

COMPOSITION AS A FICTION

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1. A Question about Composition.

Let R be a region of otherwise empty space containing three simple particles, A, B and C.



Region R

Question: How many objects — entities, things — are contained in R? Ignore the empty space. Our question might better be put, 'How many *material* objects does R contain?' Let's stipulate that A, B and C are metaphysical atoms: absolutely simple entities with no parts whatsoever besides themselves. So you don't have to worry about counting a particle's top half and bottom half as different objects. Perhaps they are 'point-particles', with no length, width or breadth. Perhaps they are extended in space without possessing spatial parts (if that is possible). Never mind. We stipulate that A, B and C are perfectly simple. We also stipulate that they are connected as follows. A and B are stuck together in such a way that when a force is applied to one of them, they move together 'as a unit'. Moreover, the two of them together exhibit behavior that neither would exhibit on its own — Perhaps they emit a certain sound, or glow in the dark — whereas C is

effectively independent of the others. Now then, How many material objects are contained in R?

2. Some Answers.

The most natural answer is probably *four*: the atoms A, B and C, and the dyadic 'molecule' A+B. Naïve common sense apparently has it that small things sometimes come together to form larger things. Common sense does not deliver an explicit rule or principle governing composition. But it does have firm opinions about particular cases. The particles in a chemical atom, the cells in your body, the cards in a house of cards, the stars and planets in the Milky Way galaxy:— by commonsensical standards these are all cases in which several things compose a single thing. The connection between A and B in our example is meant to be an example of the sort of relation that suffices for composition by commonsensical standards, whereas A and C are supposed to be so completely loose and separate as to compose nothing (or at any rate, nothing worth mentioning) by those same standards.

Common sense about composition is opposed on both sides by distinctively philosophical approaches to the topic. Certain highly restrictive theories of composition claim that common sense is much too liberal. In his closely argued book, *Material Beings*, Peter van Inwagen defends the view that several things compose a single thing only when their activity constitutes the life of an organism.¹ On this view, the cells in your body — or the perhaps better, the elementary particles in your body — do indeed compose a single thing, namely you. But when the chemist says that three quarks together make a proton, or when the cosmologist says that billions of stars and planets and specs of interstellar dust together make up the Milky Way, or when the voice of common sense says that twenty cards make up a house of cards — what they say is false, strictly speaking. There are no protons or galaxies or houses of cards. There are rather billions of simple particles arranged proton-wise and galaxy-wise and house-of-cards-wise. The most radical view of this sort is compositional nihilism, according to which there is no such thing as a composite entity. On this view, it is probable that you do not

¹ Peter van Inwagen, *Material Beings* Cornell University Press, 1990.

exist. You just might be an absolutely simple Cartesian soul. But if not — if the only objects in your vicinity are material objects — then strictly speaking, there is no such thing as you. There are rather many simple things arranged 'person-wise' and engaged in various collective activities. Since you are not any one of these particles, and since there are no other candidates, the compositional nihilist maintains that strictly speaking, you do not exist.² (Which is not to say that he is chauvinistic; he says the same about himself.) In any case, compositional nihilism and van Inwagen's 'organicism' reject the natural answer to our question. They say that there are only three things in R, and in particular that the alleged complex A+B does not exist.

Nihilism and organicism are minority opinions. But the commonsensical answer to our question is equally at odds with the most widely accepted philosophical theory of parts and wholes, according to which there exist exactly seven things in R: three atoms: A, B and C, and four composite entities: the mereological aggregates or fusions A+B, B+C, A+C and A+B+C. The theory in question is classical mereology: an axiomatic theory of the part/whole relation developed by Stanislaw Lesniewski in the 1920s, and since adopted widely, most notably by Nelson Goodman, W. V. Quine and David Lewis.³ It will be useful in what follows to have the theory in front of us.

The language of the theory is a first-order language supplemented with devices for plural reference and quantification.⁴ It contains one primitive relation symbol, '... is a part of...', which is to be understood in the usual way. Other mereological notions are defined in terms of 'part'. For example,

X is a **proper part** of Y =_{df} X is a part of Y and X ≠ Y.

X is an **atom** =_{df} X has no proper parts.

X and Y **overlap** =_{df} Some object Z is a part of X and a part of Y.

² Is this a coherent view? See below, §6.

³ For an English translation of Lesniewski's work on mereology, see 'On the Foundations of Mathematics, *Topoi* 2 (1983). See also Goodman and Leonard, 'The Calculus of Individuals and its Uses', *Journal of Symbolic Logic* 5 (1940); Eberle, *Nominalistic Systems*, D. Reidel, 1970; Lewis, *Parts of Classes*, Blackwell, 1990, §3.4; and for an extensive discussion, P. Simons, *Parts: A Study in Ontology*, Oxford, 1987.

X and Y are **disjoint** =_{df} X and Y do not overlap.

X is **pure atomless gunk** =_{df} no atom is a part of X.

The Fs **compose** X (X is a **fusion** of the Fs) =_{df} Every F is a part of X, and every part of X overlaps an F.

The theory itself has four axioms:

Reflexivity: Everything is part of itself.

Transitivity: If A is part of B and B is part of C then A is part of C.

Unrestricted Composition: Whenever there are some things, there is at least one thing that they compose.

Uniqueness of Composition: Whenever there are some things, there is at most one thing that they compose.

In this paper we focus on Unrestricted Composition and certain alternatives to it. It may be useful, however, to say a word about the other axioms.

Reflexivity is little more than a terminological stipulation. If it sounds wrong to say that Fred is a part of himself, you can always interpret the technical mereological term 'is a part of' to mean 'is a part of or is identical to'.

Transitivity may seem obvious, but consider:

Fred is part of the conga line, and Fred's spleen is part of Fred. But Fred's spleen is not part of the conga line.⁵

This sort of difficulty is not decisive, however. No doubt it sounds peculiar to say that Fred's internal organs are parts of a dance formation. But think again about the conga line. What sort of thing might it be? According to one natural answer, it is a large

⁴ This innovation in its modern form is due to Lewis, *op.cit.*

⁵ Thanks to Mark Johnston for the example.

physical object made of people, snaking its way around the dance floor— an animated organic sculpture. It has a front half and a back half, but also a top half (made of heads and torsos) and a bottom half (made of legs and feet). Once you think of the line in this way — as a single, spatially extended physical object — it becomes plausible that the parts of its salient parts are also parts of it. Fred's legs and feet are clearly part of the line. And if his legs are in, why not his spleen? In any case, we shall assume transitivity in all that follows.⁶

Uniqueness of Composition is sometimes called the principle of extensionality. It says, in effect, that composite objects are numerically identical (one and the same) whenever they have all of their proper parts in common: 'No difference without a difference maker', as the saying goes. And this should not be obvious. As we are normally inclined to think, two sentences can be made out of just the same words; two tunes can be made out of just the same notes, and so on.⁷ These examples suggest that things may differ without differing in constituency, so long as they differ in the arrangement of their constituents. Here is another example, this time involving concrete objects. On Monday, Jones takes some bricks and builds a castle. He lets it be for a while, and then takes it apart, leaving the bricks in a heap. Years later he takes the very same bricks and builds a statue of Lesniewski. On the face of it, the castle and the statue are not identical. The castle no longer exists when the statue comes to be. But they are made of just the same bricks, and therefore (plausibly) just the same parts.

