Backwaters of Ontology:

The Special Composition Question and Its Discontents

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ABSTRACT OF THE DISSERTATION

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The goal of the present work is to explore a wide variety of answers to the so-called special composition question (hereafter SCQ), which asks, given some things, the Xs, when is it that the Xs are some *one* thing, rather than *many*? For instance, given some pieces of wood, e.g., the wood (and perhaps other materials things like epoxy) compose a canoe? As with the aforementioned cases, it seems obvious that sometimes, e.g., some lumber composes a fence, some molecules compose an organism, or some quantities of alcohol compose a martini. In other situations, it seems questionable whether there is anything one could do to make some things compose another thing. For instance, is there anything one could do to make two persons and an apple pie compose one thing, some single *thing* such that it is two parts person and one part pie? As a rather famous example of the latter "strange kind," David Lewis postulates "fusions" of such disparate and

heterogeneous things as "trout-turkeys," composed of the front half of a turkey and back half of a trout. The previous illustrations are all cases in which we can ask, when do some things become one whole, and is there a general and uniform answer to be searched for?

There are three standard answers in "material object metaphysics" that philosophers have thought have some promise in answering the SCQ: sometimes, always, and never. The present work examines each of these answers, and some variants thereof, in detail. One of my primary aims is to sort the tenable answers from the untenable ones. In each chapter, I provide a general statement of the view, its alleged advantages and disadvantages, and then evaluate the cogency of arguments in favor of those allegations.

In Chapter six, I argue that noncontingentism regarding existential statements about when composition occurs have often ended in stalemates. I recommend that the relevant kind of contingentism, along with an empirically informed metaphysics, will better serve those wanting to know when composition occurs, if at all, in our world.

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This dissertation would not have happened without the support of many philosophers, friends, and my family. First off, I wish to thank my parents, Elaine and John Derstine; their love and steadfast support has been a great source of encouragement and motivation over many, many years. A special thanks to Mom for the endless stream of care-packages (including: baked goods, dinners, vitamins, newspaper clippings, stamps—you name it), her sober advice, unflappable devotion, sensible fiscal guidance and assistance, intelligent conversation, and especially for all those "little-big" things moms like her do as if it was second nature (e.g., picking up feed for my horse Areion and dropping it off at a barn far away). You *are* amazing, mom!

Onto my significant other, a certain Mr. John O'Neill. He has provided not just love and laughter, but stood stalwart as my person of refuge when the weight of the world was (as it appeared at the time) on my back again. He was and is my go-to person for everything—from bedside barista, to chess challenger, to a rockin' night out (and in). Ahem. Anyway; moving on (tally ho). My siblings—Jeff Derstine, Joel Derstine, and Julie Fosbenner—were a wellspring of inspiration and comic relief: thank-you. Another thank-you goes out to my

imbued them with the clarity and logical precision they otherwise would have

lacked.

Dedication:

To Jeff Derstine, in appreciation of your unwavering admiration and inexhaustible faith.

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CHAPTER 1

INTRODUCTION

1.1 A CRAZY METAPHYSIC

It would be silly to claim that ordinary things, like tables and chairs, do not exist.
Not just silly for the person on the street, mind you—silly, even for a
philosopher. It might even be considered crazy by some. After all, it makes good
sense to suppose at least some things exist, especially ones at which we eat
dinner and upon which we place our bums. Like tables and chairs. It would be a
crazy metaphysic indeed, to deny such things exist—Wouldn't it?

Another view—equally silly—might take the converse line of thought.
This would be one that proposed that in addition to ordinary things, like cats and
umbrellas, there were a host of other things, like *cabrellas*, objects composed of
cats and umbrellas. In fact, this person claims that for any number of objects,
there is an object composed of them, called the *fusion* of those objects. Where you
see just a book and a lamp, this person insists there remains a third object you

have yet to countenance: the *lampbook*, an object composed of—you guessed it—one part lamp and one part book.[1]

But suppose you are (just) silly enough to engage such a metaphysician in conversation. What would you say? For a start, you might point out to the denier of ordinary objects that if persons count as objects (*they obviously do*), then it follows from her view that persons do not exist (*but surely persons exist—who or what else is having this conversation?*).[2] Similar reasoning applies to the believer in *cabrellas* and *lampbooks*. Surely, you might object, no one in her right mind would be willing to accept such bizarre items on her ontological roster. In short, you support the commonsense position of a metaphysical moderate:

> **Metaphysical Moderation** (MM): Ordinary physical objects exist. Extraordinary objects do not.[3]

It would come as no surprise to find your moderate proposal is in perfect agreement with countless philosophers.

In agreement, that is, until the middle of the last century. Until then, mainstream metaphysics had your back.[4] But that was before the new normal.

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[1] And—just in case you surmise the height of silliness has finally been reached—there are further "mereological monsters," for example, transcategorical diachronic fusions, like the fusion of Socrates' singleton, the number 42, and the battle of Gettysburg.

[2] This argument—the Cartesian argument—is explored in Chapter 5.

[3] For now: *ordinary objects* are things like last night's pizza, your cat, and Lena Dunham. *Extraordinary objects* are things like the single object which is one part last night's pizza, one part cat, and one part Lena Dunham. (What, you haven't seen it around lately?)

The new normal is a lot more radical than you might expect; mainstream metaphysics is floating aimlessly in the stratosphere of extremism. On one side are the Universalists, who argue composition is, well, universal: *all* fusions exist. On the other side sits a handful of metaphysical mavericks: Mereological Nihilists. Nihilists claim no composite objects exist: no *cabrellas*; but no cats or umbrellas, either. For nihilists, the only existing things are simple things—things without parts. Nihilism and universalism are radical views about what there is. Metaphysical Moderation is not. A brief look at these accounts will help frame the discussion ahead.[5]

First, some stage setting. Peter van Inwagen's (1990) characterization of the issue at hand is especially apt. Contemporary metaphysicians have wrangled over the correct answer to his "special composition question" from the moment it he posed it:

> **Special Composition Question (SCQ)** In what cases is it true of several things that they compose one thing?[6]

In words of two syllables, the three standard answers are: *always*, *sometimes*, *never*.

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[4] Maybe. At least *some* philosophers thought *something close* to moderation was defensible.

[5] Their standard formulations originate from specific principles used in *Mereology*, a formal system of parthood relations (more on that below). However, a simple characterization in natural language will suffice for present purposes. For a thorough introduction see Varzi (2014). For a book length treatment, see Simons (1987).

[6] This is a paraphrase of one of his original characterizations, which is **"**In what cases is it true of *certain objects* that *they* compose something?" (Ibid., 48).

Universalism: it is always the case that several things (the *X*s) compose one thing: composition always occurs.

Metaphysical Moderation: it is sometimes (but not always) the case that several things (the *X*s) compose one thing: composition sometimes, but not always, occurs.

Nihilism: it is never the case that several things (the *X*s) compose one thing: composition never occurs.

1.2 CARNAP AND THE POLISH LOGICIAN

The philosophical itch induced by the SCQ is most easily approached by means of a theoretically (though not historically) accurate story of a dispute between some philosophers, often called *Carnap and the Polish Logician.*[7] In the present retelling, the moderate joins Carnap (the nihilist) and the Polish Logician (the universalist). We then imagine presenting them with a region *R* of (otherwise) empty space containing mereological simples *A*, *B*, and *C* and ask: *How many objects are contained in R?*

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[7] The story originally presented by Putnam (1987); See van Inwagen (2002) for critical discussion.

A   B   C
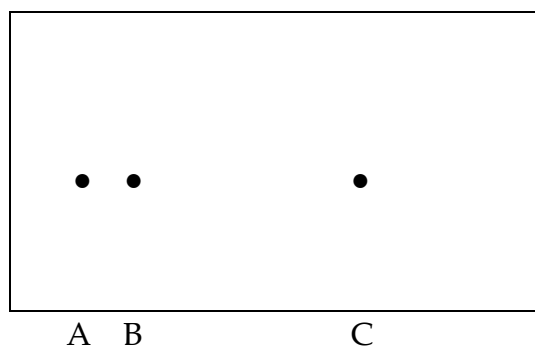
We begin with our nihilist Carnap. Her answer is that, given A, B, and C are all mereological simples, there are exactly three objects in *R*. Our Polish Logician disagrees. Recalling the teachings of his mentor Lesniewski,[8] he contends there are in fact seven objects in *R*. Classical mereology, he reminds us, includes the axiom of *unrestricted composition*. This principle says that for any number of things whatsoever, there exists a mereological sum—a *fusion*—of those things; a whole whose parts are exactly those things (plus their parts, if any, and any things that can be arrived at by fusing parts). Accordingly, *R* has a total of 7 things: A, B, C, (A + B), (B + C), (A + C), and (A + B + C). Our Polish logician is a *Universalist*: composition never fails to occur. Lastly, we turn our attention to the moderate. Initially, she sides with Carnap and says there are three things in *R*; however, she changes her position after her first impressions grow hazier upon closer inspection. She considers the situation in which it turns

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[8] Namely, Stanislaw Lesniewski, whose mereology was, as Simons (1987, 9) observes "the first extensional part-whole theory to be rigourously developed." For more on Lesniewski, see Simons (2011).

out that A and B are somehow "stuck together" or move "as a unit" when a force is applied to either of them, and decides in this case they *do* compose something (e.g., the molecule *AB*). Our moderate winds up contending that the situation is more complex than it initially appeared; composition sometimes (but not always) occurs.[9]

At this point, we are left with three incompatible theories, for each gives a different answer to our question about the number of objects in a region of otherwise empty space. At most one of them can be true. They are also incompatible in a more general sense, for each says something different about the ontology of physical (concrete) reality. In the following chapters, it will prove helpful to have in hand an understanding of the principle of composition each endorses (or rejects), in exclusion of others. Universalists defend the principle of unrestricted composition:

> **Principle of Unrestricted Composition** (PUC): whenever one has some things (the *X*s), there is a whole composed of those same things: composition never fails to occur.

Nihilists reject all composition principles, in favor of simplicity:

> *Simplicity (S):* Composition never occurs. Mereological simples, partless things, are the only things that exist.[10]

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[9] There is at least one other family of positions that I seldom consider in the present work—deflationary positions—which Eklund (2006, 320) characterizes as, roughly, those "according to which, somehow, ontological questions fall short of being objective, philosophically significant, and genuine."

[10] Simplicity: Ax where ($Ax =_{df} \neg \exists y PP yx$).

And Metaphysical Moderates appeal to a principle of restricted composition:

> **Restricted Composition** (RC): it is sometimes, but not always the case, that when one has some things (the *X*s) they also compose a whole: composition sometimes, but not always, occurs.

As universalism and nihilism reside at the extremes of moderation, we shall call them *revisionary* ontologies. Revisionary ontologies have been the standard fare of mainstream metaphysics over the past two decades. The next section provides some of the backstory to the popularity of revisionary accounts.

1.3 HOW DID MODERATE METAPHYSICS GET LEFT BEHIND?

What happened to metaphysical moderation (MM)? After all, the plausibility of (RC) seems to proceed naturally from evidence of everyday perceptual experience and practical applications of classical mechanics.[11] So how did (MM) and its core tenet (RC) get left behind? One explanation for the increase in extremism points to the felt need that the SCQ *ought* to have a systematic and general solution; one which moderate metaphysics is unable to provide.[12] Indeed, the philosophical backstory triggering the departure from moderation is largely a result of arguments to this effect. Especially notable in this context is Ted Sider's (1997, 2001) *Vagueness Argument.* Building on a prior argument from Lewis

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[11] E.g., the success of classical mechanics in predicting how to successfully engineer travel to the moon, launch long-range missiles, or predict how countless macroscopic bodies interact.
[12] Although van Inwagen rarely argues the SCQ *must* have a systematic solution, he makes a compelling case that moderate answers cannot withstand even casual scrutiny.

(1986), Sider convincingly argues that no account of composition could be restricted, on pain of infecting the resulting account with a pernicious form of vagueness. As others rightly point out,[13] the most persuasive arguments undercutting moderate ontologies are based on charges of either vagueness or arbitrariness. Arbitrariness arguments claim any appeal to (RC) entails that the distinction between composite objects and others will not be a principled one: there is no general, systematic and uniform answer to the SCQ.

Faced with such an unlovely set of options, many metaphysicians chose to forego their moderate positions.[14] By and large, revisionist arguments forced many metaphysicians to choose their poison: either nihilism or universalism. Whereas the former imposed strict austerity measures, the liberalism of the latter approach, while unorthodox, at least retained the original roster of ordinary objects. Furthermore, some argued, it could do so without incurring extra ontological costs:

> Given a prior commitment to cats, say, a commitment to cat-fusions is not a further commitment. The fusion is nothing over and above the cats that compose it. It just is them. They just are it. Take them together or take them separately, the cats are the same portion of Reality either way (Lewis 1991; 81).

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[13] Van Cleve (2008, 328); Korman (2010*b*).

[14] These moves are discussed in Sosa's (1999) discussion of the paucity of options available to the moderate.

Though not everyone agreed with the "ontological innocence" Lewis advertised, for a time it swayed the majority of metaphysicians towards universalism—after all, if there are no ontological costs, what had anyone to lose? And the converts Lewis attracted was not without warrant: Lewis (1991) presents a number of reasons for thinking his theory of composition as identity[15] could bankroll the innocence he advertised. More recently, however, compelling arguments have surfaced that cast significant doubt on whether CAI *can* underwrite any innocence claims.[16] The upshot of this turn of events is that universalism is no longer seen (even by its adherents) as ontologically innocent. If this is the case, then universalism does have a significant cost, for it entails a veritable "explosion of reality."[17] To see this, recall that universalism says any objects whatsoever (say, a cat and a dog) have a fusion (a *cat-dog*). If universalism is true, then given a world formerly thought to have n objects, universalism entails it has 2^n-1. For those sharing the intuition that cats and dogs are not the same as cat-dogs, the cost of the universalist solution sounds pretty pricey.[18] Though I will not rehearse the charges against nihilism here, for present

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[15] The thesis of composition as identity is, roughly, the claim that composition is sufficiently similar enough to identity that it is as ontologically innocent as the identity relation (no increase in entities). For more, see Lewis (1991). I examine the plausibility of CAI in Chapter 4.

[16] Forrest (1996); Yi (1999).

[17] The phrase comes from Sosa (1993) who uses it in a similar vein against a particular kind of Aristotelian.

[18] Especially if those things have vet bills.

purposes it is enough point out that others have raised equally (if not more) serious concerns for nihilism.

For reasons just stated, the past few years have witnessed renewed interest in metaphysically moderate accounts of composition.[19] A common thread running through such accounts underlines the failure of revisionary views to reconcile their extremism with ordinary thought and talk, among other things.[20] A chief complaint against nihilism is that ordinary mundane statements like, "there are two infant safety seats in my Subaru," turn out to be either blatantly false, only "as good as true," or some other implausible paraphrastic twist on ordinary discourse. Against universalism, one objection is that it accommodates moderation only by embracing conventionalism, relativism, or otherwise discredits it by attributing an unacceptable form of quantifier restriction to ordinary thought and talk.[21] To friends of moderation, these reconciliatory strategies appear superficial or *ad hoc*. A world in which people are radically mistaken about what exists sounds almost incoherent. Arguably, then, the counterintuitive costs of revisionary accounts may outweigh their strengths.

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[19] Recent contributors: Korman (2008, 2010), Thomasson (2006, 2007, 2010), Baker (2007, 2008), and Elder (2011).

[20] Other things: intuition, and semantic models of linguistic behavior.

[21] E.g., see Korman (2008) who makes a strong case against universalist claims that folk tacitly restrict their quantifiers (i.e., in order to explain how folk manage to talk about ordinary objects without also quantifying over extraordinary fusions of those things like Lewis'(1991) *trout-turkeys*).

Even so, it's not clear that moderates will succeed in responding to the most powerful revisionist charges: vagueness and arbitrariness. Having already (briefly) touched on vagueness, let's turn our attention to *arbitrariness*.

Objections from arbitrariness claim that any moderate account will inevitably fail to provide a suitably realist, systematic and uniform answer to the SCQ. In particular, critics charge that any ontological "cutoff" that corresponds precisely to ordinary thought and talk will involve either a miraculous coincidence, conventionalism,[22] or "a kind of anti-realism no one should tolerate" (Hawthorne, 2006, 109). In Sider's (2001, 156) critique of Wiggins's (1968, 1980) constitution view of collocated objects, he expresses similar worries:[23]

> On one version of [Wiggin's sortal-based collocation] view, the entities that exist correspond exactly with the categories for continuants in *our* conceptual scheme: trees, aggregates, statues, lumps, persons, bodies, and so on. How Convenient! It would be nothing short of a miracle if reality just happened to match our conceptual scheme in this way.

Van Cleve (2008) invokes a similar charge against restricted versions of composition:

> Even if one came up with a formula that jibed with all ordinary judgments about what counts as a unit and what does not, what would that show? Not I take it, that there exist in nature such objects (and only such objects) as answer to the formula. The factors

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[22] Anti-conventionalist sentiments among metaphysicians are ubiquitous; there is widespread agreement that "what exists is never a matter of human stipulation or convention" (Markosian 2008, 342).

[23] Sider's remarks concern Wiggins's view that co-located objects must belong to different sortals, and it that it is this fact that determines their different persistence conditions.

that guide our judgments of unity simply do not have that sort of ontological significance.

The viability of metaphysical moderation, in short, continues to be threatened by charges of both vagueness and arbitrariness. This has naturally led those seeking to preserve metaphysical moderation to redouble their efforts. And the dispute goes on. The previous two decades have witnessed this problem dominate the field of contemporary metaphysics. Believers in unbridled composition are accused of gratuitous ontological inflation. Nihilists are accused of having an ontology that runs smack in the face of common sense. But unless metaphysical moderates can rebut charges of vagueness and arbitrariness, it's starting to look like extremism will remain the norm. At the very least, the abundance of articles surrounding it suggest there is no easy solution.

There is something about the previous sentence that strikes me as strange. *Why* is *this* problem so intractable? There are many things one could say here, but for me it boils down to the sense that the intractability of this particular debate is particularly bothersome. How could such a simple question take decades to resolve? Accusations that participants to the debate about the SCQ were somehow "talking past each other," "merely verbal," or otherwise

nonsubstantial were not uncommon.[24] This "unsolved question" strikes some as not only "shallow," but also the wrong kind of question to ask.

A brief pause for reflection on this impasse suggests we might be better off looking for a solution that goes beyond the standard answers; perhaps one that can pinpoint why this problem is so intractable in the first place. If there is a way to mitigate the radical fallout of revisionary accounts, such a path is (surely) advisable. My aim in the present work is to help make some inroads. Along the way, my goal will be to sort out which theories of composition are tenable and which are not.

1.4 WHAT LIES AHEAD

A number of the chapters to follow consist in an examination of standard answers to the SCQ. In chapter 2, I outline the (naïve) moderate view, and highlight some of the "easy answers" that make it attractive to philosophers. However, I wind up finding easy answers unsatisfactory, for reasons that will become apparent at that juncture. Chapter 3 examines more sophisticated moderate answers. However, these too fall by the wayside, largely because of the vagueness argument, and their general lack of uniformity. Chapter 4 investigates universalism, rehearsing what makes it an attractive theory, along with some

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[24] Other forms of dismissivism regarding material object metaphysics are not unheard of; this is just a rough sampling. See Eklund (2006) and Bennett (2009)

formidable arguments against it. Nihilism is the last theory considered, in Chapter 5. I examine its most attractive advantage (parsimony), and then examine how a nihilist could defend her view against a variety of serious objections.

Surprisingly, none of these theories is robust enough *by itself* to play the role a successful ontology of ordinary objects requires. The reason for this, I argue, stems from reliance on one particular form of (metaphysical) orthodoxy: noncontingentism about existential claims in mereology. In general, noncontingentism is a view about the modal status of a (range of) statement(s). A noncontingent statement is one whose truth (falsity) holds necessarily. If false, it is necessarily false. If true, it is necessarily true. For a number of candidate solutions to the SCQ, noncontingentism (arguably) plays a large role in their inability to block certain objections. Loosening orthodoxy's grip on noncontingentism provides at least one way to partially settle at least some impasses in the material object metaphysics.

In Chapter 6, I present a broad strokes account of how three of the "standard" solutions to the SCQ might be rendered once noncontingentism about existential mereological claims is jettisoned. With noncontingentism out of the way, some might think the corresponding theoretical changes assign a reduced role to metaphysicians. For perhaps (some will say) without

noncontingentism, the deflationist gains the upper hand. Are they right? I don't think so. Given there is a metaphysical fact of the matter, at least concerning the actual world, I think metaphysics has a vital role to play in systematizing and adjudicating between competing scientific assays of the contents and structure of it.

This introduction began with a thought experiment about the existence of everyday, ordinary things, and the problem of composition that arises upon closer examination of them. Chapter 6 reflects on whether one could weave together select portions of some competing lines into one complete whole. Although it is inconclusive in regards to the correct solution to the SCQ, it suggests potential avenues for further research on the part of scientifically inclined metaphysicians. Partly to accommodate one of these ideas, I end up recommending contingentism about existential statements in mereology. We cannot read the metaphysical structure of this or any other world off existential claims in classical mereology. The *a priori* routes to discovering whether we live in an atomistic world, or a gunky one (or both), I believe, have been exhausted. Whether composition occurs in the actual world is a contingent matter, one which may be empirically discoverable. It is for this reason, among others, that I think metaphysics could use a certain amount of contingentism. In particular, I advocate discarding the existential claims of classical mereology.

Even if ultimately unconvincing, my hope is that some of the arguments presented herein are convincing, and (at least) provide a foothold for future ontologists who would like to explore novel ways to study the metaphysics of material objects; in particular, the SCQ. But for now, let us turn the first page.

1.5 CAVEATS AND ASSUMPTIONS

What follows is a short overview of assumptions that hold over the course of the work. First off, I have nothing to say about what laws (of nature) are, in the sense that I give no analysis or ontological characterization. That said, I sometimes use the phrase "dynamical laws" "laws of temporal evolution" "physical laws" and "laws of fundamental physics." Readers can interpret these phrases with their own preferred theory of laws (e.g., laws as Humean regularities, reductionistic accounts, laws as primitive, magical, whatever). Ditto for causation, time , the perdurance/endurance debate, the relationalist /substantivalist debate. Likewise, however, I will typically speak as if endurance is true, and substantivalism is correct. This is all done in the name of expository flow. Technical terms and jargon will be kept to a minimum; however, if something turns up that needs characterizing in words of one syllable, I will do so at that time.

CHAPTER 2

ORDINARY ONTOLOGY AND MODERATE METAPHYSICS

In order to facilitate an understanding of what it is for certain individual things to come together to compose a further thing, it is helpful to consider particular cases of composition. For instance, when do several celestial bodies compose a solar system? When do some planks of wood compose a fence? What must happen for some atoms to compose a molecule? In this chapter, I examine three easy answers to the composition problem, ones that offer simple, straightforward solutions to this challenging question: contact, bonding, and bruteness. Lastly, I consider a more "middling" answer—so called series-style—that makes a worthy attempt at avoiding some of the flaws found in the first three.

2.1 EASY COMPANY

In exploring possible answers to the SCQ, a good place to start is with what I call *easy answers*. Easy answers offer straightforward, simple solutions.[25] Of course, that is no indication any will be correct, especially in metaphysics, a discipline well-known for embracing sustained, critical reflection on deep issues. Nevertheless, easy answers are like stepping stones, enabling us to gain a foothold on what is often a hard, abstract, or mystifying problem. Moreover, easy

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[25] This distinction is not intended to be cut and dried, it's merely a useful way of sorting theories into ones of increasing complexity.

answers have heuristic value—helping us see where *we* might go right, by noticing where *they* went wrong.

The answers examined in this chapter are *moderate* easy answers, characterized as those which claim that sometimes, several objects compose one object, and sometimes, several objects do not compose one object. The first three sections of this chapter examine answers that look reasonable at first blush, though ultimately are unable to withstand serious scrutiny: contact, bonding, and bruteness. The last section examines a slightly more sophisticated answer that appears to be on the right track, so-called *series-style* answers. Although I wind-up concluding *series-style* and the others are ultimately untenable, it is worth bearing in mind that they still offer some insight into the nature of composition, and the ideas they call upon often wind up as parts of more sophisticated answers in the following chapters.

The general terrain ahead will consist in examining each easy answer in turn. First, we turn to contact and bonding and note why they fail (2.1, 2.2). Next, we consider the possibility that composition is a just a "brute fact" (2.3). Lastly, we trek into deeper territory and check out a middling view, series-style (2.4) and see why it too, fails to convince.

2.2 EASY CONTACT

Sometimes, it seems like composition happens on the fly: piling some bills together is enough to get a stack of them. Other times, it seems like composition needs a bit more coaxing: piling some bricks together, even in the shape of a house, does not thereby produce a house. The bricks must be attached in such a way as to withstand a certain level of force; they need to be cemented together in a particular fashion, a foundation must be laid, floor planks must be nailed down, and so on. And once in a while, it seems like composition cannot happen at all: most readers will deny there is anything one can do to get Sappho and a Cuisinart to compose anything. Reflection on cases like these makes the idea that composition occurs sometimes (but not always) a compelling one. One of the simplest and most natural thoughts that first occurs to anyone considering the nature of composition is that there is something right in thinking the parts of a whole should at least be in contact with one another. And that is why *contact* is our first easy answer. It will help to have (a version of) the SCQ handy:

> **SCQ**: Suppose one had a number of things, the Xs, at one's disposal; what would one have to do—what could one do—to get the Xs to compose something?[26]

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[26] The SCQ asks *when* several things compose one thing. The general composition question (GCQ) asks for an analysis of composition (in the sense that it does not use any mereological terms).

Using the locution "the *X*s" to irreducibly refer to the (disjoint) things we are

considering, the first answer, *contact*, says the following:

> **Contact**: to get the *X*s to compose something, one need only to bring them
> into contact; if the *X*s are in contact, they compose something; if the *X*s are
> not in contact, they do not compose anything.[27]

Reflecting on the composite objects we encounter on a daily basis, it seems

natural to assume that one component of composition must be that the parts

somehow touch each other (like bricks composing a house, or pieces of wood

composing a chair). This is the intuition that *contact* brings to bear in its treatment

of the SCQ. But however intuitive *contact* first appears, it has little staying power

after critics put it in their sights. As van Inwagen makes abundantly clear, *contact*

is not the kind of condition we should expect to apply to persons, at the very

least:

> Suppose you and I shake hands. Does a new thing at that moment come
> into existence, a thing shaped like a statue of two people shaking hands, a
> thing which has you and me as parts and which will perish when we
> cease to be in contact? (35)

The problem with answers like *contact* is that although contact may be necessary

to bring some things into existence (e.g., a house of *Legos*) and although it is true

that many composites' parts are in contact (toadstools, telescopes, turntables), it

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[27] Van Inwagen says much more than this, but, roughly, "the *x*s are in contact" means (1) no two of the *x*s overlap spatially, and (2), if *y* and *z* are among the *x*s, then *y* is in contact with *z*, or *y* is in contact with *w*, which is one of the *x*s, and *w* is in contact with *z*, etc.

fails as a general account of composition, because *contact* is prone to counterexamples that show it is neither necessary nor sufficient for composition. Not sufficient: putting my cat and dog into contact does not yield some new entity.[28] Not necessary: the parts of an atom are not in contact.[29] On these grounds alone, then, *contact* cannot be the correct answer to the SCQ.

2.3 EASY BONDING

What is needed is something more robust than mere contact, something that serves to integrate the parts into a whole, perhaps one where some kind of physical bonding takes place. Bonding relations (e.g., gluing, nailing, welding) serve to integrate the relations between the composing parts of a whole, uniting them in such a way that relevant forces would be unable to separate them. We know from developmental studies that infants attend to things that move as a unit[30] and the parts of composite objects are typically stuck together (somehow) and move as a unit: Bonding accommodates this fact. Let us then consider

> **Bonding**: For all *x*s, the *x*s compose a further object *y* if and only if the *x*s are bonded together to some degree *n*.

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[28] Well, not unless you've already come been huckstered by some high-brow philosophers.
[29] This example comes from van Inwagen (1992, p. 34).
[30] [Cite Refs] Spelke, Carrey, etc.

Van Inwagen explains one type of bonding—*fastening*—as follows:

> [I]f a nut is threaded onto a bolt, then the nut and bolt are fastened, since most ways of applying force to the nut or to the bolt or to both would not suffice to remove the nut from the bolt; most ways of applying force would produce no movement of either, or else would cause them to move as a unit.

Bonding seems to be an important factor in many visibly composite objects: houses, fences, bicycles, computers, and a host of other ordinary objects seem to require some kind of bonding of their parts, rather than mere contact. The parts of a watch, spread out on a jeweler's mat, do not a watch make. Prior to assembly in a factory, the parts of a car seem to be a scattered number of separate things, not a composite object. Squares of wool, until sewn together, may be stacked into a *pile*, yet until they are sewn into a quilt most ordinary folk would not think them a composite object. However, *bonding* also has its limitations; namely, it appears to be insufficient for composition. For instance, bonding any old objects together does not guarantee they are a composite whole—gluing, sewing, or any other bonding of two persons (even if successful) does not bring anything *new* into existence.[31] It seems just as clear there are wholes whose parts are entirely disconnected; e.g., the state of Michigan, or a bikini. We turn now to examine another easy answer, *bruteness*.

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[31] Van Inwagen uses a similar example in Material Beings (§6).

2.4 BRUTENESS

One possibility not vulnerable to the above counterexamples is bruteness. According to this account, composition is a brute fact that admits of no further metaphysical explanation. And indeed, worlds in which it is a brute fact whether composition occurs seem possible. This section looks at one recently defended version of this view, that of Ned Markosian (1998, 2008). His characterization is two-fold:[32]

> **Bruteness (B)**: (i) There is no true, non-trivial, and finitely long answer to SCQ; and (ii) Whenever Xs compose an object, it is a brute fact that they do so.

Claim (i) precludes contenders that are simply a trivial restatement of the SCQ (because they use mereological terms) and are therefore uninformative. An example of this kind of answer is, "Necessarily, Xs compose an object y iff there is a y such that the Xs are all (disjoint) parts of y and every part of y overlaps at least one of the Xs." Claim (i) also precludes answers obtained by simply listing every possible case of composition (e.g., in the form of an infinitary disjunctive

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[32] Markosian (2008). Note that Markosian uses the phrase "brutal composition" to name his account. In (1998) he separates these claims into different theses, noting they offer "mutual support" for one another. (1998) is a full defense of *bruteness*, while (2008) is an overview of restricted compositional theories, one that summarizes and clarifies some of (1998) along the way.

sentence). Claim (ii) is the positive component of the account—basically, when composition obtains, it is a brute fact that it does.

Markosian's (1998, 2008) argument for bruteness is simply that it is the best choice among relevant alternatives. Markosian considers five candidates: nihilism, bonding, organicism, series, and universalism.[33] After pointing out the standard problems with each candidate, he claims that bruteness is the only theory that shares *all* of their advantages while avoiding many of their costs. As Markosian notes, this is an argument by elimination of alternatives, and hence bruteness wins "by default." Among the advantages in favor of it, Markosian underscores the following three: it is consistent with commonsense intuitions about particular cases of composition, (ii) it is consistent with the denial of ontic vagueness, and (iii) it allows the endurantist to resolve puzzles over material constitution without the costs associated with nihilism.

2.4.1 OBJECTIONS TO BRUTENESS

For many commentators, the primary objection to brutal composition is that it is not intuitively plausible, a fact that Markosian concedes (ibid). One thought underlying this objection seems related to the call for a solution that is not

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[33] "Bonding" and "organicism" are my terms; Markosian calls them *fastenation* and *VIPA* (*Van Inwagen's Proposed Answer*), respectively (2008).

objectionably arbitrary. But the idea that compositional facts are brute and also perfectly match our conceptual scheme, with no underlying *reason* for this happy accident, does strike many as arbitrary.[34] For its answer to the SCQ is basically "That's the way it is, folks. Move along. Nothing to see here."

Moreover, recall that in laying out his two-fold view, Markosian explicitly restricts brute answers to a finite length. He does this in order to avoid a potential "brute force" answer, in the form of an infinitely long sentence that indicates, for each possible arrangement of *Xs*, whether composition occurs.[35] According to Markosian, this sentence would not supply a "real" solution to the SCQ, "since it would tell us nothing about why composition occurs, and that is really what students of SCQ want to learn." However, it's unclear brute answers fare any better on this measure, since saying "composition occurs as a brute matter of fact" will strike many as not *explaining* composition either. For some, this lack of a principled explanation of composition is unacceptable. Horgan (1993, 695) writes:[36]

> Even though explanation presumably must bottom out somewhere, it is just not credible—or even intelligible—that it should bottom out with specific compositional facts which themselves are utterly unexplainable and which do not conform to any systematic general principles. If one bunch of physical simples compose a genuine physical object, but another

[34] Cf. Sider (2001, Ch. 5), Van Cleve (1986).

[35] Ibid, p. 200

[36] This is part of Horgan's (1993) rejoinder to an imagined opponent who upholds a "brute fact" theory of composition; not Markosian's theory in particular.

bunch of simples do not compose any genuine object, then there must be some reason wh*y*; it couldn't be that these two facts are themselves at the explanatory bedrock of being.

The charge levied here is that brutal composition is not explanatorily sufficient, in addition to being highly counterintuitive.

2.4.2 THE HAPPY ACCIDENT

A related objection concerns the happy accident mentioned above. It says the brutalist owes us a story about how we manage to latch on to compositional facts. Put differently: suppose composition is a brute matter of fact. How do we know the folk manage to get it right and not, say, the revisionists? After all, the folk could be wrong about when composition occurs.

Suppose Markosian is right and compositional facts are indeed brute facts. Recall he markets this option as "consistent with commonsense intuitions about particular cases of composition." Even so, it's possible folk are wrong about when composition occurs (*there's this evil demon…*). To think otherwise suggests we can safely assume folk are somehow epistemically infallible (or close to it) about composition. But it seems that even if compositional facts *are* brute, folk might *still* be mistaken in their commonsense intuitions about particular cases. So

it's feasible folk are fallible. But if folk are fallible, the believer in brute composition owes us an explanation why brute facts precisely line up with intuitive judgments about particular cases. At any rate, further argument is needed to establish that in addition to it being a brute fact, the *only* composite objects are ones that match folk intuition, and the like.[37] Van Cleve (2008) complains along similar lines, and remarks that brutal composition seems to "involve its own brand of arbitrariness." He asks why an Aristotelian cannot use the bruteness defense in response to Sosa's (1993) "explosion of reality," whereby any compound of matter and form exists, thus generating, in van Cleve's words, "an endless proliferation of entities sharing exactly the same place and matter." Here is an illustrative toy story that embellishes on Van Cleve's charge.

Imagine a winter scene in which a moderate brutalist and her Aristotelian friend stop their snowball fight to debate whether Sosa's snowdiscalls exist.[38] They find themselves in agreement: there are no such things. *Hold on*, says the brutalist to her friend, *your view entails* every *compound of matter and form exists; you have no way to stop the ensuing explosion of reality, and thus no way to deny*

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[37] According to van Cleve (2008, 333), similar considerations undermine the commonsensical thought that the reason *why* the Eiffel tower and my nose do not compose anything, whereas the beams and bolts of the Eiffel do, is because the Eiffel is a cohesive structure, with interconnecting parts, and the like. The bruteness account says that's *not why* parts compose a whole. The fact that the Eiffel is composite is just a matter of brute fact.

[38] The concept of a *snowdiscall* is from Sosa (1999). A snowdiscall is constituted by a piece of snow and capable of taking on any of a range of shapes in-between round and disc-shaped (inclusive), and which is destroyed in coming to take on any other shape outside that range (cf. Sosa 1999).

snowdiscalls![39] (Fear not, our Aristotelian has a trick up her sleeve). She parlays the brute composition card into her own hand, and turns tables on the brutalist. *Two can play at this game*, she counters, *After all, it is a brute matter of fact that snowballs, but not snowdiscalls, exist. No reason—that's just the way it is*. But if our Aristotelian can use bruteness to avoid an explosion of reality, what prevents a revisionist from claiming that, *as a matter of brute fact*, no composites exist? (Perhaps nihilism is right after all—as a matter of brute fact, of course…)

One might initially suppose the moderate has the upper hand here, since she can still play the commonsense card. There are two reasons I think this would be a mistake. First, van Cleve makes a compelling point for thinking bruteness *undermines* commonsense, for the bruteness of compositional facts means that our commonsense thoughts about composition are not warranted. According to the brutalist, there is no commonsense reason why some things compose, say, your house, *it just happens to be that way*. Van Cleve (2008, 333), provides the following example. Bruteness undermines the following commonsense thought: the reason *why* the Eiffel tower and my nose *do not* compose anything—whereas the beams and bolts of the Eiffel *do*—is because the Eiffel is a cohesive structure, with interconnecting parts, and the like. Bruteness says that is *not* why parts of the Eiffel compose a whole. Rather, there is simply

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[39] Van Cleve writes: "I find that possibility hard to swallow, and brutal composition does not go down much easier." (2008) p. 333.

no reason the Eiffel is composite. Secondly, even if think bruteness is at least

consistent with folk ontology, whereas the nihilists' (say) is not, that consistency

only goes so far. Without the assumption that folk intuition is (usually) right

about which things are composite, there is little left to distinguish her account

from say, someone who claims several things never compose one thing as a

matter of brute fact.[40]   As I argued above, there is no reason to think folk are

correct in their perceptual or intuitive judgments about what is composite and

what is not. (I provide a more detailed argument to this effect in Ch. 5, section 4).

2.5 MIDDLING ANSWERS TO THE SCQ

Even if our easy answers are not up to snuff, perhaps we can glean some insight

by reflecting on what is wrong with answers like *contact, bonding,* and *bruteness.*

Contact and bonding are susceptible to counterexample, because the constraints

they impose on composition are either too weak or too strong. And bruteness

lacks explanatory adequacy. Given these concerns, three desiderata emerge: (i)

the account must be explanatorily adequate—it should go some distance towards

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[40] You might think she can still play the "commonsense" card, but I agree with van Cleve this
would undermine commonsense: there is no commonsensical reason why some things compose,
say, your house, it just happens to be that way.

clarifying the nature of the relation between a whole and its parts;[41] (ii) the account should accommodate the fact that different kinds of things may be governed by different principles of composition: a relation *R* among some *Xs* sufficient to compose an object *O* may not be sufficient among some *Ys* to compose anything at all. For example, gluing some *papier mâché* together may cause a new thing to come into existence (e.g., a piñata), whereas gluing two persons together does not seem to create anything (other than an uncomfortable situation). Relatedly, (iii) some composite objects have parts that are themselves governed by different compositional principles than the wholes of which they are parts.

For example, an orange follows different compositional principles than its segments—e.g., the liquid parts of an orange are parts in virtue of being "held in," whereas the orange segments are "fastened" to the rind by the fibrous pith.[42] Let me attempt to regiment (iii). If a complex whole *W* has a proper part *P*, and if *P* abides by different compositional principles than *W*, then *W* has *differentiated* compositional structure. The point of (iii) can now be precisely stated: a satisfactory moderate account should be able to accommodate differentiated compositional structure.

