsic properties of or spatiotemporal

⁴⁴ Teller 1986 speaks of *holistic relations* here, though it is not clear whether he would reject the monistic stance. The main alternatives (monism versus pluralism-plus-holistic-relations) correspond to what Healey (1999: 3) calls "ontological holism" versus mere "property holism".

relations among the many parts. The asymmetry of supervenience arises, essentially, because a duplicate of the whole *ipso facto* copies its parts and their spatiotemporal relations. Whereas emergence shows that a duplicate of the parts and their spatiotemporal relations need not copy the whole. The whole always has at least the potential of being more than the sum of its parts.

This concludes my discussion of quantum entanglement. To summarize: the entangled universe shows that only the monistic census is empirically informed, and the possibility of emergence shows that only the monistic census is metaphysically general.

2.3 Heterogeneity: Configuring the Many

There is a very general sort of empirical information, however, that might be thought to favor pluralism. The very general sort of empirical information is that the world is *heterogeneous*, in the sense of being variegated, featuring qualitative differences between its many parts.

Now the pluralist may charge that monism would entail homogeneity. Start with what is basic. Given monism, it might seem that there must be homogeneity at the basic. For the one cannot differ from itself.⁴⁵ Now turn to the derivative. It would seem that, if the derivative entities derive from a homogeneous One, then they too must be homogeneous—slice a homogeneous whole any way you like, the slices will all be homogeneous. Thus the pluralist may conclude that (i) the basic objects must be internally homogeneous, so that (ii) the heterogeneity of the world can only be due to external differences between a plurality of internally homogeneous basic parts.

Here the pluralist is charging the monist with commitment to Parmenides's vision of a perfect homogeneous sphere:

But since there is a furthest limit, it is complete on every side, like the body of a well-rounded sphere, evenly balanced in every direction from the middle; for it cannot be any greater or any less in one place than in another. (*The Way of Truth*, fr. 8)

There seems to be no way for heterogeneity to arise. Plotinus recognized this sort of problem:

From such a unity as we have declared The One to be, how does anything at all come into substantial existence, any multiplicity, dyad, or number? Why has the Primal not remained self-gathered so that there be none of this profusion of the manifold which we observe in existence and yet are compelled to trace to that absolute unity? (*Enneads* V.1.6; also V.2.1)

Here Plotinus (explicitly embracing 'multiplicity', as per priority-monism: §1.4) is concerned to explain how 'this profusion of the manifold' could possibly derive from the one whole.

I would reply, first, that internal heterogeneity within the basic must be allowed by everyone. Or at least, external differences between a plurality of homogeneous basic objects are insufficient to account for all forms of heterogeneity. For there might be *heterogeneity all the way down*, in the sense of matter every part of which has heterogeneous proper parts.⁴⁶ If this is possible, it shows that the pluralistic strategy of accounting for heterogeneity in terms of

⁴⁵ Whereas the pluralist has many basic entities, which cannot differ from themselves either, but which have the added opportunity to be different *from each other*.

⁴⁶ I will argue for the possibility of gunk (matter every part of which has proper parts) in §2.4. If gunk is possible, it seems that heterogeneity-all-the-way-down must be possible. For such constitutes a consistent distribution of properties over gunk.

differences between internally homogeneous parts is insufficient. It must be possible to account for heterogeneity in other ways. It remains to describe these ways.

What is needed is to find ways to allow for heterogeneity, which would not entail that anything is ‘different from itself’. Here are three possibilities. The first possibility (my preferred approach) is to use *distributional properties*.⁴⁷ The world might, for instance, have the property of being polka-dotted. Here there would be no question of the world being ‘different from itself’, or having any other problematic status. The claim that the world is polka-dotted is a coherent claim, which would entail heterogeneity among its derivative dots and background.

Behind every good distributional property winds a bumpy configurational path. A color, for instance, can be represented as a point in a three-dimensional color configuration space (with dimensions for hue, brightness, and saturation). The color of a two-dimensional plane figure can then be represented as a path in a five-dimensional configuration space, where each point on the figure is represented by $\langle x, y \rangle$ coordinates, and assigned a color-location $\langle \text{hue}, \text{saturation}, \text{brightness} \rangle$. A color-homogeneous two-dimensional figure will trace out a path in this five-dimensional configuration space that is flat along the three color dimensions, while a color-heterogeneous figure (e.g. a polka-dotted figure) will trace a bumpy path.