This sort of problem for Uniqueness can be evaded in several ways. According to Goodman, the time at which a thing exists counts as a non-physical part of it.⁸ On this bizarre view, the castle and the statue clearly differ in constituency, since only the castle contains Monday as a part. According to Quine and Lewis, on the other hand, the 'bricks'

⁶ There are other ways to think of the conga line. One might, for example, think of it as an *event* or *state of affairs* of a certain kind, towards which Fred is related, not as a *part*, but rather as a *participant*. The 'participation' relation has not been widely studied. But it is not implausible that it will fail to be transitive.

⁷ The claim concerns sentences and tunes considered as *types*. The sentence *tokens* "John loves Phil" and "Phil loves John" are made of distinct bits of ink. But the sentences themselves are not made of ink at all. If it makes sense to say that they are made of anything, they are made of words, and on the face of it, the very same words.

⁸ Goodman, *The Structure of Appearance*, Harvard, 1951, ch.2.

that make the castle are distinct from the 'bricks' that make the statue. On this view, temporally extended physical objects (such as bricks) are made of short-lived temporal parts or stages. The castle is not the fusion of the bricks simpliciter. It is a fusion of the Monday-bricks, the temporally restricted stages of the bricks that exist only on Monday, whereas the statue is made of an altogether distinct array of stages. Both solutions are workable, but neither is obviously correct. Uniqueness of composition is thus a bit of philosophical theory. It is not commonsensical; it requires substantive defense.

Many of the 'intuitive' objections to mereology depend on Uniqueness. For instance, the full theory entails that composition is automatic: Whenever the parts exist, the one and only whole composed of them exists as well. And this means that short of creating a brand new atom *ex nihilo*, there is no such thing as genuine creation, bringing a new thing into being. What we call 'creation' — of a painting, or a person — is really a matter of modifying the shape of an object that would have existed anyway. And that is a surprise. Nonetheless, we shall have nothing more to say about Uniqueness, and we shall not presuppose it in our discussion of mereology. Our focus will be the principle of Unrestricted Composition. This is the principle that generates the scattered aggregates $A+C$, $B+C$ and $A+B+C$ in our example, and hence the divergence from what we have (perhaps tendentiously) labelled common sense.

3. How shall we decide?

Our question was, "How many objects exist in R?" Compositional nihilism says 'three'; 'Common sense' says 'four'; and classical mereology says 'seven'. These are not the only possibilities, but let's ignore the others.⁹ The answers appear to conflict, in which case only one can be correct. So which is it? And more importantly, how shall we decide?

⁹ One of us favors the answer 'At least eight': Three atoms, four mereological fusions, and the genuine molecule AB. What's the difference between the mereological fusion $A+B$ and the genuine molecule AB? They occupy just the same space, and exhibit just the same manifest behavior. Nonetheless, they differ modally. The genuine molecule would not have existed if A and B had never been connected to one another. The fusion, by contrast, would have existed even if A and B had been at opposite ends of the universe.

The question is neither straightforwardly empirical nor straightforwardly conceptual. Each proposal is formally consistent — there are no 'paradoxes of mereology'.¹⁰ Could the meaning of 'part' be such as to render one of the proposals *analytically* inconsistent? The mereological nihilist's proposal, at least, is analytically consistent. For it is analytically consistent that no two material objects overlap spatially—no analysis of 'part' could reveal an inconsistency in this claim!—and mereological nihilism follows from this claim, assuming that every object must overlap spatially with any of its parts.

It is conceivable that there exists a compelling analytic definition of 'part' which, when substituted for the word in one of the competing principles of composition (other than nihilism), yields a contradiction or some other patent absurdity. But until someone provides such a definition, the presumption must be that there is none, for the parties to the dispute appear to speak the language well enough. We shall therefore assume that the debate cannot be resolved by conceptual analysis.

Nor can it be resolved by straightforward empirical means. Let R be located in the midst of our finest laboratory. The question is whether A and B (or A and C) together compose a single thing. Can you tell just by looking? That is hard to believe. Those who disagree with you — the nihilist and the mereologist, let us say — have eyes in their heads that work every bit as well as yours. On the basis of observation, they arrive at divergent answers. And that suggests that this one of those cases in which observation is inevitably so 'theory-laden' that a neutral observational standpoint is unavailable.¹¹ And if observation will not help, neither will experiment. Prod the particles gently: A and B stick together; C drifts off on its own. But you knew that would happen, so the result is uninformative. Wheel out your stethoscope, your electron microscope, your MRI, your

¹⁰ The common sense account has not been formulated as an explicit principle, so the claim of formal consistency does not apply. But there is no doubt that the commonsensical description of R is logically consistent.

¹¹ This is not to say that you cannot see composite things. If A+B exists, you may see it when you look at it. The point is rather that in this case, given the background of theoretical disagreement, seeing X is not sufficient for knowing that X exists.

Geiger counter. Dip the particles in acid; freeze them in liquid helium. Who knows what will happen? Our description of the case does not say. And yet it seems perfectly clear that experiments of this sort are beside the point. Our competing hypotheses are not testable in this sense. If the question is to be resolved, it must be resolved by other means.

4. Common sense and Unrestricted Composition.

Consider first the status of the principle of Unrestricted Composition. Since the most natural, most commonsensical count of objects in R failed to mention the scattered aggregates, A+C, etc., there is a sense in which the principle is 'counterintuitive' or 'revisionary'. And it might be thought that this by itself counts as a reason to reject it. The *appeal to common sense* — to what we find it natural to believe, to what we regard as settled before we come to philosophy — plays a central role in antiskeptical epistemology in other areas. Consider two competing hypotheses about ordinary experience: the commonsensical hypothesis that sense experience is a reliable source of information about the external world, and the skeptical hypothesis that everyday experience is systematically delusory. Like the dispute over composition, this skeptical dispute is neither straightforwardly empirical nor straightforwardly conceptual. But it is not unresolvable. Philosophers differ as to why the skeptical hypothesis should be rejected. But according to one account it is precisely its eccentricity that rules it out. The transition for 'where we are now' to the skeptical alternative would involve rejecting nearly everything we take for granted. The skeptic gives us no positive reason to make this transition. There is no sense in which his view is clearly 'superior' to the normal one. And so it is said: a principle of conservatism governs rational change in belief. If Unrestricted Composition (or Nihilism or some other restrictive principle) is at odds with settled opinion— and if there is nothing compelling to be said in favor of revision — then it is reasonable for us to reject it despite its consistency and its adequacy to the phenomena.

We shall not attempt to assess the appeal to common sense as an antiskeptical strategy in other areas. Whatever its merits as a response to (say) Cartesian skepticism, it cannot help us to rule out Unrestricted Composition. As Reid pointed out, common sense is invincibly persuaded that the external world exists. When the skeptical alternative is presented, it is *manifestly* incompatible with what we take for granted. It strikes us as absolutely ridiculous given what we think we know. The typical response to Unrestricted Composition is rather different. It is true that our first thought about R's inventory omits the scattered sums. But when the mereologist asks, 'Are you sure you haven't forgotten something? What about A+C, etc?', the commonsensical response is not, 'What are you talking about? There is no such thing!' It is rather much more equivocal.¹² It may even take the form: 'Well, if you count *that* as a thing, then I suppose there must be seven things in R after all.'