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[41] I'm leaving it open (for now) exactly how we spell out this requisite.

[42] In a similar vein, Johnston writes: "When an item's parts are themselves complex, they in their turn will have their own principles of unity (forms) and genuine parts (matter)…" (2006).

A nice example of the differentiated compositional structure underscored in (iii) is *Fallingwater*, the famous residence designed by architect Frank Lloyd Wright. Intended (by Wright) to seamlessly join architecture and nature, its living area spans a creek, with cantilevered terraces extending out over a waterfall below. The foundation of the house is an enormous natural boulder that has been there since the last ice age, one whose parts wind up protruding (unaltered) through the living room and serve as the hearth of the fireplace; the chimney of which is made of natural stones from the quarry up the road. Its inimitable design was constructed to enable the residents to live in "a powerful union of architecture and nature."[43] As Wright put it to the original clients, "I want you to live with the waterfall, not just to look at it, but for it to become an integral part of your lives."[44] If Fallingwater is a composite object, then the boulder that serves as the foundation, the waxed flagstone floors (emulating the creek below), the wading pool and creek flowing underneath, and the cantilevered poured concrete terraces, are surely parts of it. However, the composition of the water, the stone foundation, the ancient boulder, and concrete

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[43] These quotations can be found in an article by the National Endowment for the Humanities, at http://edsitement.neh.gov/feature/fallingwater-frank-lloyd-wrights-powerful-union-architecture-and-nature, an article whose author notes that "because the house is directly over running water, it had problems with mold. The senior Mr. Kaufmann called *Fallingwater* 'a seven-bucket building' for its leaks, and nicknamed it 'Rising Mildew.'"

[44] Ibid.

terraces are distinct things themselves, each component having starkly different relations of composition amongst *its* proper parts.

What kind of account of composition could adequately explain the complexity found in material objects as diverse and multifaceted as Fallingwater? The final section of this chapter examines a "middling" candidate that fares better in these respects than those just considered.

2.5.1 SERIES-STYLE ANSWERS

The intuitive appeal of a series-style answer can be most easily seen by reflecting on the desiderata expressed by (i)–(iii), above. Series-style answers are sensitive to the thought that composition may happen differently for different kinds of things, and not at all for others. It also allows that composition obtains in different ways among the various parts of a whole. In particular, series-style answers permit the kinds of things that jointly compose the various parts of a complex whole to have differentiated structure; they need not configure themselves in the same way as their neighbors. According to this line of thought, the answer to the SCQ is, roughly, that a number of things (the Xs) compose something when they are properly related (and do not compose anything at all if

they are not so related). This answer could be sharpened by proposing a schematic form common to all series-style answers:[45]

> **Series**: the Xs are K_1 and stand in R_1, or the Xs are K_2 and stand in R_2, or..., or the Xs are K_n and stand in R_n.[46]

For houses, this relation amounts to one thing; for persons, it amounts to another. For example, we may be certain that some objects exist—say, a ceiling, four walls and a floor—and together compose a room; however, we are not inclined to say that any objects whatsoever—say, Adolf Hitler and Mahatma Gandhi—somehow compose an individual whose sole (proper) parts are just them (and proper parts of them).

The intuitive appeal of a series-style answer can be most easily seen by reflecting on particular cases, in which composition does and does not occur. Consider the following imaginary scenario:

> *One day while vacationing at the beach with your nephew, you hear about a sandcastle building contest. You and your nephew decide to sign up as separate entries, since each entry qualifies for a free t-shirt. Your nephew begins constructing his best castle yet, complete with a moat and parapets. He even adds a drawbridge made of small twigs and sea grass. As a (mereological) prank, you begin to amass the sand near you into a large heap, clumping it into what looks like a miniature sand dune. For effect, you place a stick with a flag of plastic on top, placing a G.I. Joe figurine next to it. Upon finishing his own, your nephew looks over at your sand pile in confusion. "That's not a sandcastle!" he blurts out,*

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[45] Further discussion of series-style answers (and objections to them) can be found in Markosian (1998) and van Inwagen (1990).

[46] Where $K_1,...K_n$ are kinds of things and $R_1,... R_n$ are multigrade relations.

looking to the judge for agreement. The judge walks over to your entry with a quizzical look on his face. "What is this?" he asks. "A sandcastle," you reply, grinning. The judge walks away, shaking his head. Needless to say, you do not get the free t-shirt.

For most observers, your act of pushing sand into a heap did not thereby bring about a castle. Yet in the case of your nephew, it did. One explanation that can be given on behalf of *series* is that the relation *R* governing the sand particles of any future castle must meet certain configurational requirements in order to compose a castle (and not a heap). Sandcastles obey one kind of composition principle, sand dunes (heaps) another.[47] These various principles determine structural relations among the parts so as to generate an integrated whole.

Series-style answers seem to have what it takes to explain our intuitions regarding certain aspects of composition; however, they also face some powerful objections. The following section examines several of these, and considers how the proponent of *series* might reply. The first objection claims series-style answers preclude the transitivity of parthood. Transitivity (if *x* is a part of *y*, and *z* is a part of *x*, then *z* is a part of *y*) has the status of a conceptual truth about parthood. If *series* prohibits transitivity, one of them has to go. Following that, I consider the challenge that *series* fares poorly with respect to certain theoretical virtues.

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[47] E.g., something that unifies the bits of sand and twigs, and moats and parapets into an integrated whole. Johnston (ibid).

Although series succeeds on this measure relative to previous easy answers, I conclude by arguing that it faces other, insurmountable difficulties.

2.6 OBJECTIONS TO SERIES-STYLE

2.6.1 TRANSITIVITY

As illustrated by Fallingwater, a composite object may be complex by having component parts that operate according to various different compositional principles than the whole of which they are parts. Fallingwater has a chimney (a component operating according to distinct compositional principles) that itself has further components (e.g., stone slabs) that are composed differently than either the chimney or the house of which they are parts. As seen in the previous section, *series* sanctions this (seemingly) natural feature of complex wholes, whereby composition of component parts of the object are differentiated from the larger compositional structure in which they are embedded. But this feature is somewhat of a double-edged sword. Critics claim this stratified view of composition entails parthood is not transitive, and since transitivity of parthood seems to be an intuitive feature of what it is to be a part (of a part) of a thing, one of them has to go.

To illustrate this point, recall the fireplace at Fallingwater. The chimney is composed of hundreds of natural slab-like sandstones, $S_1…S_n$, horizontally

stacked and cemented in a jagged fashion, mimicking the rock outcroppings of the surrounding terrain. Call the relation among the stone slabs composing the chimney R_1. Somewhat simplifying things, imagine the slabs $S_1...S_n$ are each composed of mineral elements $M_1...M_n$ in a bonding relation sufficient to produce such slabs. Call the relation among the mineral elements R_2. Further simplify this toy story by imagining that the elements, slabs, and chimney are the only things in the world. Combining the above we get the following instance of the *series* schema:

> (*) For any Xs [there is some y such that the Xs compose y iff: (the Xs are slabs and stand in R_1) or (the Xs are elements and stand in R_2) or (there is only one of the Xs)]

The transitivity objection goes like this. First off, recall the axiom of transitivity:

> **Transitivity** (**T**): if x is a part of y, and y is a part of z, then x is a part of z.

Given transitivity, the minerals in our example ought to count as parts of the chimney, since they are part of the stones that are part of the chimney. However, nothing in the schema explicates how the minerals that are parts of the stones are *also* parts of the chimney. In fact, the schema prohibits this from being the case.[48] That is, any mineral part of a stone is not a part of the chimney, for according to

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[48] Or, at least, it says nothing about it.

(*), $M_1...,$ Mn *only* stand in R_2, in which they compose a stone. So the minerals, even though they compose stones that are parts of the chimney, are nevertheless not part of the chimney. In fact, the schema prohibits any part of a part to count as part of the whole if it follows different principles of composition. So if *series* cannot accommodate this, (T) is false. This is not good.

One reply to this objection, due to Thomasson (2007, 132), says to include a recursive clause in the explication of proper parthood.[49] In order to facilitate such a move, Thomasson proposes something like the following:

> **(TPP)**: x is a proper part of y iff there is a z other than x such that x and z compose y, *or*, for some x, for x to be a proper part of z and z to be a proper part of y.

So, perhaps *series* is not vulnerable to the transitivity objection after all.[50] I do not think this is how critics of series would see it, though. For example, I think van Inwagen would respond along the lines of what he says in *Material Beings*, which is, basically, that he believes likely candidates will invariably make reference to mereological terms in their characterization of the answer to the SCQ. In the case of *series*, it looks one must invoke a multigrade relation that would include reference to proper parthood. Although certain constraints imposed by van

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[49] Another idea (think I read this somewhere…): a different recursive clause that uses some multigrade relation among the spatio-temporal regions jointly occupied by minerals, stones, and chimney.

[50] This seems right to me, although it is unclear how to prevent this clause from infecting the right hand side of the schema, forcing the *explanans* to use terms from the *explanandum*, thus making it vulnerable to the charge of circularity. Van Inwagen (unconvincingly, in my opinion) points to this vulnerability as part of a general worry about *series* (pp. 64-5).

Inwagen on a proper answer to SCQ have been questioned elsewhere, forbidding terms from the explanandum to be used in the explanans is not one of them.[51] Furthermore, given (i) above, it would be odd for the *series* proponent to deny the need for it.

2.6.2 NON-UNIFORMITY

Two worries relating to uniformity stem from what might be called "the list-like nature of series." The first worry is that no matter which relations and kinds of composition are already on the list (e.g., an instance of the schema), they give us no indication as to how the list is to be continued. The second worry arises from the first: the kind of list series generates is not explanatorily sufficient. In the vernacular of contemporary metaphysics, *series* lacks uniformity and generality. Below, I first explain the general charges in more detail, consider a couple of responses on behalf of proponents of series, and wind up concluding that series-style answers to the SCQ lack the theoretical virtues (uniformity, generality) desired.

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[51] See, e.g., Sanford. On constraints of the SCQ, see Van Inwagen (ibid, 29ff).

THE LIST LIKE NATURE OF SERIES

One motivation for *series* was that it accommodates our intuition that composition may happen differently for different kinds of things. Initially, this was seen as a desirable characteristic. But this feature becomes a flaw if it entails a highly gerrymandered account of composition. When critics cite the "non-uniformity" of *series*, this is exactly the charge they are leveling against the view.[52] *Series* is far too similar to a highly disjunctive (and possibly infinite) list to be able to bring a sense of uniformity to composition relations.

In this vein, van Inwagen (ibid) remarks *series* gets things the wrong way 'round, for instead of providing a way to *discover* what composite objects there are, "we must first decide what objects we think there are and then try to devise an answer that will generate them." Of course, if the series answer just gives you a small number of relations, and says "that's it," then this (arguably) is not a problem.[53] But what if each kind of thing follows different rules of composition? Then the list will quite long indeed. In comparison, many revisionary accounts offer the kind of generality desired here: once we know what composition *is*, we can extrapolate to other cases.

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[52] For example, van Inwagen is critical of their failure to be "one-tiered" and thinks any full-fledged answer involving *series* will be "disgracefully messy" (1990, p. 66).

[53] Perhaps there are some accounts that will avoid this charge, e.g., Hoffman and Rosenkrantz (2006) have an account that has only two kinds of things. Thanks here to Dean Zimmerman for pointing this out.

One way of stating the point at issue here goes like this. If we suppose for each kind of thing that its parts will be governed by a unique composition relation, then series-style answers will be as numerous as there are kinds of things. That may not seem like such a burden if there are only a handful of kinds (e.g., natural and artificial, or concrete and abstract). But surely the intuition driving *series* is that there are many more kinds of objects than *that*, each of which obtains according to different relations amongst its parts. Van Inwagen (1990, 69) predicts there will be an unavoidable amount of arbitrariness in any series answer:

> One Series-style answer might entail that if inanimate objects are fastened to one another, they thereby compose something, but that if living organisms are fastened to one another, they nevertheless do not compose anything. But what could justify such discrimination? If the operation *fastening* has the power to turn inanimate objects into the parts of a whole, why doesn't this operation have the same power with respect to living organisms?...Isn't there a great deal of plausibility in this principle: If there are xs that compose something just in virtue of the fact that they stand in R, then, for any *y*s, if the *y*s stand in R, the *y*s compose something?

Could the proponent of *series* respond that natural objects are now to be considered all *of-a-kind*? That doesn't sound right—the idea that different kinds of things are governed by different compositional principles is what sparked the inspiration for series in the first place! The structural complexity of stars, as van Inwagen notes, is different than the structural simplicity of grains of salt, which is entirely different than the structural complexity that occurs in nucleic bonding.

Series-style answers, by their very nature, seem unable to give a uniform and general account of such different types of composition: its initial appeal was that it, unlike *contact* and *bonding*, did *not* offer a "one-tiered" solution. So whatever principles of composition *series* offers, it will not be uniform in the way (some) other moderate answers are, and pales in this respect to the uniformity and generality advertised by the extreme answers of universalism and eliminativism.

In the wake of *Material Beings*, others echoed van Inwagen's call for uniformity, as well as the need for explanatory adequacy. Horgan writes:[54]

> [A] good metaphysical or scientific theory should avoid positing a plethora of quite specific, disconnected, *sui generis*, compositional facts. Such facts would be ontological danglers…(695).

One upshot here is that *series* is not explanatorily sufficient. A plausible requirement for any adequate answer to the SCQ is that it provide insight as to why certain conditions and relations support composition whereas others do not. Regardless of how well they overcome the transitivity objection, then, series-style answers appear unable to supply the needed explanation of why different kinds of things are governed by different compositional principles. For the moderate who wants a theory that explains the salience of ordinary objects (as opposed to

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[54] He later writes that "[s]uch ontological arbitrariness is not possible in the mind-independent, discourse-independent world-the world whose constituents are van Inwagen's concern." (1993, ibid).

extraordinary or strange ones) this will be disappointing. This last point seems like the strongest strike against them.[55]

One response the series proponent can take here is to simply reject the requirement of uniformity. Why assume there will be a general and systematic answer to the SCQ in the first place?[56] And why think that metaphysical theories must mirror scientific ones? After all, reflecting upon examples like the sandcastle contest and Fallingwater, the thought that there is no one-tiered solution to the SCQ can seem benign—a natural outgrowth of intuitive judgments about particular cases. Nevertheless, calls for generality and simplicity may be usefully construed as part of a broader demand in philosophy that takes theoretical virtues seriously. A brief detour into the thinking that underwrites this principle may elucidate the demand for uniformity.

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[55] Thanks to Dean Zimmerman for helpful comments.

[56] Sometimes this is stated as a complaint about the SCQ itself. Eklund (2003) thinks that "the significance of the question is itself doubtful." Of course, many agree that the SCQ was a game-changer, something that, in Eklund's (ibid) words, basically set the agenda for a new research program. At the same time, others have concerns that the SCQ is the wrong question to ask, or that other questions in the vicinity prove more fruitful.

2.6.3 BRIEF DETOUR: THEORETICAL VIRTUES

If one views theory construction in ontology on a par with that of the natural sciences,[57] or thinks the theoretical goals of metaphysical theories are (at least in principle) no different than those of the sciences, then considerations of simplicity, generality, and theoretical elegance are desirable virtues.[58] There is also evidence of agreement among contemporary metaphysicians that their methods ought to aspire to similar theoretical virtues: objectivity, generalizability, and simplicity, among others.[59] And so it is no surprise that if we are aiming for our metaphysics to match our science in methodology, we do best when we endeavor towards such virtues in constructing our theories.

At the same time, metaphysics is not physics, and so what makes a good metaphysical theory may not always be equivalent to what makes a good scientific theory. For instance, metaphysical inquiry is more general (abstract) than science or physics in its quest to lay bare the fundamental structure of reality. For this reason, perhaps, it is also less wedded to empirical methods of investigation (e.g., falsifiability).

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[57] Cf. Quine, W.V. (1951), "Two Dogmas of Empiricism", *Philosophical Review*, 60: 20–43.

[58] Compare Quine: "Our acceptance of an ontology is… similar in principle to our acceptance of a scientific theory…we adopt…the simplest conceptual scheme into which the disordered fragments of raw experience can be fitted or arranged"(1953).

[59] Thomasson (2009).

However, putting these differences aside, and painting the metaphysical landscape in broad strokes, contemporary philosophers often adopt a *naturalistic* stance to the issues they choose to address. In saying they adopt a naturalistic stance, I mean that practitioners often counsel methodological naturalism, ontological naturalism, or both. *Ontological* naturalism—not at issue here—I mention only to set aside.[60] *Methodological* naturalism is the view that theory construction in philosophy ought to follow in the footsteps of scientific theory construction, abiding by principles of uniformity, generality, simplicity, and the like.[61] Metaphysicians subscribing to the kinds of theoretical virtues just mentioned will be understandably dismayed by the lack of uniformity series accounts might generate. Is there anything the advocate of *series* can say to assuage this worry?

2.7 REJOINDER ON BEHALF OF SERIES

I think there are a few things the *series* proponent can say by way of rejoinder.

First, she can agree that *Certainly, the end result of many scientific theories is*

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[60] This is the view that, broadly speaking, philosophical theories ought to countenance natural entities and explanations rather than supernatural ones. (Ontological) *Naturalism* is a controversial term in some respects, and different philosophers mean different things by it. Another version says that philosophers ought restrict quantification to the natural entities countenanced by (our best) science—so, reference to spooky stuff, demons, and unicorns is out and reference to gravity, electrons, and molecules are in.

[61] For a detailed statement of methodological naturalism, and a detailed explanation of the ways in which it is a separate claim than ontological naturalism, see Papineau (2010).

systematic and formally elegant. But she can then argue this is partly the result of generalizing over vast sets of data, part of which entails smoothing raw information, and purging it of any anomalies. But then she could emphasize that it is important to keep in mind that this is an entirely artificial process in that it successively refines, approximates, or idealizes by smoothing raw information, in order to obtain mathematically elegant formulae, models, and the like. Of course, such techniques do provide results that are generally elegant, uniform, and systematic.[62] This regimentation often serves practical purposes as well, by making experimental evidence more tractable through data reduction (error removal) and curve fitting.

Given the above line of response, the proponent of *series* may then accuse her interlocutors of exaggerating the importance of theoretical virtues. At the very least, she could argue that this attitude is inappropriate or impractical with respect to the SCQ. Moreover, if their demand for uniformity and generality is based on their status as virtues of methodological naturalism, the onus is on them to explain *why*, for e.g., that such virtues are in fact a guide to truth in metaphysics. As some have noted, the focus on systematic, generalist approaches to metaphysical theory construction is a recent development (at least in contrast

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[62] And (of course!) subject to c*eteris paribus* clauses. For critical discussion, see, Cartwright (1980).

to earlier approaches that conceived of it as conceptual analysis.[63] If this is the case, then it is appropriate to ask whether naturalizing metaphysics has proved to be as successful as advertised (especially given the counterintuitive revisionary theories on offer). So one recourse open to the series proponent is to say the objections at issue here are inappropriate.[64]

2.7.1 THE DISGRUNTLED HANDMAIDEN

A related response available to the moderate *series* proponent is that metaphysics should complement science—not be its handmaiden. The idea here is that metaphysics and science have a symbiotic relationship, or that metaphysical theories ought to be appropriately constrained by current science, but not *as* constrained as those sciences themselves.[65]

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[63] Or, as some claim, stems from a "Quinean scientistic approach to metaphysics," popular in contemporary circles (Thomasson 2009).

[64] One way she could provide support for this is to make an argument to the effect that the demand for uniformity fails in this case. Perhaps the SCQ is a trumped up demand for uniformity, concocted by revisionists keen to motivate the remedies they so quickly offer as a salutary measure.

[65] For example, she might agree that one hallmark of scientific theories is that they are systematic. But she may, at the same time, disagree that this ought to transfer to all cases of metaphysical theorizing. Surely some theoretical virtues aren't as important in metaphysics as in science. For example, the systematic nature of scientific theories does not typically result in bypassing evidential observations, whereas in revisionist material object metaphysics, it (arguably) has. (What I mean is that as Metaphysicians, we do not engage with empirical & observational minutia in the same way the natural sciences do).

As stated above, it is not always clear, even in science, whether some kinds of uniformity or exactness are "out there" or merely imposed by mathematical formalism. Moreover, different simplicity considerations may point to distinct methods. For example, the curve-fitting problem, where the data gives no indication on the form the curve should take. An example: say we have a data set of some arbitrary function f (e.g., the dependence of one physical quantity one another), and (say) two resulting curve fitting graphs: do we choose the simplest polynomial passing through the data points, or the simplest piece-wise linear function?[66] Series proponents may then note that although uniformity may be part of a mature scientific theory, it nevertheless may be premature to ask for it from a nascent metaphysical theory. One factor that bolsters this point is that theories of composition are underdetermined by the available scientific evidence. If scientific evidence for a particular answer to the SCQ was clear, demands for a more stringent adherence to principles like uniformity would be appropriate. Since our science isn't there yet, neither should our metaphysics. (Recall van Inwagen's own admission, whereby the structural complexity of a star is completely unlike the structural complexity of a grain of salt.) Why then, should we suppose our theory of composition will not reflect such scientific facts?

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[66] The example comes from Gordon Belot, Structure & Physics Conference, Rutgers (2013).

CONCLUDING REMARKS

This concludes my appraisal of the easy solutions to the SCQ. As is probably apparent by now, the likelihood that the SCQ admits an easy answer is slim. Of course, that hasn't stopped moderate metaphysicians from proffering other, more sophisticated solutions. In the next chapter, we consider hylomorphism and organicism, two examples of moderate approaches that meet the mark, at least as far as theoretical virtues are concerned.

CHAPTER 3

MODERATE METAPHYSICS (SOPHISTICATED)

The search for moderation continues. My goal in this chapter is to explore whether more sophisticated accounts of (moderate) composition could thread the needle of the SCQ. The accounts to be assessed are hylomorphism and organicism.

3.1 HYLOMORPHISM

Perhaps an even more "sophisticated" answer can marshal in the needed uniformity series lacks. Here's one. Some commentators propose a unifying principle or structuring relation that uniquely characterizes each kind of thing. If there are integrated wholes belonging to such kinds, the idea of a unifying principle that somehow orchestrates how the parts hang together could fill the uniformity lacunae apparent in series. Enter *hylomorphism.* As its etymology suggests, hylomorphism is the view that composite objects are compounds of matter *(hulê)* and form *(eidos; morphe).* Both hylomorphism and series agree different composition principles may govern different kinds of things. Only

hylomorphism, though, seems to evade charges of non-uniformity, since all composites share at least one feature: each has a two-fold nature that is part formal and part material content.[67]

Hylomorphism has a pedigreed history, with roots tracing (at least) as far back as Aristotle.[68] Even so, most contemporary hylomorphic accounts of composition depart from his view in various ways,[69] and so are more aptly termed Neo-Aristotelian. Contemporary hylomorphic accounts share the thought that composite objects have both a material and a formal aspect and that these interact in a special way. The formal aspect dictates how the material (matter) must be structured in order for it to be a particular kind of unified whole. Basically, the formal aspect is the source of what makes some things into one thing (i.e., into a unified whole, as opposed to an arbitrary sum).[70] As Koslicki (2008, 170) puts it, the formal component sets "the manner of arrangement" of the material parts, their variety and sometimes their number; for others like

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[67] Another shared property of hylomorphic compounds: the formal aspect is that which "structures" or "sets the matter of arrangement" of the parts.

[68] Among other ancients as well (e.g., Plato). Medieval and early modern proponents include Aquinas, Duns Scotus, and Suarez (cf. Ward 2014 and references therein). Contemporary versions can be found in, e.g., Fine (1999) Johnston (2006), Koslicki (2008), and Rea (2011). See Koslicki (2008) for a more complete set of references.

[69] E.g., by disregarding the teleological component, or the distinction between actual and potential parts.

[70] I do not intend this characterization to be very precise, since different views offer different analyses of the ontological nature of the formal aspect; cf. Fine 1999, Rea 2011.

Britton (2012) it is the "organizing structure," whereas in Johnston (2006), a characteristic 'principle of unity' joins the material content into a complex object.

3.2 KOSLICKI'S HYLOMORPHISM

Not every hylomorphic view is metaphysically moderate;[71] but Koslicki's is, and so it is hers that I focus on here. In *The Structure of Objects* (2008), Koslicki advances her view over a series of chapters. While she characterizes it as respecting "a scientifically informed commonsense ontology," she also draws insights from both Plato and Aristotle on the nature of part and whole. Although there is much more to her account (and its defense) than can be covered here, I sketch the main gist of it below and assess the extent to which it can provide a satisfactory answer to the SCQ.

After setting up some background architecture,[72] Koslicki gets down to brass tacks and argues for her "thoroughly mereological"[73] account of

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[71] For example, Johnston (2006) and Fine's theory of variable embodiments (1999) both end up countenancing far more kinds of things than metaphysical moderation would prescribe. Cf. Johnston (ibid) and Koslicki (2008, 169).

[72] Including, among other things, an primer on standard mereology (§1), an argument that composition is not identity (§3), and a critical summary of relevant work from Plato and Aristotle (§5 and 6, respectively).

[73] Koslicki's use of this phrase is intended to underscore that on her view, all mereologically complex objects are hybrid "through and through," so that any (formal or material) components that are themselves mereologically complex "display the same dichotomous structure" as the whole of which they are parts (188).

composition. Using only Leibniz's Law and a handful of intuitive mereological

principles,[74] she presents her case for the following thesis:

> **Neo-Aristotelian Thesis** (NAT): The material and formal components[75] of a mereologically complex whole are proper parts of the whole they compose.

Here is a reconstruction of Koslicki's argument for NAT:[76]

1. It is possible to for an object S to be constituted[77] by a single (pre-existing) material ingredient L (e.g., when a Statue is formed from a Lump of clay). [assumption]

2. If the material ingredient L persists through the creation of the object S, then L is a part of S. [premise]

3. In such cases, the object S is numerically distinct from the material ingredient
   L: $S \neq L$. [1, 2, Constitution is not identity[78]]

4. L is a proper part of S. [2, 3, definition of proper parthood[79]]

5. If an object has a proper part, then it must have an additional proper part disjoint from the first. [WSP[80]]

6. S has a proper part that is disjoint from L. [4, 5]

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[74] So minimal they are widely thought to be conceptual truths about parthood: asymmetry, transitivity, and the weak supplementation principle (WSP). Asymmetry: $x < y \rightarrow \sim(y < x)$. Transitivity: $(x < y \ \& \ y < z) \rightarrow x < z$. WSP: $(x < y) \rightarrow (\exists z)(z < y \ \& \ z \mid x)$.

[75] Koslicki's use of "component" is atypical; others use the term to designate a part of a composite that is itself a detachable whole or available as an 'individual unit.' Cf. Casati and Varzi (1993, 32), Simons (1987, 235), and Varzi (2014). I follow Koslicki's use when discussing her views; any other use follows the more common characterization.

[76] She does not lay it out in premise and conclusion form; see her §VII.2.7, especially 179-181.

[77] Constitution is the relationship between a whole and the matter of which it is made.

[78] The thesis that "constitution is not identity" is not uncontroversial (c.f. ibid., 179 n17 and references therein). Koslicki uses Leibniz's Law to back the claim that wholes composed of a single material ingredient (constitutionally related objects) must be numerically distinct, for they differ in modal and temporal properties.

[79] Proper parthood: x is a proper part of $y =_{df} x$ is a part of y and $x \neq y$.

[80] See n9 above.

7. There is a proper part, *N*, that is not a material part of *S* and is disjoint from *L*. [1, 6]

8. The most likely candidate for *N* is a formal (proper) part of *S*. [Inference to the best explanation]

9. *S* has a formal proper part, *N*. [7, 8]

10. There is nothing (mereologically) special about *S*.[81]

Therefore, the material and formal components of a mereologically complex whole are proper parts of the whole they compose (NAT).

According to Koslicki, NAT has a number of attractive features. First off, she emphasizes NAT's ability to solve the so-called grounding problem. The grounding problem challenges those who think numerically distinct objects can be spatiotemporally coincident (e.g., the statue and the clay that constitutes it) to explain their modal and temporal differences.[82] (A proponent of NAT can point to their different formal components). Second, Koslicki notes adherence to NAT simplifies the mereological axioms; in particular, the uniqueness of composition[83] falls out of NAT straightforwardly. Third, by allowing constitutionally related[84] objects to differ in formal parts, NAT provides a solution to the puzzle of

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[81] See, e.g., her comments (181), that the case of constitutionally related objects is fully generalizable to other cases of composition. Cf. Bennett (ibid).

[82] As well as other properties they do not share (e.g., sortalish). See Bennett (2004) for more on the grounding problem.

[83] The uniqueness of composition: it is never the case that numerically distinct wholes have exactly the same parts. For more on the uniqueness of composition, see Lewis (1991, 74).

[84] The terminology is Koslicki's: "object x and object y are constitutionally related if either x constitutes y or y constitutes x" (179, n18).

material constitution.[85] With the appeal of NAT in place (at least provisionally),

we can examine how HK fares with respect to the SCQ. Before I say anything else

though, I need to briefly mention something that will come into play later: HK

composition is not *solely* based on NAT; it is buttressed by (i) a realist view of

(scientific) natural kinds, alongside (ii) a similar defense of structures; I explain

these in the section immediately following this one.[86] After a series of

refinements, Koslicki puts forth the following analysis of composite objects:[87]

> **Restricted Composition Principle** (RCP): Some objects, m_1, …, m_n,
> compose an object, O, of kind, K, just in case m_1, …, m_n, satisfy the
> constraints dictated by some formal components *simpliciter*,[88] f_1, …, f_n,
> associated with objects of kind K.

Does Koslicki's RCP fare any better as an analysis of composition than series? At

first glance (and, granting the truth of NAT), it would appear so: it retains the

transitivity of parthood,[89] and (seemingly) gains traction against the non-

uniformity charge that beset series. It also promises to meet the benchmark for

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[85] A problem somewhat related to the grounding problem. Puzzles of material constitution ask what the relationship is between a whole (say, a statue) and the lump of clay of which it is constituted.

[86] See her Chapter VIII and IX, respectively.

[87] Ibid, 187. Actually, this is the third of four versions. The fourth is temporally relativized (190).

[88] Koslicki draws a distinction between the formal components *simpliciter* and *derivative* formal components. The formal parts *simpliciter* orchestrate how the parts must hang together in order for it to be the kind of object it is. Roughly, the formal parts simpliciter structure the kind of whole *as such* (e.g., a horse), whereas the derivative formal parts are those associated with (each) material proper part (e.g., a horse's hooves) and only structure those particular parts (e.g., hooves are composed of layered keratin). Moreover, it is only the formal parts *simpliciter* that orchestrate how the parts must hang together in order for it to be the particular kind of object it is.

[89] Of course, by invoking "components" on the right hand side of her characterization of restricted composition, it is unclear how she will avoid the same charge of circularity that Thomasson's fix of *series* received in Chapter 2.

non-arbitrariness, at least as set by some. For example, Horgan (1993) insists that

"any metaphysical theory that respects the [non-arbitrariness] principle must

provide a general and systematic answer to the SCQ—*or at least a class of such*

answers, corresponding to various fundamental kinds of material beings."[90] In these

respects, then, Koslicki's theory fares quite well compared to series. But it also

faces at least some initial hurdles. As already noted above, RCP relies on

Koslicki's defense of an ontology of kinds and structural (formal) components. In

order to evaluate the plausibility of RCP, then, we need to hear more about what

Koslicki means by invoking such terms.

3.2.1 AN ONTOLOGY OF KINDS

RCP does not get off the ground unless every genuine object belongs to some

(real) kind or other. This is something Koslicki freely admits:

> [A] mereology for ordinary objects takes as its starting point a
> presupposed scientifically informed, commonsense ontology of kinds,
> which descriptively settles the question of what mereologically complex
> objects the world contains…[91]

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[90] My italics.

[91] I am not exactly sure how to understand this claim. On one interpretation, Koslicki is saying
that only kinds acknowledged by science or commonsense are contenders for genuine objects.
Another way of thinking about her claim is that each genuine object is either already classified or
could be so classified, such that its formal component is perspicuously available to anyone who
cares to reflect on such (commonsense) things, or else consults the relevant science.

In addition, she concedes that RCP "only has plausibility if there are independent reasons for thinking that objects really do belong to kinds and that kinds really do pose constraints on the mereological composition of their members"(201). RCP is thus the thesis that a plurality of (material) things compose a (particular kind of) whole only when they meet the constraints set by formal component of that kind.

So when do some things (the *X*s) meet the required formal component of a particular kind? For Koslicki, kinds are (scientific or commonsense) categories (e.g., taxonomic classifications) that certain objects fall under based on their shared characteristics or properties. Interestingly, for Koslicki, the distinction between natural and non-natural kinds is a matter of degree, and does not depend on a distinction between *what is found in nature* and *what is man-made* (ibid). As Koslicki emphasizes (201), the distinction is best understood as a contrast between what is gerrymandered (e.g., *gruesome objects*, *children born on a Tuesday*, *trout-turkeys*) and what is not (*salt*, *insulin*, *electron*). In general, Koslicki doesn't weigh in on whether kinds have essential properties (201). She describes her view as relatively minimal: it neither presupposes members of a kind will share an essence, nor that it will be possible to provide necessary and sufficient conditions for such kinds (170).

Koslicki's ontology of kinds rests in part on her defense of natural kinds (200). Regarding artificial kinds, she allows that her considerations "cannot in general be expected to transfer straightforwardly to these other categories…" (200). Later she emphasizes,

> My analysis predicts that we only have reason to believe in the existence of an object, when that objects falls under a kind whose existence can be justified by appeal to independent considerations from outside mereology (258).[92]

For Koslicki, "independent considerations" for the existence of the relevant kind can be ascertained from either (1) scientifically informed classifications or (2) commonsensical considerations.[93] An example may help illustrate her idea. Consider a natural (scientific) object—say, an H_2O molecule, in which a kind of chemical bonding occurs between (particular atoms of) elements. The kind "H_2O molecule" dictates what the formal structure must be like (e.g., relational

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[92] Ibid, 258. Earlier, she emphasize that mereology "does not settle matters of ontological commitment; rather, it presupposes them to be resolved elsewhere within metaphysics or outside philosophy altogether" (170).

[93] Although it is reasonable to expect a mind-independent answer regarding the scientific kind under which an object falls, this will not likely be the case regarding artificial kinds. Artificial kinds, as Koslicki notes, are "in some sense created by us and are therefore dependent on human activities, cultures, intensions, goals, interests, conventions, and the like" (201). One potential point of contention—that there are significant differences between justifying a commitment to natural (scientific) kinds and one to artificial kinds—Koslicki explicitly sets aside. In her defense, she states three reasons for restricting herself to natural kinds. First, such a restriction makes her task "more manageable." Second, the wide range of literature on natural kinds offers interesting and useful applications to her present account. Third, the special case of natural kinds provides a model of the kind of reasoning needed to justify commitment to a particular class of kinds (200).

structure of the parts) for those atoms to be an instance of that kind. The formal

requirements are dictated by the kind of thing an H_2O molecule *is.*[94]

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3.2.2 KOSLICKI'S FORMAL COMPONENT

Let's take a closer look at how Koslicki understands the formal component of an

object. The formal component is a proper part of an object in precisely the same

(mereological) sense as the material components. That is, there is no special sense

of part that differentiates formal and material parts: they are all mereologically

on a par. Even so, formal components "dictate" the material components

regarding the manner of their arrangement (e.g., position, ordering,

spatiotemporal proximity); their variety (the matter out of which they can be

composed); and, (sometimes) their number (e.g., in the case of chemical

elements).

Koslicki does not say which requirements are dictated in which

circumstances; according to her, this "cannot be settled in abstraction from

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[94] But with artificial things, it seems there are plenty of cases in which an artificial thing may fall under two or more kinds. Bo Diddley used "a cobra snake for a necktie." Likewise, for example, even if someone intended to construct my Kate Spade bag as belonging to the kind *purse*, if I find it works better as a weapon with which to mug unsuspecting passersby, then who is to say it is not a weapon, after all? So it seems artificial kinds—or at least very many of them—are dissimilar to more natural ones in that *we* determine their structure, rather than discover it

particular cases."[95] Moreover, "while an object's formal components need not be very precise in the range of requirements they set for its material components… they may in fact in other cases be quite precise." As an example in which the constraints are relatively imprecise, Koslicki offers the case of an ax, which may be composed of wood and metal parts, or (alternatively) may be constructed from porcelain. As an example in which the constraints are precise, Koslicki offers the case of an H_2O molecule, in which the formal component dictates both the kind and the number of atomic parts.

There are other places in which a more nuanced view of the formal component emerges. For instance, the formal component need not be uniquely associated with the kind in question: as an example, Koslicki notes the relation of chemical bonding, which when combined with distinct material components, will produce different wholes.[96] Moreover, according to one illuminating description, the formal components can be thought of as "the sorts of entities which provide 'slots' to be filled by objects of a certain kind" and also provide constraints on "what sorts of objects can go into the various 'slots' provided by the formal components."[97]

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[95] Ibid, p. 172.
[96] Ibid, 173 n.8.
[97] She uses this metaphor, based on Verity Harte's (2002) portrayal of Platonic wholes in §5 (especially p. 115), p. 169 and p. 235.

In fact, Koslicki refrains from making decisive statements regarding many issues one might need in order to properly evaluate her particular stance on the formal component. Koslicki remains "open for future discussion" and "uncommitted" on many points regarding the ontological status of the formal component. Evidence of this can be found, e.g., in passages regarding RCP, which "leaves open the nature of the mechanism by which these sorts of constraints are imposed…" and, "how exactly we ought to think about the formal components of objects." In particular, "[RCP] does not settle the ontological category to which the formal components of objects belong…"[98] Koslicki does not come down on whether the formal components are universals (properties, tropes) or whether they are (abstract) objects, relations, and so forth.[99] This is disappointing.[100] Be that as it may, there are other worries I have that can be put forth despite of her silence regarding these matters.

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[98] Ibid, p. 169.

[99] 172 n. 4

[100] This has been criticized elsewhere in the literature, but here is my version of what is worrisome about her silence. Suppose Koslicki is right. The formal aspect is an immaterial proper part of the whole. What is the ontological nature of this entity? Koslicki rarely addresses this issue, and ultimately decides it will be left to further investigation (2008). Even so, in the scant places in which she does comment on it, she registers only three categories to which it might belong (the usual suspects: object, property, or relation) and registers a preference for *object*. But how does an abstract object manage to causally effect the material parts? Of course this is a familiar issue with abstracta, but it almost seems like one Koslicki has issued to herself, at least insofar as she suggests an object-oriented account is preferable, rather than say, universals or properties. Koslicki's silence regarding the ontological nature of formal components does not spell disaster for her view, but it leaves a great deal unexplained.

3.3 Objections to Koslicki's Account

My main worries with Koslicki's account stem from her characterization (or lack

thereof) the formal component, in the following ways. First, I have doubts her

argument for NAT is sound. Second, I cannot wrap my head around the need or

justification for an *immaterial* formal component. Third, I think Koslicki's formal

component is subject to the same vicious regress Aristotle pointed out a Very

Long Time ago.