The representation of the heterogeneous world via a bumpy configurational path is not just standard in physics—it is the gold standard in mathematically rigorous physics. In quantum mechanics, the wave function of the universe is represented as a field in a multi-dimensional configuration space.⁴⁸ The state of the world at a given time is a point in such a space. If we add a time dimension, then the state of the world over time is a path in the resulting space. The heterogeneity of the world is the bumpiness of the path.⁴⁹

Here there is no question of the world being ‘different from itself’ or having any other problematic status. For the monist, the general fact that the world is heterogeneous is due to the world’s instantiating the determinable property of *being heterogeneous*. The specific way that the world is heterogeneous is due to the world’s instantiating the determinate property of tracing such-and-such a path through physical configuration space. Thus the one whole can be parturient.

The second way to allow for heterogeneity without contradiction is to *regionalize instantiation*. Here the idea is that things only instantiate properties relative to regions. So the world might be heterogeneous by, for instance, instantiating red here and green there. The main disadvantage of this approach is that it is doubtful that instantiation is relational at all, much less a relation to regions. At least, some independent argument would be needed for positing relativity to regions, and I have none on offer.

The third way to allow for heterogeneity without contradiction is to *adverbialize properties*. Here the idea is to speak of distinct modes of existence for a single thing. So the world

⁴⁷ Here I follow Parsons (2004), who offers examples such as *being polka-dotted* and *being hot at one end and cold at the other*, and invokes the possibility of heterogeneity-all-the-way-down to argue against the reductionist view that distributional properties derive from a plurality of homogeneous parts.

⁴⁸ The configuration space has $3n$ dimensions for n particles. In this way, a system with a configuration space of n dimensions can be partitioned into $n/3$ particles.

⁴⁹ Here I am drawing especially on Albert 1996, who argues that the most straightforward reading of the quantum formalism is monistic, involving a single world-atom zipping through configuration space.

might be heterogeneous by, for instance, existing red-here-ly and green-there-ly.⁵⁰ The main disadvantage of this approach is that it is virtually incomprehensible. Adverbial modes are, as it were, apt for verbish entities like events, but not for nounish entities like the world.⁵¹

I will remain neutral on how best to account for heterogeneity. As indicated, my preference is for the first account (distributional properties grounded in configurational paths). But this will not matter here. Indeed, even if all three of these accounts were to fail, I would fall back on the claim that heterogeneous basic entities are needed to allow for heterogeneity-all-the-way-down, so such should be allowed even should an explicit account remain elusive.

This concludes my discussion of heterogeneity. There is no problem for the monist here. Basic objects can be heterogeneous after all, even the one whole. That is exactly what standard physical configuration space represents.

2.4 Gunk: Of Limitless Decomposition

I turn now to a final argument, which is that the pluralist cannot provide a decent account of *the possibility of gunk*. The possibility of gunk is the possibility of matter every part of which has proper parts, so that there are no ultimate parts (no atoms) for the pluralist to count.

To begin with, there is good reason for thinking that gunk is possible. The best tests for whether a scenario is possible are whether it is conceivable, logically consistent, and posited in serious scientific theories. Gunk passes every test (Schaffer 2003). It is conceivable. For instance, it is conceivable that everything is extended, and that everything that is extended has two extended halves. This generates a Zeno sequence of halvings without limit. Likewise it is conceivable that (as Pascal supposed) there is an endless nested sequence of microcosms, in which every physical ‘atom’ of the universe houses a miniature replica universe, every ‘atom’ of this mini-universe houses its own mini-universe, *ad infinitum*.⁵²

Further, gunk is logically consistent. No logical contradiction follows from it. Or at least, there are gunky models of classical extensional mereology, such as that of the regular open sets of a Euclidean space, with parthood taken as set-inclusion (Simons 1987: 41).