According to the mereologist we can always explain away the intuitive counterexamples to unrestricted composition in this way. Ordinary discourse, he will say, proceeds with a vague restriction to 'unified' objects in place. If an object fails to display a certain degree of integrity or 'thinginess' — if its parts don't tend to move together; if it does not contrast with its surroundings — then we tend to ignore it. We don't count it when we tally up the number of 'things' with a given feature. Suppose someone puts a 2 lb. cannonball and a feather on the table and asks, 'How many objects weighing more than one pound are there in front of you?' Your first thought is 'one'. But the mereologist will suggest that you are ignoring countless things: the top 2/3 of the cannonball; the bottom 2/3; the ball plus the feather, etc. None of these things is sufficiently 'thingy' to feature as an object of concern or attention in any normal context. But to say that X is properly ignored for certain purposes is not to say that X does not exist.

Contrast the mereologist's attempt to call your attention to these inconsequential items with the demonologist's attempt to call your attention to the invisible two lb. imp

¹² Strictly speaking, of course there is no such thing as *the* commonsense response. The point is that someone who responded in this way would not strike us as odd or bizarre. In this sense, the response is at least compatible with a common sense view of the matter.

perched on top of the cannon ball. You are not inclined to say, 'Well, if you count that as a thing, then I guess there must be more 1 lb. objects than I supposed'. No, the demonologist strikes us as straightforwardly deluded: he sees things that aren't there. The mereologist strikes us, by contrast, as pointlessly observant. The objects she bothers about may not be worth bothering about. But that is not to say that they do not exist.

The mereologist explains the seeming oddness of her view by appealing to a vague restriction governing ordinary discourse about material objects. This appeal is not ad hoc. It corresponds to something real in the 'phenomenology' of our encounter with the mereologist. For this reason, the appeal to common sense is unpersuasive in this context. Common sense may not bother with heterogeneous mereological fusions, but upon reflection, it is not robustly committed to their non-existence. At best, it is committed to the view that the scattered objects of mereology, if they exist, are for the most part not worth mentioning. But that is something the mereologist may well accept.

5. Common sense and Compositional Nihilism.

The appeal to common sense may not exclude Unrestricted Composition. But doesn't it at least exclude compositional nihilism and the other highly restrictive views we have mentioned? These views deny the existence of composite entities whose existence common sense appears to affirm with utter confidence. They say: "You may think that there is such a thing as the molecule A+B. You may think there bricks compose a house; that the trees compose a forest; that the bits of ink and paper compose a book. But strictly speaking you are mistaken. There is no such thing as a house; there is no such thing as a brick. So when you claim that there are ten houses on your street, six of which are made of bricks, you are wrong." Is not this view, at least, so profoundly at odds with common sense that we can dismiss it in the same spirit in which we dismiss the more familiar skeptical hypotheses?

Even this is not so clear. Common sense as we have construed it claims that A and B together make up a further thing. The compositional nihilist denies this. But of

course he doesn't deny that A and B are stuck together, that together they exhibit behavior that neither would exhibit on its own, that together they contrast with their surroundings, and so on. In short, he denies the existence of the molecule but agrees that there are some things arranged 'molecule-wise'. And he will say the same about bricks and houses and the rest. Strictly speaking, there is no such thing as a brick or a house; but there are some things — God knows how many — arranged brick-wise and some other things arranged house-wise. This arrangement is not merely a matter of disposition in space. For some things to be arranged house-wise they must cohere; they must collectively possess a certain mass, a certain shape, and so on. If we put some things arranged house-wise on the corner, they would look and feel and act just like a house, whether or not they constituted a single thing.

So consider two claims:

- (1) There is a house on the corner.
- (2) There are some things arranged house-wise on the corner.

These claims are distinct. The nihilist asserts (2) but denies (1), whereas common sense affirms (1) without conscious reservation. Now, there are many cases in which we do not strictly believe what we say. We exaggerate or oversimplify. We speak metaphorically or elliptically. And when we do, we are not committed to believing the proposition expressed by the sentence we utter. In most of these cases, if we interrupt the speaker and demand, "Is what you just said strictly true?" he will say, "No. I was just exaggerating (or what have you)." In conceding that common sense affirms (1) *without conscious reservation*, we are conceding that our claim about the house is not plausibly assimilated to non-literal speech. We do not think of (1) as a rough and ready shorthand, a way of conveying, if somewhat misleadingly, the sober truth expressed by (2). Let us not deny then that common sense is committed to the existence of composite objects of various sorts, and that it is therefore incompatible with compositional nihilism. The question is how deep this commitment runs and what sort of authority it should be accorded.

The first thing to note is that common sense has never given (2) a moment's thought. It takes some effort to get someone to see a difference between (1) and (2). (That's why it is implausible to attribute to common sense the thought that (1) is simply shorthand for (2).) But once we bring the contrast into focus we can ask, "Now that you see the difference, is it really so obvious that the bricks compose a single thing? Can you point to something in the perceptual scene which indicates, not just that the bricks are arranged housewise on the corner, but that, in addition, composition has taken place in this case?" If the answer is 'no', or 'I'm not so sure,' as we think it ought to be, then we find ourselves in the following situation. *Unreflective* common sense comes down squarely on the side of (1). But upon reflection it emerges that in taking this stance, common sense is excluding an alternative without having considered it, an alternative which, so far as we have yet been able to see, is undetectably different from the preferred alternative, and which, upon reflection, common sense hesitates to exclude. To insist upon the epistemic authority of ordinary, everyday common sense in this context is to lapse into an unappealing dogmatism. Naïve common sense may be forgiven for unreflective acquiescence in a theory of composition incompatible with nihilism. But would be a mistake for us — having raised the question explicitly — to defer to an authority which has never considered the matter and which delivers no decisive verdict when the question is put directly.

6. Compositional nihilism and the self

There is a striking argument for the conclusion that even if some very restrictive theory of composition is true, at least compositional nihilism is not true. It runs as follows:

1. I exist.
2. If I exist, I have proper parts.
3. Therefore, there is at least one composite object.¹³

There is no doubt that the premises of this argument are very compelling and plausible, that their denial initially strikes us as absurd. But this is true of the conclusion as well. If

¹³ This statement of the argument is due to van Inwagen, *op. cit.*, p. 73.

the argument is to get us anywhere, it can't be just another version of the appeal to common sense. Our confidence in the premises must be less prone to being undermined when we consider scenarios in which compositional nihilism is true than our confidence in the existence of houses and bricks.