3.3.1 The argument for NAT

My first objection is that Koslicki's (abductive) argument for NAT is unsound.

First off, notice the inference at hand rests on a specific kind of relation—material

constitution[101]—which, although related to composition, is not the same as it, for

it is one-one, whereas composition is many-one (with identity as the limit

case).[102] At the very least Koslicki cannot assume so, since the possibility that $S =$

L then becomes a live option, making (3) false. Now, I suppose she could argue

that *in this very case*, constitution is not identity. But then (10) is false: the relation

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[101] Recall Koslicki's constitutionally related objects: "object *x* and object *y* are constitutionally related if either *x* constitutes *y* or *y* constitutes *x*" (179, n18).

[102] Cf. Bennett (2009). Varzi (2014) notes that "most contemporary authors would either deny that material constitution is a relation of parthood or else treat it as *improper* parthood, i.e., identity…" A few paragraphs later, he writes, "many contemporary authors would rather construe [constitution] as a *sui generis*, non-mereological relation (see e.g. Wiggins 1980, Rea 1995, Baker 1997, Evnine 2011) or else as the relation of identity (Noonan 1993, Pickel 2010), possibly contingent or occasional identity (Gibbard 1975, Robinson 1982, Gallois 1998)."

between *S* and *L is* (mereologically) special, and so cannot be expected to obtain in all circumstances.[103]

3.3.2 THIS IS NOT IMMATERIAL

But even if the argument for it is flawed, NAT could still be correct. So let's suppose that it is: all mereologically complex wholes *do* have formal proper parts. My concern then would not be about their *formality*, but their *immateriality*. Sure, there are uses of "formal" that suggest a certain amount of abstractness, but the two are not inextricably joined. For example, an architectural firm's blueprints (among other things) for the skyscraper they just built[104] seems like a perfectly ordinary concrete component (broadly construed) that structures the building. And with natural (scientific) kinds, the evidence for material structuring components is even more conspicuous. Consider the mereologically complex wholes that are human beings—are we not justified in thinking our DNA is a *material* component that dictates the structure of the whole to which it belongs? Or think about Koslicki's example of chemical bonding in an H2O

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[103] Digression: Here is the question that prompted this section: why is the *only* case of 'composition' that underwrites NAT a one-one relation of material constitution? Why couldn't it be many-one? After all, we do not actually think a lump of clay has *no* parts; it is not a mereological simple. So it has proper parts. But if it has proper parts, then by transitivity of parthood, those parts are also parts of the statue created from the clay. But then S already has disjoint proper parts, and there no need to look for a remainder via WSP.

[104] Obviously I do not think architects go out and construct buildings. I am striving for brevity here.

molecule: do we not think there are actual physical relations (e.g., DNA); Material structuring components easily fill the shoes of Koslicki's immaterial ones; they set the "arrangement of the parts" quite nicely all by themselves. If we already have *material* structuring components doing the necessary work, what further task remains for the immaterial component, if it is not to be an "ontological dangler"?[105] Thus an immaterial formal component strikes me as both obscure and ontologically redundant.

Koslicki's choice of an immaterial formal component is mystifying for another reason, which is that the rest of her story is largely naturalistic—that is, it seeks explanations from the natural sciences in all other relevant areas. Especially noteworthy in this context is her realist account of scientific natural kinds, one she motivates by underscoring the important work they do in accounts of induction, laws of nature, and causal explanation. When coupled with her avowed adherence to a scientifically informed account of material objects, the fact that a similar stance is not taken towards the formal component, or at least shown to be unworkable,[106] is baffling. In other words, if realism about natural kinds is motivated by appeal to their importance in scientific inferences

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[105] It is hard to predict what Koslicki would say here; the issue I am raising is not addressed. She does promise to investigate the ontological nature of the formal component further (in Ch. IV); although by my lights, she does not even do that (see, e.g., her comments in n)

[106] That is, at least explain why material components would *not* offer the best explanation of how natural kinds set the agenda for the structural requirements to impose. I would hope that *some* account of material components would be defensible, especially if one is already committed to a naturalistically oriented ontology.

and explanations, as well as being part of a naturalistic taxonomy and (seemingly) governed by laws of nature, I would expect that we have good reason to think a *material* structuring component was in the offing. As I said earlier, I think we *already* have empirical evidence that some parts of material things do structure the wholes of which they are part. It is not so odd, then, that evidence for Koslicki's formal components is so hard to find. She is looking in the wrong place. I daresay, if Koslicki's formal parts were *ubiquitous*, they would be more *conspicuous*.

The last worry I have about an account of the formal component as an object is that it seems more likely to invite the regress Aristotle worries about concerning his own brand of hylomorphism.

3.3.3. STRUCTURES STRUCTURING STRUCTURES

There is an argument against taking the formal aspect as a proper part of an object, the roots of which go back to ancient philosophical discussions about the plausibility of a structuring component that is literally a part of the thing it structures.[107] Let's take a look at it.

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[107] Some readers may wonder how I can put forth an objection that seems to conflict with my previous one (i.e., that structuring components ought to be material parts). I cannot debate that here.

First, I am jettisoning one thing I think Koslicki should not say, which is that the formal component is mereologically structureless; an atom with no further parts.[108] So I assume the structural component is itself mereologically complex—that is, it has its own formal component. It will be easier to follow me here if we name the structural component of a material whole to start off with, so let's call him Bob. If Bob is mereologically complex, then Bob himself has a structural component. But this structural component (in order to do the structuring) must itself be mereologically complex. Let's name that component Tom. If Tom is mereologically complex, then he has a formal component that determines his structure, let's call that component Sally. If Sally is mereologically complex, then… and so on and so forth, as far as we care to go. It looks like we have a regress of structures that structure structures, *ad infinitum*. Mark Johnston (2006) offers a similar argument in defense of his brand of hylomorphism, one that does *not* involve a structuring element as a part. According to Johnston, it is entirely wrongheaded to have the unifying principle be a part of the object, for if

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[108] Proponents of Koslicki's view might reject this (though she seems not to). They might say the structural component is mereologically simple. But I think this is a bad move. Mereological atoms are structureless. How could a structural component do the work required of it if it has no structure? And, for Koslicki, it has a lot of work to do, since on her conception it "sets the selection requirements" for the material components, organizing the material parts in their "variety, configuration, and even their number"(170). How could an unstructured, partless simple manage to do *that*? So the structural component is mereologically complex. But then by parity of reasoning, there is a structural component of *that* component…, and so on. To me, this signals an explanatory regress.

it is a part of the object then one needs yet *another* unifying part that serves to unify the first formal part and all the other (material) parts, *ad infinitum.*

Koslicki is aware this kind of argument will be a formidable objection to her view. She writes:

> [M]y current project is addressed specifically to the question of how the parts of ordinary material objects are related to the wholes they compose; in the course of this inquiry, it turned out to be necessary to recognize within these objects the presence of structural components. Of course, if these structural components themselves turn out to have parts, then a new version of the question with which I began can be asked for them: how is it that the parts of structures are related to the structures they compose? But to respond to this query would constitute a different project, one that is specifically addressed to the nature of structures, rather than to that of ordinary material objects; and it is a project which deserves its own thorough discussion.[109]

As indicated in the passage above, Koslicki is aware that if the formal part is itself hylomorphic, there is potentially an infinite regress of hylomorphic structure. But, as is evident from the above passage, she wants to fight that fight another day (although she does say a bit more, see below). Still, we can at least briefly consider what a proponent of her view might say.

Potentially, one could respond that only wholes with *material* parts are eligible to be hylomorphic compounds. Then it could be argued that since the structural components are not material objects themselves, but only immaterial

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[109] Ibid, p. 254 n19.

parts of them, they are of a different ontological kind than material components, and need not exhibit the same kind of hylomorphic structure as the latter.

Perhaps something like this response could work. Right now, I do not see how if formal components are "strictly and literally" proper parts of material objects, this move will shield them from the regress. In order to be successful, a response would have to justify why certain complex components (i.e., the formal one) could be strictly and literally part of a composite object without being governed by the same compositional principles as the other parts.[110]

But in fact, Koslicki does not make this move. Instead, she says something at odds with the potential response just laid out, stating that, "each mereologically complex object consists of formal and material components, which in turn, if they are themselves mereologically complex, *display the same dichotomous structure as the whole they help compose*."[111] This is unfortunate, because it seems to invite the regress articulated above. Thus, I conclude my investigation of Koslicki's hylomorphism with a mixed mind... in certain ways I think she is on the right track, but I have to wait until her account is further supplemented (i.e., addresses the concerns laid out above) to properly understand what it entails.

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[110] Koslicki also discusses a bit about (193ff) whether the principle of unity needs to be unified to a higher degree than the things it unifies.

[111] Ibid, p. 188.

CLOSING REMARKS

Although moderate hylomorphic accounts satisfy the call for uniformity and generality, the formal component that does all the work to meet those requirements has not been given adequate justification or explanation. In addition, although hylomorphic accounts are uniform in the sense that they ascribe a "principle of unity" or a structuring characteristic to all composites, there remain questions regarding *how* this work is done, whether it *can* be done without inviting a vicious regress, and *what* the proper analysis is of their (at present) mysterious ontological nature. Another suitably moderate answer, *organicism*, avoids these charges, and it is to this theory that we now turn.

3.4 ORGANICISM

One candidate not vulnerable to problems encountered by hylomorphism comes from the originator of the SCQ, Peter van Inwagen (1990). Although van Inwagen refrains from naming his "proposed answer," it has become known as *organicism*. On this account, the only composite objects are living organisms. More specifically, van Inwagen's claims that in order for the *X*s to compose something, the activity of the *X*s must jointly constitute an organic unity: they must constitute a *life*. Since this position obviously rules out artifacts (among

other things), its inclusion in the present chapter may seem curious to some. [112]

Yet even while van Inwagen concedes his proposed answer is both "radical and far reaching," he maintains it is the only *moderate* answer that addresses the SCQ in a non-arbitrary way *without* contradicting our ordinary beliefs. How he manages to argue for the previous sentence's claim, and whether it is convincing, is something I take on below (section 3.5.2). Meanwhile, here is a statement of his position:

> **Organicism**: the *X*s compose *Y* if and only if *Y* is an organism and the activity of the *X*s constitutes the life of *Y*.

3.4.1 A ROUGH SKETCH

For van Inwagen, finding the correct answer to the SCQ is no small matter. It is a Very Big Deal. As he is the originator of the question, this is understandable; moreover, he devotes a book length treatment to developing a solution. This

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[112] Before getting your knickers in a twist, let me get in a few words edgewise. According to van Inwagen, moderation is about restricting composition, which is how I characterized it earlier (I never said it was going to be pretty!) It is commonplace—but mistaken—to think a restriction on composition will always result in a theory that precisely matches our everyday, commonsense thinking about what exists. There are some who will object: *But isn't* moderation *opposed to* revisionism*?* Here is how (I think) van Inwagen's response would go: *moderation* is *opposed to extremism; but starting from moderate assumptions and convictions sometimes leads to radical and far reaching conclusions.* While interesting, this is not the place to untwist the perverted etymology of philosophical terms of art (I didn't coin the term revisionary; notably, neither did van Inwagen: he uses "extremism." Of course, there are many who think van Inwagen's organicism is not only radical, it is *also* revisionary. See his chapter 10 for his thoughts on "Why the proposed answer….radical though it is, does not contradict our ordinary belief" (98). For more on his case against revisionary theories, see his chapter 8 (ibid).

overview, then, does not pretend to be exhaustive. My goal here is to sketch the

main contours of it, and examine its most interesting attractions and costs. It will

help to start with some of the "convictions" van Inwagen sets from the get-go:[113]

- The solution to the SCQ cannot be "intolerably arbitrary,"
- It must acknowledge that thinking requires a unified single subject,[114]
- Those subjects are material objects.
- Material objects are ultimately particulate (electrons, quarks, etc.)
- What exists is never a matter of stipulation or convention.

Another thing van Inwagen does not budge on is that *we* are the "material

beings" that fit this bill. As he puts it, we *most obviously* exist, and are clearly the

kind of unified entity that is wanted by the above desiderata. (Even so, he

provides reasons why pluralities of simples will not cut it).[115] Equally obvious (to

him) is that we have parts. Lastly, in order to preserve the desideratum of non-

arbitrariness of his view, van Inwagen includes *all* living organisms in the

purview of "what obviously exists."

3.4.2 NEGATIVE AND POSITIVE CLAIMS

Simply put, van Inwagen's negative thesis is that both immoderate accounts (i.e.,

nihilism and universalism), as well as all moderate accounts (besides his) are

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[113] Many of these are stated in the preface of his (1990).

[114] E.g., one that can be the subject of true statements involving singular terms, or mental predicates like "is in pain" or "is thinking of Vienna"(180).

[115] Ibid, p. 99.

wrong.[116,117] As for his positive thesis, he does not so much advance a linearly organized argument for it as defend it against various objections, as well as illustrate how it ameliorates a wide swath of thorny issues on the metaphysical landscape. "I do not suppose that it is possible to prove a philosophical thesis," he says, adding that the best reasons for accepting one "are hard to capture in consecutive prose." Nevertheless, here is my reconstruction of the main elements of, and an argument for, his thesis:

1. Simples exist [assumed]

2. I exist. [Cartesian assumption]

3. If I exist, I have parts. [assumption]

4. I am a living organism. [assumption][118]

5. If I exist, and am a composite living organisms, then others like me exist.

6. Other composite living organisms exist.

7. Artifacts do not exist.[119]

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[116] Here is one of his arguments against nihilism: (1) I exist (2) I have parts. Therefore, nihilism is false.

[117] Van Inwagen arrives at this conclusion after lengthy examination of various moderate answers to the SCQ, some of which were included among the "easy answers" we encountered previously. These, according to van Inwagen, generate "intolerably arbitrary" results.

[118] Here van Inwagen might also call in his assumption in the preface that two objects cannot be composed of the same parts at the same time (see preface).

[119] Although he does not always claim no artifacts exist (137). Here is one way he seems to argue they do not (see his Chapter 13): (1) If statues exist, gollyswoggles exist. (2) Gollyswoggles do not exist (see e.g., 126). (3) Therefore, statues do not exist. (4) If statues do not exist, then it would intolerably arbitrary to countenance any other artifacts. (5) So, in order to not be intolerably arbitrary, all artifacts are out.

8. The only things that exist are organisms and simples.

Furthermore, since all extreme accounts are wrong, and all other moderate accounts are intolerably arbitrary, by elimination of alternatives, organicism is the best answer to the SCQ.[120]

3.4.3 ORGANIC ATTRACTIONS

As I said earlier, van Inwagen's main gripe against all other moderate accounts amounts to a charge of arbitrariness. A correct answer, for him, will be suitably "one tiered;" treating composition as a kind of *sui generis* event. Another perceived advantage is its ability to dispense with so-called puzzles of material constitution (e.g., the statue and clay): if artifacts do not exist, there are no things for the puzzles to be about. Perhaps most importantly, for van Inwagen, is the light his answer sheds on a wide variety of perplexing issues in metaphysics and further afield. He spends considerable time plying his solution like a salve that will alleviate a good number of lingering metaphysical maladies, as well as some others in ethics, philosophy of mind, and logic.[121] To this extent, fulfills van

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[120] For a brief explanation of *why* these other accounts are wrong, see n54 above.

[121] The topics are as wide ranging as Oxford's Dictionary of Philosophy; he illustrates how his answer interacts with beginning and end of life issues in ethics, "brain-switching" cases in philosophy of mind, consciousness and memory, personal identity. In logic, he makes inroads

Inwagen's "best reasons" for accepting a philosophical thesis, which "involve the ways in which a host of more or less unrelated problems, convictions, observations, and arguments interact with that thesis" (115).

3.5 OBJECTIONS TO ORGANICISM

There are at least two elements of organicism that would-be adherents find hard to swallow. First off, organicism banishes all non-living things (*sans* simples) from the ontological register; most moderates find that to be more revisionary than they care to consider. Second—for moderates who make it past that choice point—van Inwagen winds up endorsing a succession of radical moves, each progressively worse than the last: vague composition, which in turns implies vague existence; vague existence, which in turn implies vague identity; vague identity,… well, that's enough. Van Inwagen endorses a fuzzy logic to help some of these moves more palatable, but most commentators are remiss to undertake such non-standard logical maneuvers. The next two sections see if van Inwagen has anything that can mitigate the damage these objections seem to inflict. First however, a very brief detour.

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into vague identity (including sketching a formal semantics for it) and fuzzy logic. In metaphysics, he makes progress on how thinking organisms persist through change, puzzles of material constitution, vague composition, and how to have quasi-artifacts.

3.5.1 THE POSSIBILITY OF GUNK

Organicism says the only composites are living organisms, though it does not say composites are the only things that exist. Van Inwagen assumes ultimate particles—mereological simples—are ontological bedrock. But what if there are no mereological simples? What if there were just parts, all the way down? In other words, what if each genuine object had proper parts, all of whose proper parts have proper parts (*ad infinitum*)? Lewis (1991) calls this atomless gunk.

Gunk: An individual, all of whose proper parts have proper parts.

If our world contains gunky individuals, then it cannot all boil down to mereological simples. That would effectively rule out organicism. However, the possibility of gunk is something I set aside for now, since it arises as a problem for any account that relies on mereological simples. As such, it arises for the nihilist and will be thoroughly discussed there (chapter 5.8). Any obstacles the possibility of gunk presents for nihilism will redound to organicism.

3.5.2 THE DENIAL

At the outset of *Material Beings,* van Inwagen urges readers to forestall dismissing organicism simply because of its most obvious drawback—*the denial*.

Surely, he enjoins his readers, *informed incredulity* is preferable to un*informed incredulity*. Basically, the worry is that it "denies" the existence of most of the objects of everyday ontology; according to organicism, simples and living beings are the only objects around. The denial is just what it sounds like: the denial that normal everyday objects—peanuts, parking lots, pagodas—exist.[122] I exist, but there are no dresses to clothe me. This raises the charge that the view is not *suitably* "moderate" after all, for it is not in line with standard ontological commitments to, e.g., cars, computers, countertops. So, even if organicism does accord with some of our ordinary ontological beliefs, too many items are left off the register for it to be compelling to moderates. If van Inwagen cannot make sense of ordinary talk about grocery lists, gun control, or golf clubs, his denial would strike many as unacceptable.

Fortunately, van Inwagen has an inventive paraphrastic technique meant to illustrate how the denial does not contradict ordinary belief in artifacts and other non-living things. It relies on van Inwagen's conviction that matter is ultimately particulate, and that there is a physical bedrock of subatomic particles that have no further parts.[123] And though they do not compose any artifacts, they

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[122] What's worse, the denial extends to *parts* of living things that are not somehow "caught up" in their lives: Plato exists—his beard does not.

[123] Van Inwagen often calls them (mereological) "simples;" however, it makes no difference in the present context to use "particles" (which he also uses). The possibility of gunk is not what is currently at issue. However, although I set it aside here, I briefly mention it below (3.3.3) and discuss it in detail in Chapter 5 section 8.

do "cooperate" to be arranged in certain ways. Accordingly, van Inwagen

suggests the truth of claims about (say) the chairs in the next room can be found

by paraphrasing talk of chairs as talk about particles "arranged chair-wise." For

example, when folk discuss the grocery list, and one asks, "Did you remember

the eggs?" van Inwagen can explain her egg talk as referring successfully—not to

eggs—but to a number of simples (the *X*s) arranged egg-wise.[124] In this way, van

Inwagen can maintain his theory acknowledges the fact that speakers ordinarily

express truths when they talk about non-living things.

Van Inwagen, earnest to mitigate the outlandishness of the denial, also

quickly underscores the importance of a *correct* understanding of it; that is, in its

proper *theoretical* context. Initially, this context is given by way of analogy with

other ordinary sentences ("the moon passed behind the clouds") that would be

denied in a theoretical context (e.g., by astronomers). Any sentence we ordinarily

take to be about *one* thing (the table) can be re-described as one about many

things (particles) acting in concert. The point is to illustrate how "the table is

heavier than the chair" can be rendered into talk that does not imply there are

any *composite* objects there. This is not an *analysis* of ordinary talk about artifacts;

it is only meant to show how the paraphrase describes the same fact as the one

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[124] As Eklund (2003) puts it, one way to characterize van Inwagen's paraphrastic strategy is to describe some *X*s together *play the role of* a given object. For example, concerning the carton of eggs, the idea would be that there are some *X*s and some *Y*s in the vicinity, and some *X*s together play the *egg-role* and the *Y*s together play the *carton-role*.

we would ordinarily use. Consider an organicist who offers the following explanation to a non-believer:

> In the world of everyday experience, the table in front of me is a thing—*one* thing—that precisely fills or occupies a certain table-shaped region of space. According to classical mechanics (to keep things simple), there is no "one-thing" that exactly fills or occupies that region of space. Instead, there are many, many interacting things—subatomic particles—whose dynamic activities present a "manifest image" of the singular, solid, and stable table in that very same table-shaped region of space. Of course, as the particles are many orders of magnitude smaller than I am, perceiving their activities is impossible. Sure, my characterization may be atypical of our normal talk about tables, but it does not falsify it, at least not any more than statistical analyses of the average number of children falsify my claim that children do not come in units of 1.6.

This is not like a delusional claim that there is *nothing at all* where the table is—only that there is no *one*-thing there.[125] This does not strike me as remarkably different than the moderate who denies there is no one-thing that is part-trout and part-turkey.

Even so, van Inwagen's defense of the denial, along with his paraphrastic strategy, has failed to gain many adherents. For example, Eklund (2002, 249) objects that organicism is really not a proper moderate view, given that it denies belief in many things moderates believe in:

> Though the claim that organisms exist does not by itself run contrary to ordinary beliefs, the claim that organisms exist, although no other

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[125] Yes, the above description is cumbersome, or would be, if we engaged in it every time we talked about tables. But it is not *absurd* to think such an explanation describes the table in front of me. In fact, at one level of description, it is a more perspicuous rendering of the scientific fact of the matter.

complex objects do, certainly does run contrary to ordinary beliefs. Van Inwagen does not only need to justify the antecedently plausible claim that organisms exist, but rather the claim that assuming no other complex objects exist, organisms still exist.

And it still appears patently absurd to some, like Bigelow (1996, 143), who objects to "van Inwagen's paradoxical notion that though there are subatomic particles clothing him, there is no such thing as a shirt that he is wearing." Although most critiques focus on the denial, I think van Inwagen has given them a run for their money. Indeed, if there are ultimate physical particles that have no further parts, then it seems reasonable to understand most ordinary objects as the activity of collections, clusters, or distributions of those particles. We already know our sensory experience only approximates the world outside; for reality is not static, tables are not solid in the traditional sense, etc. For anyone who *also* is certain of her own composite existence, it makes sense, at least from a naturalistic and ontologically economic perspective, to leave out the artifacts and other non-living things (while keeping the particles).

3.5.3 VAGUE COMPOSITION, VAGUE EXISTENCE, VAGUE IDENTITY

The ontology of organicism contains only simples and (composite) organisms. Setting aside (for now) a defense of simples, we can see that a large part of

organicism's campaign needs to focus on explaining what constitutes a life, or when some things are "caught up in a life." As van Inwagen concedes, it is often an indeterminate matter when simples are caught up in the life of an organism. The following passage is, according to van Inwagen, "a typical or central case of an object's becoming and then ceasing to be a part of an enduring thing":[126]

> Alice drinks a cup of tea in which a lump of sugar has been dissolved. A certain carbon atom that is part of that lump of sugar is carried along with the rest of the sugar by Alice's digestive system to the intestine. It passes through the intestinal wall and into the bloodstream, whence it is oxidized in several indirect stages […] and is finally carried by Alice's circulatory system to her lungs and there breathed out […] The entire process … occupied the span of only a few minutes.

Along with other relevant cases,[127] van Inwagen brings home the point that vague (indeterminate) composition is an inevitable result of organicism, because there is inherent indeterminacy regarding whether some simple is "caught up in the life" of an organism.[128] He accepts the unintuitive consequences of this, and actually shows how what might initially be thought of as a flaw in certain cases results in novel solutions. Along with a number of other philosophers, van Inwagen thinks the best way to talk about and clarify (formally) the occurrence

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[126] Ibid, p. 94-5.

[127] For instance, beginning and end of life issues (when is my body no longer a body?). Another case of vagueness mentioned by van Inwagen (1990, p. 278) and Hawley (2004) is the case of viruses, and the dispute over whether they are living or non-living, thus making it vague whether or not the activity of their parts is such that their joint activity constitutes a life.

[128] Moreover, he writes: "I confess… to an inability to supplement [the proposed answer] with a coherent general statement of conditions that are individually necessary and jointly sufficient for the persistence of an individual life."

of vagueness is by utilizing fuzzy logic. Fuzzy logic softens the blow to those

who think vague composition cannot be taken seriously by allowing what counts

as a life to admit of degrees, and permitting borderline cases of composition.

Fuzzy logic is only an extension of standard logic, with truth values given not by

a "on-off" binary value {1, 0}, but also not opposed to it (truth-values are taken in

degrees over the interval [1, 0] inclusive). Also, given what follows from the

vagueness argument (discussed below), it seems *any* moderate account will need

to find some way to account for vague composition; fuzzy logic is the best

theoretical choice.

3.6 THE ARGUMENT FROM VAGUENESS

Now, before we get started on the road to vagueness, consider a famous passage
by Lewis:

> The question whether compositional takes place in a given case, ….can be
> stated in a part of language where nothing is vague. Therefore, it cannot
> have a vague answer. There is such a thing as the [fusion], or there isn't It
> cannot be said that because the desiderata for composition are satisfied to
> a borderline degree, there sort of is and sort of isn't. What is this thing
> such that it sort of is, and sort of isn't, that there is any such thing? No
> restriction on composition can be vague. But unless it is vague, it cannot
> fit the intuitive desiderata. So no restriction on composition can serve the
> intuitions that motivate it. So restriction would be gratuitous.

Except for organicism, there is one general style of argument that can be lodged

at all moderate accounts, and so deserves separate treatment: the Lewis-Sider

argument from vagueness. Building on a prior argument from Lewis (1986), Sider (2001) convincingly argues that no account of composition could be restricted, on pain of infecting the resulting account with a pernicious form of vagueness.[129] If sound, this argument will be bad news for any moderate ontology that does not embrace vague composition. We will start with an intuitive picture of it, move on to a semi-formal reconstruction of the argument, and lastly to critiques of it.

3.6.1 THE INTUITIVE STORY

Think of a composite object—yourself, for example. Following Sider, call this a "case of composition." Next, imagine that each individual molecule composing you begins to move away from its neighbors, so that all gradually move further and further apart from each other. At some distance, the molecules will be far enough from each other that they clearly no longer compose *you*.[130] This is *not* a

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[129] The argument from vagueness is an argument developed by Sider (2001) from Lewis (1986) in the course of arguing for the theory of four-dimensionalism. Lewis's argument claims to demonstrate the universality of composition. Sider summarizes Lewis's argument thus: "If not every class has a fusion then there must be a restriction on composition. Moreover, the only plausible restrictions on composition would be vague ones. But there can be no vague restrictions on composition, because that would mean that whether composition occurs is sometimes vague. Therefore, every class has a fusion" (Ibid, p. 121).

[130] Alternatively: Assume, for simplicity, that a certain degree of proximity between some things suffices for composition to occur. Consider a situation in which a plurality of things do not compose anything because they are the relevant distances apart from one another, and then imagine them coming closer and closer together until they attain the relevant proximity to compose something. For example, Korman (2010) imagines pieces of a hammer that are as yet

case of composition. What we have, then, is a sequence of cases, with a clear case of composition at one end and what clearly is not a case of composition at the other end (a *sorites of composition*). But at what point in the series did composition cease to occur? Those who hold a moderate view must say it occurs somewhere between the endpoints.[131] But where? Any sharp cutoff would be intolerably arbitrary. So, moderates allow it is sometimes unclear where the boundary lies between cases and non-cases of composition. But then composition is sometimes indeterminate (i.e., vague).[132] But composition cannot be vague, because it can be stated in a language that contains no vague terms (logic, quantifiers, and so on).[133] So the assumption that composition is restricted is false.

As revisionists are quick to point out, the upshot of this argument is that the only principled place to draw an abrupt cut-off is at either end-point in the series. So, composition either occurs all the time (universalism), or not at all

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unassembled in a factory, which come to compose a hammer somewhere within the "intuitive grey area." It is worthwhile noting all that is needed for the argument to go through is that there is at least one case in which a continuous series connects a non-case and a case of composition, and does not depend on either case mentioned here.

[131] According to Lewis, if moderates did not say this their view would fail to match the intuition that composition does not obey a hard and fast rule.

[132] Although I am using "vagueness" and "indeterminacy" interchangeably here, this is mostly for expository purposes. For more on differences between the two, or whether they are in fact interchangeable see, e.g., Weatherson (2010), Williams (2008).

[133] Alternatively: If composition *were* vague, then existence would be vague (this entailment is not denied anywhere; c.f. Smith (2005 n7). But existence cannot be vague. So composition cannot be vague. For more on vague existence, see Sider (2003), van Inwagen (1990), and Smith (2005).

(nihilism).[134] Since this argument is important, and will arise in the next section, we should have a grip on its structure. Here is one reconstruction:

> 1. If any moderate answer to the SCQ is true, there can be a sorites series connecting a case of composition and a non-case of composition. [assumption]

> 2. Every sorites series connecting a case of composition at one end with a non-case of composition at the other end contains either (i) borderline cases of composition, or (ii) contains an arbitrary sharp cut-off between cases with respect to composition. [sorites of composition]

> 3. There cannot be borderline cases of composition. [denial of vague composition]

> 4. There can be no arbitrary sharp cut-offs with respect to composition [composition is not a brute fact; restrictions on composition cannot be arbitrary]

> 5. So any moderate answer to the SCQ is false.

This concludes our discussion of why the argument from vagueness shows that moderate ontologies, in allowing that when some things compose another thing is sometimes indeterminate, cannot be correct. So the argument from vagueness, if sound, poses a formidable hurdle for moderate views of composition. As Koslicki aptly observes, "everything turns on 'the argument

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[134] The remaining premises in favor of universalism continue: But clearly composition occurs at least sometimes. So nihilism is false. Universalism is the only remaining option. Universalism is examined in Chapter 4.

from vagueness.'"[135] It looks like composition either happens all of the time or not at all. But I don't think moderates should tuck their tails and go home yet. We should at least try to give the argument a run for its money. And that is exactly what we explore next.

3.7 CHALLENGING THE ARGUMENT FROM VAGUENESS

The argument is valid. In response, I see only two moves here for the moderate. One is to argue that composition is indeed vague (and accept what that entails or argue against the entailments). The second is to deny one of the premises, the most obvious being (3). I explore these objections below.

3.7.1 REJECTING THE THIRD PREMISE

A question that springs to mind for many commentators asks why composition should be treated any differently than other cases of vagueness. That is, since premise (1) invokes the notion of a sorites series, and "is composite" is a predicate, it seems obvious that composition go the same way as other vague predicates in standard sorites puzzles, which is standardly handled by the linguistic theory of vagueness (more on that below). For example, consider the

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[135] Koslicki (2003). Her remark there is aimed towards Sider's alleged vindication of four-dimensionalism over endurantism; however, considering its equally influential power in the debate over composites, it seems *apropos* here as well.

poster child of vague predicates, "is bald." When encountering a sorties about baldness, by far the most popular choice is to accept that "is bald" is vague, and then choose a theory of vagueness we think best handles it. My point here is just that we go with our intuitive judgments about baldness (that it does not mark a sharp cut off) rather than picking parallel extreme views the argument would seem to force on us: we do not think no one is bald, nor do we think everyone is.[136] Why should it be otherwise in the case of composition? This question helps to frame both of my responses to vagueness argument. The claim under consideration is

(VC) "is composite" is a vague predicate

The standard way of handling vague predicates is the Linguistic Theory of Vagueness (LT).[137] According to LT, puzzles about vagueness are the natural fallout of (semantic) indecision over the meaning of our expressions. Take our token example, baldness. According to LT, the vagueness of "is bald" is purely semantic in origin. It stems from language use, and conventions about it, and has

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[136] I do not intend epistemicism here as an extreme view about vagueness. Epistemicism is more like the brute composition view. See Sider (2013a) on why he thinks epistemicism won't work here.

[137] In the following sections, I follow Koslicki and ignore treatments of vagueness other than LT , in order to simplify things. For alternative treatments (e.g., epistemicism), see, e.g., Williamson (2000).

no precise meaning. It is *we* who hesitate to give it a precise meaning. It would be preposterous to make it precise by, say, somehow postulating that in order to apply the term *bald* to anyone that person must have a head with less than 257 hairs.[138] Similarly, perhaps we should let LT handle "is composite." Premise (3) claims this cannot be done. To see why, look closely at Lewis' version of the argument for unrestricted composition:[139]

> L1. If it's not the case that every class has a fusion,[140] then there is a continuous series connecting a pair of cases such that in one case, composition occurs, and in the other composition does not occur.
>
> L2. In no continuous series of cases is there a sharp cut-off in whether composition occurs.
>
> L3. In any case of composition, it is either definitely true or definitely false whether composition occurs.
> L4. Contradiction
>
> L5. Every class has a fusion.

Clearly—Lewis emphasizes—the definition of fusion contains no vague terms,[141] and the remaining claims contain only logical vocabulary. Therefore, since it

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[138]In order to resolve issues with more finicky vague predicates, supervaluationism is sometimes incorporated along with LT or as a standalone theory. Supervaluationism advises us to eliminate vagueness by assigning terms multiple legitimate *precisifications*, one for each way of making the meaning of the term precise.

[139] This is drawn from Sider's (2001) reconstruction of it.

[140] A *class* of objects should be understood as having a precisely defined membership (cf. ibid, p. 125).

[141] Lewis's argument concerns fusions, as opposed to composite objects. Roughly, the difference between them is that a fusion of objects does not require the parts to be disjoint (overlap of parts is allowed). For the purposes here (e.g., atemporally) x is a fusion of a class C iff (i) every member of C is part of x, and (ii) each part of x overlaps some member of C.

contains no vague terms, LT will not resolve the issue, as it does for other sorites

arguments (etc.) with vague predicates. So, the argument goes, composition

cannot be vague.

Koslicki (2004) rejects Lewis's argument as blatantly circular. She cites

Lewis's justification of (3), in which he states:

> Vagueness is semantic indecision. But not all of language is vague. The truth-functional connectives aren't, for instance. Nor are the words for identity and difference, and for the partial identity of overlap… How could any of these be vague?

As Koslicki points out, in arguing for the conclusion that composition is never

vague, Lewis cannot assume that overlap is not vague, since composition is

defined either in terms of overlap or parthood, which are each interdefinable.

Doing *that* would be assuming exactly what is at issue (as well as using a vague

predicate), and so Lewis's vagueness argument from vagueness fails.

But not so fast. Someone repaired and fortified it. Sider (2001) improves

on Lewis's argument through a novel strengthening of (3): he reformulates it

without using mereological terms (the weak point in Lewis's argument), and

then gives it a numerical twist. Roughly, here is how Sider's version goes. First,

Sider reasons that if it were indeterminate whether every class has a fusion, then

it would be indeterminate how many objects there were. For example, in a world

with a finite number of (concrete, say) objects, if it were indeterminate whether

every class has a fusion, then it would be indeterminate whether the world had n

or $n + 1$ concrete objects. Next, he notes that numerical claims about how many concrete objects exist can be stated in a language containing only logical vocabulary and the predicate "is concrete," which applies to objects such that it is either definitely true or definitely false.[142] Sider's formulation seems to accomplish what Lewis set out to do. Using logical notation to provide a count of objects, we can travel all the way up the number line for any n objects a world contains.[143] If the predicate "is concrete" is not vague, it's unclear what could be. The upshot is that vague composition entails either that some numerical statements are vague or a world with a sharp (metaphysical) cut-off that is objectionably arbitrary.

As the argument now stands, there is little to poke at, given what we've got. Sider amasses a large body of evidence for S3 by launching a fuselage of reasons supporting his claim that numerical sentences never have indeterminate truth value. He arrives on firmer ground than Lewis: if composition is restricted—and therefore vague—the number of objects in a (finite) world is

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[142] Sider defines "is concrete" for the purposes of his argument: an object is concrete if it does not fall into one of the following ontological classes (or any other relevant class): sets and classes, properties and relations, numbers, universals and tropes, and possible worlds and situations. See Sider (2001), p. 127.

[143] We are using only the finite case here. For example, here is how it would go for a world with one, two, and three items (respectively):

(1) $\exists x(Cx)$ & $\forall y(Cy \rightarrow y = x)$
(2) $\exists x \exists y\ [Cx$ & Cy & $x \neq y$ & $\forall z\ (Cz\ [z = x \vee z = y])]$.
(3) $\exists x \exists y \exists z\ [Cx$ & Cy & Cz & $x \neq y$ & $y \neq z$ & $x \neq z$ & $\forall w\ (Cw\ [w = x \vee w = y \vee w = z])]$.

indeterminate.[144] But no numerical statement can have indeterminate truth value.

So composition cannot be restricted. Here is Sider's argument (123-5):

> S1. If not every class has a fusion,[145] then there must be a pair of cases connected by a continuous series such that in one, composition does occur, but in the other composition does not occur.
>
> S2. In no continuous series of cases is there a sharp cut-off in whether composition occurs.
>
> S3. In any case of composition, either composition definitely occurs or composition definitely does not occur.

Challenges regarding the soundness of Sider's argument from vagueness have recently surfaced; as with Lewis's argument, it is P3 that is controversial. I don't think their arguments work, for various reason. Below, I raise my own worry about (3) that I think pinpoints a certain amount of vagueness in it.[146] Sider's defense of (P3) rests on the claim that "for any finite n, there is a sentence of *pure* first-order logic with identity (i.e., containing no non-logical symbols) that says that there exist exactly n things."[147]   He continues, "So vagueness in

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[144] "Surely," he says, "if [S3] can be violated, then it could be violated in a finite world." (127).
[145] A *class* of objects should be understood as having a precisely defined membership (cf. ibid, p. 125).
[146] Koslicki motivates her objection to the vagueness argument by first constructing a "strikingly bad" parallel argument and then asking why Sider's should not in fact be construed similarly. On analogy with Sider's "case of composition," Koslicki proceeds to mirror the argument using a case of baldness. Of course, it is intuitively plausible that baldness is restricted, and highly implausible that parallel extreme views about baldness are correct. Why should it be otherwise in the case of composition? Korman (2010) agrees that "it seems just as clear that there can be borderline cases of composition as that there can be borderline cases of redness and baldness."
[147] Sider requests (n6) that we "ignore the wrinkle about 'concreteness,'" however, as my objection will make clear, I am concerned that (concrete) "object" is the term to which semantic

how many objects exist in a finite world would imply vagueness in one of the symbols of pure first-order logic with identity." Suppose, with Sider, the count of (concrete) objects in a world W is determinate in number. Also suppose, with Sider, that the claim "There are n concrete objects in W" is determinate in truth value. If we agree that (1) and (2) have no non-logical vocabulary (ignoring the concreteness predicate),[148] then there are no plausible contenders for precisification. Therefore, (2) must be determinate in truth value.