⁵⁰ The idea of using adverbials is lifted from adverbialist theories of perception, such as developed by Chisholm 1957. The adverbialist about perception replaces a plurality of objects of experience (sense-data) by a single subject who senses in different manners. So when I perceive a red patch here and a green patch there, the adverbialist account is that I am sensing red-here-ly and green-there-ly. Thus Burgess and Rosen apply the adverbialist line to monism (in skeptical tones) as follows:

Nominalists are very moderate compared to monists, whose view is summarized by Prior [as]: ‘there is only a single genuine individual (the Universe) which gets John-Smithish or Mary-Brownish in such-and-such regions for such-and-such periods’. (David Lewis has pointed out that Prior really should say, ‘...regionally and periodically’.) And Mary Brown and John Smith don’t do anything: the Universe does things Mary-Brownishly and John-Smithishly. (1997: 185-6) Here Burgess and Rosen (and Prior and Lewis) are following the Russellian misinterpretation of monism as existence-monism (§1.4), but the adverbial strategy is the same either way.

⁵¹ The monist whose basically ontological category is *process* (a verbish sort of entity) may still find adverbialism apt. Indeed, Rescher suggests that process philosophy is monistic at heart: “The basic idea of [process philosophy] is to view the world as a unified macroprocess that consists of a myriad of duly coordinated subordinate microprocesses” (1996: 84). So, as perhaps should be unsurprising, the question of how to account for heterogeneity is interwoven with the question of the category (§1.3).

⁵² Zimmerman 1996 argues that if there are extended material objects that can touch, they can do so only at gunky junctures. If so, then gunk is at least a logical consequence of something conceivable.

Finally, gunk is scientifically serious. Thus Dehmelt (1989) posits an infinite regression of sub-electron structure, and Georgi suggests that effective quantum field theories might form an infinite tower which “goes down to arbitrary short distances in a kind of infinite regression... just a series of layers without end” (1989: 456). In this vein, Greene considers what strings are made of, and allows at least two possible answers: “First, strings are truly fundamental--they are ‘atoms’, *uncuttable constituents*, in the truest sense of the ancient Greeks.” He then adds:

History surely has taught us that every time our understanding of the universe deepens, we find yet smaller microconstituents constituting a finer level of matter. And so another possibility,... is that [strings] are one more layer in the cosmic onion... (1999: 141-142)

So I would suggest:

23. Gunk is possible.

Now the monist has no trouble with the possibility of gunk. If the world is gunky, that’s the way the world is. It is such that every part of it has proper parts. (Likewise if the world is atomistic, that’s the way the world is. It is such that every part of it has ultimate parts. Likewise if the world contains a mixture of gunk and atoms, that’s the way the world is. It is such that some parts are such that every part of them has proper parts, and some parts are such that every part of them has ultimate parts. The monist has no trouble with any possibility here.) Hence:

24. If the one whole is basic, then gunk is possible.

But how can the pluralist account for the possibility of gunk? There seem to be three main options. First, the pluralist might move to the idea of *endless dependence*, where things get ever more basic without limit. This is the thematic extension of the pluralistic motif of part prior to whole. But this would entail that nothing is basic, *contra* 6. There would be no ultimate ground. Being would be infinitely deferred, never achieved.⁵³

Second, the pluralist might go *disjunctive*, offering an atomistic pluralistic census for atomistic worlds, and remaining silent (or perhaps even going monistic) concerning gunky and mixed worlds. But this would violate the metaphysical generality requirement of 7. There would be ways the world could be (gunky), that the atomistic pluralistic base could not be. The disjunctive treatment here is no better than the claim, made at a seventeen electron world, that the base has the general form of some seventeen electron inventory (§1.2). The world might not feature exactly seventeen electrons. It might not feature atoms, either.