In the case of the first premise, there is a relevant difference between your belief that you exist and the belief that some other composite object exists. An important part of the compositional nihilist's strategy for undermining your belief in galaxies and tables and molecules and even other people is the observation that things would *seem* the same way to you whether or not those composite things existed, provided that the atoms continued to be arranged in the same way. This is hard to deny when other composite things are in question. But when your own existence is challenged, you might well respond: 'Indeed, no one *else* would be able to tell the difference if my atoms were arranged as they are even though I didn't exist. But *I* can tell the difference. If I did not exist, things would not seem any way at all *to me*. My own existence is immediately evident, for while I can doubt that things really are the way they seem to me, I cannot doubt that things do seem that way to me.' The thought is compelling. But the compositional nihilist has a response: 'You don't exist; but the things you used to think of yourself as doing get done all the same. Certain atoms *jointly* think those thoughts, dream those dreams, and so forth. Things seem the way they do to those atoms jointly, but not to any single thing.'

Does the compositional nihilist's story make any sense? If we admit that it does, it will be hard to maintain our former degree of confidence in our own existence. Whatever I might do to convince myself that I exist, it is possible that some atoms might collectively do—but when those atoms collectively think 'I exist', they express a falsehood. Would you not at least start to get worried if you found out somehow that most of the thinking at the actual world was done collectively by atoms rather than individually by composite entities? If so, we are back to discussing the probability of the compositional nihilists' hypothesis. Thus, if you want to maintain your right to be completely confident that you exist, there is considerable pressure on you to declare that

the compositional nihilist's story is conceptually incoherent.¹⁴ You must maintain that thinking, or desiring, or feeling, or being seemed to, is not the sort of thing that several things could do collectively. It is not clear to us how this view could be argued for; and in any case, until it had been argued for, compositional nihilism remains an option.

7. The appeal to science.

The appeal to common sense is only one gambit in antiskeptical dialectics. Another approach, and perhaps the most significant from our point of view, is what might be called *the appeal to science*. Just to vary the example, consider the following hypotheses:

- (1) The physical universe is roughly 11 billion years old.
- (2) The physical universe was created 500 years ago by an impish deity with all the traces of an extensive past in place.

As before, neither hypothesis is self-contradictory and there is no crucial experiment to tell between them. And yet we think we have compelling grounds for accepting (1) rather than (2). In this case, however, the grounds come not from 'common sense', but from astrophysics. There is no clear consensus as to how this fact is to be understood. But let us begin with the following rough caricature. The sciences embody a practice for distinguishing between more or less 'acceptable' theories. Some theories are better at explaining the data. Some are more faithful — they make fewer or less extreme mistakes in prediction or retrodiction; and among equally faithful theories, some are simpler, more compelling, more tractable, more easily reconciled with settled doctrine in other fields, and so on. The appeal to science then exploits a general epistemological principle which may be framed very roughly as follows:

¹⁴ This is the attitude taken by van Inwagen, *op. cit.*, p. ***.

- (*) It is rational — rationally permissible, and perhaps even rationally obligatory— to believe the best, most acceptable scientific theory, and in particular to believe in the real existence of the objects that exist according to that theory.

The old earth hypothesis — (1) above — is clearly more acceptable by astrophysical standards than the trumped up alternative (2). That is why — so the story goes — we have reason to believe that (1) is true.

How does this bear on our question about composition? Just as there is little doubt that common sense bears a commitment to run-of-the-mill composite entities, there is little doubt that the best, most acceptable scientific theories that we have posit the existence of composite things at every scale: nucleons are made of quarks; atoms are made of nucleons and electrons.... Galaxies are made of stars and planets and interstellar debris. According to astrophysics, there is even such an entity as the universe itself, which is roughly eleven billion years old. Given (*), it follows that it is rational to believe that composite objects exist, and so to reject nihilism, organicism, and any other restrictive principle of composition.

One way to resist this argument is to reject the appeal to science altogether. It is sometimes said that we should regard even the best modern science as a useful fiction with no distinctive claim on our belief. On this view, the fact that modern chemistry makes reference to composite objects provides us with no reason whatsoever to believe that such things exist. But let us set this radical antisecularism to one side.¹⁵ Let us assume that the best modern science is a genuine source of information about its subject matter. Still, it is clear upon reflection that (*) is not quite right: the injunction to believe the best, most acceptable scientific theory requires qualification along several dimensions, and these qualifications bear directly on the appeal to science in the case that interests us.

¹⁵ Cf. van Fraassen, "'World' is not a Count Noun", *Nous* 29 (1995).

There are several contexts in which it would clearly be a mistake to believe most acceptable extant scientific account of the phenomena, and in particular to believe in (all of) the objects it posits.

(A) *Sometimes the best theory is known to be false.* General relativity (GR) is the best available theory of gravitation. It is more fully developed and better confirmed than any rival, and cosmologists routinely take it for granted in their calculations. Nonetheless it is incompatible with an even more successful theory of the other forces: quantum field theory. Given this, it would be unreasonable to believe the theory as it stands. It is one thing to say that something roughly like GR must be correct, or that GR must be the 'classical limit' of any convincing successor theory. Perhaps these opinions are licensed by the success of GR in its domain. But it is another thing altogether to say that we have reason to believe the theory in its present form. If (*) implies this strong conclusion, it is unacceptable.

(B) *Sometimes the best available theory is not good enough.* There are several theories about the origins of life. Some posit rudimentary systems of self-reproducing nucleic acids; others posit proteins that catalyze their own duplication. One such theory —the RNA world hypothesis¹⁶ — is widely held to be superior to the others. And given this, it obviously makes excellent sense for scientists to elaborate this theory, to seek confirmation of it, to attempt to reproduce the mechanism that it posits and so on. But at this stage even the best theory is too sketchy and too speculative to merit significant credence by scientific standards. The prevailing attitude seems to be, "This is a promising line of research, but the theory faces formidable difficulties."¹⁷ Under the circumstances it would be a bizarre scientism to insist that we are obliged to believe it nonetheless, simply because it is more promising than the alternatives.

¹⁶ Gilbert, "The RNA world" *Nature* 319 (1986), p. 618

¹⁷ Orgel, "The Origin of Life on the Earth" *Scientific American*, October 1994, pp.77-83.

(C) *Sometimes the best theory is not significantly better than its nearest rival.* Prior to the discovery of the microwave background radiation in 1964, there were two competing cosmological accounts of the Hubble expansion: the big bang theory, according to which all of spacetime is expanding from a singularity of infinite density, and the steady state theory, according to which new matter is constantly created and in such a way as to maintain a constant mean density in a universe of constant size. Both approaches had proponents, and each theory had its difficulties. Let us suppose that by the early 1960s, the Big Bang hypothesis was the better hypothesis overall. Still, the theory was not significantly better than its most serious rival. And given this, it is clear that a commitment to science did not require that one repose any significant confidence in it at the time. It was clearly permissible and perhaps even required to say rather: "We don't know what explains the Hubble expansion. We have two competing theories. One is better than the other, but we cannot rule either one out. The marginal superiority of the big bang theory at this stage does not constitute scientific grounds for believing that it is correct." Insofar as (*) is incompatible with this sensible posture, it is unacceptable.