To warm you up to the idea I am about to present, ask yourself "how many concrete objects does the room I am in contain?" Pretend I already have an answer written out in "Sider-style:" a numerical sentence in logical notation that includes the predicate "is a concrete object"—hereafter, shortened to "numerical sentence." Let's say I offer you a billion dollars if you answer as I did. Now, would you start straightaway, or see if you could ask *me* a few questions of your own? I think the latter, since I think that, before you go a-counting, you would first want to know what counts as *one* thing, or as I like to say "a one-thing." That is, you want prior specification of the conditions under which something should be treated as "a one-thing."[149] Suppose I refuse to answer any questions, and you

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indecision most reasonably ought to be traced, and so I leave "C" as a placeholder to stand for the predicate "is a (concrete) object." Please note, however, that my main concern is with *object*, not *concrete*.

[148] See previous note.

[149] For example, is my mixer one object, or five (the two beaters, the two attachments, and the base)? As Frege observes, we cannot count unless we know what to count: "The *Iliad*, for

go ahead and count the objects anyway, and give me your numerical sentence to compare with mine. If it turns out our sentences contradict one another, what will you say? (Perhaps you'll say there's metaphysical vagueness, or something sneaky going on. Never mind that.) *I* say, the fact that your numerical sentence contradicts mine shows *neither* worldly *nor* numerical indeterminacy, it only shows the meaning of numerical sentences are not fixed world-wise until we decide what we mean by "is a concrete object" or "is one concrete object."

I'd like to examine this idea—that "is one" is a *predicate* to which we ought to trace the vagueness in Sider's argument—in further detail. Let us understand "count indeterminacy" as the claim that it is indeterminate how many concrete objects there are. Korman lays out Sider's support for (3) in the following way: [150]

> (K1) If there can be borderline cases of composition, then there can be count indeterminacy.

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example, can be thought of as one poem, or as twenty-four Books, or as some large Number of verses; and a pile of cards can be thought of as one pack or as fifty-two cards." (1950, §22)

[150] I think Koslicki's view is best portrayed as rejecting (B2). She thinks the reason that (B2) is false is because the count indeterminacy can be traced to a (tacit) disagreement over what the quantifier is meant to range over, rather than on the meaning of the quantifiers or the other logical vocabulary. Koslicki writes:

> [S]ettling on the meaning of the existential quantifier by itself does not settle what its range is: two philosophers can perfectly well agree on what the symbol '∃' means, while still carrying on a thoroughly sensible dispute over the size and the nature of the domain of quantification (while both of them are talking about unrestricted quantification).

Not everyone will be persuaded by Koslicki's suggestions here. In particular, some will want to resist her claim that two philosophers can have a "thoroughly sensible" dispute about the character of the domain in question while both are talking about unrestricted quantification. But I think there is something to her general worry about (P3), and I think it arises from (B2).

(K2) If there can be count indeterminacy, then some expression in some numerical sentence can be vague.

(K3) No expression in any numerical sentence can be vague.

(3) So there cannot be borderline cases of composition.

One way to resist the vagueness argument—the way I am urging—is by dislodging support for (3) by rejecting (K3), the claim that no expression in any numerical sentence is vague.[151] I'm not sure I can do that for just *any* numerical sentence, but I think I can for Sider-style numerical sentences, by revealing a predicate that has a certain amount of vagueness to it.

To many, the first thought that will come to mind here is that the only predicate used in the numerical sentence is the one for concreteness, *C*. As Sider lays it out, there are no other predicates in numerical sentences. I disagree. I think "one" is a predicate, and although the logical notation does not employ the word, it is plausibly being used (implicitly) as part of the predicate *C*, "is *one* concrete (object)." (What else could "is *a* concrete object mean" in the context of counting?)

Of course, we are used to passing over the numeral "1" when used in a formal context, and in which its usage denotes a natural number, and is univocal

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[151] Korman chooses to object to a different claim underlying K3*, which is that no expression in a numerical sentence has multiple admissible precisifications. Korman develops one line of resistance according to which the problem lies in the use of "concrete."

(e.g., in arithmetical formulations). But I do not think that is not how it is being used in this context, when it corresponds to a thing in the world that is not the natural number, or anything remotely like it (as it is abstract and we are talking about concreta). Anyway, the abstract number *one* is purely or absolutely *one.* Concrete things are not purely or absolutely *one* in that same sense. *What* is concrete is extended is capable of division.

Presumably, in order for something to be *one* (simpliciter) is for it to be impossible that is otherwise, e.g., if it is indivisible. But the only things I can think of with that status are (perhaps) physical mereological atoms or an abstract numerical unit whose business it is to *be* indivisible (in which case I do not think it is *one* but *zero*). But unless we are nihilists, that is not what we mean when we say that we only have "one" car, cat, or any other object that we describe using "one." In those cases, "one" is being predicated of some *other* thing, which acts as a unit of measurement by which we are intending to count, not as the arithmetical number *one*, which when used in mathematical operations (represented by the numeral "1") has a univocal, determinate, meaning.[152]

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[152] I am thinking that "object" as used in this context is clearly restricted, for otherwise sets, classes, numbers, properties, relations..., etc. would also count as objects, and in defining "concrete object" he explicitly refrains from such a broad use of the term. Moreover, Sider notes that his stipulative definition of concrete object is "defined by a list of predicates for fundamental ontological kinds," indicating that he has already restricted his use of *object* to something less than the completely general (formal, unrestricted) sense of *object*. Whether this concept of concrete object is suitably restricted so as to provide a rule for counting is considered below.

Sider does not speak to this point explicitly, since he moves to the claim that "is concrete" is precise, and does not (to my knowledge) discuss the difference between using a number in the context of a mathematical expression versus predicating it of a material object. He does say the reader should "note that the concreteness predicate, 'C', presumably has precise application conditions since it was defined by a list of predicates for fundamental ontological kinds that do not admit of borderline cases." Apparently, then, we have a precisely defined class of concreta, and we can apply the predicate "is one" to each member of it without ambiguity, in order to obtain an definite count. But it is not obvious that "is *one* concrete object" has precise application conditions. As Frege and others observe, we can say equally truly of some trees that they are one or five. And as Plato points out (*Parmenides*, 1973), there is a way to turn one object—say a glass vase—into many: simply throw it to the ground.

So, a proponent of the present objection contends that, at least in this context (in its predicative use) *one* is like any other vague predicate, in that it does not provide a universally stable way of characterizing worldly objects. It is only in mathematical expressions that it attains univocal meaning. She will agree "concrete" seems to be precise since it does not share a border with any other ontological categories. But she will contest that when combined with words like "one" (and perhaps "object") its precise nature is eroded, and thus engenders

count indeterminacy.[153] At the very least, it lends initial plausibility to the thought that perhaps our meaning and subsequent use of "is one" is not in fact very clear at all, even when used unrestrictedly.

CLOSING REMARKS

The argument from vagueness has amassed a large following. The systematic, generalist reasoning it utilizes appeals to a wide swath of the philosophical community. Perhaps one could buttress a moderate hylomorphic account, or van Inwagen's in order to avoid some of their more contentious consequences. However, such an account has yet to be adumbrated, much less defended.

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[153] Is a clonal stand of *Quaking Aspen*, or an amoeba, one concrete thing or many? Presumably, these are cases where metaphysically vagueness also plays a role. In fact we often use examples of (concrete) objects in philosophy (e.g., Sosa's snowdiscall) that give rise to count indeterminacy.

C HAPTER 4

U NIVERSALISM

4.1 I NTRODUCTION

My aim in the previous chapter was to investigate moderate answers to the SCQ;

answers whereby composition sometimes, but not always, occurs. But moderate

accounts are vulnerable to several arguments that appeal to systematic, general

principles. Especially notable in this context is the *vagueness argument* (VA),

which wields considerable logical force for its conclusion that composition

occurs all the time, or not at all. Given the consequences of (VA) for moderates,

my goal in next two chapters is to evaluate whether revisionary accounts fare

any better in ameliorating the problem of mereological composition. The present

chapter examines one such revisionary account: universalism, the thesis that

composition always occurs. According to universalism, whenever there are some

things, there is the fusion of those things, some one entity whose parts are exactly those things.

This is a big chapter and needs a lot of signposting, which is exactly what the present paragraph is intended to do. In §4.2 I present some reasons that philosophers find universalism attractive. §4.3 begins to lay out the case that universalism may not be ontologically innocent, unless its proponents can defend the thesis of *Composition as Identity* (CAI). Following that, §4.4 argues that the strong form of CAI cannot be maintained without giving up the innocence thesis. §4.5 examines the prospect that, if true, CAI entails universalism. After briefly considering whether universalism could be innocent, even without CAI (§4.6), I finally turn to a series of objections and rejoinders (§4.7).

4.2 THE ATTRACTIVE BITS

One way to understand the appeal of universalism is through the words of an early campaigner, David Lewis. Under his guidance its advantages were promulgated with such artful clarity they became as well-known among metaphysicians as a popular drugstore jingle. Mereology is "unproblematic,

perfectly understood, and certain."[154] And given the core tenet of universalism is a basic axiom of classical mereology, universalism was championed as equally unproblematic. The core tenet just mentioned is the principle of unrestricted composition (PUC). Basically, PUC says that whenever there are several things, there is a whole composed of them.[155] Unpacking this, we have:

Principle of Unrestricted Composition (PUC): for any Xs, there exists some y that is the *fusion* of the Xs.

A *fusion* is a mereological whole:

Fusion: y is a fusion of the Xs iff (i) each of the Xs is a part of y, and (ii) every part of y shares a part with at least one of the Xs.

As noted earlier (§2.6), one explanation for the increase in revisionary ontologies points to the felt need that the SCQ *ought* to have a systematic and general solution; one moderate accounts seem unable to provide.[156] Subsequently, many moderates opt for one of two extremes: nihilism or universalism. The answer the eliminativist provides to the SCQ is, in a word, "never," to which the universalist contests, "always." However, whereas the

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154 See, e.g., Lewis (1991), pp. 72-87. There are other advantages cited by Lewis; these three were chosen for their prominence in the current literature. Cf. Van Inwagen (1994), Yi (1999), Hawley (2013), and Bennett (2011).

155 A clear and through introduction to Classical Extensional Mereology (CEM) is offered in Varzi (2011). In what follows, I will simply call CEM "mereology."

156 That is, unless they are able to counter other issues that arise (e.g., Koslicki's account of the formal component).

former imposes severe ontological austerity measures, the liberalism of the latter approach, while unorthodox, manages to retain the original roster of ordinary objects. Further, its proponents claimed it could do so without incurring any extra ontological costs. (Whether this is indeed the case is the topic of §4.3 below.)

This chapter first canvasses some arguments in favor of universalism, and then critically evaluates their cogency. As with previous chapters, we move from simpler to more complex arguments. The first two arguments discussed below, the *Elimination* argument (4.1) and the *Why Not* argument (4.2), are based on a premises whose truth needs to be investigated more thoroughly on its own merits. This requires carefully examining the composition relation, which occurs in the section directly following them (4.3). But first let's look at these two simple considerations in favor of universalism.

4.2.1 THE ELIMINATION ARGUMENT

One factor contributing to universalism's popularity is the dearth of options that remain in the wake of the argument from vagueness (hereafter VA). Since the VA, if sound, deposes moderate answers, the only choices left are universalism and nihilism . One way to argue for universalism, then, is by repudiating

nihilism: universalism wins by default. Some universalists accomplish this is by arguing that nihilism cannot be correct, since it rejects even the most obvious composites (living organisms, ordinary objects, and so forth).[157] So, if one agrees it's obvious that at least some composites exist, nihilism is a non-starter.[158] The only game left in town is universalism. This argument rests on the elimination of alternatives:

1. Only one of Universalism, Restrictivism,[159] or Nihilism is true [assumed].

2. VA-style arguments show that restrictivist accounts are false [premise].

3. Some composites obviously exist [assumed]

4. Nihilism claims that no composites exist [Nihilism]

5. Therefore Nihilism is false [3, 4]

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Universalism is true [1, 2, and 5].

Whether universalism indeed fares better than its rivals, all things considered, remains to be seen. The above argument fails if universalism's rivals are not as

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[157] There are other arguments against Nihilism that will do the trick; e.g., the argument from "atomless gunk." I consider this argument in Chapter 5.

[158] This consideration seems to be what is driving Rea's (1998, 356) comment that "it seems much more obvious to me that there is such a thing as my car than that there is no such thing composed of my tennis shoe, W.V. Quine, and the Taj Mahal."

[159] If the only viable forms of restrictivism are the moderate versions, the two are equivalent for present purposes.

easily discharged as it presumes, or if (1) does not exhaust the logical possibilities.[160] Another deciding factor may be whether universalism is the "ontological free lunch" its proponents advertise it as. But first, let's set aside that worry, and look at some reasons philosophers find universalism attractive.

4.2.2 THE *WHY NOT* ARGUMENT

The heart of universalism—the principle of unrestricted composition—says that whenever there are some things, there is the fusion of those things: a whole whose parts are exactly those things (and any parts of proper parts, etc.). For some, this principle sounds dubious from the *get-go*, since it seems to countenance fusions *in addition to* the original items. And that looks bad for reasons of ontological economy. For those who find parsimony considerations like Occam's razor appealing, this proliferation of entities is pretty pricey.

There are universalists who reject this portrayal, insisting that fusions are not *additional* things to be included in our inventory of the world. They claim that whenever we are committed to some objects we are thereby committed to their fusion, at no extra ontological cost:

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[160] One way some have thought these options do not exhaust other possibilities: Deflationary accounts, some of which propose, e.g., quantifier variance, or conventionalism about composition (i.e., our concepts and intentions determine what (composite) objects there are.

> Given a prior commitment to cats, say, a commitment to cat-fusions is not a further commitment. The fusion is nothing over and above the cats that compose it. It just is them. They just are it. Take them together or take them separately, the cats are the same portion of Reality either way.[161]

According to (this kind of) universalist, the fusion is "nothing over and above" the parts, "nothing besides" the parts, and "the same commitment, either way."[162] In other words, universalism is *ontologically innocent*.[163] And, the believer continues, given universalism is ontologically innocent, questions regarding its acceptance should not be a matter of why, but why *not*?

One popularizer of this view is Lewis. Included alongside his mereological mantra that mereology is "unproblematic, perfectly understood, and certain," is the claim that it is ontologically innocent to boot.[164] Ontologically innocent theories require no new "ontological commitments" — things that must exist in order for the (sentences of the) theory to be true.[165] Lewis is not alone on

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[161] Lewis, David (1991). Other philosophers echo this sentiment. Here is Hawley (forthcoming):
> Once you accept the existence of the cats, you are thereby committed to the existence of their fusion, whether you realise it or not. So accepting the thesis of unrestricted composition does not give you any further commitments; the commitment to the existence of the fusion was already incurred when, as a small child, you incurred a commitment to the existence of kitties.

[162] Cf. Lewis (ibid).

[163] Ontologically innocent theories (and sentences) do not require a commitment to any new entities; i.e., entities other than those to which you were already committed.

[164] In the context of his (1991), Lewis' claims about mereology may be read as claims about universalism (alternatively: that composition is unrestricted.)

[165] The ontological commitments of a theory are just those things that must exist in order for the sentences of the theory to be true; a sentence is ontologically committed to Fs just in case its truth requires that the world contains Fs. For discussion, see Hawley (2013), Varzi (2013), and Rayo (2007). For a classic account on what the criteria of ontological commitment ought to look like, see Quine (1953).

this front; as a formal theory, mereology has been championed by an impressive pedigree of authors from its inception.[166] Universalism is a natural outgrowth of an appreciation for the basic axioms of mereology.

So it is no surprise, given the innocence claim, that universalists have advertised the innocuous nature of their view. A recent example of this can be found in van Cleve's (1999) defense of universalism. When confronted with "scattered objects"—fusions of disconnected and dissimilar parts, like the moon and six pennies—Van Cleve declares (2006, 323), "my reaction was not 'how crazy!' but 'Why not?'" Subsequent remarks indicate his attitude arises from universalism's innocence: he urges readers recognize that in countenancing an aggregate of matter (such as the moon and six pennies) they "already agree" the fusion exists. This is the case "even if [they] don't consider that aggregate to be very thing-like. It need not be a *thing*, in any narrow sense of the term; it need only be *there*" (ibid).[167] If fusions are cheap—an "ontological free lunch"—what's the big deal?

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[166] Other campaigners: Leonard and Goodman(1940), Quine (1951), Armstrong (1978) and (1989).
[167] Van Cleve's italics. I should point out, however, that Van Cleve wavers on this point; a few pages later he concedes that "classical mereology does admittedly involve an expansive proliferation of entities…"

4.3 THE BIG DEAL

The response to this line of thinking is that fusions just do *not* come that cheaply, and so they are a Very Big Deal. In fact, the innocence thesis is arguably *the* central controversy plaguing universalism. If universalism is not innocent, then critics' portents that PUC allows all sorts of unwanted entities into the fold are worth listening to. Their objection to the PUC would then have an appeal to parsimony underwriting it. For take any things; any at all—say, a teacup and a horse—the principle of unrestricted composition says a unique whole composed of the teacup and horse exists. In fact, with unrestricted composition, the generation of new things by fusion continues without limit (the teacup, the horse, all the world's marmalade, the North Star, etc.). And, since mereology is a formal theory (and thus neutral with respect to the kinds of entities over which it quantifies), the worry is composition does not end at concrete, material objects.[168] So PUC governs all kinds of things; abstract and concrete, universal and particular. Thus it seems universalists are committed to transcategorical fusions (given their parts exist). According to universalism, there is an object composed of (the property) *having a heart* and the North Star. And, given other views like platonism and eternalism,[169] there is an object whose (proper) parts are: *having a*

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[168] Quote & ref Lewis in Parts of Classes about the kinds of monsters he's fine with. There are worse things than trout turkeys.

[169] Eternalism is the view that there are such things as past and future entities.

heart, the number 42, and the Hanging Gardens of Babylon. For many philosophers, PUC generates an unbelievably oversized (not to mention disturbingly exotic) ontology. And that is why the status of the innocence thesis is of great importance.

In an attempt to assuage such worries, Lewis argues that mereology is ontologically innocent.[170] Call a theory *ontologically innocent* if there are no ontological costs in terms of the proliferation of (kinds of) entities required by the truth of the theory. If universalism is innocent, strange fusions are not so strange after all. If not, the profusion of "mereological monsters"[171] is a serious drawback, indeed. Therefore, in order to be a genuine contender to its rivals, universalism needs to defend the innocence thesis:

Innocence: universalism is ontologically innocent.

The offshoots and outgrowths of the debate over the innocence thesis have virtually spawned a new research agenda;[172] its focus the principle on which *innocence* is traditionally thought to rest: Composition as Identity (CAI). As a

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[170] See, e.g., Lewis (1991), p. 72-87, for a full dress rehearsal of his views on the thesis.

[171] I use "mereological monsters" in the present work to as a general term for extraordinarily bizarre fusions, for example, transcategorical diachronic fusions, like the fusion of Socrates' singleton, the number 42, and the battle of Gettysburg. This usage is not intended to be the same monster as the "monster objection" found in Fine (1999). (cf. Koslicki (2008).

[172] Moreover, its intersection with a number of other sub-disciplines runs deep. See, for example, Carrara et al (eds.) (forthcoming). *Unity and Plurality. Philosophy, Logic, and Semantics*. Oxford University Press; Baxter and Cotnoir (eds.) (forthcoming) *Composition as Identity*. Oxford University Press.

rough gloss, CAI is the "strange, yet strangely compelling"[173] theory that the composition relation and the identity relation are one and the same: composition just *is* identity. The impact of this claim and the debate surrounding it can hardly be overemphasized; teasing apart the myriad strands of this tapestry is a formidable task. For this reason, the present examination is not exhaustive.[174] In return, I hope to provide a more thorough understanding of the central threads.

4.4 CAI and Innocence

Lewis lays out exactly what he has in mind by the innocence thesis by juxtaposing it to the lack of this feature in set theory. For Lewis, set theory's association of a singleton set with each individual is the antithesis of innocence. A singleton is a set with exactly one thing as its member. If for each individual there exists a singleton set (as set theory dictates), automatic proliferation of entities ensues. For instance, if in addition to Socrates we have the singleton of Socrates, there is a further entity to be tallied on our ontological roster. Worse yet, given the singleton of Socrates is a (distinct) entity, we have the singleton of the singleton of Socrates, and so on and so forth. As Lewis puts it: "Set theory is

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[173] Sider (2007a)

[174] Some arguments against CAI we will not discuss: CAI entails mereological essentialism, e.g., Merricks (1992). For a work-around, see Wallace (2013); McDaniel's (2008) argument that strong CAI entails strongly emergent properties are impossible. For a reply, see Sider (2013a, §??).

not innocent. Its trouble has nothing to do with gathering many into one. Instead, its trouble is that when we have one thing, then somehow we have another wholly distinct thing, the singleton. And another, and another, ... *ad infinitum*" (ibid).

Lewis contends that mereology provides a way to talk about the many in an entirely different fashion; unlike set theory, it has "no trouble gathering the many into one." One way Lewis makes this claim plausible is by introducing a principle he calls *Composition as Identity* (CAI).[175] Composition as identity says the relation between a whole and its parts is one of identity: it *is* them; they *are* it. Admittedly, this is an odd use of the identity predicate, for the relation it depicts is one—many; not one—one. But it does not seem *so* odd as to be incoherent; especially when the relation is between a whole and its parts, taken collectively. Consider the following oft-cited (but inventive) scenario, from a classic paper by Baxter (1988a) on one—many identity:[176]

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[175] CAI admits of both strong and weak interpretations that will be distinguished shortly.

[176] Baxter, Donald L. M. (1988). Identity in the loose and popular sense. *Mind* 97 (388):575-582.

> Suppose a man owned some land which he divides into six parcels. Overcome with enthusiasm for [the denial of CAI] he might try to perpetrate the following scam. He sells off the six parcels while retaining ownership of the whole. That way he gets some cash while hanging on to his land. Suppose the six buyers of the parcels argue that they jointly own the whole and the original owner now owns nothing. Their argument seems right. But it suggests that the whole was not a seventh thing.

As Baxter emphasizes, when several things collectively occupy the same spatial region as the whole they compose, as well as jointly share its properties, then "it is odd to insist that in addition to the parts collectively occupying the location, the whole does, too." (It's not only odd, it's absurd). The upshot of CAI is that, if true, critics' charge of ontological promiscuity fails. Counting wholes as something "additional" to their parts is somehow redundant. Others agreed; witness Armstrong (1997): "Mereological wholes are not ontologically additional to all their parts, nor are the parts ontologically additional to the whole that they compose."

Lewis thinks universalism is ontologically innocent. If CAI is true, it is easy to see why. CAI provides a plausible explanation of how universalism manages to come by this innocence honestly. The plausible explanation rests on the claim that composition is (literally) a kind of identity relation. One way this would make sense is if there is a generalized identity relation (discussed below) that cares not whether the *relata* are singular or plural, only whether they contain the same portion of reality.

By PUC, whenever the parts exist, the fusion automatically does as well; and if CAI is true, fusions are as innocent as can be. Under CAI, fusions impose no extra ontological baggage; in addition to the parts there is no distinct individual for which we must account. If the *Xs* compose *y*, then *y* = the *Xs*. No other conditions are needed; composition is not only automatic, it's innocent to boot.

If true, CAI enables universalists to deflect the charge that their theory comes at great ontological expense.[177] It is for this reason that it is worth scrutinizing CAI. First, however, notice it has both a *strong* and *weak* reading.[178] The strong form claims the composition relation is, literally, an identity relation. The weak form claims that composition is importantly *analogous* to identity. We will not be evaluating weak identity in this chapter. That is because weak composition as identity *does* seem to generate further ontological commitments: If composition is not genuine identity, then the whole is distinct from its parts, and if the whole is distinct from its parts, then it is an additional ontological burden on its proponents.[179] In what follows I set aside a discussion of weak CAI:

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[177] But see Cameron 2012 and McDaniel 2010 for arguments that composition as identity does not entail unrestricted composition.

[178] But see Cotnoir (forthcoming) for a discussion of moderate CAI.

[179] Consider a world in which two individuals exist (e.g., a cat and a dog); according to universalism, the world automatically contains their fusion (e.g., a *cat-dog*). If composition is *not* identity then this fusion is distinct from any other individuals. But that means there are three individuals, not two. Clearly a world that contains three individuals has more entities than a world that contains only two. And, again, if composition is only *analogous* to identity, it is unclear

in order for universalism to be innocent by way of CAI, it is the strong form that

must be defended.[180]

4.4.1 MOTIVATING STRONG CAI

Basically, strong CAI absorbs the (formerly distinct) composition and identity

relations into one general identity relation (symbolized *=* below).[181] The upshot

is that the relation between a whole and its parts is just a different form of

identity: the whole just *is* the parts, the parts are the whole. The "are" of

composition is literally the plural form of the "is" of identity. More exactly:

> **Strong Composition as Identity (**CAI$_S$**):** For any Xs and any y, if y is
> composed of the Xs then y *=* the Xs.[182]

There is surely *something* intuitive about CAI$_S$. For starters, it seems

obvious that whenever we quantify over several things, if it turns out those

things are collectively identical to one thing, there is no proliferation of entities. I

buy a six-pack of beer at my local milk bar. Metaphysical mischief aside, no one

would bar me from standing in the express lane because I had 7 items instead of

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how to block the inference that a distinct individual has been added to the ontological roster. So, endorsing weak CAI does not help the innocence thesis.

[180] See, e.g., Yi (1999).

[181] As Cotnoir (2013) puts it: "… CAI seems to be a simple, straightforward thesis that reduces a difficult question about the nature of composition, to a much easier question about the nature of identity."

[182] Here and elsewhere, capital variables (the Xs) are used to indicate plural reference (e.g., $x_1, …, x_n$).

one (six beers plus their fusion).[183] Nothing surprising about *that*. And surely

identity is innocent.[184] For instance, if Hesperus is included in my ontology, and

Hesperus = Phosphorus, then including Phosphorus in my ontology incurs no

extra ontological cost. If our mereologist's espousal of CAI$_S$ is nothing more than

this—if the "are" of composition is just the plural form of the "is" of identity—

she is right to defend universalism's innocence. The whole (singular) just is the

parts (collectively); an inventory of things that counts both the whole and the

parts incorrectly sums the number of things.

CAI$_S$ also helps make sense of the intimate relation between a whole and

its parts. As Sider (2007) explains, there is something special about the nature of

parthood relations; something that makes the relation between a whole and its

parts much closer to the identity relation, and much different than other relations

like friendship or distance.[185] One reason for this is parthood and identity are

relations connecting a thing to itself,[186] rather than other kinds of relations that

connect one thing to another thing (e.g., the *taller-than* relation). Another

similarity parthood and identity share is that of locational fidelity: if $x = y$, then

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[183] This example is adapted from Baxter (ibid). As he points out, we may question whether the six-pack is *one* or *six*, but not whether it is both one *and* six. Of course, given unrestricted composition, the number of items would be $2^n\text{-}1$.

[184] "Identity is no addition to being," and as such is ontologically innocent (Turner, 2013). For example, imagine counting students in a seminar, a seminar that includes Norma Jane and Marilyn Monroe on its roster. Since Marilyn Monroe *is* Norma Jane, one would be mistaken to include "both" as distinct attendees.

[185] Lewis expresses similar thoughts in (1991).

[186] Or so we think.

wherever *x* is located, *y* is located. Likewise, a whole is located wherever its parts are located.[187] Put your foot across the foul line, and *you* are across the foul line. Park the front end of your car in a no-parking zone, and your car is in the no-parking zone.[188] Lewis writes:

> If Mary's lamb goes everywhere that Mary goes, and if this is so not just as a matter of fact but as a matter of absolute necessity, we have a highly mysterious necessary connection between distinct existences. But if it turns out that Mary and the lamb are identical, then there is no mystery at all about their inseparability. Likewise if it turns out that the lamb is part of Mary, and if Mary is *wholly* present wherever she goes, then again the inseparability is automatic, and in no way mysterious (ibid, 87).[189]

Yet another similarity between identity and composition is uniqueness. Just as a thing is related to itself by identity, so any two wholes having the same parts are (arguably) identical, or at least share a relation that is identity-like, e.g., constitution. Cotnoir (ibid) states: "If two wholes have the same parts, then because each whole is identical to those parts, the wholes are identical merely by the transitivity of identity."

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[187] Here is Cameron (2012?) quoting Sider (2007, p.75)… revisit this passage from Sider…:
> Everyone accepts the inheritance principles [that the whole is where the parts are, that the whole's intrinsic nature supervenes on the parts' intrinsic natures]. If they are true, then the part whole connection is a uniquely intimate one. The intimacy of this connection must be explained. The best explanation is a conception of parthood that renders the connection between parts and wholes as intimate and identity-like as possible.

[188] Some authors challenge this; e.g., Sider (2007) thinks that CAI helps explain how a whole is located wherever its parts are collectively located, but not how a whole is located where each part taken separately is located.

[189] Wallace (2011) makes a related point about locational fidelity, which is that CAI_S helps make sense of intuitions against collocated objects.

CAI$_S$ also alleviates worries about causal overdetermination. For example, Merricks (2001) argues we ought to "eliminate" macrophysical objects from our ontology if they lack causal powers outside those of their microphysical parts; otherwise, events are overdetermined by their causes. Given CAI$_S$, however, Merricks's point loses its edge: wholes and their parts are *not* in causal competition because they are identical.

The previous paragraphs marshal strong support in favor of composition as identity. But CAI$_S$ is incredibly controversial, and detractors far outnumber proponents. Not even Lewis accepts CAI$_S$: *why not*?[190]

To begin with, let's get straight on what exactly the proponent of CAI$_S$ believes, and why it is so contentious. As an in-road, consider the widely accepted principle of identity known as *Leibniz's Law* (LL), which expresses deep-seated conceptual intuitions concerning the nature of identity. Informally, (LL) says that if x and y are identical, then x and y have all the same properties.[191] The most commonly cited formal properties of identity are that it is reflexive, transitive, and symmetric:

Reflexivity: $\forall x \, R(x, x)$

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[190] See, e.g., Lewis (1991), pp. 84 and 87.

[191] Also known as the *indiscernibility of identicals*. Formally, Leibniz's Law says: $\forall x \forall y \, [x{=}y \rightarrow \forall P(Px \leftrightarrow Py)]$.

Transitivity: $\forall x \forall y \forall z \, [(R(x, y) \wedge R(y, z)) \rightarrow R(x, z)]$

Symmetry: $\forall x \forall y \, (R(x, y) \rightarrow R(y, x))$

If the many-one identity endorsed by CAI_S fails to have these properties, or does not obey (LL), it is hard to see how it could literally *be* identity. And as just noted, identity is reflexive. A reflexive relation is a relation each thing has to itself and nothing else; it is "one-one," so to speak. In order for the composition relation to be reflexive, a fusion must bear the identity relation to itself. But how can this be, if the fusion is one and the parts are many (a "many-one" relation)? Burgess (*forthcoming*) notes that in fact, CAI_S fails to have both reflexivity and a certain kind of transitivity:

> It is not reflexive, since some two or more things, the *x*s, never stand in this relation to themselves, or to any other two or more things, the *y*s. And though it is transitive in the sense that when a single *x* bears this relation to some *y*s and those *y*s bear the same relation to a single thing *z*, then *x* is identical with *z*, it is intransitive in the sense that even when some two or more things, the *x*s, bear this relation to as single thing *y* and this *y* bears the same relation to some two or more things, the *z*s, the *x*s still do not bear this relation to the *z*s.

But this is precisely what the proponent of CAI_S says is going on. Here is one way to get our heads 'round her claim.[192] First, imagine our proponent as making the claim that a person is identical to her (many) parts. That is, she claims a person is the fusion of her parts. Take me, for example. I am composed of my

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[192] The following example is from Sider (2007).

head (h), arms (a), legs (l), and torso (t). Therefore, according to our proponent, I am identical to h, a, l, t.

Notice, however, what our proponent is *not* saying. She is *not* saying there is some set-theoretical coating that first collects my many parts into a "one-thing" so that the items flanking the identity sign are both singular. CAI$_S$ is *not* logically conservative: it says the identity here is *many*-one, not one-one. So, she does not say, e.g., that I am identical to the set of my parts:

Derstine = {*h*, *a*, *l*, *t*}

Rather, she says something like

Derstine *=* *h*, *a*, *l*, *t*

where the identity in question (call it *general* identity) is insensitive to whether the terms flanking the identity sign are singular or plural. In English, this kind of identity claim is far from grammatical.[193] But never mind the syntax (for now), how can *one* thing be identical to *four* things, as in the above example? This is a central worry about CAI$_S$, since in order for composition to be identity, it must be possible for *one* thing to be identical to *many* things. In order for CAI$_S$ to be properly defended, then, our proponent owes us an explanation of how identity

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[193] However, such statements are grammatical in other languages that do not differentiate between singular and plural hybrids, e.g., Hungarian (cf. Sider 2007) and Nordic (cf. Cotnoir 2013b).

can hold between one thing and many things. If she can do this, the innocence of universalism may be defensible. The next section looks at how she might go about doing just that.

4.4.2 MAKING SENSE OF CAI$_S$

One way of characterizing the relation of composition would be to construct a language in which identity admits both singular *and* plural items (entities) as *relata*. So when the proponent of CAI$_S$ says

Derstine *=* *h*, *a*, *l*, *t*

she should be understood as claiming that the relation of (one-many or many-one) identity is between (all) my parts and myself, without the intervention of some intermediary single thing (e.g., a set).

Another way to see this point is by understanding the identity at issue here as *collective*, rather than *distributive*. This characterization seems plausible once we recognize a distinction between collective and distributive predicates. By way of example, consider

(1) The philosophers are tall.

In this example, *tallness* is predicated of (and *distributes* over) each of the philosophers as individuals. If the philosophers are Abelard, Berkeley, and

Chryssipus, then (1) says that Abelard is tall *and* Berkeley is tall *and* Chryssipus is tall. This is an example of *distributive* plural predication, where $P(Xs)$ is distributive iff the truth of $P(Xs)$ implies the truth of $P(x_i)$ for each x_i among Xs. To put it slightly differently, distributive plural predication reduces to singular predication.[194] In contrast to this, consider plural *collective* predicates, like "surrounded," which are irreducibly plural. They apply to pluralities of things as a whole, and are not true of each individual taken separately from the whole.[195] As an example, consider:

(2) The philosophers surrounded the mathematician.

This statement is *not* saying that, e.g., Abelard surrounded the mathematician *and* Berkeley surrounded the mathematician *and* Chryssipus surrounded the mathematician. Nor is it saying a single entity somehow gathers the philosophers into one thing (some amorphous shadowy being?) and *it* surrounded the mathematician. Rather, the philosophers jointly did so. It is for this reason that "surrounded" is called *irreducibly* plural collective predicate. Call a plural predicate *P irreducibly* collective iff $P(Xs)$ is true only for pluralities of things, and never true of the things taken individually. Carried over to our many-one identity claim, "Derstine *=* *h,a,l,t*," is irreducibly collective, and hence should

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[194] For more on the logic of plurals, see, e.g. McKay (2008) *Plural Predication*.
[195] Compare these to "The philosophers danced," which can take both distributive and collective readings.

not be understood as making the distributive claim that Derstine = *h and* Derstine = *a and* Derstine = *l and* Derstine = *t*. Rather, many-one identity holds between the parts (taken collectively) and their fusion.

4.5 AGAINST CAI$_S$

For the most part, objections to CAI$_S$ fall into three categories. First, there are worries that it cannot be coherently stated; for example, the syntax of English disallows many-one identities. Second, and more importantly, is the objection that CAI$_S$ is incompatible with Leibniz's Law and other properties of identity and so cannot be an identity relation.[196] The third, perhaps most formidable, objection to CAI$_S$ is that it leads to problems with the standard analysis of 'is one of' that undergirds many systems of plural logic.[197] Call the first worry the *syntactic* objection, the second *incompatibility*, and the third the *'is one of'* objection. Solutions to the syntactic objection will be (briefly) covered in the discussion of rejoinders to incompatibility arguments, and are set aside in order to allow more space for examining of *incompatibility* and *is one of* objections.[198]

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[196] Consider Sider (2007, 56): "Defenders of strong composition as identity must accept Leibniz's Law; to
deny it would arouse suspicion that their use of 'is identical to' does not really express identity."
[197] For an introduction to plural logic, see Linnebo (2012).
[198] For an early argument of the syntactic type, see van Inwagen (1994). For recent discussion, see Cotnoir (2013b).

4.5.1 INCOMPATIBILITY ARGUMENTS

If the composition relation just is an identity relation, it needs to behave like identity in all relevant respects. But it does not.[199] One way to illustrate this objection uses Leibniz's Law[200] to point to differences between properties of the parts and properties of the fusion. Now, there is little doubt regarding the truth of (LL) in regards to identity proper.[201] And in accordance with this principle, there cannot be properties of a fusion that the parts (collectively) lack. Yet the fusion is one thing while its parts are many things. Since the property of being one thing is clearly different than the property of being many things, the fusion and its parts have different properties. So composition cannot be identity. Here is another way to look at it. Imagine observing the dance movements of twenty-one person flash mob. The fusion of the persons has the property of *being exactly one in number*, whereas the persons taken together have the property of *being exactly twenty-one in number*. So they have different properties. Therefore, by (LL), the fusion is not identical to its (collective) parts. Lewis concedes this point:

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[199] Examples of this objection can be found in Lewis (1991) and Yi (1999).

[200] Leibniz's Law says that necessarily, for anything, x, and anything, y, x is identical to y if and only if for any property x has, y has, *and* for any property y has, x has.

[201] But see Baxter (*ms*), who rejects this characterization of identity; that is, identity *is* discernible. Turner (2013) provides an excellent regimentation of Baxter's view. Also, note that there has been some kickback to the universality of LL, especially in quantum mechanics regarding, e.g., so called indistinguishable or identical particles.

> What's true of the many is not exactly what's true of the one. After all they are many while it is one. The number of the many is six, as it might be, whereas the number of the fusion is one.[202]

In fact, a number of concerns about CAI are based on (LL). For example, any parts of a fusion of material objects will be spatially related in a way their fusion cannot be. Consider the fusion (n) of some random items on my desk; say, a coffee mug (c) and keyboard (k). The parts (collectively) have the property of being located a foot away from each other, but their fusion does not have the property of being located any distance from itself. The objections to CAI_S relying on LL typically exhibit the following general format:[203]

1. If CAI_S, then $o_1, o_2, o_3, \ldots, o_n = O$. [Definition of CAI]

2. If $o_1, o_2, o_3, \ldots, o_n = O$, then for any property P, $o_1, o_2, o_3, \ldots, o_n$ have P if O has P. [LL]

3. For some property R, either ($o_1, o_2, o_3, \ldots, o_n$ have R and O does not) or (O has R and $o_1, o_2, o_3, \ldots, o_n$ do not). [Premise]

4. So, $o_1, o_2, o_3, \ldots, o_n \neq O$. [2, 3 *modus tollens*]

5. So, CAI_S is false. [4, 1 *modus tollens*]

Call arguments of this form *incompatibility* arguments. The straightforward nature of *incompatibility*, with its reliance on a standard

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[202]Ibid, 87

[203] This characterization follows Wallace (2011a).

inferential rule (*modus tollens*) and LL, gives the CAI$_S$ theorist little room to maneuver. However, there is a response open that allows her to evade their conclusion. By revealing a fallacy of equivocation, the CAI$_S$ theorist can often show that many versions of *incompatibility* are either unsound or invalid. The strategy involves first introducing a language that contains a generalized identity predicate (e.g., our *=*) able to take both plural and singular terms as arguments, thus solidifying the grammaticality of many–one identity statements.[204] In order to accomplish this, the new language needs a way to talk about many things in one fell swoop. In what follows, we indicate this by using ',' as a way of concatenating plural terms. Using *=* for generalized identity, and given our example, the defender of CAI$_S$ may point to the identity predicate in "Derstine *=* *h*, *a*, *l*, *t*" as having an generalized reading that identifies one thing and its many parts. With this language in place, the CAI$_S$ theorist can now straightforwardly—and grammatically—represent her many-one identity claim.