⁵³ The argument in the main text might be rendered more carefully as follows: (i) necessarily, there exist basic entities (as per the arguments for 6); (ii) not necessarily, there exist mereological simples (by 23); therefore (iii) not necessarily, the basic entities are mereological simples. Now the pluralist might convert this style of argument into an argument for mereological simples: (iv) necessarily, there exist basic entities; (v) necessarily, the basic entities are mereological simples (as per the thematic extension of pluralism); therefore (vi) necessarily, there exist mereological simples (*contra* 23). Indeed, both Leibniz and Wittgenstein seem to have deployed something like this second line of argument. Thus Leibniz maintains: “There must be simple substances because there are composites; for a composite is nothing else than a collection or *aggregatum* of simple substances... Monads are the true Atoms of nature, and, in fact, the Elements of things.” (1960: 455; compare Wittgenstein 1990: 35) Here the arguments for the possibility of gunk, as per 23, prove crucial. For they provide *independent* rationale for preferring the first line of argument involving (ii), to the second line involving its denial in (vi).

Third, the pluralist might advert to a *molecular census* (§1.3), maintaining that what is basic is mereologically intermediate. But this seems *arbitrary*, especially in cases where there is no natural joint in the infinite descent. For instance, in the case of a homogeneously pink cube of gunk, all the levels of mereological structure (save for the top) are intermediate, and all are homogeneously pink. Is there supposed to be a fact of the matter as to which divisions are the joints of nature? Homogeneous gunk thus emerges as especially problematic for the pluralistic, since (i) there are no atoms for the atomistic pluralist, and (ii) there is no privileged level of molecules for the molecular pluralist. The only privileged level of structure is at the top.

Further, the molecular census is already *quasi-monistic*. That is, such a census already treats whole as prior to part, for the basic molecules and their dependent parts. So it is hard to see how the molecular pluralist could have a principled objection to monism. Indeed, it is hard to fathom why the molecular pluralist would stop at molecules, when she could go right to the top.

I conclude that, pending further suggestions, the pluralist can provide no decent account of the possibility of gunk (not for nothing did Leibniz and Wittgenstein try to banish gunk from the realm of possibility). Thus:

25. If the many parts are basic, then gunk is not possible.

Here a second mereological asymmetry comes to light: *the asymmetry of existence*. The asymmetry is that mereology guarantees the existence of a maximum (as per 1), but not of any minima (as per 23). In fact, the maximum entity U is the only sort of entity that classical extensional mereology guarantees on every model. If such models correspond to possibilities, then the only (concrete) entity that is guaranteed to exist in any possible world is (perhaps unsurprisingly) a world. The only guaranteed existence is the one whole.⁵⁴

This concludes my discussion of the possibility of gunk. What emerges is that only the monist can offer a metaphysically general conception of what is basic, providing a unified treatment of atomistic, gunky, and mixed worlds.

Putting everything together: The question of whether reality is one or many has long been misinterpreted. It is not a question about whether exactly one thing exists, but rather a question about whether the one whole or its many parts is basic. The basic entities must be minimally complete, metaphysically general, and empirically specificifiable. Only the world has these features. The world is minimally complete (as per 8), and the mereological asymmetries of supervenience and existence establish that only the world is metaphysically general and empirically specificifiable. Thus reality is one. The whole is basic, its partitions derivative.⁵⁵

⁵⁴ Alongside the asymmetry of mereological existence is an asymmetry of set-theoretic existence, in ways that suggest some general features of asymmetry-making for the dependence relation (§1.2). I have argued that in the mereological case, U is basic and everything else depends on it. In pure set theory, it seems that \emptyset is basic, and everything else (such as $\{\emptyset\}$ and $\{\{\emptyset\}\}$) is founded on it. There is a general asymmetry of existence that fits the basicness of both U and \emptyset . In mereology, only the topmost element is guaranteed to exist, and bottommost elements are not guaranteed. In pure set theory, the bottommost element is guaranteed to exist, and topmost elements are not guaranteed—indeed, such are guaranteed not to exist, on pain of Russellian paradox. Thus a general asymmetry of existence would support both a top-down approach to mereological dependence, and a bottom-up approach to set-theoretic founding.

⁵⁵ Thanks to the A. M. Monius Institute for generous support. For helpful comments, my thanks to Frank Arntzenius, Don Baxter, Phil Bricker, Troy Cross, Edwin Curley, Michael della Rocca, Ned Hall, Terry Horgan, Ned Markosian, Josh Parsons, Brian Weatherson, and audiences at the Free University of Amsterdam, University of Toronto, Ohio State, Yale, and Brown.

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