(D) *Sometimes the best theory employs what are known to be simplifying assumptions or devices of convenience.* With a small number of speculative exceptions, every developed theory of physical processes assumes the continuity of physical space and time. Without this assumption, the mathematical apparatus of the calculus is inapplicable. The assumption of a continuum is thus for all intents and purposes practically indispensable in modern physics. (*) therefore suggests that we have reason from science to believe that spacetime is continuous. But is this right? Penelope Maddy has argued persuasively that the very fact that this hypothesis is forced upon us by considerations of mathematical convenience counts against the claim that the continuity of spacetime is well supported by recent physics.¹⁸ The hypothesis has not been tested; indeed it is unclear how it could be tested. Alternatives have not been explored in detail; certainly none has

¹⁸ Maddy, *Naturalism in Mathematics*, Oxford, 1997, ch.2, §6.

been developed with anything like the generality of the standard approach. In light of all this it is not unreasonable to suggest that the continuity of space and time is to be regarded as a working assumption which may turn out to be an idealization, and not, therefore, as a settled result.

We acknowledge that, without exception, the best available theories make extensive reference to composite things. Simple-minded application of (*) would then that we reject compositional nihilism. But we have seen that (*) should not be applied simple-mindedly. The last two reservations are especially relevant in the present context. We do not suggest that working scientists themselves regard the appeal to composite entities as a matter of convenience, in the sense in which some regard the appeal to the continuity of spacetime in this light. And we do not suggest that extant theories exist side by side with near rivals that manage to do without composition. But once the possibility of doing without composition has been drawn to our attention, it does not require any great expertise in science for us to introduce new theories which differ from the old ones in being neutral on questions of composition. A team of scientifically-inclined compositional nihilists would have no trouble with the job.

There is a canonical way of eliminating the mereological commitments of almost any theory.¹⁹ The method is to rewrite the theory in such a way that singulars are replaced with plurals throughout. For example, the current best theory in chemistry might be full of talk about molecules allegedly being composed by atoms. The new, mereologically neutral theory will be constructed from the old one by:

- (i) replacing every occurrence of ‘there is something which’ with ‘there are some things which’
- (ii) replacing every occurrence of ‘for every thing’ with ‘whenever there are some things’
- (iii) replacing every occurrence of ‘is part of’ with ‘are among’ (the *xs* are among the *ys* iff whenever something is one of the *xs*, it is one of the *ys*).

¹⁹ The main ideas are implicit in van Inwagen, *op. cit.*

- (iv) replacing every occurrence of ‘is identical to’ with ‘are the same things as’ (the x s are the same things as the y s iff for any thing, it is one of the x s iff it is one of the y s)
- (v) replacing every singular predicate in the theory with a new plural predicate. Thus ‘is a molecule’ is replaced by ‘are arranged molecule-wise’, ‘has mass M ’ is replaced by ‘have mass M ’, ‘is located one nanometer away from’ is replaced by ‘are located one nanometer away from’.^{20 21}

A new theory constructed according to this method will not be *logically* entailed by the old theory upon which it was based, since it will contain predicates that did not occur in the old theory (‘are arranged molecule-wise’, ‘have mass M ’, and so forth). But it is very plausible that the meanings of these new predicates are systematically related to the meanings of the predicates of the old theory in such a way that the old theory *analytically* entails the new theory. It’s part of the meaning of ‘are arranged molecule-wise’ that atoms which in fact compose a molecule are *ipso facto* arranged molecule-wise. This doesn’t depend on the assumption that the predicates of the new theory orthographically contain the corresponding predicates of the old theory. If we had written the new theory using nothing but arbitrary predicate-letters, the meanings of these predicate-letters would still have been fixed in such a way that if the old theory was in fact true, the new theory could not have failed to be true.

²⁰ Understand all these plural expressions in such a way that there is nothing contradictory in claiming that there are some things such that there is only one of them. So it may be compatible with our new chemical theory that atoms are single things--that is, whenever there are some things arranged atomwise, there is always necessarily only one of them. By contrast, since it followed from the old theory that most molecules have more than one part, it will follow from the new theory that mostly, when there are some things arranged molecule-wise, there are more than one of them.

²¹ What do we do if the old theory contained *plural* quantifiers? It seems that in that case we will need to introduce ‘pluplural’ quantifiers in the new theory, quantifiers which stand to plural quantifiers just as plural quantifiers stand to singular ones (see Allen Hazen, ‘Relations in Lewis’s framework without atoms’, *Analysis* 57, 1997). Ordinary language doesn’t contain any clear examples of such quantifiers, though it does, arguably, contain ‘pluplural’ referring expressions (‘the Beatles and the Stones’ might be an example, on one of its disambiguations). Some philosophers have claimed not to understand such quantifiers. Others have claimed to be able to understand them only as disguised quantifiers over sets. The question what implications this view, or the related view that *plural* quantifiers are only intelligible as quantifiers over sets, would have for our proposal is too deeply embedded in the philosophy of mathematics for us to address here. In any case, few extant theories in science seem to make any essential use of plural quantifiers.

This method is not guaranteed to work —sometimes the new theory one gets by applying (i)–(v) is not entailed by the old theory, or is even contradictory—but for currently accepted scientific theories it works perfectly well.²² In these cases, since the old theory analytically entails the new one, the new theory cannot be less credible, or less well confirmed, than the old one.²³ Anyone who thinks that science somehow gives us reason to believe in composite objects must therefore maintain that by scientific standards, the old theory is *almost* as well-supported as the new one, so that if we were sure that the new theory were true, we should be almost as sure that the old theory, with all its mereological commitments, were true as well.

What grounds could there be for believing the stronger, old theory rather than the new one? Given that we are justified in thinking that there are things arranged star-wise, solar-system-wise, and galaxy-wise, what further scientific considerations can be cited in support of the further conclusion that there are stars, solar systems and galaxies?

To give a really satisfying answer to this question, one would have to point to some piece of *data* that was better explained by the old theory than by the new one. Initially, nothing seems easier: Ordinary science explains why unsupported bricks fall towards the earth, why ice cubes melt, why bombs explode; whereas, far from explaining these things, mereologically neutral science doesn't even commit itself on the question whether there are such things as bricks, the earth, ice cubes and bombs. But if we help ourselves to descriptions of the data in terms of composite things, the appeal to science will have turned out to be nothing more than a disguised version of the appeal to common sense. To vindicate the claim that there is some distinctively *scientific* reason to believe some claim about composition, one must describe the data in neutral terms so as not to

²² This assumes that the theory in question is formulated in such a way that predications the form 'x is part of y' are made *tenselessly*. If the theory uses the notion of tensed parthood—so that 'x is part of y at t' can be true without 'x is part of y at t'' being true, a more elaborate version of the algorithm needs to be used, since of course 'the xs are among the ys' is not the sort of thing that can be true at one time and not at another. The more elaborate version of the algorithm introduces a new four-place predicate taking two plural expressions and two times as arguments to do the work done in the old theory by identity through time. The new translation of 'x is F at t' is 'there exist a t and some ys such that R (the xs, t, the ys, t') and the ys are arranged F-wise at t.'

²³ This echoes an argument of van Fraassen's. See, for example, 'Empiricism in the Philosophy of Science, in Churchland and Hooker, eds. *Images of Science*, Chicago, 1995, p. 294..

“beg the question” against the neutralist; we must speak of things arranged brickwise falling towards things arranged planetwise, things arranged ice-cube-wise melting, things arranged bombwise exploding. When this is done, it is hard to see how the old theory’s explanation of the data can be better than that given by the new, mereologically uncommitted theory.