However, not all incompatibility arguments are undermined by this disambiguation strategy.[205] For example, as Wallace (2011*b*) concedes, the

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[204] This may seem like no small matter. However, I am sliding over difficulties here for expository reasons. For more on general identity relations, and different variations thereof, see, e.g., Sider (2013, §1), Wallace (2011a).

[205] I only discuss the *many-one* objection here, but see Wallace (2011b) for a thorough discussion of one closely related to it (the *counting* objection) along with two others (the *temporal* and *modal* objections).

following argument against *many-one* identity is impervious to the aforementioned reply:

> **MANY-ONE:** If CAI$_S$, then the parts are strictly identical to the whole. But if so, then by LL, any property the parts (collectively) have the whole must have as well. But the parts are many, while the whole is not. So, the parts are not identical to the whole. So, CAI$_S$ is false.

By way of reply, Wallace recommends adopting one of two fixes: *relative counting* or *plural* counting, both of which deny there is a unique numerical value that answers questions about 'how many things' there are. Relative counting argues this by claiming that unique numerical values can only be applied to counts that include reference to *kinds* or *sorts* of things one is to count (e.g., cards, suits, decks). She explains:

> Since counts cannot be taken without a sortal (or concept, or way to count by) there will be nothing that is many *simpliciter*, or one *simpliciter*… rather, the many are (e.g.) *many eggs*, and the one is (e.g.) *one dozen eggs*. So, as far as numerical predicates are concerned, we do not have a violation of the indiscernibility of identicals.

Plural counting is similar to relative counting, except that it avoids reference to sortals (or concepts, etc.). The plural counter utilizes a method by which she counts the number of distinct variables in the domain of each side of her many-one identity claim. Call the domain on either side of *=*, the right hand domain and left hand domain, respectively. Next, "singularly count" the variables of

each, in order to obtain a separate tally for each domain. For example, our keyboard-mug fusion "(k, m) *=* n" is "2" for the left domain and "1" for the right. The plural counter is then able to answer "how many" questions without resorting to sortals (etc.) by saying something like "there are two things and there is one thing, *and the two things are identical to the one thing*." I have italicized the last portion of the former sentence to underscore what I see as problematic about it.

First, the plural counter must also endorse a separate identity claim that seems to just write in the many-one identity by hand, i.e., the italicized statement above. (In Wallace's words, the plural counting strategy "endorses an identity claim that cannot be ignored.") But this sounds *ad hoc*. Second, Wallace claims that plural counting yields a satisfying answer that is never a case of double-counting, one "whereby someone might think there is one and two and three things, and then adds all of these things up, yielding a total of six things." But again, this is only the case because it is directly put in by hand. So although Wallace shows there is a response available on behalf of the CAI_S theorist, doing so requires two unsatisfactory moves. First, relative count says that asking for a count *simpliciter* is an illegitimate question. Second, plural count seems convoluted and *ad hoc* as a response to a simple question.

At any rate, it does look as though many incompatibility arguments can be blocked, at least insofar as introducing general identity is allowed. Even so, the response objections based on differences between properties *being many* and *being one* will seem forced and ad hoc to some. (For example, it requires saying things like "two things are equal to one thing.") Perhaps these wrinkles can be smoothed out. However, as we shall see below, the counterintuitive consequences of CAI$_S$ loom even larger once we how adopting bears on plural logic and predication.

4.5.2 PLURAL QUANTIFICATION AND THE "IS ONE OF" ARGUMENT

Sider (2007) shows how CAI$_S$ saddles us with strange and unsettling consequences in regards to plural logic and the predicate "is one of" many of its practitioners employ.[206] Very roughly, Sider's argument is that anyone [any universalist] who endorses CAI$_S$ will find the alliance of the two "collapses" the distinction between mereologically equivalent pluralities. In turn, this "collapse" distorts the natural interpretation of "is one of" and the logic of plural

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[206] Boolos's logic of plurals has a one-place plural predicate (…. "is one of"__). Others (Burgess, cite refs) prefer a two place plural predicate (___ "are among" ___). Regardless, it seems that plural logic, like other offshoots and modifications of standard logic, is here to stay. Its advantages in the axiomatization of set theory, and the development of monadic second order logic, are discussed in McKay (cite refs).

quantification that makes use of it. Additionally, collapse has another untoward

consequence: distributive predicates become virtually obsolete. This section

walks through these consequences in detail. Sider's first argument uses some

definitions that will be handy to have nearby:

> **Strong composition as identity** (CAI) For any Xs and any y, if y is
> composed of the Xs then y = the Xs.

> **Fusion** $x\mathrm{Fu}Y = df\ \forall z(Yz \to z < x)\ \&\ \exists z(z < x \to \exists w(Yw\ \&\ Ozw))$.

(This says that a fusion—read "*x fuses the Ys*"—is an object of which each

of the Xs is a part, and each part of which overlaps[207] at least one of the Xs.) Sider

begins by establishing that anyone defending the combination of CAI_S and

classic mereology (e.g., universalists) is committed to the following claim:

> **Collapse:** y is part of the fusion of the *Xs* iff y is one of the *Xs*.[208]

Taking the left-to-right side first, we have:[209] let a be the fusion of the *Xs*, let y be

proper part of a. Then, in addition to being composed of the *Xs*, a is composed of

y and b (where $b = a - y$).[210] Next, given CAI_S , we get that a = *Xs*, and also that a =

y and b; and so the *Xs* = y and b. Since y is one of y and b, it follows that y is one of

the *Xs*. The right to left part, Sider notes, "follows immediately" from the

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[207] Two things overlap when they share a part. Formally: $Oxy = df\ \exists z(z < x\ \&\ z < y)$.
[208] This is called *parts □ one of* in Sider (2007), and *collapse* in, e.g., Sider (2013*a*)
[209] This is only a slight modification of Sider's (see n49).
[210] Sider has "y and a", but acknowledges this could be substituted with y and the remainder of a, $(a - y)$.

definition of fusion. However, in order to be thorough, let's walk through it.

Taking the right-to-left side; let a be the fusion of $(x_1,...,x_n)$. Given the definition

of *fusion*,[211] we get that for any x_i among $(x_1,...,x_n)$, Px_ia. Given CAI_S, we get that a

$= (x_1,..., x_n)$. Let y be one of $(x_1,..., x_n)$. So either $(y = x_1$ or,...,$y = x_n)$. Since y is one

of $(x_1,..., x_n)$, it follows that y is part of a.

But, as Sider points out, *collapse* implies the failure of the following

principle:

Lists: x is one of $y_1,..., y_n$ iff $(x = y_1$ or,..., $x = y_n)$

Lists fails because given collapse, *any* part of the fusion—not just $(x_1,..., x_n)$—will

count as one of $(x_1,..., x_n)$. That is bad news indeed. To see this, imagine standing

on a floor made of black and white squares in chessboard fashion, each square of

which is composed of 2 triangular tiles (of the same color). If the floor is the

fusion of the squares, then each triangular tile, given collapse, is one of the

squares.[212] Or consider the fusion of the books on my bookshelf. Given collapse,

any part of the fusion is one of the books. But that's just wrong—no page is a

book.

Moreover, collapse has further consequences for the kinds of pluralities

philosophers often trade in, e.g., the Xs such that something is one of them iff

[211] Should I add something here? Perhaps I should note that Sider is assuming classic mereology?
[212] This is similar to an example found in Cotnoir (2013).

that thing is one of the citizens of the United States. There are no such pluralities, given collapse.[213] For any plurality of them—their fusion—will include many things that are *not*, e.g., citizens of the United States, but are part of their fusion: citizen hair, citizen noses, citizen cells, anything that is part of a citizen is one of the *X*s. Sider writes:

> [D]efenders of composition as identity often describe their view as implying that a person is identical to her subatomic particles. But given Collapse, the plural term 'her subatomic particles' denotes nothing. It is intended to denote *X*s such that something is one of them iff it is a subatomic particle that is part of the person in question; but any *X*s of which each such part of a person is one will also include further things— anything (such as the person's head) that contains multiple subatomic particles from the person will also be one of such *X*s.

Another consequence of collapse is it runs afoul of collective and distributive predicates. While, e.g., collective predicates such as "John and Ringo lifted the piano" are true, so are "Rohn and Jingo lifted the piano" where Rohn = John's body + Ringo's head, and Jingo = Ringo's body + John's head. Given CAI$_S$, John and Ringo are identical to Rohn and Jingo.

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[213] If there are no such pluralities, then plural comprehension principles (i.e., those guaranteeing there is a plurality of things that satisfies any predicate) are false.

Distributive predicates are another story altogether, for they practically "cease to exist." Recall that $P(xx)$ is distributive iff the truth of $P(xx)$ implies the truth of $P(x_i)$ for each x_i among xx. Following Sider,[214] call this law

Distribution $\Pi(x_1,\dots, x_n)$ iff $\Pi[P(x_1),\text{and},\dots,P(x_n)]$

Sider's argument runs like this.[215]

> Suppose Π obeys Distribution, suppose $\Pi (x_1,\dots, x_n)$, suppose $y_1+\dots+ y_m = x_1 +\dots+x_n$ ('+' denotes fusion), and $\sim\Pi(y_i)$ for some i. By strong composition as identity, we have $y_1,\dots,y_m = y_1+\dots+y_m$ and $x_1,\dots,x_n = x_1+\dots+x_n$; by transitivity and symmetry of identity we have $x_1,\dots,x_n = y_1,\dots,y_m$; by Leibniz's law we have $(y_1,\dots,y_m)$; by Distribution we then have $\sim(y_i)$; contradiction.

4.5.3 LESSONS LEARNED

There is much to like about CAI_S, but there are also significant drawbacks. First, there is the objection that it is incompatible with Leibniz's Law, and therefore cannot be identity. Some incompatibility arguments have been surmounted— but certainly not all. In order for CAI_S to warrant further consideration,

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[214] I believe Sider is just using Π for "predicate" in a broad sense that can be understood as completely general (i.e., in the context of a law).

[215] The only way this argument will fail is when parts of fusions of things satisfying Π are also Πs (so-called *aliquot* parts).

proponents need to adequately address these objections. Second, CAI$_S$ wreaks havoc on the logic of "is one of," plural comprehension principles,[216] and corrupts natural interpretations of collective and distributive predicates. These issues have yet to be sufficiently resolved in the literature. This lacuna makes it difficult to assess the impact CAI$_S$ ultimately has on universalism's innocence thesis. If true, CAI$_S$ makes sense of the innocence thesis. But it will need to overcome the hurdles just articulated in order to do that. This uncertainty leaves open a different avenue I (briefly) consider next: could universalism be innocent, in some sense, even if CAI$_S$ is false?[217]

4.5.4 COULD UNIVERSALISM BE INNOCENT, ANYWAY?

Clearly, Lewis thinks PUC is ontologically innocent. We can find evidence of such thinking by consulting *Parts of Classes*, in which he devotes an entire section to elucidating this exact claim.[218] He emphasizes, for example, that a fusion is "nothing over and above its parts," and continues, "if you are already committed to some things, you incur no further commitment when you affirm the existence

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[216] That is, principles that for every (satisfiable) predicate ϕ, there is a plurality of things that satisfy it. If CAI collapses the distinction between different pluralities (those having the same fusion), then there is not a plurality of things that satisfy every predicates (e.g., "the *X*s such that something is one of them iff that thing is one of the citizens of the United States" in 4.3).

[217] We have not yet considered arguments claiming CAI entails universalism. One of these will be considered further along in this chapter.

[218] Ibid, pp. 81-87.

of their fusion."[219] Soon after making these claims, Lewis begins to endorse composition as identity. As we've seen, there are many reasons to doubt its cogency.[220] But all is not lost unless CAI_S is the only route to ontological innocence.[221] This section looks briefly at one attempt to do so, and dismisses it because it results in a kind of *quasi*-universalism.[222]

4.5.6 VIRTUAL MEREOLOGY?

Indeed there are other systems of mereology by which one may obtain ontological innocence, sans CAI. The problem with some is that they are unlikely to appeal to universalists. For example, Carrara and Martino's (2009) virtual mereology (VM) does manage to achieve a combination of PUC and innocence; one in which "the ontological innocence of mereological sums can be vindicated." Unfortunately, their account will sound like cold comfort to

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[219] Ibid, pp. 80-82.

[220] Or, at least, all versions of it that entail a robust universalism. For an argument to the effect that CAI ("properly understood") entails unrestricted composition (on a certain "thin" sense of quantification) that seems benign, see Bohn (CAI book); however, Bohn's "existential" quantifier only supports a "thin" notion of existence.

[221] Lack of space prevents me from closely examining one other options for the innocence thesis. namely, whether it helps if fusions are derivative (non-fundamental) and therefore ought not count in tabulating ontological profligacy. (At least, not in the sense they would need to in order for the innocence thesis to fail). For further reflection on this see Cameron (2012).

[222] Another attempt at buttressing the innocence thesis is Hawley (cite). According to her "levelling up account," an ontological commitment to some parts "somehow automatically involves a commitment to the whole." Basically, on this account, we can have ontological commitments that are epistemically inaccessible.

universalists, since the trade-offs required are not in the spirit of universalism. Very roughly, they suggest adopting a "virtual mereology," involving two non-standard moves. First, they assume an atomistic ontology;[223] second, they understand fusions as a kind of "virtual object" that is "not real" but rather a "plurality of [real] atoms." Basically, (VM) amounts to atomism plus (irreducibly) plural quantification.[224] Of course, there are many reasons universalists will find this combination of ontological innocence and unrestricted fusion unsavory. For example, atomistic ontologies are standardly thought to be incompatible with gunk whereas good old fashioned universalism is not.[225] And, as universalists are well aware, the fact that their theory is consistent with gunk is a strength that rival theories (viz., nihilism) lack.

However, a more pressing worry with (VM) is its close proximity to a quasi-universalism, one that superficially attains innocence from a "light" reading of the existential quantifier employed in fusion talk. But if talk of fusions is merely a way of *talking* about the Xs *as if* they are one thing, without being ontologically committed to them as individuals, universalism loses its moxie. Universalism is not a semantic thesis; it's a metaphysically serious view that

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[223] Atomistic mereologies incorporate an atomistic axiom, usually $\exists y(Ay\ \&\ Pyx)$. See Varzi (2014) for other ways this axiom could be spelled out. Atomistic mereologies are explored in the next chapter.

[224] A mereology along these lines will be considered in more detail in chapter 6.

[225] There are certain kinds of atomistic gunk. Cf. Varzi (2014, section XXX) and Cotnoir (2014).

says any time you have some Xs you have one thing: their fusion.[226] But unless

the (quasi)universalist regards fusions as individuals, there is little separating her

position from that of a smooth talking nihilist who attempts to upsell her view to

neophytes by incorporating a similar "light" reading of the existential quantifier,

in order to showcase her ability to engage in fusion talk as well as the next guy. If

both parties speak *as if* fusions are individuals, and neither is ontologically

serious about their talk, their "debate" begins to look like a good target for the

charge of superficiality, á la Hirsch. No universalist worth her salt can condone

this combination of PUC and innocence without seemingly losing credibility as a

universalist. Burgess writes: "It is difficult, however, to see how anything less

than literal identity could suffice for ontological innocence." I agree.

4.6 CAI$_S$ does (not) entail Universalism

Given the arguments against it, one could not be blamed for wondering why

we've spent so much time discussing CAI$_S$. However, those arguments were not

conclusive. And for universalists, a lot hinges on the truth of CAI$_S$. Another

potential virtue sometimes claimed for CAI$_S$ is that, if true, CAI$_S$ implies

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[226] Of course, Leonard and Goodman (1941) do say that mereology is a formal apparatus that allows us to speak of any collection of things *as if* those things are an individual (*n.b.* their calculus of individuals is not atomistic). However, my point is just that speaking of some things *as if* they are an individual is not the same as some things *being* an individual.

universalism.[227]   This section briefly looks at an argument to this effect, from

Sider (2007). We then consider an argument that CAI$_S$ *cannot* entail universalism,

from McDaniel (2010).

4.6.1 SIDER'S ARGUMENT

Sider (2007) considers two arguments to the effect that CAI$_S$ entails universalism.

We're just going to take a look at the first one. Sider's argument uses the notion

of *superstrong* CAI$_S$, which adds a biconditional to the identity claim:

> **Superstrong composition as identity** (CAIss): For any Xs and any y, y is
> composed of the Xs if and only if y = the Xs.

The argument runs like this. Take any *Xs*. The plural forms of identity and

existential generalization then give us: (1) there are some *Ys* identical to the *Xs*

(i.e., the *Xs* themselves). For the defender of CAI$_{SS}$, characterizing the Ys as many

is no less appropriate than characterizing them as one. It is for this reason that

CAI$_{SS}$underwrites an otherwise "dodgy move" whereby "some y" replaces

"some Ys" in (1), resulting in (1*): there is some *y* that is identical to the Xs. And

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given CAI_{SS}, we get that there is some y composed of the Xs. From this, universalism follows: for any Xs, there is some y that is their fusion.

But an objection arises when we see that CAI_S, as it stands, makes only the following claim:

$$\forall x \forall Y(x \text{ Fu } Ys \rightarrow x = Ys) \text{ (Composition as identity)}$$

So, CAI_S is merely the conditional claim that *if* the Xs have a fusion, then that fusion is identical to those things. The biconditional extension adds that *if* a collection of things is identical to one thing, then that thing is their fusion. But neither form of CAI says given any collection of things there is some one thing.[228] If it did, that would be tantamount to including $\forall Y \exists x(x \text{ Fu } Ys)$ as part of the claim. But then the argument that CAI_{SS} implies universalism assumes the very thing under dispute.

4.6.2 MCDANIEL'S ARGUMENT AGAINST THE ENTAILMENT

McDaniel (2010) argues directly against the entailment from CAI to universalism. Roughly, his argument (allegedly) shows how the mutual consistency of three claims entails both CAI and the *falsity* of universalism. (Put differently, it says

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[228] Simons (2006, n4) writes: "It is surprising how many ontologists—unlike Lesniewski—fail to distinguish between a collection of many individuals and the one individual they compose, if they do…"

that a nihilist could jointly (consistently) hold all three theses, CAI, and reject universalism). Thus, CAI cannot entail universalism. I attempt to get clearer on the structure of McDaniel's argument below, and then move to criticisms of it.

McDaniel begins his argument by introducing three familiar (in spirit if not in name) doctrines: (1) modest pluralism, (2) mereological nihilism, and (3) property extensionalism. Modest pluralism is the claim that at least two disjoint objects exist.[229] Mereological nihilism, as McDaniel characterizes it, says that necessarily, some objects (the Xs) compose an object (y) just in case there is exactly one of the Xs and it is identical to y.[230] Property extensionalism is the view that necessarily equivalent properties (and relations) are numerically identical.[231] Some brief comments on the premises. Modest pluralism is *very* modest—only existence monists will reject it. And property extensionalism seems innocuous enough to pass muster. Lastly, although (2) is highly controversial, the only work it does in the argument relates to its joint imcompossibility with universalism.[232] (Basically, its role is such that one need not be a believer for the

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[229] That is, at least two objects exist that share no parts.

[230] McDaniel mentions other formulations, as his is not entirely standard. His uses the above formulation because it highlights the fact that "Trivially, everything composes itself."

[231] In other words, two necessarily co-extensional properties are one and the same property. For example, a property extensionalist would claim that the property of being equiangular is identical to the property of being equilateral, since these properties are necessarily coextensive.

[232] McDaniel's proof of that nihilism and universalism cannot both be true goes like this:

Suppose the number of such things is n. If compositional nihilism is true, then there are exactly n material objects. But if compositional universalism is true, then there must be at least $2^{(n+1)}$ things—the original n-numbered objects plus the various fusions of them.

argument to succeed.) McDaniel's argument aims to show that together, these three doctrines entail both CAI and the falsity of universalism. In other words, CAI does not entail universalism.

McDaniel first makes sure the internal coherency of each view is evidenced, along with the fact that all three are jointly consistent.[233] His argument goes like this. First, nihilism and property extensionalism jointly entail CAI in the following (atypical) sense: For the nihilist, the identity relation is necessarily coextensive with the composition relation (as per the definition given above). But then, given property extensionalism, composition *is* identity. Now, given there at least two disjoint things (i.e., modest pluralism), nihilism and universalism are jointly incompatible. Recall that modest pluralism, nihilism and property extensionalism are jointly consistent, and entail CAI. Add to that they are jointly *in*consistent with universalism (since nihilism, if true, is necessarily true). So modest pluralism, nihilism, and property extensionalism jointly entail CAI is true but universalism is false. So, CAI cannot entail universalism.

As will become clearer in later parts of the present work, my preferred way to get the universalist out of this mess is for her to simply deny substantial mereological theses are noncontingent. Perhaps there is a lesson to be learned

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Compositional nihilism and compositional universalism cannot both be correct answers to the question of when composition occurs.

[233] That is, that they can all be held simultaneously.

here about why CAI ultimately does not work. Contingentism about substantial mereological claims is further explored in 5.8.

Another option for the CAI-*cum*-universalist is to object that the characterization of nihilism is tendentious; mereological nihilism is the view that mereological relations like composition fail to obtain, couching nihilism in compositional garb is illegitimate. Instead, McDaniel has characterized nihilism as explicitly concerning composition: the xs compose y just in case there is exactly one of the xs and it is identical to y. This seems to be the only way he manages to have the nihilist turn out to be a CAI theorist. That seems somewhat contrived on his part, even if formally correct, and if it is necessary for the argument's validity, then his characterization of it needs to be scrutinized.[234]

What I am most unsure about is the veracity of McDaniel's claim that whether someone holds all three doctrines "is irrelevant" to his project, and that "what matters is that the three views are obviously consistent with each other, and so someone could consistently hold all three views." I'm not fully convinced that he is right, but then again I cannot explain exactly what is wrong with it.

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[234] In McDaniel's defense, this *is* how nihilism is sometimes defined, and it *is* formally correct. McDaniel might instead say that the CAI theorist wants to define her view to avoid this result, then she needs to start articulating what her theory could mean or should mean, *sans* nihilism.

4.7 Universalism *Sans* Innocence

How does universalism fare, *sans* ontological innocence? Not very well. What follows are some of my thoughts on the most unattractive consequences.

4.7.1 Worlds with 2^N-1 objects

If unrestricted composition holds, then given any number of (basic, atomic) objects, there are 2^n-1 fusions of them. That puts a strange requirement on how many objects there could be in a finite world. It seems that according to universalism, even-numbered object worlds are impossible. If mereological principles are noncontingent, there could be no worlds with 2, or 4, or 6, 2*n*…, etc. objects. Now, this seems to be a kind of brute necessity if universalism is true. Furthermore, if noncontingentism holds, then if true, universalism is necessarily true. The upshot here is that worlds with an even number of things in them are impossible (and even some odd numbered ones are left out). Yet it seems that, for example, *God* could create a world with only two objects. And no one ever objected to Black's (1952) argument about the indiscernibility of identicals his seemingly benign world of two spheres was *incoherent*; I take that as ample evidence most of us do not think it obvious that two-object worlds are impossible.

Let me try to put my point another way. Everyone agrees there is something[235] (the question is *why* this is, not *that* it is so). But given there *is* something rather than nothing, why could there not be *any* numerical value of "the some-thing(s)—what's so wrong about "even numbered" worlds? Truly astonishing (metaphysical discoveries!). Astonishing claims call for astonishing evidence. Mereological universalism has the former, but not the latter.

4.7.2 STRANGE FUSIONS

Without innocence, and given universalism, there are now strange fusions of magpies and marzipan and other nonsense, the vast majority of which have no obvious role in causality, laws, or any other subjects in which metaphysics normally takes an interest (e.g., personal identity, free will, and so forth). Yet though we rarely speak of them, much less catch a glimpse of them, according to Lewis (1991, 82), we are ontologically committed "to all manner of unheard-of things: trout-turkeys, fusions of individuals and classes, all the world's Styrofoam, and many, many more. We are not accustomed to speak or think about such things." Without innocence, universalists somehow have to explain the fact that we tacitly (seemingly unknowingly and to our dismay) are

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[235] It's not the case that there is nothing.

ontologically committed to strange fusions and (just as tacitly and unknowingly) restrict our quantifiers. As Lewis has it, "You can declare that there just does not exist any such thing—*except*, of course, among the things you're ignoring."

Perhaps we ought not be so irked over bloated ontologies. The more the merrier. But other difficulties now surface. One of note is that universalism's real cost is not solely a product of its inflated ontology, but the devaluing of ordinary objects that accompanies it. The thing is, if any objects whatsoever have a fusion, there is nothing metaphysically distinctive about all the natural ordinary things—even our own selves.[236] Strange fusions of pompadours and parasites are metaphysically "on par" with persons, peach trees, and parakeets; they are all wholes of the same sort (some are just more interesting to us).[237] But if there is nothing ontologically special left to distinguish cats and dogs from *catdogs*—then I'd like to know *why* we only ever see one and not the other.

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[236] In fact ordinary objects become the weird ones. Cf. van Inwagen (1990) on Unger.
[237] Baker draws a similar conclusion, that, for believers in PUC, "there is no metaphysical difference between ordinary objects (putatively, the sums that we recognize) and arbitrary sums" (2008, p. 14). Sidelle notes that "any distinctions between materially filled portions of the world which do, and which do not, contain objects would be ultimately arbitrary—so [universalism] treat[s] all such regions alike".

4.7.3 REBEL WITHOUT A CAUSE

Without innocence, universalism looks like a rebel without a cause. To see this, first consider a follow up point on something I noted above: strange fusions play no obvious role in causality, laws, or any other subject in which metaphysics normally takes an interest (e.g., personal identity, free will, and so forth). So that's something to worry about. They are explanatory idlers. But if taking on an assumption does no explanatory work, why do it? In explaining the scientific and ordinary world, what explanatory work is done by fusions? We have plenty of concepts from philosophy's drop box that can be put to use here: no need to be radical without cause. Formally, there is no mereological issue in talking about any portion of space time, no matter how gerrymandered, and it sure seems like we can do so without making any existence claims that such portions are *wholes*. If so, why suppose *all* exist, rather than some, or none?

4.7.4 SPEAKING INTUITIVELY ABOUT REAL WHOLES

A final thought that I examine and comment on is usually given as a general complaint that universalism's characterization of wholes does not jibe well with our concept of what it is to be a whole.

Motivation against universalism can be found by reflecting on the common intuition that what we might call a "real whole" or a whole in the intuitive sense *is* "something more than" its parts "taken together." As noted in Chapter 2, one natural enough thought is that just putting any old things together does not guarantee something "new" comes to exist. Other times, putting some things together does cause some new *thing* to come into existence (e.g., baking a cake from scratch). If universalism is true, the fusion exists as long as the parts do—but there seems to be something missing involving the relations among the parts (especially in "ordinary object" contexts). This is the sense in which a motorcycle in pieces on the shop floor is not a whole, but it is when its running on the open road. If composition is identity, it would be hard to explain the intuition that sometimes the relations among some things come together in such a way that they *generate* a new thing. *Pace* Lewis, the objection is, "take them together or take them separately," they are *not* the same portion of reality, either way.

The fact is, it seems plainly obvious (maybe painfully obvious, too) that an apple pie is distinct from its ingredients piled on my countertop, or any other way it could be thrown out into spacetime. Yet it remains a whole. Contrast that to pluralities. The plurality of ingredients that made my pie will always be the same plurality, for pluralities always exist as long as the *X*s do (and let's pretend

the ones that made my pie still exist), even though the "real" whole (my pie) may not. That seems totally fine to me. Nothing strange about *that.* But universalism gets this kind of thought mixed up, for universalism tells us the same *whole* still exists, though it no longer is such an arrangement that I would call a pie (but no matter! it is whole and still exists!)

A related point is raised by Elder (2008), who reasons as follows. Universalists believe the mere existence of a several things guarantees the existence of a single unitary thing. But as Elder points out, this claim does not explain why these (initial) things are parts of a unified whole: in what sense are they unified? Here the concern is whether universalism offers a satisfying explanation of the special relationship many feel exists between genuine wholes and their parts. Fusions need not be integrated, or unified, and often are no different than a random list of objects (let us recall our Quine and Lewis: *any portion of space time, no matter how gerrymandered, will do*). But, intuitively speaking, genuine wholes seem different—there are further conditions that need to be met in order for some things to be parts of (or generate) a unified whole.[238] The mere existence of the parts does not cut it, in the most common of cases. A real, whole, apple pie, for example, does not exist unless its parts (apples, sugar, flour, butter) are suitably integrated; just having the parts assembled on the

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[238] Cf. Simons (2006).

countertop (or anywhere else in the universe) will not do the trick.[239] So, although there may be other reasons for thinking unrestricted composition is true, conformity with our natural intuitions about "real" wholes and their parts is not one of them. There is what might be called an explanatory gap. By way of illustration, contrast the above example of the parts that jointly compose an apple pie with Lewis's comment about the cats that jointly compose the cat-fusion:

> It just *is* them. They just *are* it. Take them together or take them separately, the cats are the same portion of Reality either way. Commit yourself to their existence all together or one at a time, it's the same commitment either way (ibid).

Universalists attempt to reconcile this mismatch between strange and ordinary fusions by claiming we commonly attend only to fusions recognized by our conceptual schemes (or whose parts are in contact or move as a unit, etc.),[240] but many find this kind of response hard to swallow. Do parts and the whole they jointly compose really amount to the same thing?[241] In cases of familiar, ordinary

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[239] Yes, I know the (universalist) answer: it's just that *that* fusion is no longer an apple pie. But this just gets the wrong things right and right things wrong. As I said earlier, it makes a mess of natural ordinary things.

[240] For example, Lewis (1991, 80): "If you wish to ignore [strange fusions], of course you may. Only if you speak with your quantifiers wide open must you affirm the trout-turkey's existence. If, like most of us all the time and all of us most of the time, you quantify subject to restrictions, then you can leave it out. You can declare that there just doesn't exist any such thing - *except*, of course, among the things you're ignoring." See also Lewis (1986): "Our idioms of existential quantification may be … tacitly restricted in various ways."

[241] Real wholes, it might be said, cannot be decomposed any which way and remain the whole they were. An apple pie can be sliced into pieces on the table, and *the* pie is still on the table (yet decomposed). But you cannot vacuum the pie off the floor, discard it in the dumpster, and think the pie still "exists." Fusions are not like this. What is the relation between the fusion of that pie's actual parts and the apple pie itself?

objects, this seems unlikely, for we frequently distinguish between unassembled pieces of furniture, a pile of sand, or scattered water molecules, and the wholes these parts (respectively) may compose (e.g., a table, a sandcastle, and a puddle of water).

To get clearer on this point, it is helpful to recall Aristotle's distinction between *wholes* and *heaps.* Wholes are (artificially or naturally) unified and are "something besides the parts." Heaps, on the other hand, do not constitute wholes in any way because they do not form genuine unities, and so are not "one," but mere aggregates.[242] As Keith McPartland puts it, "Aristotle tells us that a whole is something that encompasses things in a way that makes the things encompassed some one thing."[243] While we may be able to understand a fusion as "some one thing," this is an unorthodox use of "one" (and certainly not one that Aristotle would recognize).[244] In short, whatever independent merits unrestricted composition has, commonsensical cachet is not one of them.

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[242] *MetaphysicsH.6.* In *Metaphysics Δ. 26*, Aristotle addresses three senses of "whole": (1) wholes that have no missing parts in virtue of which they are called natural wholes, (2) unified wholes (i.e., Aristotelian universals and substances), and (3) totals, which are wholes in an extended sense of the term, given that the position or order of the parts does not make a difference to the whole of which they are parts (e.g., water). Cf. Aristotle; Ross translation (1993)

[243] McPartland, (ms, 165), who is here discussing the same passage (*Metaphysics Δ. 26*).

[244] See, e.g., Aristotle's discussion in *Metaphysics H.6* and *Z.17.* McPartland also tells us that "In the case of material objects, Aristotle denies that every haphazard collection of entities will be unified in the right way to constitute a whole," and suggests that he would deny the principle of unrestricted composition.

CHAPTER 5

MEREOLOGICAL NIHILISM

5.1 INTRODUCTION

In the previous chapter, we considered a revisionary answer to the SCQ: universalism. According to universalists, composition never fails to occur. In this chapter, we consider another revisionary answer: mereological nihilism. According to the nihilist, composition never occurs. That is, nihilism says that composite objects—things with parts—do not exist. On the face of it, nihilism can seem an unintelligible (at best, preposterous) theory. Given the myriad objects encountered daily—people, computers, last night's dishes—all appear to be clear cases of composite objects. What shall we make, then, of the nihilist claim that such things do not exist? (And even if we can make sense of her denial of composite entities, what arguments could possibly be given in favor of such a

desolate ontological outlook?) But let us be charitable. Surface appearances are not always what they seem.

This chapter consists in an effort, firstly, to establish coherence of the position itself (§1). Nihilism involves both a negative and a positive claim; but in particular, its negative claim can be a source of misunderstanding, and so clarifying it is my next order of business (§2). With these fortifications in place, we can safely proceed to a positive statement of the theory (§3). A brief detour (§4) addresses an initial complaint among detractors (basically: nihilism contravenes our perceptual evidence), which must occur prior to a proper assessment of its core virtue (§5; the argument from parsimony). A large part of the remaining sections (§§6—9) investigate standard objections (the cogito argument, incompatibility with contemporary physics, the argument from gunk), along with rejoinders on behalf of the nihilist. The last section casts a favorable (albeit hesitant) eye on the prospects of a specific form of nihilism has some promise: nihilism is contingently true, if true at all.

5.2 INTERNAL COHERENCE

Before embarking on our discussion, we first turn to a worry about whether mereological nihilism is coherent.[245] Consider a standard nihilist claim, e.g., that

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[245] I assume here that there is nothing conceptually incoherent in the notion of mereologically simple *concreta*; these could be, for example, the fundamental particles described by

there are no tables, trains, tigers and so on. The nihilist often reconciles her denial

with commonsense beliefs by granting that, though there are no tables (tigers,

trains,…,), there *are* simples *arranged* table-wise (tiger-wise, train-wise,…,). But to

many philosophers this sounds incoherent; "tables exist" is not only true, but is

(or can be) made true by simples arranged table-wise. By their lights, the nihilist

is just confused about what it takes for there to be a table: nothing more is

needed than what the nihilist already countenances. If this is all the nihilist is on

about, the thought continues, then her claims are not coherent; she has failed to

realize that if there are such and such particles arranged *x*-wise, there are *x*s.[246]

Are the claims of the nihilist conceptually confused? Does it follow from

the meaning of *table* that the nihilist is committed to the truth of "Tables exist"?

Let's assume, for the moment, the following definition of *table*:[247]

x is a table $=_{df}$ x is a collection of simples arranged table-wise.

Given the above definition, we can derive the following as a logical truth:

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contemporary physics, or point-particles of classical physics, or even fundamental elements of a future "best" physics.

[246] Thomasson (2009, 456) seems to make this point. According to her, if interlocutors apply their respective terms (e.g., "table" and "particles arranged table-wise") under the same conditions, then "it becomes difficult to find a difference between their views." Moreover, Thomasson continues, the nihilist can "mimic" what, e.g., a believer in tables says with talk of "particles arranged table-wise." She therefore not only "distinguish[es] her view from the 'madman's' view;" she can account for the truth of ordinary language claims like "there are two tables in the next room." But once this is allowed, Thomasson urges, "it is hard to see on what grounds she can deny that there *really* are tables." (Of course, there is much more to Thomasson's view; the above is used only as an illustrative example). See also Chalmers (2009) and Rayo (2012). For defenses, see Merricks (2001, Ch. 1 pIII).

[247] This line of response draws heavily on Sider (2009) and Dorr (2002 ms).

> For all x, if x is a collection of simples arranged table-wise then x is a collection of simples arranged table-wise.

Things are not looking good for the nihilist. It now seems like she must yield to her critics, and grant that "For all *x*, if *x* is a collection of simples arranged table-wise, *x* is a table."

Not so fast. That conclusion is too quick, for the above use of "collection" is one the nihilist rejects. For the nihilist, there is no single object, *the* collection. Rather—in an irreducibly plural sense—there are just *several things* arranged table-wise. As we learned from Boolos (1984, 1985) and Lewis (1991), believers in irreducibly plural quantification can reasonably deflect "singularist" attempts to distort their position.[248] The nihilist claims her theory shares a natural affinity with irreducibly plural quantification: reference to *several things* does not entail reference to a "one-thing" that somehow gathers the things into a single entity.[249] The singularist interpretation of "collection" in the above sentence is precisely what the nihilist rejects. That makes the translation scheme employed in service of her critics' argument fail to be truth-preserving: "collection" is equivocal. If

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[248] Here is Boolos's (1984) classic riff against (semantic) singularism: "Although 'the many' might be thought by some to always constitute a certain collective kind of 'one', plural reference itself has no single corresponding object; it is reference to 'many distinct ones', and not 'a single one'."

[249] Roughly, the singularist stance is one whereby the semantic value of a term is always singular. the reverse is true: reference to *several things* is always reference to a "one-thing" that somehow gathers the things into a single entity (e.g., a *set*). I am sliding over quite a lot here; semantic singularism is different than syntactic singularism, and semantic pluralism is different than syntactic pluralism. (Cf. McKay 2008).

nihilist and universalist are not using "collection" synonymously, the deflationist

argument at issue is unsound.[250,251]

There is another way the nihilist position could be a non-starter. For

perhaps the nihilist and the universalist mean different things by their use of

quantifiers, and are merely talking past one another. The kind of deflationary

point being set forth is this: since the nihilist and the universalist diverge in their

use of quantifiers, they are not genuinely disagreeing.[252] On one interpretation of

the quantifier, "There are tables" comes out true; on another, it comes out false.[253]

So, the deflationist concludes, the dispute is not substantive.

This kind of deflationary move can be countered by pointing out that use

is not the sole determiner of meaning. Other important factors are fit and

eligibility.[254] According to this line of thinking, certain meanings of terms more

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[250] Another way to get at the underlying flaw in the critics' argument is by thinking about the situation in mereological terms, as Sider suggests in (2013). The nihilist and the universalist disagree over whether, given several things arranged *x*-wise, there is a single thing which has those things as parts (i.e., their fusion). The universalist thinks there is; the nihilist thinks there is not. For more on this line of thinking, see n2 and also Sider (2009; 2013). There are more things that could be said; however, I lack space to address every incoherency objection to nihilism in the present work.