In the absence of a really satisfying answer to the question, we must appeal to ‘tie-breaking’ considerations like simplicity and the rest. Now there can be no doubt that in most cases the old theory is more familiar, more convenient to use, more perspicuous, and so on. But as we have seen, it is not at all obvious that these virtues by themselves ever count by scientific standards as reason for belief. For our judgments about relative simplicity of theories to have clear weight in justifying belief, we must abstract away, to some extent, from merely practical considerations. There is some question whether this abstraction needs to be total: maybe the Martians have scientific theories which are empirically equivalent to ours but which are so alien to our ways of thinking that we can be justified in disbelieving them on those grounds alone. The mereologically uncommitted substitutes for our current scientific theories are not like that, however. They are well within our grasp; we could talk that way if we wanted to, although it would be awkward and time-consuming. They preserve all of the structural features of the theories they are based on, so that scientists themselves (with their lax standards for theory individuation) are liable to treat them as notational variants of a single theory. Given all this, it would be dogmatic scientism at its worst to suggest that science as we find it requires us to believe in the real existence of composite entities.

As we have said, the algorithm described in steps (i)–(v) does not always succeed in producing a mereologically uncommitted weakening of a theory. In certain cases it generates a contradiction. This happens when the original theory the falsehood of one or more of the axioms of mereology; it also happens when the original theory entails the existence of atomless gunk.²⁴ What happens if our current best scientific theory of

²⁴ If the algorithm does not generate a contradiction, it may still fail to generate a theory entailed by the original theory. For example, applying the algorithm to the theory ‘Either there are some things that compose two different things, or there are no stars’ gives us something logically equivalent to ‘there are no

something or other is like this? Does the appeal to science then justify us in having some substantive view about composition?

We doubt it. First, consider what a theory would have to be like to conflict with mereology. One way for a theory to put itself at odds with mereology is for it to be the conjunction of some ordinary scientific theory with some tendentious independent claims about composition. We can find a mereologically uncommitted rival to such a theory just by dropping the additional claims, and then applying the algorithm as before. The task becomes somewhat more difficult when the mereological presuppositions of the theory are more tightly woven into the science. For example, we can imagine a version of physical theory in which the question ‘how many other things have exactly the same parts as a given object?’—a question whose answer is always ‘None’, according to mereology—plays an important role in predicting the behavior of that object. Say that X is bad if and only if it has exactly the same parts as another object. Then there might be a law according to which bad things repel one another while attracting things that are not bad. The strategy for eliminating the mereological presuppositions from theories like these is clear: We replace mereological predicates with new predicates. For example, instead of speaking of ‘the number of other objects which have exactly the same parts as x ’, we can just speak of ‘the P-number of x ’, leaving it open what something’s having a given P-number might amount to. We can then apply the algorithm to the revised theory.

The only theories we can think of which contradict the axioms of mereology are trumped-up and artificial. By contrast, it is possible to develop natural, unified scientific theories that entail the existence of gunk. Initially it might seem that a physics of gunk would have to be very unlike any theory of physics that has been seriously entertained since the seventeenth century. For all of our theories, since then, have used a geometric framework that is most naturally interpreted as a way of talking about certain *point-sized*

things that are arranged starwise’, plainly not a consequence of the original theory. In general, the algorithm runs into trouble when the theory we start with is one according to which the non-mereological facts—those to which even the new theory generated by the algorithm is sensitive—depend somehow on mereological facts which contradict the axioms of gunkless mereology. For the algorithm to be successful, each possible world at which the original theory is true must be *atomistically equivalent* to a world at which the original theory is true, the axioms of mereology are true, and there is no gunk.

entities.²⁵ But Whitehead showed how the believer in gunk can give an alternative interpretation of the framework, using nested sequences of pieces of gunk as surrogates for point-sized things.²⁶

Nevertheless, it is hard to see how a gunk-postulating theory could ever be decisively superior to its mereologically uncommitted rivals from a scientific point of view. Given a gunk-postulating theory consistent with the axioms of mereology, it is not hard to come up with a new, gunk-free theory modelled after it, by adding some extra things ('points') not posited by the original theory. The gunk-free theory will of course not entail the gunk-positing one, but if we do the construction correctly it will entail that the gunk-positing theory comes out true when all quantifiers are restricted to things other than the points.²⁷ Having generated a gunk-free theory in this way, we can then apply the algorithm to generate a mereologically uncommitted theory which is equivalent to the original gunk-positing theory for all scientific purposes. This theory will not be entailed by the original theory. But it seems sure to be a strong competitor, and it is doubtful that any properly scientific considerations could favor the gunk-positing theory over the mereologically uncommitted one.²⁸

Of course we cannot predict what the future will bring. It is conceivable that science will someday provide grounds for believing, with Anaxagoras, that "neither is there a smallest part of what is small, but there is always a smaller".²⁹ Our point is not that these issues are absolutely, in principle, immune to resolution on scientific grounds.

²⁵ Couldn't there be a point-sized piece of gunk? Perhaps: but why would anyone believe in such things?

²⁶ Whitehead, "The Method of Extensive Abstraction", Chapter 4 in *The Concept of Nature*, Cambridge University Press, 1920.

²⁷ This is a consequence of Stone's Representation Theorem for Boolean algebras (see Hazen, *op. cit.*, p. 246).

²⁸ Sometimes an inductive argument in support of the gunk hypothesis is suggested (e.g. by Ted Sider, 'Van Inwagen and the Possibility of Gunk', *Analysis* 53 (1993): 285-89, p. 286). Macroscopic things turned out to be composed of molecules. Molecules turned out to be composed of atoms. Atoms turned out to be composed of protons, neutrons and electrons. Protons turned out to be composed of quarks. Given this history, isn't it somewhat likely that everything is composed of some other, smaller things? The problem with this argument, in a context where we are trying to decide among theories of composition, is that the mereological nihilist does not accept its premises. According to the nihilist, it did not turn out that molecules were composed of atoms; rather, it turned out that molecules didn't exist. Plainly there is no force in an inductive argument for the conclusion that nothing at all exists!

It is rather to stress that even given the widespread commitment to composite things in extant science, compositional nihilism remains on the table.

8. Problem or Pseudoproblem?

The true principle of composition — whatever it may be — is neither analytic nor straightforwardly empirical. If it is knowable at all, it must therefore be a synthetic a priori proposition, and a non-evident one at that. We do not deny the existence of such principles. It may be — it *may* be — that the truths of mathematics, the truths of ethics, the principles of metaphysics, and the like must be accorded such a status. Our case for agnosticism about composition does not depend on the rejection of synthetic knowledge a priori. It is rather the upshot of having canvassed the main sources of grounds or evidence and come up wanting. In other domains in which substantive a priori knowledge appears to be possible, one ultimately comes upon principles which, though clearly synthetic, nonetheless strike us as obvious or indisputable, perhaps on pain of incoherence. These underived principles need not be obviously obvious. It is not a platitude that 'whatever looks luminous does not look gray'³⁰. But on reflection, the claim "strikes us" as clearly correct, and this fact plays a central role in the account of what (if anything) justified its acceptance.

In our opinion, there is nothing analogous in the case of principles of composition. Upon reflection, unrestricted composition is a contender; but so are certain more restricted principles, perhaps including nihilism. Close your eyes and think through the alternatives. Some will strike you as more 'plausible' — but that is the appeal to common sense, which we have rejected. None will strike you as evident, as indisputable on pain of incoherence, or so we say. The choice is a choice among coherent alternatives. And for the present we see no basis on which it might be made.

²⁹ In Kirk, Raven and Schofield, eds., *The Presocratic Philosophers*, 2nd ed., Cambridge University Press, 1983, p.360. Cited in Sider, *op. cit.*

³⁰ Wittgenstein, *Remarks on Color*, G. E. M. Anscombe, trans., University of California Press, 1977, p. 7.

Now some philosophers are profoundly impatient with this sort of question. They will say — or try to say — that the appearance of an epistemological impasse is based on a mistake. The most straightforward version of this gambit proceeds as follows:

Take the two extreme alternatives, nihilism and universalism. On the face of it these seem like different, incompatible theories. They appear to disagree, for example, about the number of objects in R . But this appearance is misleading. The two parties employ distinct 'conceptions' of an object. When they make seemingly incompatible claims of the form 'There are n objects in R ', in effect, they mean different things by their words. Nonetheless, any description of the world framed in terms of one account can be translated into a description framed in terms of the other *without remainder*. And when these translations are borne in mind it turns out that the two sides do not really disagree at all. Consider the following exchanges:

First exchange:

Nihilist: I don't believe in composition. There are only three objects in R ; there is no such thing as a house or a brick, only atoms arranged house-wise and brick-wise, and so on.

Universalist: I agree completely, but from my point of view, you have expressed yourself misleadingly. I see from what you say that your quantifiers are restricted. When you say "There are only three objects in R ", what you mean is expressed in my language by the sentence "Considering only the atoms, there are only three things in R ". When you say that there are no houses, etc., what you mean is that considering only the atoms, there are no houses, etc. In general, when you say "For all x " or "For some x ...", what you really mean is "For all x , if x is an atom ..." or "For some x , x is an atom and ...". Your quantifiers are thus restricted, whereas mine are wide open, ranging over everything there is. In order for me to say in my language what you say in yours, I must make the

restriction to atoms explicit. But when I do, I agree wholeheartedly with what you say.

Second exchange:

Universalist: I believe in unrestricted composition. Given n atoms, there exist $2^n - 1$ objects altogether. So there are seven things in R. There is an object composed of your head and my body, etc.

Nihilist: I agree completely, although from my point of view you have expressed yourself misleadingly. I see from what you say that your quantifiers always fall within the scope of a tacit operator. When you say that there are really seven objects in R, what you say is better expressed in my language by the claim that *if unrestricted composition were true and the atoms were arranged just as they are, there would be seven objects in R*. When you say that there exists a scattered object composed of your head and my body, you mean that such a thing exists, *according to the mereological fiction*. In general, when you assert a sentence S, what you say is better expressed in my language by the sentence "So far as the atoms are concerned, things are as if S were true." You routinely speak from within a tacit fiction. You convey information about the configuration of atoms in actuality indirectly by speaking counterfactually about how things would be if there were composite things. I speak directly, without a detour through fiction. In order for me to say in your language what you say in yours, I must make this fiction or hypothesis explicit. But when I do, I agree wholeheartedly with what you say.

If either of these proposals were correct, the dispute would be merely verbal: Both sides could be right. In an interesting variation on this suggestion, Hilary Putnam has proposed that since the crucial claims of synonymy are indeterminate in truth-value, there is no fact of the matter as to whether the two parties disagree.³¹ Against this, we

³¹ Putnam, 'Truth and Convention', in *Realism with a Human Face*, Harvard, 1990.

maintain that the translations in question clearly fail to preserve meaning. To be sure, they may be adequate translations for certain purposes. The disputants might well want to *pretend* that their respective translations are correct, so as to enable them to talk about other things without always being distracted by their disagreements about mereological matters. But this kind of pretence must be distinguished from a serious interpretation of another person's opinions. This is made vividly apparent when we imagine the following continuations of the dialogues:

First exchange, cont'd.

Nihilist: Who are you to tell me that my quantifiers are restricted? When I say that composite things do not exist, I mean that among all of the things there are, with no restrictions or qualifications (pound table, stamp foot) there is no such thing as a composite object. You yourself have been known to say "There are composite objects" in expressing your view. Focus your mind on the claim you made by using these words: it is the negation of *that very claim* that I mean to express when I say "There are no composite objects".

Second exchange, cont'd.

Universalist: Who are you to tell me that my claims are prefixed by a tacit operator? When I say that there exist seven objects in R, I am not talking about what would have been the case if some far-fetched conjecture were correct; I am not talking about what is so according to some false story. I am speaking strictly and literally and without ellipsis. My view is that in the actual world — forget about the others — the principle of unrestricted composition obtains. You yourself have been known to say 'There exist some things which compose nothing'. Focus your mind on the claim you made by using these words. It is the negation of *that very claim* that I mean to express when I say that whenever there are some things, there is something they compose.

The availability of these responses rules out the idea that the dispute must be merely verbal. If the universalist and the nihilist respond in these ways, then we have no option but to take them at their words.

9. What to do?

We thus have no choice but to regard the dispute as genuine. And yet it is quite unclear how it is to be resolved. We have not shown that there is no straight solution. In particular we have not shown that considerations of philosophical theory cannot do the trick. Principles of composition may not be self-evident; but they do interact with other principles in metaphysics, and it may be that the only satisfying systematic account of problems in other areas — problems of identity over time, problems about causation, or problems in the theory of universals, for example — are consistent with only one (or only some) principle(s) of composition. We cannot hope to survey every possible argument of this form. Let us suppose, however, that at this stage in our reflections, we find ourselves at an impasse. Let us suppose that we do not know what to think. This raises a practical question. What should we do? How should we speak? What attitude should we take towards those aspects of science and common sense which appear to make claims about composition?

In some areas the agnostic's predicament is less than urgent. If you have no opinion about the age of the earth or the extinction of the dinosaurs, then you should not pretend you do. If someone asks you what you think, you should say, "I don't know", and you should not assert any statement which entails a position on these topics. When it comes to principles of composition, however, this sort of abstention is not an option. To refrain from *talking* about composite things is to refrain from talking altogether, at least if one is constrained to speak ordinary English. And this is not just a point about outward speech. We have no way to think about the world we live in, whether for practical purposes or for more purely intellectual ones, without invoking composite things of various sorts. You are hungry and you wonder whether there's an apple in the fridge; so you do your best to remember whether you saw one there last time you looked. If you doubt whether apples exist strictly speaking, then you are not in a position to ask this question much less to

answer it by normal means. But if you can't think about what to eat, you're in trouble. What to do?