[251] Perhaps the concern is instead over analyticity; that "tables exist" just means "there are particles arranged table-wise." Reservations about the analytic/synthetic distinction aside, I doubt this worry retains much force under reflection. If analyticity was the issue, then questions like "even if there are particles arranged table-wise, do tables also exist?" ought to sound redundant, similar to the way "I know he's a bachelor, but is he married?" sounds redundant.

[252] There are many kinds of deflationary views in the vicinity. See n3 and references therein.

[253] For example, one group of speakers could be construed as restricting the domain of their quantifiers so as to range over simples, or organisms, etc. See Hirsch (2005).

[254] This is part of Lewis's "best candidate" theory of meaning, as espoused by Sider (2001, xxi-xxiv), whereby "meaning supervenes on use and eligibility." Fitness is about us, our use of expressions and the conventions involved that determine what our words mean. Eligibility is the

perspicuously limn the structure of reality than others; *ceteris paribus*, an interpretation that ties the use of a term with its maximally natural candidate meaning is better. As Sider (2009) points out, if there is an eligibility component to meaning, then a highly natural candidate meaning of the unrestricted quantifier is in the offing. We can then understand debates about composition as taking place in a language using this quantifier, one that is distinctive to fundamental ontology. In fact, we might proceed by stipulating ∃ to carry its most fundamental sense, one whose meaning is fixed by the maximally natural candidate meaning (whilst carrying the same inferential role as the original).[255] Following Sider, call this language *Ontologese.* The response to the deflationist is that even if disputes over composition are pseudo-disputes in *ordinary* discourse, there is still an important and sensible debate that can continue in Ontologese.

The aim of this section was to argue that nihilism is indeed internally coherent, and that deflationist objections can be reasonably set aside.[256] Are there

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degree to which certain candidate meanings of terms mark out the natural joints in the world better than others; they are "more eligible to be meant" (xxi).

[255] For more on this kind of operator and this kind of language, see Sider (2009) and Cameron (2010a,b) and Dorr (2008).

[256] Another kind of deflationism says ontological disputes of the kind the nihilist is engaged in are in some way, superficial. The nihilist is simply making a choice about linguistic terminology, and her disagreement with, e.g., the universalist, is on a par with a dispute among wine enthusiasts over whether sparkling wine from California is champagne. Those who take this kind of deflationary attitude towards ontological disputes think they are "merely verbal," and amount to nothing more than differing – but equally good— linguistic choices among disputants. For example, Eli Hirsch (2005, 2009) takes this kind of position. Of course, this is not the only form of ontological deflationism in the literature. For recent work, see, e.g., Thomasson (2007, 2009), and Sidelle (2002). Carnap (1950) and Putnam (1987) are important predecessors. For critical

other reasons to think nihilism is absurd? Yes. Another reason nihilism fails to get a fair hearing is because it denies a truism of everyday experience: composite objects exist. But misunderstanding the precise nature of this denial, according to van Inwagen (1990), is what causes most philosophers to disembark. In order to remedy this situation, the next section pays close attention to precisely what the nihilist means when she denies ordinary, everyday objects exist.

5.3 The Denial

The ontology of mereological nihilism is a very sparse ontology indeed. To its detractors, mereological nihilism involves claims no one in her right mind would be willing to accept. Despite such scrutiny, a handful of metaphysicians have chosen to defend it. In doing so, proponents invariably find themselves attempting to mitigate the radical nature of the nihilist claim that (composite) objects of everyday experience do not exist. Call claims of this sort by the nihilist, *the denial*.[257] My aim in this section is to show that once the denial is properly understood, nihilism no longer seems patently, outlandishly, false.

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discussion, see Bennett (2009), Hawthorne (2009), and Sider (2009, 2011, chapter 5, 9). As remarked upon in earlier sections, the present work sets aside arguments in favor of conventionalism, deflationism and other "anti-realist" positions.

[257] As far as I am aware, the phrase originates in van Inwagen (1990). Other efforts to ward off misconstruals of the denial can be found in Merricks (2001, chapter 1) and Sider (2013).

One way philosophers misconstrue the denial results from equivocating *mereological* nihilism with its more radical cousin(s), *metaphysical* or *ontological* nihilism. Metaphysical nihilists say there could have been no concrete objects at all. Ontological nihilists assert *nothing* exists. But the mereological nihilist does not say *nothing* exists: she is not a nihilist, full stop.[258] The mereological nihilist only denies composite objects—things with parts—exist. The nihilist is not in the business of denying that *some* things (perhaps elementary particles) cause me to perceive what looks like a table in front of me. Instead, the nihilist denies a single composite object (*the* table) is the origin of this percept. In this way, the mereological nihilist is doing nothing more than what other metaphysicians past have done: denied there is something of a particular kind, e.g., the nominalists' denial of *abstracta*, or the moral anti-realists' denial of ethical truths. To be sure, the varieties of nihilism are related; that is, they all deny some portion of what is normally considered reality is suitably "real". But that is where their similarities end.

A second kind of misconception about the denial is that entails perceivers are radically mistaken about the content of their percepts. Included here are characterizations of nihilism under which ordinary folk are victims of widespread perceptual error, or that their percepts are objectionably mind-

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[258] But see Hawthorne and Cortens (1995) and Turner (2011) for stimulating discussion of ontological nihilism.

dependent, or those that eschew nihilism as a form of external world skepticism. And, the thinking continues, since skepticism and widespread perceptual error are more closely aligned with science fiction than with science, nihilism is guilty by association and is to be dispensed with in similar fashion. This is a case of mistaken identity. No nihilists (none I am aware of, anyway) claim our everyday perceptual experiences are delusional or hallucinatory. Nor do they claim our perceptual systems are defective. Lastly, they do not typically hold views in line with other self-described anti-realists or conceptual relativists, or regard themselves as writing in the tradition of such philosophers.

A third misconstrual of nihilism assumes it must endorse a semantic theory under which common sense utterances are invariably false, or at best semantically defective.[259] Again, this is at odds with what proponents of nihilism actually say.[260] For example, van Inwagen (1990) argues at length that propositions expressed by utterances like "there are no chairs" are not inconsistent with what ordinary English speakers express by, e.g., "there are two very valuable chairs in the next room."[261]

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[259] And thus do not consider nihilism a viable option, perhaps for the reason that principles of interpretive charity instruct us otherwise.

[260] [Here you should point out the mistake of associating nihilism as analogous to moral error theories (e.g. Mackie); it is more akin to non-cognitivism in that it is conciliatory in spirit.]

[261] As detailed in Chapter 2, van Inwagen is not a mereological nihilist, except with respect to inorganic objects (like chairs). For more on van Inwagen's view, see both the Introduction and §10 of his (1990). For other attempts to avoid misrepresentations of the denial, see Merricks (2001, chapter 1) and Sider (2013).

Another reconciliatory strategy, suggested by Sider, is that utterances of ordinary folk are in important ways still *correct*,[262] even if (strictly speaking) untrue. Evidence for this view can be found by reflecting on how the cognitive and communicative roles of such utterances would closely parallel those of true utterances. For example, although ordinary language claims like "a campfire caused the forest fire" and "there is Queen Elizabeth's crown" are untrue, they are distinctively different than the way in which "phlogiston caused the forest fire" or "Queen Elizabeth is a toaster" are false.[263] Given certain standards of ordinary discourse, the former are in accordance with them; the latter are not. The sentences that are correctly assertible in ordinary language are functionally equivalent to the role played by true assertions.[264] Ordinary language existence assertions are importantly "truth-like," in the sense of Sider (1999), which characterizes presentist claims as at least getting at an "underlying truth" and as

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[262] Perhaps this is a kind of "norm of assertion;" at the very least Sider says "it would be sensible for creatures like us to adopt a system of conventions or norms that prescribe saying things like "there is a chair" in appropriate" on p. 13.

[263] Sider also offers (I think this is his considered opinion, but will have to check) a more robust interpretation upon which the folk speak truly, as he distinguishes between nonfundamental and fundamental languages. The central difference between the two is that the latter uses a fundamental sort of quantifier. See Sider (2011, chapter 7) and (2013, section 3). For different views of fundamentality and its cognates (ontological priority and dependence, grounding, etc.), see, e.g., Correia (2008), Schaffer (2009), and Sider (2011).

[264] This is not to deny there are some dissimilarities. In order for the truth conditions (of an utterance) "there are F*s*" to be satisfied, the world must contain F*s*, whereas the correctness conditions (of an utterance) "there are Fs" to be satisfied, the world need not contain F*s*.

such are accorded "positive status."[265] My point is not to deny that revisionary ontologies ought offer *some* account (e.g., a 'paraphrase scheme') that reconciles sentences of ordinary language with the underlying ontology. Rather, the point I am making here is that while nihilism may indeed require conciliatory semantics, this is not *in itself* a reason to reject it sight unseen.

5.4 THE THEORY STATED

When do things some things form a whole of which they are parts? Nihilism has a simple, straightforward answer: *never*. Nihilism is generally characterized as having both a negative and a positive claim. Negative: the thesis that there are there are no composite objects (things with parts). Positive: there are only mereological simples (things with no proper parts). Presumably, macroscopic material objects, if they exist, are composite. Thus the nihilist denies the existence of macroscopic material objects.[266]

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[265] In his (1999) Sider develops the notion of a quasi-truth, which (informally) is one that "philosophical niceties aside, is true" and "similar enough to the way [the world] would have to be for the sentence to be genuinely true."

[266] There are many variants of this theme, and not all of them are consistent with the thesis as stated above. Schaffer (2009) thinks nihilism is best understood as granting that composite objects exist; they are just not fundamental (and the only fundamental entities that exist are simples). I call this Schaffer-Style nihilism. As Schaffer puts it, "When the mereological nihilist denies that fusions exist, what she is denying is that such entities *ultimately* exist—she is denying that such entities are fundamental" (361). For a version of mereological nihilism that does not entail eliminativism about ordinary objects, see Contessa (2014). What I call *Sider-style* nihilism (2013a)

Formally, we may characterize nihilism as follows.

Mereological Nihilism: $\forall x \forall y(Pxy \rightarrow x = y)$

The ontology of mereological nihilism is a very sparse ontology indeed, especially in comparison to rival compositional theories. Qualitatively, there is only one *kind* of thing; mereological simples. Of course, the most common understanding of nihilism is that there are plenty of them, perhaps uncountably many.[267] But no matter how many objects there are, any compositional theory has more. Given unrestricted composition, for example, any world with n simples will have $2^n\text{-}1$ objects. On a quantitative scale, then, nihilism is also more economical than its competitors.

The nihilist regards composite entities as ontologically redundant. For if nihilism is empirically adequate, the postulation of composite objects in addition to a plurality of simples (and their relations) is gratuitous. Nihilists are the puritans of ontology: if positing something does no work, one ought not posit it. One way a nihilist might parlay her position into an argument is by pointing out that, given certain widely received views, composite objects do not earn their

is an interpretation of nihilism as the thesis that *fundamentally speaking, every thing is mereologically simple* (or: *fundamentally speaking, there are no mereologically complex things*.)

[267] But this need not be the case. Schaffer (2007) makes a compelling case that nihilism most naturally culminates into existence monism, which gives the nihilist the "simplest sufficient ontology" whereby there is only One partless whole, the World. (Schaffer does not defend existence monism).

keep in ontology. Consider, for example, the various forms of microphysicalism, all of which give ontological priority to subatomic particles (and the like) over their macrophysical counterparts (if such there be). According to one characterization of microphysicalism, all facts are metaphysically grounded in (or some similar notion) the microphysical facts.[268] According to another, all macro-level causation takes place in virtue of micro-level causation.[269] If this version of microphysics is correct, composites are superfluous to (at least fundamental) causal explanations. But then, the reasoning goes, if composite objects are causally redundant, we ought not posit them. Consider a situation we would ordinarily describe as a baseball crashing through a window. It seems once we describe the event in terms of interactions between fundamental particles and forces, any event able to be predicted or explained can be acquired solely through that information. According to the microphysicalist-*cum*-nihilist, no further information is needed. Countenancing the window and baseball in addition to an assemblage of interacting particles amounts to causal overdetermination. Why propose multiple causal levels when a single one will do the job?

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[268] Papineau (2008), Must a physicalist be a microphysicalist?, In Hohwy, Jakob & Kallestrup, Jesper (eds.) (2008). *Being Reduced: New Essays on Reduction, Explanation, and Causation*. Oxford University Press.
[269] Hutteman (2004).

A further point can be made: if a purported composite object's causal "powers" are determined by its parts, it is also 'explanatorily idle.'[270] But, again, if certain purported objects are explanatorily idle (we can tell a complete causal story without them), we ought not posit them.

For the mereologically inclined, microphysicalism can be understood as the thesis that all composite objects (if such there be) are composed of mereologically basic things: simples. Nihilism just takes the mereological characterization one step further and says all there is are simples. Arguably, certain facets of Lewis' Humean Supervenience lend support to this kind of characterization. Regardless of whether the nomenclature fits, there is surely something for the nihilist to like about the Lewis who says things like

> [A]ll there is to the world is a vast mosaic of local matters of particular fact, just one little thing and then another … we have a geometry: a system of external relations of spatiotemporal distance between points…And at these points we have local qualities: perfectly natural intrinsic properties which need nothing bigger than a point at which to be instantiated…All else supervenes on that (1986b, *x*).

> [Humean Supervenience] says that in a world like ours, the fundamental relations are exactly the spatiotemporal relations: distance relations…and perhaps also occupancy relations between point-sized things and spacetime points. And it says…the fundamental properties are local qualities: perfectly natural intrinsic properties of points, or of point-sized occupants of points (1994, 474).

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[270] I copped this term from Turner (2013).

So perhaps nihilism will appeal to believers in Lewisian Humean Supervenience who are also nominalistically inclined or have mereologically conservative scruples.

A BRIEF PAUSE

Before investigating nihilism further, there remains a question that needs addressing, which is: When the mereological nihilist claims there are only simples, to *what* exactly does she intend to refer? Certainly, the atoms of contemporary science cannot be our nihilist's atoms, for they apparently exhibit compositional structure. Without a corresponding empirical anchor on which to bank the notion of a simple, why consider nihilism a live option?

The most natural response here is that if matter is particulate in nature, *a posteriori* resources *will* warrant the tenability of nihilism.[271] Of course, evidence that nature is fundamentally particulate (rather than say, holistic) has recently been challenged. I say more about this in section 8. For the time being, the nihilist could suggest a number of ways mereological simples might be empirically cashed out, but insist she need not take a particular stance at this juncture. Mereological simples might refer to elementary particles, points of space-time, or

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[271] For more on why, see 5.9 on contingentism, and chapter 6.

even remain as an ontological place holder in a law-constitutive account.[272] Other options are available,[273] but since many virtues and costs of nihilism can be weighed without finer empirical detail, the formal conception is all we presently require. Meanwhile, is there anything the nihilist can say from an *a priori* standpoint?

A PRIORI CONSIDERATIONS

The concept of a whole is first and foremost (or perhaps most conceptually fundamental) understood as none other than the most fundamental kind of whole: an indivisible whole. The claim is that in order to have the concept of a "whole" or "some one-thing" we must already be able to think of that one thing *as* a one-thing; solely a one-thing. And that is very close to the concept of a mereological atom. The idea here is that a indivisible one (viz., mereological atom) is the conceptual limit (or ideal) of a one-thing as strictly speaking, *one*.

This idea is related, I think, to my point that, in the context of the Carnap and the mereologist thought experiment, one way to get Carnap and the

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[272] The kind of law constitutive account I have in mind would say that ultimate constituents of matter are whatever the laws (of our best physics) say they are. Brading (2012) suggests this was the approach of both Newton and Descartes in regards to bodies and composite systems of bodies. For other views that center on Laws as the metaphysical bedrock of reality, see French and McKenzie (2012, and references therein), who advocate understanding fundamental objects and properties along structuralist lines, which can then be law constituted in a number of ways, e.g., by "identifying particles in terms of the symmetries of laws."

[273] For example, a group theoretic account (Castellani 1998), or perhaps the elementary particles of a complete physics (i.e., if quarks turn out to have substructure).

mereologist to agree on "how many things" are in region R is IF we take, e.g., *a*, *b*, *c* to be atoms. This suggests that everyone at the table has a concept of some one thing that is irreducibly one.

I think there is something to the claim that in order to even think about composite individuals, we must first have the concept of "one" and to have that concept, we must first have the concept of an indivisible unit (e.g., 0). This idea here is that the concept of an indivisible unit, a "some one-thing" plays an important role in *a priori* reasoning. Indeed plural reference to "units" that are solely one-things or at least seem indecomposable (e.g., a person) seems conceptually prior to or at least simpler than singular quantification over composite ones that at least appear decomposable into many (e.g., a pile of sand).[274] It seems plausible that in order to think about plural reference to many ones, or to understand how one composite *is* composite (i.e., decomposable into many ones), we must first be able to think of a *one* one.

I submit that in order to structure and compartmentalize reality according to our concepts, the idea of a unit, a "one-thing" *is* an *a priori* (or: a required) concept. As Russell put it, "whatever *is*, is one." It is hard to imagine what it would be like to engage in metaphysical thought without the concept of some *one*-thing first (think: otherwise *one* thing that decomposes into many things—a

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[274] This appears to be one upshot of developmental studies on object permanence (cite Carey, Xu, Spelke).

composite—could not get off the ground). Summarizing, I have just argued that there is an *a priori* concept that is required before we can even properly consider problems that concern composition, decomposition (either finite or infinite); this is the concept of an indivisible unit, a one-thing that is only a one-thing.

5.5 MOOREAN OBJECTIONS

Common sense has it that composite objects populate the world around us: from mountains to magpies to marzipan, everything we come in contact with is composite. Moorean objections claim that our certainty regarding these matters are more entrenched (and justified) than any claims that could be brought against it. It is the platitudinous nature of such thoughts that inspired Moore to appeal to statements like "here is a hand" as evidence of an external world. Similarly, someone might invoke truisms about the composite nature of ordinary objects. It is just obvious that an orange is (partly) composed of its segments, or that a trunk is only part of a tree. Equally obviously, things with parts exist. Although nihilism has not often faced the most serious charges on this front,[275] in

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[275] Of course, there is ample extant testimony that is somewhat dismissivist towards (a mixture of) ordinary common sense and the like; e.g., Williamson (2004), van Cleve (1986) that (pre-philosophical) intuitive judgments about the everyday world of folk ontology do not, in general, provide substantial evidence for philosophical theories of fundamental anything, much less metaphysics. Dorr and Rosen (2002) write: To insist upon the epistemic authority of ordinary, everyday common sense in this context is to lapse into unappealing dogmatism… It would be a mistake for us – having raised the question explicitly – to defer to an authority which has never

its full force the Moorean objection would charge that nihilists underestimate the certainty of ordinary judgments about the nature of objects, and should be dismissed as too radical to take seriously. As Williams[276] characterizes it,

> It may nevertheless be unreasonable for us to change our beliefs to endorse the characteristic nominalistic or nihilistic claims. Aren't the beliefs we acquire through general education and common sense (—the number of my hands is *two*; —I'm sitting at a *table*, —the force required to accelerate an object is proportional to its *mass*) better entrenched than the revisionist's philosophical premises? Isn't it unreasonable to give up educated common sense, rather than the philosophical claims, if the two conflict? This is the *Moorean* challenge to revisionary ontology.

And here is McGrath (2008)

> Of course, there remains the *Moorean alternative*, which is to say that, even if it is unclear where and how the revisionary sides go wrong, they nonetheless overestimate the plausibility of the principles they appeal to and underestimate the plausibility – the *certainty* – of ordinary claims they take themselves to undermine. This epistemic mistake about relative plausibility leads them to make the mistake about the ontological facts.

My response to Moorean objections of this sort may disappoint some readers, for I will only make the briefest of comments, and then set Mooreanism aside. This is not because I think Moorean objections are somehow obviously wrong, or unimportant for nihilists to take into consideration, but rather that in order to thoroughly examine more pressing and complex objections, I have chosen to

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considered the matter. See Korman (2010a) for a defense of intuitive judgments about particular cases in material object metaphysics.

[276] Unpublished. See his Williams, J. Robert G., Requirements on reality.

limit others. My first response is that that the nihilist should point out that appeals to common opinion and intuition are not the final word in philosophical argumentation, which is often seen as a product of serious reflection on deep and controversial issues. In order to critically engage in attempting to solve or resolve puzzles such as those presented by the SCQ, it is necessary to consider the strongest arguments in favor of each solution; to dismiss it without argument or proper examination is the antithesis of this approach.

The perennial pull of moderate metaphysics stems, in part, from its respect of everyday, perceptual judgments and commonsense intuitions. Even if objections from these areas are set aside, the nihilist ought to provide some small response to a more serious charge in the vicinity, one that is implicated by reflection on *why* commonsense thought and judgments on matters of particular fact are so well entrenched. Perhaps we should take commonsense thought and opinion seriously not because of what they are, but because we have good perceptual evidence for what we ordinarily think and say.

5.6 THE GIVEN

The natural assumption that there is an objective world of extended, composite objects seems both automatic and obvious: it has the characteristics of what

Strawson (1959), among others, calls "the given." The given is that which we

cannot help but to perceive; ostensibly, a world chock full of composite objects.[277]

I agree this is perceptually given. I also agree that if nihilism could not provide

an explanation why, if there are none, composites are so entrenched in

perceptual experience, this would be a significant strike against it. My aim in this

section is to undermine some of the alleged motivations for thinking what is

perceptually given warrants belief in composite objects, and argue that nihilism

is materially adequate for what we do perceive.[278] For arguably, there would be

no perceptible difference between a world composed of mereological simples

distributed in a particular way as opposed to composite objects.

The nihilist needs to supply a reasonable story about *why* we perceive

what we perceive. Yet, it seems, armed with the tools and insights of cognitive

science, the nihilist is well equipped to do just that. Abundant evidence from

experimental psychology, primate studies, as well as developmental studies of

infant cognition, overwhelmingly confirms our experience of individual objects

is controlled and constrained by our visual hardwiring. Many developmental

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[277] Strawson's given is presumably about composite individuals, though he only speaks of "individuals" in a network of space and time (1959, p. 12). Others make similar statements about the perceptual given; Berkeley says that "…in truth the senses perceive nothing which they do not perceive immediately: for they make no inferences." And Armstrong (1976, p. 23) discusses the "completely uninferred element of perception."

[278] See Sider (2013) for a defense of nihilism against the charge that existence of composites is part of our evidence, and we therefore have knowledge of composites, given Timothy Williamson's (2000) argument that evidence is knowledge. Weatherson (2009, *ms*) argues that evidence is not knowledge.

studies concentrate on the object based nature of visual attention, including the primary features that individuate objects as distinct components of the visual field. For example, developmental scientist Elisabeth Spelke's research on infant cognition has generated widespread consensus that infants are come into the world predisposed to quantify over "cohesive, bounded, three-dimensional objects" that "move as a whole," as the primary constituents of their experience.[279] Related research by Scholl documents similar results in adult visual representation: the "objects" picked again and again are the familiar "Spelke objects," entities that exhibit spatiotemporal continuity, cohesiveness, and persist even though their properties may change.[280]

This helps explain how, though visual and cognitive scientists agree the information that reaches our retina provides *no indication* of (Spelke) objects or other demarcations of individuals (and thus no composite ones, either) we turn out to have perceptual experiences that indicate otherwise. As Scholl (2001) puts it, "visual processing begins with an undivided wash of unbound features, and results in the visual experience of discrete objects and events." Carey and Xu (2007) agree: at the input level, the information is "continuous," and that "the array of light on the retina….is not segregated into individual objects." (In fact,

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[279] Spelke (1990, 1993); see also Huntley-Fenner et al (2003),
[280] Scholl (2002a, 2002b, 2007), Carey & Xiu (2001; 2009), among others.

the visual information at the retinal level is not three, but two dimensional). But, as they are quick to point out, this input is transformed, for

> It is individuals we categorize into kinds; it is individuals we reach for; it is individuals we enumerate; it is individuals which we represent spatial relations such as "behind" and "inside"; and it is individuals that enter into causal interactions and events (ibid).

Scholl's (2007) article, written with an eye to metaphysical issues concerning objects, concerns the body of research in mid-level visual processing; an area which he says has the most relevance for contemporary metaphysics (since it primarily concerns itself with what philosophers call mental content). According to Scholl, the consensus of studies of object perception, persistence, and tracking is that certain elements of visual processing are "primitive," in that they are hardwired, occur early in infancy (and thus pre-conceptual), and arose early in phylogenetic development (2007, 56).

However, there is still room for dissent. A critic might observe that the nihilist has yet to explain why a species would have evolved complete with visual hardwiring that attends to (composite) macroscopic bodies if there simply are none in the offing. At the very least, perceptual experience gives us prima facie reason to think composites exist. If nihilists think there are no composite objects, only various and sundry simples arranged x-wise, then why do we see a chair (say), rather than a plurality of swarming subatomic particles?

In reply the nihilist should point out that the upshot of her claim is not that perceptual evidence implies nihilism, but rather that it is *consistent* with it. For perceptual evidence seems to leave open whether composite objects exist *in addition* to pluralities of subatomic particles in various arrangements and distributions. Thus nihilism is "materially adequate" in that it can "reconstruct" the world of common sense and science.[281]

A final point needs to be addressed. Does the nihilist require a kind of error theory in order to explain our everyday ordinary experience of a world containing composite objects? I submit she does not. That is, there is nothing misleading or illusory about our normal visual experiences. Consider figure 1, in which what we normally see is revealed as an illusion of depth and size (cite refs).

Fig. 1

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[281] This locution is from Sider (2008).

At the level of visual hardwiring, if one cares to look at the consensus opinion, this stuff is hardwired so early on in visual processing that it ought not to be called an illusion, for it's an evolutionarily *useful* optical approximation of the world we need to see to survive. It is unlike hallucinations or delusions, as there is absolutely no way to experience it other than how one does experience it, even if one knows that the "illusion" is what it is. Moreover, cognitively useful "illusion" adaptations are not illusions in the ordinary sense of the term: for mislead us they do not.

What the common sense respect for objects is about runs far below the radar of common sense. We are wired to believe in individuals; individuals that appear to have parts. We see our home; not electromagnetic radiation.[282] Our cognitive architecture has been fine-tuned by our evolutionary backstory to provide information that is useful to systems[283] such as ours in order to survive. This information may be most useful to us in streamlined and generalized (or approximated) form, considering the differences in scale between subatomic

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[282] And we cannot chose otherwise. Any ancestor who could had a terribly short life. As Feynman inimitably put it:

> The question of whether or not when you see something, you see only the light or you see the thing you're looking at, is one of those dopey philosophical things an ordinary person has no difficulty with. Even the most profound philosopher, sitting eating his dinner, hasn't many difficulties making out that what he looks at…still implies the existence of the steak…The philosophers that were unable to make that analysis…have fallen to the wayside through hunger.

[283] Recall the nihilist will be able to analyse "system" as a certain plurality of subatomic particles, a distribution of mass and energy, the actions of which constitute the macroscopic appearance of a single individual, a one-thing.

particles and macroscopic bodies this is entirely plausible. We certainly do not need to see subatomic particles that have no causal powers over us in small numbers. Even if a tiger is—as the nihilist might characterize it—a smeary interaction of hadrons and leptons, it may still be evolutionarily adaptive strategy for our visual system to approximate the macroscopic results of such activities as a single individual that is hungry for dinner.

5.7 SIMPLICITY

The appeal of nihilism is most greatly felt by reflecting on its simplicity. Among philosophers in general, and metaphysicians in particular, lovers of desert landscapes find strength in austerity. This section articulates how Nihilism exhibits this appeal on a variety of fronts.

5.7.1 WAYS TO BE SIMPLE

Metaphysicians often distinguish between a theory's *ontology* and its *ideology*.[284] The ontology of a theory concerns what objects there are. Its ideology concerns the primitive concepts a theory employs.[285] Taken one step further, let a theory's *ontological commitments* be the number of entities whose existence is required for

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[284] For historical precursors, see Quine (1951; 1953). For more recent examples, see Sider (2013), Cowley (2014).
[285] Alternatively, they are the "core undefined expressions" (Sider 2008).

the truth of theory. Similarly, let a theory's *ideological commitments* be the number of primitive concepts it employs. Now, as far as theoretical virtues go, metaphysicians generally champion minimizing both kinds of commitments.[286] In other words, they are committed to both ontological and ideological parsimony. *Ontological Parsimony* demands austerity in our ontological commitments.[287] *Ideological Parsimony* demands austerity in our ideological commitments. These virtues can be unpacked a bit more by extending the notions to include not only quantitative, but also qualitative, forms of parsimony.[288,289] Quantitative parsimony concerns minimizing the number of ontological or ideological commitments of the theory. But, as others point out,[290] purely quantitative parsimony cannot be only factor in evaluating commitments.

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[286] Consider: defenses of physicalism against dualism, defenses of nominalism against universals, defenses of modal realism + sets that minimize ideology (the kinds of things postulated, e.g., propositions, a la Lewis 1986).

[287] Basically, a theory is ontologically simpler if it quantifies over fewer entities or kinds of entities than its rivals.

[288] There are other kinds of simplicity I do not have the space to discuss here, e.g., simplicity of laws (of nature). One comment will have to suffice: Jettisoning parthood relations from our ideology will effectively reduce the complexity of fundamental laws of nature that formerly made use of them (cf. Sider 2013).

[289] See, e.g., Lewis (1973) Nolan (1997) Sider (2011).

[290] E.g., consider Sider (2013, 5), who writes that, "merely counting primitive notions is too crude a measure of ideological simplicity, since one can always replace many predicates with a single many-placed predicate; the many-placed predicate would be, in an intuitive but elusive sense, a highly complex notion despite being one in number." Intuitively, we might seek some kind of constraint whereby the minimal length of the primitives stated in perfectly natural terms (a la Lewis) or in the fundamental language (a la Sider) could play a role here. See also Nolan (1997) and Cowley (2013).

Qualitative parsimony—that is, minimizing the number of *kinds* of commitments

is of equal (some would say greater)[291] importance.

5.7.2 PARSIMONY

Such nitpicking over the niceties of parsimony could be taken as (partial)

evidence of philosophers' veneration of it. And value it they do. Why? A number

of answers come to mind—not a one of which is fully satisfying—though

together they achieve a certain amount of credibility. A glance at the relevant

literature tells us that some philosophers think simplicity is a guide to truth.[292]

And some maintain a particular motto of the middle ages that one ought not

multiply entities beyond necessity. Others say simplicity increases explanatory

power.[293] Various others champion simplicity as an inductive inference drawn

from scientific case studies.[294,295] A worry arises: what has been argued for is only

the *empirical* or *scientific* value of simplicity, whereas what is wanted is a defense

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[291] E.g., Lewis writes: "I subscribe to the general view that qualitative parsimony is good in a philosophical or empirical hypothesis; but I recognize no presumption whatever in favor of quantitative parsimony" (1973, 87). See Nolan (1997) for a defense of quantitative parsimony.

[292] E.g., that simplicity is an epistemic virtue (Harman, 1997).

[293] Baker (2003).

[294] E.g., Baker (2003) argues that quantitative parsimony often brings with it other theoretical benefits; in particular, explanatory power.

[295] This claim could be supported, e.g., by an inductive argument based on successes of empirical science, or as an inference to the best explanation, based on those same successes. If predictive success converges on truth, then simplicity is a guide to truth (*ceteris paribus*). If we accept (in general) that theoretical virtues in science are usefully extended to metaphysics, then simplicity can also be a guide to truth in metaphysics.

of the *philosophical* value of it.[296] Are lovers of desert landscapes merely trying to mimic their scientific brethren?

I doubt it. We are not comparing the value of simplicity in physics with its value in *Hoysala* Temple design. There is a strong analogy between theorizing in fundamental metaphysics and theorizing in fundamental physics: each domain endeavors to uncover insights about reality's deep structure. This analogy suggests that if fundamental physics finds value in parsimony, then metaphysicians seeking to reveal fundamental ontological structure are wise to follow suit. If we take on a naturalistic mantel to "follow the science" in doing fundamental metaphysics, it seems reasonable to follow their lead in the relevant theoretical values as well.

After all, if all extant answers to the SCQ are materially sufficient, a comparison of theoretical virtues seems reasonable, at least insofar as it may help to illuminate whether one has a relative advantage over its rivals.[297]

For the moment, let us suppose that all offers are indeed equally matched (as seems to be the case) in terms of explanatory sufficiency, empirical adequacy, and other theoretical virtues. Nihilists can then claim a two-fold advantage over compositionalists in respect of parsimony: (1) ideologically, since there are fewer

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[296] "What makes parsimony reasonable in one context may have nothing in common with why it matters in another." (Sober 1994).

[297] But see Bennett (2009) for an argument to the effect that the nihilist must "buy her way out of ontology with the coin of ideology," e.g., in the form of highly structured properties or predicates.

distinct primitives, and (2) ontologically, since only mereological simples

exist.[298],[299]

What the above is not claiming is that parsimony is the only virtue of

value in metaphysics (or science, for that matter). By all accounts, a theory ought

to have explanatory power, fertility, conservativeness (fit with previous held

beliefs), and mesh well with its theoretical neighbors. But, as just articulated, we

are supposing that our assessment is correct—all theories are on equal footing

with respect to other virtues. It is then that parsimony acquires a distinguished

role.[300] It is for this reason that the nihilist can claim ownership of the most

parsimonious theory amongst the options. This is a very strong suit.[301]

5.8 CARTESIAN ARGUMENTS

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[298] This claim is arguable. Schaffer (2007) makes a compelling case that it is monism that truly delivers what the nihilist requires ("the simplest sufficient ontology"), for it posits only one simple, the Cosmos.

[299] Varzi (2014) states "it is a fact that the models of a theory *cum* composition principles tend to be more densely populated than those of the corresponding composition-free theories. If the ontological commitment of a theory is measured in Quinean terms—*via* the dictum "to be is to be a value of a bound variable" (1939: 708)—it follows that such theories involve greater ontological commitments than their composition-free counterparts."

[300] As Sider (2013) tells us, "we turn to simplicity only when multiple theories fit the evidence…"

[301] Another objection stems from Schaffer's (2003) arguments against the existence of a fundamental level (where the fundamentalia have ontological priority). In the course of arguing against a methodological presumption in favor of atomism over infinite divisibility, he writes that "economical preferences" cannot bear that much metaphysical weight; we need empirical evidence in addition to methodological considerations. Section 8 of this chapter discusses arguments against nihilism based on incompatibility with (fundamental) physics.

Another objection often leveled at nihilism stems from Descartes' *cogito*. Basically, it goes like this. I am entitled for Cartesian reasons to believe in my own existence (viz. *cogito*). So I exist. But I am composite. So composites exist. Any nihilist worthy of her game is has to confront this fortress of philosophical reasoning. She needs to present a case against the following argument.[302]

> D1. If I think, then I exist
> D2. I think
> D3. I exist
> D4. I am composite
> D5. Something composite exists

The argument is valid. But the nihilist will say D4 is false, and that whatever supporting arguments are needed for the truth of D4 (e.g., remember van Inwagen's argument: (1) I exist (2) I have parts (3) Composites exist) will be illegitimate in this context. However, there are reasons to think another stronger argument is in the vicinity. Surely there is some intuition or reasoned judgment that warrants the use of "I"—it seems natural and obvious enough. Perhaps there is something about thinking, or consciousness, that underwrites this intuition. I submit it stems from the idea that somehow, a "mere many" cannot engage in thinking; there must be a singular subject at the helm. But that is something to be argued for, not assumed.

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[302] Hell, we might all be nihilists otherwise: "Thanks, God, for Descartes, else I might've thought I was not." —*excerpt from Recovering Nihilists' Breakfast Prayer.*

At any rate, a neutral formulation of the cogito--one that does not presume the "I" is singular in reference—does not entail the desired conclusion. For nihilism can accept that, say, some xs are arranged thought-wise. My point can be put a bit more rigorously. Consider the content of D1—D4, above. The premises rely on the implicit assumption that a single object is the subject of the propositions.[303] However, to be fair to the nihilist, the premises ought not presuppose the existence of a composite entity, for this claim is precisely what is at stake. Of course, if one *were* to employ a neutral characterization of the *cogito*, one that takes "I" to be capable of irreducibly plural reference to a mere-many, D4 comes out false. According to the nihilist, an improved characterization of cogito style arguments will imply a conclusion that is more perspicuously plural, like "there is thinking" or "thinking is occurring now." At any rate, she would contend, a proper conclusion ought not exclude the possibility that many Xs (i.e., mereological simples) are engaging in the process of (or an event that is) thinking[304]—a possibility that becomes particularly relevant when examining the argument against the backdrop of the SCQ.

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[303] If they did not, then the move from 4-6 would be illegitimate.

[304] Or as van Inwagenese would express it: many xs arranged thought-wise.

It is instructive to note that Descartes' arguments in Meditation VI, the mind is *not* composite; the "I" which thinks is essentially indivisible.[305] It is only on the further contemporary assumption that Descartes was wrong about the referent of "I" that ammunition can be marshalled against the possibility that pluralities may be arranged thought-wise. But if Descartes could be wrong about the metaphysical correlate of "I," (i.e., that it is an indivisible soul) believers in composites must offer some support for thinking they are not in a similar situation in assuming a single composite individual is what is thinking. So, for example, it seems that any cogito style argument against nihilism should make the case that the following statements are equally indubitable.

(1) I am thinking.

(2) The "I" that is currently thinking is one single individual, and

(3) The "I" that is thinking has parts (is composite).

My point here is that while (1) may be indubitable, (2) and (3) are not.

Notice if the conclusion of the modified cogito is more charitably formulated—e.g., as "there are thoughts" or "thinking is occurring,"[306] that is

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[305] "[T]he body is by its very nature always divisible, while the mind is utterly indivisible. For when I consider the mind, or myself in so far as I am merely a thinking thing, I am unable to distinguish any parts within myself…"(CSMK; II, 59).

[306] Others have also noted this error, albeit with different aims in mind. For instance, Russell remarks that Descartes "nowhere proves that thoughts need a thinker, nor is there reason to believe this except in a grammatical sense" and later that it "does not describe a datum." (Russell, 567). For more on the history of this topic, see Williams (1978, Ch. 3). Williams, Bernard. (1978). *Descartes, The Project of Pure Enquiry, that talks about the history of this issue*.

sufficient to show that—on a more neutral reading—a nihilistic version of the cogito is available (and sound).

A related worry might have more to do with the lack of a plausible explanatory story on behalf of the nihilist. More specifically, the worry is that even if we grant that composite wholes[307] are not required for consciousness, they still offer the best explanation of it. Therefore, the worry continues, we should be wary of nihilistic arguments to the contrary. The onus is on the nihilist to provide a satisfactory answer.

I have argued that "thinking is occurring" (or the like) is the correct way to capture the *cogito's* conclusion. In addition, the premises use of "I" does not guarantee a composite whole is the referent of that term. That said, merely showing nihilism is consistent with one rendering of Descartes' argument does not show much about other arguments in the vicinity, for example:

C1: I am conscious

C2: Consciousness is necessarily or essentially unified.

C3: Consciousness is a brain process (or state)

C4: Brain processes (or states) are composite

Therefore, I am composite.

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[307] My use of "composite whole" here is intentional, and should not be construed as redundant. First, it underscores the believers thought that selves are a paradigmatic case of something that is both one (self) and many (i.e. selves have parts). Second, the phrase is intended to evoke an understanding analogous to composite whole numbers in mathematics,
i.e., whole numbers greater than 1 that are not prime (indivisible by nothing other than 1 and themselves). I continue to use this phrase throughout the remainder of this section.

Believers in composite objects can argue from introspection and the authority of self-knowledge that C2 is true.[308] Empirical evidence underwrites both C2 and C3. I lack the space to conduct a detailed examination of this alternative, here are some brief remarks. I think the nihilist can undermine support for C2, for it seems unlikely the truth of it can be established via introspection or self-knowledge for several reasons. First, persons with psychiatric disorders, split-brain subjects, and those in hallucinogenic states are commonly held to have *dis*unified consciousness.[309] Secondly, it is possible our senses misguide us in representing our selves *as if* we are composite wholes.[310] Consciousness of a unity does not imply unity of consciousness. In fact, one could agree the experience of consciousness is necessarily holistic, but still maintain the underlying cause is (irreducibly) plural in nature.

5.9 PHYSICS INCOMPATIBILITY

There are several ways contemporary quantum physics[311] can be utilized in arguments against nihilism. In fact, nihilism faces some of its most serious

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[308] For example, this move could be justified via an argument from the authority of self-knowledge. Basically: (so-called) "privileged access" arguments provide us with ontological certainty that "I am a composite whole" is true. For more on privileged access, see Gertler (2003). For more on the unity of consciousness, see Tye (2003).

[309] See Tye (2003). Though this has recently been challenged by Bayne (2010). See Prinz (2013) for discussion and an account that allows disunified states of consciousness.

[310] This claim is similar in spirit to the critique levelled in § 1 regarding the coherence of nihilism, for one might argue that a suitable principle of unity *is* what makes some things compose a whole (e.g., that a sufficient condition for being a composite whole is that many simples are able to jointly engage in unified conscious experience).

[311] In what follows, I restrict my attention to realist theories of quantum mechanics which regard the wave function as a concrete physical object. For discussion see Albert (1996). This

challenges on several fronts in this area.[312] I do not address all of these in this section. Instead, I restrict my attention to three particular objections. Each of these is but one token of a more general kind of argument levied against nihilism, the conclusions of which are

1. There is a lack of evidence for fundamental (mereological) simples.

2. There is good evidence for composites.

3. There are reasons to think there may be exactly one fundamental thing or that there is exactly one thing, period.

The next sections consider their corresponding token arguments:

1. The No Legos argument

2. Entangled systems

3. Wave function monism

5.9.1 NO LEGOS

In §5.7 I explained why parsimony is nihilism's greatest strength. One claim made there was that parsimony is of value in fundamental metaphysics because

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significantly simplifies the discussion, and, as far as I can tell, has no impact on the arguments at hand, especially since metaphysical realism is assumed throughout this dissertation. For discussion, and a philosophically mature introduction, see Albert (1996). For the most part, I do not discuss related areas in physics, like (relativistic) quantum field theory or quantum gravity.
[312] Many of which cannot be addressed here, e.g., the objection that composites are needed in physical geometry (in the form of paths and regions). For discussion, see Sider (2013, §11). Others: Uzquiano (2011) suggest gunky spacetimes are hostile environments for mereological simples (and vice versa). See also Hawthorne and Weatherson (2004 n19).

we should "follow the science," and parsimony is a theoretical virtue of fundamental physics. That was a point about methodology—should we say the same regarding ontology? The next sections focus on what fundamental physics has to say about the *ontology* of the world. For while it is generally agreed that Newtonian mechanics of centuries past is most naturally regarded as one in which point-like particles of matter are fundamental,[313] one cannot say the same with regard to quantum physics, where the consensus view is that what is fundamental cannot be read off the mathematical formalism in a straightforward way. Ontologically speaking, and painting the picture in broad strokes, different interpretations of quantum mechanics make different claims concerning the fundamental ontology of the world. But mereological nihilism places a constraint on fundamental ontology, and by extension, fundamental physics. If there are no fundamental building blocks, no truly basic particles, then nihilism is not materially adequate.

Even so, some claim that whatever the fundamental nature of the universe, the "ground floor" is unlikely to contain fundamental building blocks, ultimate scientific particles, and the like. I address an inductive argument to this effect below. Other incompatibility arguments—ones I have neither space nor

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[313] "God in the beginning formed matter in solid, massy, hard, impenetrable, movable particles ..."(*Optics* bk. 3 p. I p. 400; quoted in *The Cambridge History of Science: Volume 3, Early Modern Science*, edited by Roy Porter, Katharine Park, & Lorraine Daston.

proficiency to consider could be arrived at from physics' understanding of so called "identical particles"[314] or from the claim that quantum fields are more basic than their associated particles.[315]

The *No Legos* challenge to nihilism says we have inductive reasons for thinking no fundamental physical simples are in the offing. Support for this claim comes from the history of science in general and fundamental physics in particular. To get us started, recall that one way nihilism's positive claim could be cashed out is if future physics finds fundamental building blocks—the *Legos*— upon which the structure of reality is built. But then it seems someone could object as follows:

> *Our best science once told us things that turned out to be molecules were the most fundamental constituents of matter (earth, air, water). But that proved false. Then science told us that atoms were the most fundamental constituents of matter. But that proved false, and just as atoms were formerly thought to be fundamental building blocks, they were found to be made of other, more fundamental parts*

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[314] If mereological nihilism is the theory that every existing thing is a mereological atom, and if to be an atom is to be an individual complete with criteria of identity and diversity ("no entity without identity"), then nihilism seems to be at odds with quantum physics' understanding of subatomic particles, which lack individual "thisness". For example, electrons, which all share essential properties like spin, mass, and charge (quiddity) lack unique individuality or "primitive thisness" (haecceity). This matter is the subject of current debates in the philosophy of physics. I have neither the space nor expertise to adequately discuss the debate over whether elementary particles are individuals. See, e.g., Saunders (2003; 2006), French (2003), Stachel (2006), Teller (1998). For more on haecceity and quiddity see Adams (1979).

[315] No one I know of makes this argument against nihilism *per se*, but the general "received view" in (relativistic) quantum field theory (RQFT) is that particles are at best a *facon de parler* for field interactions; the mathematical representation of particle-like entities is not supported by the formalism (at least not in the intuitive sense, according to which particles are localizable and countably additive). See Malamet (1996), Halvorson & Clifton (2002). For critical discussion, see Bain (2011). For philosophically sensitive introductions to QFT see Huggett (2003) and Kuhlmann (2006).

> *(nuclei and electrons). Now science says the fundamental constituents are quarks, leptons and gauge bosons. The possibility that there are no fundamental parts, that mereological relations never bottom out at any kind of truly fundamental particle, is inductively supported by the history of science.*

There are a number of versions of the above scenario in the literature. The similarities between them stem from their use of inductive reasoning and the possibility of infinite mereological descent.[316] For example, Hawthorne and Weatherson (2004, 339) entertain a similar scenario in order to facilitate a discussion of supertasks in a gunky world:

> Atomism, the view that indivisible atoms are the basic building blocks of physical reality, has a distinguished history. But it might not be true. The history of physical science certainly gives many of us pause. Every time some class of objects appeared to be the entities that Newton had described as 'solid, massy, hard, impenetrable, movable Particles' out of which 'God in the Beginning formed Matter,'' further research revealed that these objects were divisible after all. One might be tempted to see that history as confirming Leibniz's dismissal of atomism as a "youthful prejudice." Perhaps material objects and their parts are always divisible. There are no extended atoms; nor are there point particles which compose material beings.

Although the authors are not concerned with nihilism *per se*, they rehearse a story that could be levelled against nihilism's positive claim of the type we are currently examining. Schaffer (2001, 2003) enlists a similar scenario as a prelude to a further argument involving atomism, which he characterizes as the claim

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[316] The quotations in this section are not intended to suggest that the authors are targeting nihilism *per se*– the possibility of infinite mereological descent is a matter of metaphysical interest for a variety of reasons.

that "there are no macroentities at all but only fundamental entities in various arrangements." He writes:

> Indeed, the history of science is a history of finding ever-deeper structure. We have gone from ''the elements'' to ''the atoms'' (etymology is revealing), to the subatomic electrons, protons, and neutrons, to the zoo of ''elementary particles'', to thinking that the hadrons are built out of quarks, and now we are sometimes promised that these entities are really strings, while some hypothesize that the quarks are built out of preons (in order to explain why quarks come in families). Should one not expect the future to be like the past?

The next section examines some ways the nihilist could respond.

A HASTY GENERALIZATION

As an initial move, the nihilist should reject the enumerative induction as a hasty generalization. As Sider (2013) observes, inductive inferences like those above are too weak to carry any evidential weight. After all, the first (imaginary) scenario enumerates only four cases of decomposition into more fundamental parts, and then rushes to the conclusion that *all* parthood relations admit of *infinite* descent. The second doesn't fare much better. Both extrapolate from the finite to the infinite and from some structures to all structures. In a similar vein, Sider compares the above type of induction to an argument that there must be

infinitely many people, since for each person observed, there exists one who is taller.[317]

By way of a second reply, the nihilist can just stand her ground and hold fast to her minimalist principles—in this case, parsimony. She could contend that a theory upon which matter bottoms out at a fundamental level (or on which there are smallest bearers of fundamental properties) is simpler than one on which there is infinite mereological descent of fundamental entities (or properties). *Ceteris Paribus*, simplicity is a guide to truth, and thus she is right to maintain minimalist scruples.[318] Callender (2001) reacts similarly:

> [F]rom the point of view of scientific methodology, there is a striking asymmetry between our two hypotheses about the structure of nature. The obvious point to make is that a theory appealing to only a finite descent is far simpler than an infinite descent model. Simplicity is perhaps the cardinal theoretical virtue of scientific theories (cite page refs).

By way of a third reply, the nihilist may contend that in science, conservatism remains a valued and viable virtue. If positing something does not contribute to our scientific understanding of reality, and evidence for it is weak (at best), we ought not posit it. Ontologies with fundamental building blocks provide a

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[317] Sider (2011, p. 135), who thanks Cian Dorr.

[318] I'm not sure how much weight to give the following remark by Russell (1928, 292), who offers the following criticism of (Whiteheadian) gunk: "Let us begin with the absence of a lower limit or minimum. Here we are confronted with a question of fact, which might conceivably be decided against Dr. Whitehead, but could not conceivably be decided in his favour." In other words, science could conceivably show that matter is atomic, whereas is could never prove it is infinitely divisible.

straightforward explanation of the macroscopic world that is lacking in ontologies of infinite mereological descent.[319] An example: Consider any ordinary object—a child's toy castle, say. Now, say the child asks what the castle is made of. You reply that it is made of Legos (and that's it, full stop). Given the Legos as building blocks, you have a satisfactory reply. But imagine your answer contains an explanation of Legos, made of other Legos, that are made of even more Legos, *ad infinitum*, perhaps traveling up the set theoretical hierarchy to strongly inaccessible cardinals.[320] Your description of what grounds her experience is truly a never-ending story. To parlay some of Schaffer's (2003) own words into service, "Being would be infinitely deferred, never achieved."

A POSTERIORI EVIDENCE FOR SIMPLICITY

As will become apparent further along in the present section, I think *a posteriori* evidence has an important role to play in any account of composition. For now, however, let me just point out how the nihilist can parry inductive claims about

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[319] Huemer (2009) lays out solid reasons for the presumption of simplicity in science, and also contends that infinities are less simple (e.g., they have no upper bound) than theories that are not (for they converge towards 0). For further discussion about the justification of parsimony in science, and some critical discussion concerning parsimony in philosophical methodology see Huemer (ibid).

[320] Assuming that hypergunk is just as plausible as gunk. Cf. Nolan (1997). For some critical discussion, see Hazen (1999).

infinite mereological descent (like Schaffer's) with an inductive argument of her

own. For example, uncovering the reasons that lie beneath reasons behind certain

well entrenched "methodological" presumptions can reveal equally compelling

evidence for fundamentalia. By way of introducing my present point, notice that

not all methodological presumptions are *a priori*—some are genuine products of

inferential reasoning based on empirical cases. In particular, the methodological

presumption I have in mind—simplicity—seems to be paradigmatically so.

Here's why. First, I seriously doubt scientists value simplicity because of some

deep-seated conceptual revelation—scientists value simplicity because there is

strong inductive evidence of its empirical value.[321] That leads me to contend that

the presumption of simplicity in scientific theorizing is distinctively *not a priori*.

Not only is it attractive for its success (predictive accuracy, that kind of thing)—

there is also a wealth of inductive evidence that simplicity is an *epistemic* virtue.[322]

So although the inductive argument as first set out maintains there is enough *a*

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[321] If the laws of nature are contingent, there are helter-skelter worlds in which simplicity is definitely *not* a virtue.

[322] The catalog of cases in which simplicity has panned out is extensive, so let me just point to some of the more obvious ones: the "Copernican revolution," Einstein's special theory of relativity, and the Darwinian theory of evolution. Even the structure of DNA—a double helix—is mathematically elegant. Certainly scientists' valuing of simplicity is a case of inductive reasoning (or inference to the best explanation) from past successes. For further discussion about the justification of parsimony in science, and some critical discussion concerning parsimony in philosophical methodology see Huemer (2009). Huemer lays out solid reasons for the presumption of simplicity in science, and also contends that infinities are less simple (e.g., they have no upper bound) than theories that are not (for they converge towards 0).

posteriori evidence to settle this fight, I say we already have it.[323] Inductive

evidence from the history of science reveals that choosing the simplest theory

(*ceteris paribus*) is an epistemic virtue.[324] In this vein, Callender's (2001) response

to Schaffer agnosticism[325] regarding fundamentalia seems right on point:

> The fundamental problem is that we shouldn't posit what we don't have evidence to posit. Schaffer's theory needs a shave from a certain medieval nominalist. Schaffer is not supposing that there is some phenomenon that quantum field theory cannot account for, a phenomenon requiring the existence of lower levels. The infinity of levels below quantum field theory are completely redundant. There is no phenomenon (broadly construed) that their existence would explain. Isn't positing such entities, an actual infinity of them at that, committing the gravest sin one can in scientific methodology? As Newton said, "Nature does not affect the pomp of superfluous causes." This is not *a priori* true, but rather it seems supported by the history of science.

Agreed.

5.9.3 EVIDENCE OF COMPOSITES

Another, more serious, challenge for nihilism is that quantum mechanics seems

to require composite objects. This is because certain complex systems it describes

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[323] Schaffer uses inductive evidence from history to provide evidence for the "myths" of atomism. How is inductive evidence for a methodological presumption any different?

[324] For example, Nolan (1997) remarks on the fact that physicists don't go around positing, say n^{17} particles to explain a certain (class of) phenomenon: they apply quantitative parsimony instead.

[325] This is not to say I completely disagree with Schaffer's agnosticism, for reasons that will become clear in due course (section 9). My main point here is that the historical success of a methodological presumption of simplicity can be taken as *a posteriori* evidence in favor of fundamentalia. The inductive arguments stand on equal footing, by my lights.

do not seem amenable to decomposition.[326] One kind of complex system that exhibits evidence for composites is given by entangled systems. This section first gives a rough account of what physicists mean by entangled systems. Next, I present some evidence for thinking entangled systems are in fact indecomposable (fundamentally composite). Potential responses from the nihilist follow.

5.9.4 ENTANGLED SYSTEMS

As Sider observes, nihilists have a (comparatively) difficult time "grounding scientifically ultimate features of complex systems that resist decomposition into features of individual subatomic particles" (2008, n9). Although he is not explicit about what kind of complex systems he intends, one that easily comes to mind is multiparticle systems, most of which have quantum states that are "entangled." The property of entanglement is often thought to show that such composite systems are indecomposable into their component parts. Of course, in order to discuss whether this is truly an issue for the nihilist, we first need to know a little bit about what an entangled state of a multiparticle system *is*, and also why one would think it is irreducibly composite. In order to do that in a conceptually

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[326] Sider (2008; n9), observes that nihilists have a (comparatively) difficult time "grounding scientifically ultimate features of complex systems that resist decomposition into features of individual subatomic particles."

intuitive way, I am going to avoid the technical jargon and mathematical formalism necessary for a detailed and even marginally thorough account of such systems, which can easily be found elsewhere in the literature.[327] This is in trade, hopefully, for a more mereologically perspicuous account, which better suits our present goal, which is to figure out, at least in broad strokes, whether the nihilist can redeem her position in light of these purported composites.

For starters, consider a simplified one particle system (e.g., an electron). Let us express the quantum state of it having the property of being located[328] at (1, 0, 0) as

$$\Psi_1 | (1, 0, 0) >$$

As is generally understood, particles in the quantum world can evolve into states that are called superpositions. Think of the superposition as all the theoretically possible ways our electron could have a particular (intrinsic) property; in this example, all the ways of being located within certain parameters. Here is a representation of our electron in superposition of being at location (3, 0, 0, 0) and (6, 0, 0,):

$$\Psi_2 | = \sqrt{\tfrac{1}{2}} | (3, 0, 0) > + \sqrt{\tfrac{1}{2}} | (6, 0, 0) >$$

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[327] E.g., the introduction in Ney (2013), North (2009), and Allori (2012). What follows relies heavily on Ney (ibid) in both presentation and content.

[328] I use "location" here for expository reasons; I would think a physicist would say I should call them "positions."

Call each location A and B, respectively. If our electron is in this state of superposition, none of the following statements about it are true:

- It is at location A.
- It is at location B.
- It is at both location A and location B.
- It is neither at location A nor at location B.

What is true is the following. If we measure our electron's location, it has a 50% chance of being located at A and a 50% chance of it being located at B, and zero chance of finding it anywhere else.

Now imagine a combined particle system, consisting of a positron (p) and an electron (e). We will treat these particles just like we did the one above. That means each particle also obeys the superposition principle. If these two interacting particles are in superposition then A and B are possible states of each. So we have

$$\Psi_3| = \sqrt{\tfrac{1}{2}}|(3, 0, 0)_p| (6, 0, 0)_e> + \sqrt{\tfrac{1}{2}}|(6, 0, 0)_p |(3, 0, 0)_e >$$

If our particles are in superposition with respect to their position, *none* of the following statements are true:

- p has determinate location at (3, 0, 0,).
- p has determinate location at (6, 0, 0,).
- e has determinate location at (3, 0, 0,).
- e has determinate location at (6, 0, 0,).

What is true is the following. If we measure our particles' locations, there is a 50% chance of finding our positron at A and our electron at B. There is also a 50% chance of finding our positron at B and our electron at A. There is no chance of finding them anywhere else. Notice that in this combined state, neither the location of the positron by itself nor the location of the electron by itself can be predicted with certainty.

However, there are things we know about the *combined system* of particles. That is, we can know with certainty we will always find them correlated in the following way: the pair will always be found at a distance of 3 from one another along the x dimension. Their states are correlated: they are *entangled*. The "parts" of the composite system do not have determinate or "intrinsic" properties (here, locations), only the composite does. As Schrodinger put it, "a complex state of the whole system… contains more information than can be inferred from the individual parts." Earman and Roberts (2005) put this characterization of entanglement in plain English:[329]

> according to quantum mechanics, there exist entangled states of composite physical systems in which multiple, space-like separated sub-systems have a joint state, though none has its own state characterizable in terms that refer only to its own spatiotemporal location. Hence, the

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[329] More technically, Schaffer writes, "An entangled system is one whose state vector is not factorizable into tensor products of the state vectors of its *n* components." E.g., we have a one particle system with spin up, represented by a vector in a two dimensional space, and a separate one particle system with spin down, represented by a vector in a different two dimensional space, the *pair's* spin state will be represented by the *product* of those two dimensional vector states, which is a four dimensional space $\Psi = 1/\sqrt{2}$

quantum state of a composite system does not, in general, supervene on states of its separate, "point-like" parts.

This inability to write the combined state as the product of the individual states, says Ney (2013), is the "distinctive feature" of an entangled state and characterizes entangled states as "superpositions involving multiparticle systems." It is widely thought that such states reveal a certain amount of ineliminable holism present in quantum phenomena.[330] As Ghirardi (2013) puts it, "the phenomenon of entanglement [entails] in the most extreme case… that the constituents of a composite system do not possess any objective property; only the system as a whole, when it is isolated, has some properties."

I think the nihilist has a few moves she can make in response to the charge that entangled states do indeed provide evidence of irreducibly composite systems. The next section briefly considers one of those, which utilizes the notion of irreducibly plural quantification.

PLURAL QUANTIFICATION TO THE RESCUE?

One response available to the nihilist is to say that just because a certain property can only be ascribed to a number of things collectively (a "system"), and not the things taken individually, need not entail there is a single, composite entity that

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[330] For more on holism in quantum physics, see (cite Maudlin, or some other ref from SEP on holism in QM.

is the bearer of that property. All the nihilist needs, apparently, is the notion of irreducibly plural quantification. This response is explored below.

When we use language to refer to things in the world, our expressions can be singular ("the rabbit") or plural ("some rabbits"). In the not-so-distant past, some philosophers began to think that plural expressions ("the gunslingers") ought not to be understood (as was traditionally the case) as semantically singular. (A term is *semantically singular* if it denotes a single entity). For example, a plural expression should not be taken as singular reference to a set of things (a *set* the members of which are the gunslingers), but as plural reference to many things (the gunslingers themselves). Furthermore, as Boolos (1984, 1985) and others[331] argue, the plural nature of these expressions is not captured by singular quantifiers ($\forall x$ and $\exists x$) and should instead be rendered using their plural counterparts $\forall X$ and $\exists X$ ("for any things, the Xs" and "for some things, the Xs").[332] A tradition has developed from Boolos's work, one that "takes plural logic seriously;" in particular, it regards the semantic values of such expressions

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[331] Boolos 1984 and 1985a; McKay (2008). Lewis (1991) writes that plural reference is ontologically innocent and "perfectly well understood." I take it this is a further claim, and do not intend to claim that plural reference (logic, etc.) will not present other problems for the nihilist. The logic of plurals is a recent and controversial subject matter, and it is not clear that using its machinery will not adversely affect the ideological parsimony of nihilism. See Uzquiano (2004) for critical discussion, and Linnebo (2012) for general discussion.

[332] There is a lot I am glossing over here. Boolos urges this as one way to avoid the (unwanted) move to set theoretical ("singularist") approaches to capturing plural expressions that are "nonfirstorderizable." For example, the so-called Geach-Kaplan sentence, "Some critics admire only one another" cannot be properly symbolized in classical first-order logic (without sets). See Boolos (1984), 432-3 for the proof, which he attributes to Kaplan.

as referring to many ones (pluralities; e.g., the *X*s), and eschews interpretations that plural reference must always be understood as singular reference (e.g., to a class, set, or in this context, a composite whole).[333] As Boolos inventively puts it, "It is haywire to think that when you have some Cheerios, you are eating a *set*—what you're doing is eating THE CHEERIOS" (ibid, 448). Plural reference (e.g., the *X*s arranged table-wise) does not require a singular semantic unit of reference. Some thing*s* acting in concert (think: lions hunting an antelope) do not require that a single entity—an individual—is at work. Multiplicities of unities do not require the unity of multiplicities.

The nihilist can parlay plural reference, and the formalism that undergirds it, into her response to the objection from quantum entanglement, for why assume entanglement involves ascribing a property to a composite whole (*the* system) as opposed to ascribing a collective property of the things themselves (the particles)? That is, perhaps there are some things (the particles) that have an (irreducibly) collective property (entanglement). Using the tools of plural logic, properties of "composite systems" in physics can be understood as irreducibly

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[333] Boolos (1984) also showed how singularism was not applicable to all cases of plural reference, e.g., in regards to the axiomatization of set theory, for it is not always the case that "some sets" form a set (viz., a set of sets). Consider: It is (seemingly) true that "There are some sets such that any set is one of them if and only if that set is not an element of itself" though "There is a set of sets such that any set is an element of it if and only if that set is not an element of itself" is self-contradictory.

plural properties of "mere manys."[334] Besides, what is a system a system *of* if not

relations among *many* individuals? All the nihilist is claiming is that the activity

of many things acting in concert, or exhibiting certain collective properties, need

not be a single individual any more than a school of fish or a hundred sparrows

"flocking" is a single individual. Einar Bohn (2011, 213) makes a similar point:

> Taking plural logic metaphysically seriously, it is simply false that duplicating the intrinsic properties of these particles, along with their spatiotemporal relations, does not metaphysically suffice to duplicate their fusion and its contents. The pluralist should simply say of the two particles that they have a quantum property Q. Having Q is a plural, collective intrinsic property of the two particles. A plural collective property is a property holding of some things *xx* taken together, but not holding of each one of *xx* individually."

And later, asks

> How did we get from many entangled particles to a composite object composed of them anyway? There is simply no valid move in the neighbourhood from the *entanglement* of some *things* to the fundamentality of some *one whole*. We only get the fundamental *interconnectedness* of some *things*, not the fundamentality of some one whole. This is what's seen by taking plural logic seriously (ibid).

5.9.6 COSTS OF THE SOLUTION PRESENTED

I can see two potential issues that arise for the nihilist who takes this course. The

first is it seems like we now need fundamental multigrade relations or something

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[334] Cameron 2007 distinguishes between what he calls "mere-manys" and "one-manys." Basically, the idea is that mere-manys are pluralities that are irreducibly plural whereas one-manys are composite unified wholes. This is somewhat similar Russell's (1903) distinction between "classes as one" and "classes as many."

very much like that,[335] in order to explain what is going regarding entangled quantum systems or any other quantum phenomena that "requires" composite objects. Prima facie, it seems that causally fundamental properties should be monadic, or at least not multi-grade or variably polyadic relations, which do not seem like a nice fit for roles in laws of nature.[336]

The second is the worry that, no matter what, irreducibly plural quantification will bring along a larger ideology. If this is true then the nihilist will lose some of her claims to parsimony. I cannot evaluate this worry here, and will only point out that (irreducibly) plural reference and its logic, and whether it would significantly add to one's ideology, is an open question, one that I have not yet seen addressed in the literature. So, this is one area a nihilist will want to explore more thoroughly.

For the nihilist who wants to avoid plural quantification altogether there is at least one other option. This is to characterize claims about entangled systems and any other postulated composite phenomena as claims about sets instead. This is the kind of response Sider (2013) seems to recommend. Basically, Sider says, there is always an equivalent interpretation using first-order quantification over sets (e.g., whose members are arranged x-wise) that the

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[335] (fundamental variably polyadic relations) cite someone who uses this??

[336] Of course, the nihilist might press the importance of this concern and ask, What's the big deal with fundamental multigrade relations? Surely (she continues) if you have more than one thing there will *always* be relations, and they will obviously be multigrade, and these are (arguably) no different than properties. If you have one or some or several what's the difference?

nihilist can offer in place of any statements that appear to be about composite systems.[337]

By way of conclusion, I will simply point out that the concerns raised in this section present several serious obstacles for the nihilist. I am not sure what else to say at present, except that they constitute genuine challenges to nihilism that its proponents have yet to address.

5.9.6 WAVE FUNCTION MONISM

The next objection takes its cue from current debates in the ontology of quantum mechanics. The idea here is that what is fundamental is the quantum state of the universe. According to wave function monists, the ontology of the quantum state of the universe is given by its (universal) wave function; and in particular, they maintain that the only concrete physical entity that exists is the wave function. Thus there are no fundamental minima to regard as mereological atoms: the universal wavefunction is all there is. But if the ontology of physics is one that takes the universal wave function as not only fundamental, but also the only entity, then unless the nihilist becomes a one thinger (i.e., an existence monist)

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[337] This option may not be attractive to everyone. One reason, due to Dean Zimmerman (personal communication) is that the causally fundamental properties of things shouldn't be properties of sets. But (arguably) there are properties of complex groups of particles that *are* causally fundamental.

she cannot accommodate this ontology. Below I examine this challenge, and how the nihilist might respond.

THE ONE THINGER

It is widely acknowledged that the particle ontology at work in classical mechanics is a relic that cannot be made to fit the quantum world. (This point is noncontroversial). Some take that a step further, arguing fundamental physics is no longer "about particles"—and thus not about reducing macroscopic systems to their fundamental constituents. According to one version of this challenge, what is fundamental is the wave function, with particles emerging as derivative entities or not at all. This seems like bad news for nihilists; after all, what can they hang their hats on if not some kind of fundamental particulars?

Formally speaking, the wave function is a mathematical representation of the quantum state of a system at a time (North 2012). Of course, depending on your metaphysics of mathematical objects, spacetime regions, etc., this will in turn affect how you think mathematical models of QM are related to physical or world structure.[338] According to wave function *realism*, the wave function is not a mathematical tool that describes reality, it is the fundamental object of that

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[338] See North (2009) for a few general thoughts and Albert and Ney (eds. 2013) and references therein.

reality.[339] Most wave function realists think of it as a physical field completely spread out over an extremely high dimensional space;[340] sort-of like an electromagnetic field. I say "sort-of" because the space the electromagnetic field "lives" on is our ordinary three-dimensional space, whereas the wave function (somewhat notoriously) lives on a $3N$ dimensional space (in other words, if there are 10^{23} distinct particles in the universe, then the space it inhabits is 3×10^{23} dimensions).[341] Ney (2012) provides a very clear characterization, and so I include the entire passage here:

> The high-dimensional space in which the wave function exists is what physicists refer to as 'configuration space'. Traditionally, 'configuration space' refers to an abstract space that is used to represent possible configurations of particles in three-dimensional space. Each point in the configuration space represents a possible spatial configuration and may be labeled by an ordered n-tuple in which the first three members represent the three spatial coordinates of the first particle, the second three members represent the three spatial coordinates of the second particle, and so on. For a collection of N particles then, the corresponding configuration space is $3N$-dimensional. Each point in this $3N$dimensional space ($x1, y1, z1, x2, y2, z2,..., xn, yn, zn) represents a state in which the n particles are arranged so as to be at locations ($x1, y1, z1$), ($x2, y2, z2$), ... and (xn$, y$n$, z$n$).

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[339] As Maudlin describes it, "According to the wavefunction monist, wavefunctions do not describe things: they *are* things"(Maudlin's wavefunction monist is a realist, but not the converse).

[340] E.g., Ney (2013): "The wave function is a field in the sense that it is spread out completely over the space it inhabits, possessing values, amplitudes in particular, at each point in this space. "

[341] To be fair, the wave function realist will probably respond that my characterization is somewhat tendentious, albeit typical. As Ney (ibid) points out, the dimensionality of the wave function space "may be captured heuristically by the formula d = $3N$, where N is the number of particles in the world, but this is merely a heuristic. The proper way to understand the dimensionality of configuration space is in terms of the number of degrees of freedom needed to accurately capture the quantum state of the universe."

One argument for wave function realism arises from the thought that we should infer the fundamental ontology from the dynamical laws and the geometry of space required to support them, which indicates the wave function is the fundamental entity (as opposed to matter in ordinary 3 space, like particles or mass-density, e.g.). So, one objection to nihilism says that if the wave function is the only thing there is, nihilism (at least in its pluralistic form) is wrong. Wave function monism seems to present a genuine problem for nihilism. Is there anything the nihilist can offer by way of mitigation?

5.9.7 RESPONSES FROM THE NIHILIST

As noted above, it is widely acknowledged in quantum physics that what is fundamental cannot be read off the mathematical formalism in a straightforward way. Wave function realism is only *one* interpretation of what to read off the geometry of spacetime and the dynamical laws that govern it. At this stage, the nihilist can simply reject monism in favor of an alternative interpretation. So the nihilist does have options. Her recommendation at this juncture should be to go for so-called *primitive ontology* theories that regard particles as fundamental, and the wave function as a dynamical law (or temporal development) that tells matter particles "how to move". Here is how one proponent, Allori (2012) describes them:

[Q]uantum theories can be interpreted as sharing the same *common structure* as the other fundamental physical theories: there are primitive variables in three-dimensional space or in space-time which represent the fundamental constituents of macroscopic physical objects, and then there is the wave function whose role in the theory is to implement the dynamics for the primitive ontology. The specification of the primitive and non-primitive variables completely determines the theory.

Another point the nihilist can press is that the wave function alone is insufficient to account for macroscopic reality.[342] In particular, it has problems locating our ordinary world in an ontology consisting solely of a (concrete) field-like object in extremely high dimensional space.[343] In this regard, Monton (2012) makes a similar complaint about this conception of fundamental ontology and the wave function:

> [W]e don't need the wave function as a physical field evolving in a physically existing $3N$-dimensional space—all the information about the system that the wave function carries can be carried by a single property of the N-particle system in physically existing three-dimensional space.

A central tenet of wave function monism is that space is *not* three dimensional. On most accounts, the low dimensional space of the macroscopic world does not exist at all (on some it may arise as an emergent phenomenon). Such theories lack what Bell (1987) called "local beables," the entities (particles)

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[342] Sure, the nihilist may look like she has no room to talk here, but recall the point of section 4, in which Nihilism was judged to be materially adequate.

[343] As Maudlin describes it, "According to the wavefunction monist, wavefunctions do not describe things: they *are* things"(ibid).

that are needed to explain how quantum phenomena connect up with our ordinary experience of macroscopic world. As Maudlin (2013) describes monism, there are no particles that are the "localized entities of which familiar objects are made." Elsewhere, he inveighs,

> If all there is is the wavefunction, an extremely high dimensional object evolving in some specified way, *how does that account for the low-dimensional world of localized objects that we start off believing in, whose apparent behavior constitutes the explanandum of physics in the first place?*[344]

Here's another way of framing the issue at hand. If there simply are no particles, only the wavefunction, what is the wavefunction a wavefunction *of?* If the elements the function describes are particle configurations, there had better be some particles lying around somewhere (otherwise, we might reasonably cut CERN's budget). For this reason, theories that take the wave function space as fundamental will not appeal to anyone interested in a physical theory that takes matter in ordinary three dimensional space seriously. Maudlin writes[345]

> We begin by thinking there are localized objects inhabiting a low-dimensional space, whose behavior we seek to explain. The obvious way for a physical theory to accomplish this talk is to postulate that there *are* localized objects in a low-dimensional space… that constitute macroscopic objects, and to provide these objects with a dynamics that yields the sort of behavior we believe occurs.

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[344] Although he is speaking directly to the wavefunction monist here, he later states this issue arises for any theory that posits extremely high dimensional space as ontologically fundamental. Now, the wavefunction fundamentalist can respond to this objection by providing a story about how low dimensional reality space emerges from high dimensional reality, but according to Maudlin, such an account has yet to be given (ibid).

[345] This is just a general remark he makes about quantum ontology.

Although he is speaking directly to the wavefunction monist here, he later states this issue arises for any theory that posits extremely high dimensional space as ontologically fundamental. Now, the wavefunction fundamentalist can respond to this objection by providing a story about how low dimensional reality space emerges from high dimensional reality, but according to Maudlin, such an account has yet to be given (ibid).

Given its commitment to fundamental building blocks, nihilists will naturally gravitate towards theories which, like Allori's (2012*a,b*), take a realist stance towards a primitive ontology of particles (and laws governing them).[346] These theories have their own strengths. For example, Allori (ibid) emphasizes how theories with *primitive ontologies* provide a more intuitive account of the "manifest image" than *wave-function ontologies* (i.e., wave function monism). She also makes a compelling case that some primitive ontologies[347] are both more conservative and have greater explanatory power than rival wave function realisms.[348] Monton echoes her, and remarks (2006):

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[346] Allori, 2012, Monton (2006, 2012).

[347] E.g., some interpretations of Bohmian Mechanics and some GRW theories. I suspect not all theories with primitive ontologies are likely to attract many metaphysicians. E.g., a primitive ontology of discrete collapse points of the wave function, a la JS Bell. Allori explains one version as follows: "First of all, we have John Stuart Bell's proposal [Bell 1987]. Consider the space-time points *(xi,ti)* in which the wave function collapses. One could call these events "flashes" [Tumulka 2006]. Bell's proposal is to take these events as the primitive ontology of the theory: forget about the fact that they are collapse points, the flashes are what the world is made of."

[348] See North (2012) for a compelling defense of wave function realism.

Given the choice between a radically revisionary 3*N*-dimensional ontology, and a normal three-dimensional ontology where the *N* particles in the universe collectively have a certain property, we have no good reason to endorse the radically revisionary ontology.

5.9.8 GUNK

The positive thesis of nihilism maintains that only mereological simples exist. Obviously, then, one way nihilism can go wrong is if there are no simples. This would be the case if matter turned out to be infinitely divisible, in the sense that there were no smallest parts; no simples.[349] Following Lewis (1991), call an individual *gunky* if each of its parts has proper parts. There are at least two kinds of objections to nihilism based on gunk. One starts off by noting that the possibility of gunk, along with other considerations from topology and physics, is enough to warrant investigation into an ontology in which regions are primitive (i.e., not simples).[350] If this is successful—if there are strong reasons for thinking regions are ontological bedrock—then simples cannot be. The second

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[349] As others (e.g., Cotnoir 2012; Varzi 2014, fig. 6, who cites Eberle 1970) have shown, there are *atomistic* mereological models that admit of infinite divisibility as well, e.g., closed sets of a Euclidean space. Though these are not models of nihilism, it seems that all one would have to add is that fundamentally speaking, only the atoms in those models exist. See Cotnoir 2013 for interesting discussion.

[350] More carefully: theories that do not take points as primitive, and build up regions as composed of points. Instead, regions based theories take regions (of non-zero measure) as primitive, and define points as, e.g., idealized sets of nested converging spheres. For more on "pointless ontologies" with regions as primitive, see Gerla (1990).

objection say the *possibility* of gunk is enough to render nihilism false. Let's take

the latter case first.

POSSIBILITY

Worlds with gunky individuals seem metaphysically possible.[351,352] Could ours be

one? We can skip that question (for now); one needs only the possibility of gunk

to repudiate nihilism.[353] The argument goes like this: First, recall that

metaphysical propositions, theories, and the like are widely regarded as

noncontingent: they are either necessarily true or necessarily false.[354] So if

nihilism is true, then it is necessarily so. But if gunk is metaphysically possible,

then nihilism is not necessarily true. But nihilism is noncontingent. So, nihilism is

necessarily false. Therefore, it is actually false.

However, the nihilist can parry this attack by turning the argument on its

head: Nihilism is possibly true. Since nihilism is a metaphysical thesis, it is

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[351] Worlds with gunky individuals are conceivable (or at least not inconceivable), logically consistent, and have mereological *cum* mathematical models (e.g., open regions of Euclidean space, with parthood interpreted as subset relation); although recall that gunky mereologies are non-well founded (cf. Cotnoir 2013).

[352] I am not concerned with epistemic possibility for reasons similar to those given by Sider (2013, § 10).

[353] Sider (1993) argues against van Inwagen's quasi-nihilism along similar lines. Sider now seems to reject this type of argument (2013, n 58).

[354] Mereological propositions, theories, etc. are often regarded as equally noncontingent. See, e.g., Schaffer (2007*b*, 2.3.2; 2010, 62), Rosen (2006) and references in Cameron 2007.

noncontingent. So nihilism is necessarily true. So gunk is metaphysically impossible. Therefore, our world is not gunky.