Here's our advice. There are two sorts of attitudes one can adopt to the settled claims of common sense and science — the claims one is prepared simply to affirm without reservation, whether in conversation or in one's own practical thinking. One can regard these claims as strictly and literally true: that is the default option. But one can also regard them as in one way or another apt or adequate, where aptness and adequacy fall short of truth. Perhaps the clearest everyday examples of this phenomenon occur in figurative speech. I may express my disgust with my unpleasant neighbor by saying (or thinking) 'Fred is the most hideous man alive' without believing that my claim is strictly true. Another example, perhaps more pertinent for our purposes, is everyday discourse about the content of a fiction. When you ask me what happened in the film, I may answer by saying, 'A young woman in New York gave birth to the Antichrist.' Now I don't believe that this sentence, taken literally, expresses a truth. But that doesn't matter, because when I uttered it I was expressing a different belief, a belief about what happened in the film. I wasn't committing myself to the literal truth of the sentence. I was committing myself, rather, to its truth *in the movie*.³²

As we have suggested, we do not ordinarily maintain conscious reservations of this sort about what we say concerning parts and wholes. When the chemist says that a water molecule is made of two atoms of hydrogen and one of oxygen, he does not take himself to be speaking figuratively. If you ask him whether his claim is meant to express the sober truth, he may well say, 'Yes, of course; this is serious business.' Nonetheless, apprised of the considerations we have rehearsed in the paper, he may be inclined to back off from his confident claim about composition. If he is canny he may say, 'I'm not sure whether what I said is strictly true. But what I am sure of is this: what I said was *true on the assumption that composite things such as molecules exist*.'

³² Given that the sentence isn't literally true, but is true in the movie, is it true *simpliciter* in the context in which it was uttered? Is the case one in which a false sentence is used to express or convey true beliefs, or is it one in which contextual factors allow a sentence to be true without being *strictly* or *literally* true? We

There are in fact many different statuses short of strict and literal truth which one might claim for sentences about composite objects whose strict and literal truth is cast in doubt. One such status is that of *atomistic adequacy*. Roughly, we can say that a sentence is **atomistically adequate** iff it is true, or would be true if the facts about composition were different but all else were just as it actually is. If precision is desired, it can be supplied using possible worlds talk: a sentence is atomistically adequate iff it is true at some world that is *atomistically equivalent* to the actual world; two worlds are **atomistically equivalent** iff they share a *mereological closure*; the **mereological closure** of a world *w* is a world where everything that exists at *w* exists and is exactly as it is at *w*, and there also exist just enough extra things to make the principle of universal composition true.³³

Atomistic adequacy is a particularly undemanding status. A sentence and its negation can both be atomistically adequate: this will be true whenever S says that certain things compose something. There are many more demanding statuses which lack this feature. For example, there is *truth according to the fiction that composition is universal*. This can be thought of as equivalent to truth at the mereological closure of the actual world. Likewise, for any other theory of composition, we can speak according to the fiction that that theory is the correct one. A sentence is true according to the fiction that

adopt no view about which of these accounts is correct, or even whether there is a genuine issue between the two.

³³ There are two ways to understand the claim that a sentence is true at a given world. We can consider the proposition that is actually expressed by the sentence, and ask whether *it* is true at the world; alternatively, we can consider the truth of the proposition that would be expressed by the sentence at the world in question. The answer will be the same when the world in question is like the actual world as far as the propositions expressed by sentences are concerned. How should we understand the notion of truth at a world as it occurs in our definition of atomistic adequacy? Perhaps the second way is better. For if compositional nihilism or any other restrictive theory of composition is true, many of the proper names and demonstratives which we normally take to have referents are actually denotationless. If so, according to an influential tradition in the philosophy of language, simple sentences that contain these names either express no propositions at all, or express necessarily false propositions. To get the result that ‘Mars is a planet’ is atomistically adequate even if there are no planets, we need to take account of the fact that ‘Mars’ *would* have had a referent if certain particles arranged planetwise had composed something.

T is the correct theory of composition iff it is true at all the worlds which are atomistically equivalent to the actual world, and at which T is true.³⁴

We can explicitly disavow commitment to the literal truth of sentences about composite objects. We can prefix a sentence like 'Water molecules are composed of hydrogen and oxygen atoms' with an operator like 'On the assumption that composite things exist...', or 'It is atomistically adequate that...', or 'Doubts about the existence of composite entities aside...'. But of course it would be tedious to speak in this way at any length, just as it would be tedious to keep saying 'in the movie, this' and 'in the movie, that' when discussing a film. The solution is to adopt a general policy of committing oneself only to the atomistic adequacy (or truth according to some theory of composition) of what one says or thinks. One may begin to regulate one's speech and explicit verbalized thought, not by what one takes to be strictly true, but rather by what one takes to be true on the hypothesis or assumption that one or another principle of composition is correct. This principle need not be a fully worked out theory of composition. It might even be the vague principle that several things compose a single thing when they are sufficiently 'unified' or 'connected'. The vague principle is objectionable if construed as a serious theoretical claim. It seems to entail the deeply obscure doctrine that it is a vague matter how many things there are.³⁵ But there is no comparable obstacle to employing the vague principle as a fiction that guides our thought and talk.

There is no doubt that this is a feasible policy. Consider the mariner who knows full well that Copernicus was right. When he is navigating he speaks and thinks in Ptolemaic terms. In the midst of a storm, when things are urgent, he may have no conscious reservations about what he says or thinks. Nonetheless, when he says "If Venus has crossed the moon, we're off course" he is not committed to its truth. His

³⁴ This account of the semantics of 'according to the fiction' is too simple to be quite right. It breaks down when there is no world atomistically equivalent to the actual world at which the relevant theory of composition is true. This will happen, for example, if the actual world contains counterexamples to Uniqueness of Composition and the theory is classical mereology. It will also happen if the actual world contains gunk and the theory is compositional nihilism or some other restrictive theory. A more sophisticated sort of semantics would be required to settle what to say in such cases.

³⁵ See Lewis, *On the Plurality of Worlds*, Blackwell, 1986, pp. 212-213.

official view, his genuine view, is that Copernicus was right and that his Ptolemaic remark is a useful fiction

It is possible to regard the idea of composition as a fiction to live by. We speak as if composite things were ubiquitous. But we need not, in so speaking, take on a commitment to this hypothesis. We may take a light-hearted stance toward our discourse about composition. So far as we can see, there is nothing unreasonable in this policy. It is, after all, merely a retreat to a weaker set of commitments than is usual, and again, so far as we can see, nothing of scientific or practical importance is thereby lost.

Is anything lost? That remains to be seen. We have already mentioned that for certain philosophical purposes, it may turn out to matter whether composite things in fact exist. It is plausible, however, that at present, no such consideration decides the question. If you agree, then our fictionalist agnosticism should seem like an attractive option. We have no serious alternative but to speak as if we knew a great deal about when several things compose a single thing. But on reflection, it is hard to see how we could have such knowledge. Would it be better to know? Of course it would. But in the meantime we need an alternative to the bad faith that comes from pretending to know in 'daily life' what one does not know in philosophy. The fictionalist stance we have described is designed to serve this purpose. The ambitious metaphysician will not be satisfied. She wants to know how things stand simply for the sake of knowing. We do not disparage this ambition — far from it. But until it can be realized, fictionalism strikes us as preferable to dogmatic acquiescence in 'common sense' or in the sciences.