The apparent stalemate between the above arguments suggests another route for the nihilist. For the stalemate arises from a crucial assumption about the modal status of metaphysical propositions (principles, theories, etc.). Call this assumption (metaphysical) *necessitarianism*. Necessitarian orthodoxy tells us that most (perhaps all) metaphysical propositions (principles, theories, etc.) are necessarily true, if true at all. We can use the term *mereological necessitarianism* for the corresponding thesis about mereological propositions.

> Mereological necessitarianism (**MN**): mereological propositions (principles, theories) are noncontingent: they are either necessarily true or necessarily false.

Among contemporary metaphysicians, MN has achieved the status of a law-like mandate: submit, or face conviction for disorderly conduct. By way of example, one need only consider the preponderance of arguments that invoke MN—ones that without which, of course, would fail to be compelling.[355] But many competing incompossible mereological systems are equally conceivable, logically consistent, as well as "scientifically serious;" qualities often cited as indicators of

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[355] See, e.g., Van Inwagen (1990), Sider (1993), Armstrong (1997), Schaffer (2003), Williams (2006), Smith (2009), Varzi (2009), McDaniel (2010).

possibility.[356] What gives? If mereological necessitarianism is true—if incompossible mereological propositions are noncontingent—why are arguments for them so equally matched? This characteristic fallout of mereological necessitarianism, often enough, incites standoffs. These standoffs foment discontent amongst the heterodox. Perhaps some mereological truths are contingently true, if true at all.

MEREOLOGICAL CONTINGENTISM

Necessitarianism has long been the party line in metaphysics.[357] Perhaps this is because metaphysical theorizing, traditionally conceived, is an exercise in either *a priori* reasoning or conceptual analysis.[358] If propositions of metaphysics are either *a priori* or analytic (conceptual) truths, this underwrites their noncontingent modal status.[359] Likewise, if they are Kripkean *a posteriori* truths

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[356] Schaffer (2007) and Bohn (2009a).

[357] I am only considering necessitarianism in regards to metaphysical propositions, theses, etc. that are central to debates in metaphysics (e.g., *platonism,* persistence, universals, and time). Opposing sides by and large agree that whichever account is actually true, it holds as a matter of metaphysical necessity.

[358] At least before Kripke's (1980) argument for necessary *a posteriori* truths. Witness Putnam, who writes, "Since Kant there has been a big split between philosophers who thought that all necessary truths were analytic and philosophers who thought that some necessary truths were synthetic *a priori*. But none of these philosophers thought that a (metaphysically) necessary truth could fail to be *a priori*" (Putnam 1975, 233).

[359] Dean Zimmerman has suggested (in conversation) at least one exception here, e.g., indexical statements (e.g., "I am here now") which are *a priori* and contingent.

about natural kinds, individual essences, or true identities containing rigid designators. It seems implausible to suppose mereological propositions with existential import fall under any of these categories.[360]

Recently, a number of philosophers have cast doubt on the sanctity of mereological necessitarianism.[361] Cameron (2007, 101) writes

> I am not happy to take it on faith that the truth about composition is a necessary truth; if there is necessity here, I want to be given a reason for thinking so, and I want to be told the source of this necessity. Given that we are not saying what it is for composition to occur, but merely saying when it occurs, it seems to me strange to suppose that a true answer must be necessarily true, and so the burden of proof seems to me to lie with the necessitarian.

Rosen (2006) takes a similar line, but his subject matter is more general. He suggests two conceptions of metaphysical modality; the standard (necessitarian) view and what he calls the Others,[362] who hold the non-standard conception. The

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[360] For example, propositions concerning the possibility of gunk are unlikely to find empirical confirmation; moreover, they fail to be analytic, conceptual, or logical truths. And even if some mereological claims, like unrestricted composition, are (arguably) conceptual truths, they are such only if interpreted as conditionals.

[361] See Rosen (2006), Cameron (2007), and Miller (2010). Cameron defends contingentism regarding mereological axioms. Miller's account extends Rosen's by providing some epistemological reasons to think it correct, at least in some cases. Bohn (2012) defends contingentism regarding unrestricted composition. Also note Field (1993) defends contingentism regarding mathematical propositions, e.g., Hume's principle. See also Parsons (2006, unpublished *ms*).

[362] Rosen (ibid, 21) describes the Others as

> a tribe of outwardly competent philosophers whose contact with the mainstream has been intermittent over the past (say) thirty years. The Others share our tradition and they are concerned with many of the same problems. In particular, they take themselves to have absorbed the main lessons of the modal revolution of the 1960s. Metaphysical modality is the modality that mainly interests them, and they do not confuse it with analyticity and the other semantico-epistemological modalities. When they introduce the

Others (some of whom might be Us) hold that *possibility* is the default status for many propositions in fundamental metaphysics. This "differential" and "deviant" class of propositions is largely composed of existential and synthetic *a priori* truths in fundamental metaphysics. These include existential truths in mathematics, particularly set theory. Rosen's primary example from set theory is the pairing axiom in set theory, which says that for any things x and y, there exists a set that contains them as members. In mathematics, he suggests *Platonism* is contingent. In mereology, the principle of unrestricted composition is given the same treatment. He writes that "the account entails that the existential truths of mathematics and metaphysics are uniformly contingent" (ibid, n10). And while a detailed exposition would take us too far afield, its characteristic feature is correct conceivability:

> **Correct Conceivability**: a proposition is correctly conceivable just in case it, along with a fully informed account of the intrinsic natures of the items involved, entails no hidden absurdity or logical contradiction.

According to the Others, correct conceivability of a proposition provides necessary and sufficient conditions for its possibility, and conceivability of its

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notion to their students their informal gloss is much like ours. In particular, they agree that the Kripkean '*a posteriori*' necessities are paradigm cases of metaphysical necessity, along with the truths of logic and the analytic truths more generally.

negation supports contingency.[363] For the heterodox among us, this view provides support that the stalemate arising in debates over existential claims in mereology is a natural product of the fact that they are equally correctly conceivable. For example, Bohn (2010) claims that "the world might be gunky is plausible for very similar reasons it is plausible that the world might be junky."[364] Correct conceivability of competing substantial claims in metaphysics (arguably) leads to Rosen's brand of contingentism. If a mereological proposition contains no hidden absurdity, and it's clear that there is no more information about the nature of the terms involved that could make a difference either way, then both it and its negation are contingent.

Another reason this line of response (contingentism) sounds plausible: there are consistent mereological models that contain both gunk and atoms. If mereological models provide any evidence of possibility (which they surely do on the non-standard conception), then philosophers who reckon both can exist in the same world are right on point.[365]

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[363] Rosen (ibid, 24). He cautions that this is not intended as a reductive analysis (nonetheless, it may well be true). He also thinks complete account may presuppose the notion of metaphysical necessity, but at this juncture, states that it involves only: (1) the notion of a *proposition*, (2) the notion of *logical entailment among propositions*, and (3) the notion of an *absurdity* or *contradiction* (ibid).

[364] Others concur; see Morganti (2009), Bohn (2012).

[365] Cf. Lewis (1991); Zimmerman (1996). Sider (1993 p. 288) writes "Surely there are both atomistic possible worlds and gunk worlds, and for that matter in-between worlds with both atoms and gunk." Varzi (2014) presents a number of atomless and atomistic systems that are compatible if suitably restricted.

And while Bennett does not say mereological propositions are contingent, she agrees they are not all merely analytic or conceptual:

> [Mereology] is in part simply a formal codification of our ordinary notions of parthood and composition—just conceptual analysis in fancy, symbolic garb. But that is certainly not all it is. Conceptual analysis might secure the antisymmetry of parthood, or that it obeys weak supplementation. But it will *not* get us the hotly disputed claims of unrestricted composition or extensionality. Mereological systems do not merely make analytic claims about the nature of parthood, but also substantive and controversial philosophical claims about what exists. They are tools that serve philosophical purposes and reflect antecedent commitments. …Mereologists need not actually endorse every system they explore any more than modal logicians do (2013, 102).[366]

Notice that the nihilist need not be a total deviant with respect to metaphysical modality. She can point out that even if necessitarianism holds for a certain class of metaphysical propositions, it is one to which existential mereological propositions do not belong.

I have argued that the nihilist has a decent response to arguments from the possibility of gunk, for she need not think substantial (i.e., existential) mereological claims are necessary, she can instead maintain they are contingent.

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[366] Earlier (101ff), she makes a similar (contingentist friendly) remark about the dispute between Lewis and Armstrong over the (non)mereological nature of structured universals:

> The problem here is that Lewis assumes, and Armstrong follows him, that no relation counts as parthood unless extensionality holds. But is that part of the meaning of 'parthood'? Unless it is analytic that two entities cannot be composed of the same parts—unless 'non-extensional mereology' is a contradiction in terms—Lewis is not automatically entitled to the terms 'parthood' and 'composition', and Armstrong need not have ceded them so quickly. He could speak of 'nonextensional mereology' instead of 'non-mereological composition'.

My suggestion is that lack of an asymmetry between arguments for one of two incompossible mereological conclusions gives us reason to believe they are contingent. Moreover, the argument about the possibility of gunk is not the only case in which the reliance on mereological necessitarianism plays a crucial role. Another example is Bohn's (2012) argument that, given junky worlds are possible, monism is false. A junky world is one in which each thing in it is a proper part. Likewise, mereological theses that say when composition occurs are similarly intractable are ameliorated by contingentism.[367] I think the take-away from these cases is that some mereological propositions are contingent; in particular, the possibility of gunk is a paradigmatic case of this kind.[368,369]

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[367] Morganti (2009, 286) seems to suggest a similar route:

> …the opinion is becoming widespread that there are no clear arguments for believing that facts of composition are necessary… In this perspective, the possibility of junk can be taken as an element going in favour of such a claim of contingency. For, if junky worlds are possible, unrestricted composition is not a necessity. In this sense, the possibility of junk, instead of being deemed unacceptable because in conflict with allegedly self-evident truths, could be employed in the framework of a larger project aimed to critically analyse currently widespread beliefs and provide arguments and explanations to replace presuppositions.

[368] Alternatively, she could join Sider's camp and say that arguments from metaphysical possibility are undermined by what he calls *modal Humeanism*, which is a kind of deflationism about modality (2011, chapter 11; 2013, §10). More specifically, modal notions (necessity, possibility, and the like) are not fundamental. Rather, notions like necessity reduce to propositions that are (1) true, and (2) of a certain kind (Sider provides four). Now, Sider believes metaphysical principles are of this ilk, whereas I would refrain from doing so (at least for mereological principles with existential import, as you can tell from the main arguments above). To be sure, his defense of modal Humeanism is much more detailed than I can properly explain here. Here is the rough and ready version. Since claims about the necessity (possibility) of nihilism or gunk are both metaphysical propositions, the only way to adjudicate between the two is by ascertaining whether one of them is *actually* true. Possibility cannot play an important role here, because the modality of the two are on a par. But then the argument from the possibility of gunk fails, by Sider's lights.

Another benefit that contingentism provides is an explanatory salve to the persistent "shallowness"[370] afflicting contemporary metaphysics, for it ameliorates a number of notoriously intractable (yet seemingly non-trivial) debates by explaining how they came to be so in the first place (to wit: they—mistakenly—presumed mereological necessitarianism).

Here's another way contingentism works as a salve. Consider the dispute between *robust* and *deflationary* conceptions of ontology (2008). Contingentism provides the fodder for a potentially robust response to deflationary critiques of metaphysics, where for present purposes let's just take Eklund's characterization as the claim that "*somehow* ontological disputes are non-disputes; and that *somehow* there is no privileged carving-up of the world into objects." Contingentism could also be parlayed into an answer to Eklund's "agnostic" who complains that "even if ontological questions are genuine, there is no way to settle ontological questions, so the project of ontology is still futile." The agnostic about ontology is somewhat a debaser of metaphysical vitality, for although not strictly a deflationist, her stance is "still be good enough for the purposes of the

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[369] This is not to say that contingentism in general is epistemologically adequate, or has no problems of its own. I cannot spend time on those issues here. For a reasonable defense against such worries, see Miller (2009). If contingentism in the sense I have adumbrated turns out to be untenable, I would recommend the nihilist consider joining Sider's camp (see above note) and subscribe to modal Humeanism.

[370] Manley (2008).

would-be deflationist: the criticism of the enterprise of ontology [its futility] still stands"(ibid).

REGIONS AS PRIMITIVES

There is a more empirically-minded objection to nihilism, one that uses the possibility of gunk as yet another reason to take regions as primitive. And, the argument continues, if regions are our primitives, then mereological simples (points) cannot be (or need not be). In an earlier paper, Arntzenius (2003) suggests the objects of quantum mechanics might be more perspicuously characterized as living in a pointless space—one that is not decomposable into ultimate parts. Later, he (2008) employs the possibility of gunk as part of his motivation for a topology of regions:[371]

> [I]f there are no smallest regions, and if there are no smallest parts of objects, then a spatial or temporal decomposition of a region, and of an object, can not bottom out at an ultimate level. The idea that the features of large regions and large objects are determined by the features of minimal-sized regions and minimal sized objects can not work if space and time, and the objects in it, are gunky, i.e. pointless. Space, time, and objects would simply not have ultimate parts.

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[371] Arntzenius voices other worries that I haven't the space to properly discuss here.

Basically, Arntzenius's interest in developing a regions-based mereology arises from three (kinds of) problems that arise for pointy (atomistic) space and matter: (1) measure-theoretic paradoxes (e.g., Banach-Tarski), (2) contact relations between atoms is evidently impossible, and (3) non-relativistic quantum mechanics has no need of them (because it fails to mention Lebesque measure 0 differences). It should be noted, though, that Arntzenius's project is more about investigating the *prospects* of non-atomistic physics (i.e., no points), rather than a full dress defense of gunk. At any rate, we can still look at how a nihilist might best respond to a regions-based ontology that eschews points.

WHY REGIONS SHOULD NOT BE BOTH PRIMITIVE AND GUNKY

If individuals are gunky, then instead of points as primitive, regions are our primitives; wholes are prior to their parts. I explain my concerns in detail below, but basically, my first claim is that metaphysically speaking, that just moves the bump in the carpet: now we have to say what the *regions* are—the regions become our primitives![372] My second point is more serious (but based off the first). If there are no simples (points), and regions are our primitives, and those

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[372] NB: Reminder: I'm setting aside, for purposes of the dissertation (for the most part), the ontology or topology of spacetime—I'm not interested, yet, on this matter]. I'm merely defending the claim that composite, ordinary objects (read: stuff made of matter, *concreta*, what have you) do not (fundamentally speaking?) exist.

regions must be (gunky and) disjoint (cf. Hazen, Burgess), the view becomes embroiled in some difficulties I think anyone interested individuals should think carefully on.

CAN DISJOINT GUNKY INDIVIDUALS EXIST WITHOUT POINTS?

This objection ends by claiming that that gunky individuals are a problem for everyone. Why? Well, for starters, recall Lewis's characterization of a gunky object:

> **Gunky object** (GI): an individual whose parts all have further proper parts.

The believer in ordinary objects (of the restricted composition type) will need to say *something* about why the gunk is "contained" as "pieces of gunk." For example, Hazen (1997) says gunky individuals must be pieces or "units" of gunk, and Burgess states there must be "nonoverlapping globs of it"[373] in the gunky regions that are now our primitives. Here's a simple question to get us started: How do these individuals manage to have the boundaries they supposedly need in order to be disjoint from their globby neighbors? Pointless topologies typically shun *actual* boundary elements (which are made of points—mereological

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[373] (Unless one wants to be a monist and say the whole cosmos is one gunky object)

simples), and so presumably would the gunkist arguing against nihilism or at the very least atomistic moderate views.[374] As Cotnoir explains, however, "a boundary in *connected* space is best thought of as involving *the overlap of something with its complement*." So, gunky individuals are likely hard to come by in a connected space (Yet, we don't want a topologically *disconnected* space!).

So, some of my misgivings about gunk pertain to the thought that it is just misguided to think one can get disjoint individuals that are composed of gunky matter unless one takes them to be "brute" or given from the start. But suppose they are brute (somehow). Then I *still* have questions about how they manage to be disjoint; without any points, lines or surfaces to prevent the regions

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[374] Arntzenius's measure-theoretic explanation of the structure of gunk employs the null region (set). Elsewhere, Arntzenius says he's trying to model space without *any* points, i.e., places with Lebesque measure 0. But his theory looks like it must sneak in *at least one* atom (the null region) through the backdoor—but that seems just wrong. Here's my reasoning. First, consider Varzi (2014), who states that "it is worth noting that if one assumed the existence of a 'null item' that is part of everything, corresponding to the postulate

$$(P.10) \quad Bottom$$
$$\exists x \forall y Pxy,$$

then such an entity would *perforce be an atom*. Accordingly, no atomless mereology is compatible with this assumption."

Second, note that everyone leaves out the null/bottom "individual" or "element" when doing mereology, and there are reasons they do this— the axioms of classical mereology are entirely silent on both atomism (a bottom element) *and* atomlessness. As such, mereology is often described as a complete Boolean algebra *with the null set (bottom element) removed*. For this reason, I think there's something fishy with "pointless" or atomless mereologies that use a bottom element (even if it's "just one"—to which, of course, they map all the Lebesque measure 0 regions). Tell me, in a genuinely *pointless* ontology, *why* would they need to do *that*? It's not whether Arntzenius's theory or those like it must incorporate this into the fundamental ontology (perhaps, e.g., it is just an artifact of the model), but if it does then it strikes me as something that demands explanation.

from overlapping.[375] But if not, and the gunky individuals are overlappers, then we are in for a One whole overlapping gunky cosmos (cf. Forrest 1996)—see comment (1) below. That's why I think Hazen, Burgess, et all say the gunk *must* be out there in individual disjoint "units" (e.g., Appendix to Lewis, 1991). But it's not clear how to do this without any atoms or points at all, and seems like something that still will need to be argued for. I suspect, that without boundary points or other denizens than regions,[376] an explanation is going to involve something tricky, or fishy, or both—see comment (2) below.

TWO BRIEF COMMENTS

(1) If gunky individuals are not disjoint, then they overlap. Then, if I'm correcting in saying (via Forrest 1996) that the gunk explodes to the whole of space, I think I'll hope there is no gunk. This is what Simons says about this last kind of case:

> A moment's thought shows that this too cannot be a model of part and whole. What we have here is a universe all of whose parts overlap each

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[375] Otherwise: Are there gaps where non-gunky matter or some kind of "empty space" prevents the gunk from overlapping? The concept I have of the kind of "boundaries" needed to do any work here—a topological analysis of which is notorious to construct in topology—may need to be somehow topologically disconnected.

[376] Surely we can do pointless topology. But the main purpose of that, as is widely acknowledged, is to start with regions as *primitives*. The points are *always*, as far as I know, then constructed from the regions. Why? Because, topologists, mathematicians, and physicists, still *need* the points to underwrite differential functions and obtain distance measures, etc. Cf. Gerla (1995).

other. But surely if a universe is complex (i.e., has proper parts at all), then at least two of these parts will be disjoint.'[377]

(2) You might think Lewis Burgess and Hazen have a fix all wrapped up that will resolve my concerns. However, the fix seems to have one feature that I do not understand the need for, if the gunk can be adequately "contained." That is, they advertise (something like) getting relations for free, since they are what separate the universe (disjoint) into two halves. However, I see no reason for thinking this is anything other than a set theoretical technique (similar to the pairing axiom) that is a substantial claim. So, if you think our universe is separated like that, you better have a good reason why. And I do not see Lewis as having one.

And that's the end of this section, in which I've explored my thoughts on why gunky individuals are an issue for anyone wanting to locate *individuals* in the world (composite or not).

GUNK ESCHEWS DIMENSIONS LESS THAN THREE

It may be worth noting the following line of reasoning doesn't seem to have been explained as of yet (to my knowledge, anyway). Suppose—as seems to be the

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[377] Donnelley ( ) points to the intuition that "a complex universe **must** have *some* disjoint parts" which may be captured by a weaker principle than (WSP).

case—that the believer in (the possibility of) gunk models it as a theory of the topology of space in terms of (pointless) regions being the primitives. That is, that regions (or the denizens thereof) are the "fundamental spatial entities" rather than "points, lines, or surfaces" (i.e., nothing of smaller dimension than a region, each region being of the same dimension).[378] If so, then I would like an explanation why (by parity of reasoning) no proponents of this theory seem to place similar constraints on spaces of *higher* dimensions. That is, they only eschew dimensions less than 3, but are okay with 4, and sometimes any *n* besides 1 or 2 is fine! Are we to suppose that although there is *some* dimensional hierarchy here, it only "begins" at three? What reason is there to suppose this, other than that our pre-reflective and perceptual intuitions are that of 3 dimensional space, rather than any other dimensional space (except in recent times, that of 4 dimensional spacetimes, which only confounds the issue).

CONCLUDING REMARKS

One conclusion of the preceding chapter is that mereological nihilism has one central virtue; it is the most parsimonious—both qualitatively and quantitatively, ideologically and ontologically—of all extant answers to the SCQ. Some other

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[378] Forrest (1996); Arntzenius (2003).

attractive qualities are related to its central virtue: (1) it surpasses other answers in avoiding explanatory redundancy, and (2) it provides uncomplicated solutions and straightforward explanations for many outstanding problems, and (3) manages to circumvent many objections that plague other answers, without taking on new ones.

But as is often true in philosophy, this cannot be the whole picture; for mereological nihilism, left unsupplemented, leaves unanswered certain questions about what *does* correspond to (our representations of) composite objects, both natural and artificial. To put it differently, nihilism does not, by itself, provide a positive account of how the salient macroscopic features of perception arise from the activities of subatomic particles arranged x-wise give rise to our perception of them as composite wholes. [it also does not provide a parallel explanation of how its atomistic ontology could arise from gunky regions of spacetime]. In this area, nihilism has been shown incapable of explaining many commonsense *and* theoretical intuitions regarding the nature of matter in space. More will be said concerning this particular matter in the following chapter.

If the only two answers to van Inwagen's special composition question were nihilism or universalism, we'd be in trouble. But it is not. There is a middle way, and it is not hopelessly intractable, with some help.

CHAPTER 6

CONCLUSION

6.1 INTRODUCTION

My primary goal in the present work was to carefully examine a wide variety of

answers to the special composition question and evaluate their plausibility, with

an eye cast towards sorting those that are tenable from those that are far from it.

In this chapter, I briefly defend and subsequently assume that certain substantial

claims in the compositional analysis of material object metaphysics are

contingently true, if true at all. I then propose three reworkings of

hylomorphism, nihilism, and universalism in light of it, and some ways in which

these variants avoid (previously discussed) problems for the view in question. At

the end of each modified view, I suggest some areas of empirical research (and

its mathematical ground) that could potentially provide worldly support for

their truth. The theories I chose are not based on their tenability as they currently

stand, but rather on how they look and what they would say about composition given my modifications. I start with my least favorite candidate, universalism, then move on to nihilism, and, lastly, moderate hylomorphism.

6.2 CONTINGENTISM

First, let me say a bit to forestall some potential objections to contingentism. One moral arising from my study of the composition problem is that existential claims in mereology are contingently true, if true at all. Throughout this work, I have pointed to situations in which noncontingentism (of the relevant kind) leads to a stalemate in debates over composition. My proposal is to rid ourselves of the stalemates by ridding ourselves of their cause. Now, the idea that *any* existential (substantial) principles or theses in metaphysics are contingent may strike some readers as implying a reduced role for metaphysics—that we have reached the end of inquiry, insofar as *our* role is concerned.[379] I disagree.[380] One of my present tasks, then, is to suggest ways in which metaphysical theorizing, when combined with a more serious study of, and investigation into, empirical scientific research on the structure of natural phenomena (and the mathematics

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[379] And thus aligns itself with Bennett's (2009) "third kind" of dismissivism, who says that though the "work on the metaphysics of material objects is [not] pointless" but "we have more or less done it already" (73).

[380] I am not saying my disagreement with noncontingentism is entirely new. See, e.g., Cameron (2007), Morganti (2009), Bohn (2012).

underlying it) has a vital role to play in adjudicating the fundamental structure of *this* world.[381]

A question that will spring to mind for some readers is exactly what kind of scientific research could possibly inform us about the nature of composition; other readers will think its trivially true that science will obviously have something informative to say about the compositional nature of things in the actual world. Regardless of which camp you fall into, in the next section I suggest some areas of scientific study that I suspect may have some insights that will repay those concerned with defenses of particular existential mereological claims, or those interested in how such studies may potentially advance our knowledge of the fundamental mereological structure (if such there be) of our world.[382]

I assume that our world (at least *this* corner of it) is somehow structured, for it seems clear that there is an order and (perhaps transient) stability (level of predictability) often found in natural phenomena. It is hard to imagine that there is not some kind of role that mereology plays in this (e.g., a partial ordering).[383]

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[381] Toraldo di Francia, in Castellani's *Interpreting Bodies,* observes that "we must humbly *learn,* rather than *prescribe*, what nature is made of.

[382] Cf. Healy (2005) for critical discussion of the notion of whole and part in fundamental physics.

[383] Given mereology has the same structure as a Boolean algebra with the zero element removed, it goes the way of such algebras.

6.3 Universalism

I've never met an extant version of universalism that I didn't dislike. Even so, I am going to suggest one modification that could make it more agreeable to those who share my sentiments. My reworking will not appeal to the most fervent believers, but it may make sense to those who sit on the borderline, or who are convinced that contingentism is a viable option. Before I get into it, though, let me first recall a gripe I have about unrestricted composition; namely, that is explanatorily idle.

Here are what I take to be some basic facts about how we may want or need to talk in discussions about material objects. We may want (or need) to talk about many things in one fell swoop (though they remain many); we have plural reference for that. We may also want (or need) to talk about many things by "gathering them into one;" we have talk of sets and classes for that. We also want to express the idea that sometimes, many things *become* or *create* a unified whole; we have talk of composition for that. But, I have not yet heard of a felt need—let alone a compelling one—to talk about many things that are in no way unified but are indeed a single concrete whole; so it seems perturbing to me that we have strange fusion talk for that.

Be that as it may, and though I deny that any number of things, no matter how gerrymandered, are *necessarily* a single concrete whole, I do not think it

impossible. So, perhaps (and granting contingentism) there is something right about universalism's broad-mindedness in this respect. Of course, at the same time, I find this aspect of universalism both bewildering and intriguing; for it involves the idea that one could decompose a given whole in a myriad of ways, and still have the very same whole. And while I am aware of no evidence (*a priori* or otherwise) for a concrete whole of which this is true, I am drawn to answer affirmatively when asked if it is possible. Let me make my point clear: I do not believe any material portion of spacetime—no matter how gerrymandered and disparate—is *actually* a one-thing, but I do believe it is possibly one thing.

Here is the (perhaps flawed) reasoning underlying my belief.[384] First off, I think gunk is possible (and only comes in pieces; individual chunks).[385] So, to keep things simple, suppose (in the spirit of monism) we have a world in which only one thing (fundamentally) exists, though since it is gunky, it has parts "all the way down." This world seems to have all the requirements of a world in which universalism is true. In that case, there would *be* one-thing, capable of infinite mereological decomposition, that remains the *same* one-thing (no matter

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[384] According to my—again, perhaps flawed—calculations, the result of dividing one piece of gunk gives the same mathematical result as a world in which unrestricted composition holds: 2^n-1. So, for me it's easier to get my head round how 2^n-1 things could be *one* thing by *decomposing* one piece of gunk than by imagining the universal fusion of everything in an atomistic world (which is, of course, 2n+1).

[385] If you think it weird or nonsensical that I am starting from a piece of gunk, see the previous footnote. The reason I say it comes in pieces is because this is how Lewis (1991), Hazen(1999), and Burgess (2012) all characterize it, as well as (my understanding) of why it must be so constrained (see previous Ch. 5.9 for discussion).

what). As far as I can tell, the most natural way to imagine this division is by decomposing our piece of gunk into two parts, take each of those parts and decompose each of those in into two parts, and repeat the process to each newly decomposed part, "on down the line," so to speak, as far as we please. We pause in our chopping up gunk, and ask whether it is possible that our pile of gunky parts (now decomposed in 2n+1 ways) could still be the *same* thing? I say yes, for I do not find this prospect inconceivable, nor incoherent, and given my espousal of contingentism, it is possible. So, a case in which 2n+1 things exist (for any given n) is possible.

My suggestion, then, is for universalists to distinguish *actual* from *possible* wholes, and say that unrestricted composition is possible (but admit it may not be actual). If my proposal works without bringing along further serious costs, then universalists have a way to dispense of their greatest burden (*actual* unrestricted composition) without giving their liberal notion of composition. My main motivation for this addendum stems from contingentism, along with the intuition that unrestricted composition in the actual world is highly unlikely (it causally unobservable, explanatorily idle, and so forth). So, it seems to me, the most plausible universalism is one that claims any material portion of space-time—no matter how gerrymandered and disparate—is *possibly* a single concrete whole, rather than *actually* a single concrete whole. This is no longer standard-

fare universalism, but if the relevant form of contingentism is correct, then it is one way universalism remains viable, and seems plausible enough, as long as one works out a theory of actual versus possible unrestricted composition (e.g., by using possible worlds).

One advantage sometimes claimed for universalism is that it does not have any problems accommodating gunk. If any parts of our world turns out to be gunky, universalists can parlay this finding into a positive argument that their account has a significant advantage over those that cannot accommodate gunk. The question, of course, arises whether we could ever discover physical evidence that our world is gunky? In other words, what kind of physical evidence would be evidence for gunk? Though my idea here would require thorough development and empirical backing, I can sketch one kind of evidence I think shows promise in this area. My suggestion, then, is that evidence that certain phenomena and material objects in nature have a fractal dimension should be taken as evidence for gunk.[386] An object or phenomenon with a fractal

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[386] And it seems the evidence for fractal structure of certain systems is widespread. Some examples less known natural events and objects widely regarded as having fractal structure: (i) retinal vascular structure, bronchial and cardiovascular structure, tumors, dendritic branching (of neurons) (ii) earthquake analysis of hypocenters and predictive success in plotting earthquake recurrence intervals (cf. Turcotte, D., "Fractals in geology and geophysics," p 171-196 of *Fractals in Geophysics*, C. Scholz, B. Mandelbrot, eds., Birkhauser Verlag, Basel, 1989.,) and related predictions on fault parameters and distributions of which every known study has shown to scale fractally. The fractal distribution of galaxies on scales up to 50 million light years is also studied, according to which the distribution of galaxies is "remarkably well approximated as a fractal with dimension d = 1.23," (though beyond these distances the distribution becomes homogeneous). From Peebles, P., "The fractal galaxy distribution," *Physica D* **38** (1989), 273-278.

dimension is one that, among other things, displays self-similarity over a wide range of scales,[387] and whose fractal dimensions are typically non-integer (e.g. 1.67, 2.6), and seem structurally similar to the "boring descent" aspect of (some kinds) of gunk that others have pointed towards.[388]

6.4 A New Kind of Nihilism

There is a position in the vicinity of nihilism[389] I think its proponents ought to consider. In some ways, I see it as an alternative to nihilism; a position that is nihilist friendly, but seems to avoid problems nihilism faces from fundamental physics. This view I am envisioning may appeal to metaphysicians who are attracted to certain elements of nihilism, but who also think there is nothing mereologically special about the fundamental structure of reality. Let me spell this out in a bit more detail.

First, notice that many philosophers past have been drawn to the idea that there are fundamental units of matter. Second, this view seems to have become

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[387] I.e., in contrast to *evolutionary* laws (which are temporal), structural laws are about the spatial relationships (proportions) between dimensions (e.g.) and metabolic rate (e.g.) of organisms. Cf. Dorato (2012) who argues that there are biological structural laws that display a fractal nature of the kind to which I would point the believer in gunk. This research stems from the use of mathematical models to represent biological phenomena.

[388] Though their comments were not about any kind of fractal nature, on reflection, it does seem to mimic what they, in a separate context, are after see, e.g. Schaffer (2007), Cotnoir (2013), Varzi (2014).

[389] That is, it is nihilist in spirit, at least in the sense that it eschews composite objects of the macroscopic kind.

conflated with nihilism's positive claim, which in turn would mean such philosophers believe fundamental concreta are partless, structureless and physically indivisible. But what should we say to the metaphysician—mistaken for a nihilist—who believes there are concrete fundamental minima but also believes they are not mereologically special? For example, imagine a string theorist who agrees with Dorr's (2010) remark that there aren't any "good a priori grounds to expect the fundamental structure of the world to include anything like mereological structure," and yet believes strings are concrete structured fundamentalia.[390] Is she forced to take yet another mereological position, i.e., that extended simples are possible? I think Callender's (2011) remarks here are apropos:

> The no-extended-simples argument…claims…that anything actually extended with heterogeneous properties is not simple. […] On its face, it seems to contradict any science that posits non-point-like fundamental entities.

Furthermore (ibid):

> If they exist, superstrings have some of their properties heterogeneously distributed, for example, nontrivial energy densities across a string. The no-extended-simples argument therefore applies to superstrings. Followed through to its conclusion, we know that superstrings are not the basic building blocks of the world, for they have parts. […] And to the

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[390] Strings are not the structureless, partless, simples of mereology proper, but if they turn out to be fundamental physical minima which are the source of the visible world around us, this should not deter the empirically inclined nihilist, for her belief that there are fundamental physical minima is retained in spirit if not in letter. The minima physicists previously called *points* are naturally transposed to the minima physicists now call *strings*. As Brian Greene observes, "old language dies hard"(146). For an accessible introduction to string theory, see Greene (1999).

degree that superstring theory leaves out the parts, it is incomplete and not fundamental. For, recall, this argument is not about the regimentation of our concepts; if the argument is right, then strings really are composite. No new colliders need be built to test this—witness all the tax dollars potentially saved!

The kind of metaphysician I am imagining here believes mereology has neither the correct ideology nor the correct ontology to lay bare the fundamental structure of reality.[391] But notice that she does have a view about macroscopic ordinary objects that comes quite close to her nihilist doppelganger: macroscopic material objects do not exist; they are (metaphysically, etc.) reducible to dynamic pluralities of elementary particles (and relations among them) *and that's it, full stop.* When someone assumes she believes in structureless, partless simples, she pulls a face (and not a nice one). She thinks that when some metaphysicians

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[391] But I think the nihilist-cum-string theorist *could* defend her position as mereological, if she so desired. For her, the ideal minima of mereology should not constrain her any more than ideal points in mathematics should constrain physics. Leonard and Goodman (1940) *do* employ the concept of an "individual or whole" that is "whatever is represented in any given discourse by signs belonging to *the lowest logical type of which that discourse makes use.*" They further explain that the concept of an individual is a tool "for distinguishing *one segment* of the total universe from all that remains. " (Of course, the Greek word for individual (ἄτομος) is obviously etymologically related to that of an atom, as is the German *urelement*.) If the concept of a mereological atom is conceptually the most basic kind of individual (or involved in the most basic kind of singular count predication), one might interpret their attitude towards the formal concept of an individual as akin to the nihilists' attitude towards the formal concept of a simple. In closing, Leonard and Goodman also state

> …[*the calculus of individuals] performs the important service of divorcing the logical concept of an individual from metaphysical …prejudices*, thus revealing that the distinction and interrelation of classes and wholes [i.e., individuals] is capable of a purely formal definition, and that both concepts… are available as neutral tools for the constructional analysis of the world. […] The dispute between nominalist and realist as to *what actual entities are individuals and what are classes is recognized as devolving upon matters of interpretative convenience rather than upon metaphysical necessity* (ibid, my italics).

It seems the nihilist can make an analogous point about the worldly referent of her simples.

taken her view as a positive mereological thesis they've entirely misunderstood her.[392] Of course, she does have one claim that is borderline mereological:

> **Non-mereological fundamentalia** (NF): concrete fundamental minima are those things for which a further division into parts (for whatever reason) makes no sense.[393]

And evidence for her claim will most naturally be confirmed or falsified by research into fundamental physics, including quantum mechanics and particle physics, in order to substantiate her claims about concrete fundamental minima.

6.5 HYLOMORPHISM

I think hylomorphism has a lot going for it. However, Koslicki's account (Ch. 3) does not does not offer plausible reasons to take the formal components to be immaterial. As I noted there, I think there are better reasons to suppose that if composites things have a formal or structural element, a natural assumption should be that it is physical. Empirical evidence for structure or formal elements in natural concrete objects seems to me obvious. The DNA sequences found in cell nuclei and mitochondria, its underlying mathematical structure is clearly a

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[392] For her, while it's perfectly alright to claim the (concrete) world has fundamental mereological structure, this is something to be argued for, not assumed.

[393] For example, because it is not metaphysically relevant, or functionally basic, or explanatorily useful (and so on and so forth).Or, they might be the smallest realizer or bearer of fundamental properties (or maximally natural properties) into which a further division of (concrete) parts makes no sense because they are nomologically basic.

double helix,[394] the relation of chemical bonding, molecular structure and bonding of chemical atoms exhibit well known mathematical configurations and stable parameters and bonding angles.[395] The empirically minded hylomorphist will likely have to defend a nomological account of mathematical structure or otherwise present evidence that spatial structure of particles is empirical evidence of mathematical structure.[396] Of course, if structure is interpreted as involving natural kinds (a notoriously difficult subject in itself) she will have to defend an account on which they are immanent universals, tropes, or a particular kind of object. I am setting those issues aside for now: my point here is just that there is clear empirical evidence of structure and order from a wide swathe of biology, chemistry, and so forth. It is then the metaphysicians' task to reveal (via argument and analysis) how this structure is inherently hylomorphic. Science doesn't study strange fusions (at least not yet), but it does study all sorts of natural concreta. This is where proponents of hylomorphism should turn first, in order to find evidence of a formal component.

[394] Except of course, in linearly organized mDNA, which are associated with human pathogens. But this empirical finding supports my case: the physical structure of the mDNA matters. Cf. "Linear mitochondrial genomes: 30 years down the line." by Nosek J, Tomáska L, Fukuhara H, Suyama Y, Kovác L. *Trends Genet.* 1998 May;14(5):184-8. See also Nosek J, Tomáska L. "Mitochondrial genome diversity: evolution of the molecular architecture and replication strategy." *Curr Genet.* 2003 Nov;44(2):73-84.

[395] While I am aware that the "models" used in elementary chemistry classes are idealizations, the underlying structural facts are well evidenced by modern spectroscopic tools (based on interaction with electromagnetic radiation) that such structures *are* three dimensional, spatially related, organized configurations. For a tutorial on spectroscopic methods, consult the internet for a wide range of full online introductory texts from various universities.

[396] I'm thinking something along the lines of Maddy (1990) would work quite well.

6.6 CONCLUSION

The same role and task should be implemented by those in metaphysics who wish to uncover the role of matter and material objects, mereological or otherwise, to determine whether it is grounded in a fundamental account of reality's structure. My just stated characterization of the role metaphysics has in this enterprise is based on my conviction that philosophy ought not be from an armchair in a tower, telescope in hand with which to gaze and critically assess scientific findings from afar. Rather, metaphysics should actively engage with science, learning its lessons and gleaning its insights whenever possible. Then (and only then) ought it travel—not back to a tower—but into the recessed mines of philosophical analysis, to procure its refined ores of insight, for which it is so valued.

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