

Against a Motivation for Hylomorphism

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Following David Lewis (1991), we take *Classical Extensional Mereology*, henceforth abbreviated (CEM), to be a theory upholding the following three axioms:

AXIOM 1 (Unrestricted Composition):

Whenever there are some objects, then there exists a mereological sum of those objects.

AXIOM 2 (Uniqueness of Composition):

It never happens that the same objects have two different mereological sums.

AXIOM 3 (Transitivity):

If O_1 is a part of some part of O_2 , then O_1 is a part of O_2 .

Call a defender of (CEM), a *mereologist*, short for classical mereologist.

Recently, defenders of a neo-Aristotelian theory of material things and their parts—*hylomorphism*—led by Kit Fine, have leveled an attack against (CEM) in hopes of supplanting (CEM) with hylomorphism. According to the hylomorphist, the mereologist is faced with a destructive dilemma. Either the mereologist assigns the wrong existence conditions and spatiotemporal location to ordinary material objects or, in an attempt to assign the proper spatiotemporal location, misrepresents the part-whole structure of ordinary objects. In either case, (CEM) is shown inadequate.

We aim to investigate this objection to (CEM), an objection that I find unpersuasive. There are two reasons for investigating this argument.

The first is dialectical. There are advantages of hylomorphism over (CEM). It more naturally accords with our modal and temporal persistence intuitions, for example, and gives an account of why some divisions of material objects seem to be more natural than others.¹ But the hylomorphist is ultimately at a dialectical disadvantage against the mereologist. For hylomorphism is a heavyweight theory of material things and their parts as contrasted with (CEM), attended by a host of heretofore unrecognized *sui generis* relations² and greater ontological commitment.³ The appropriate reaction to hylomorphism on the part of the mereologist is, “It seems to do much of the metaphysical work that we need done, but do we really need all that baggage?”

It is the hylomorphist’s charge to answer this question in the affirmative, and her leading attempt to do so, as of yet, has been to offer the argument that we have set out to investigate. Hence one important reason for investigating and assessing this argument against (CEM): the motivation for hylomorphism seems to depend on its success.⁴

The second reason is that investigating the hylomorphist’s argument provides us with occasion to make some subtle points about (CEM) that are in their own right interesting additions to studies of the nature of parts and wholes.

¹ Think of two different ways of dividing a chair into three divisions: first, into four legs, a back and a seat; and second into two legs and a back, a seat and a leg and a leg. It might seem to you that the first division is more natural—that it somehow better captures the breakdown into parts of the chair. The hylomorphist would most certainly think that the first division of the chair is more natural than the second, and account for this with her material things as hierarchical sets view. The chair is not like {leg, leg, leg, leg, back, seat} which has no natural divisions into three, as much as it is like {{leg, leg, leg, leg}, {back}, {seat}}, which does have a natural divisions into three.

² I quote Koslicki: [hylomorphism at least as Kit Fine has pursued it] leads...to a proliferation of distinct, primitive relations, which are not obviously needed in order to capture the conditions of existence, identity, location, character and part-whole structure of ordinary material objects. (Kathrin Koslicki 2006, 150)

³ I quote Fine: We are familiar with the prodigious ontology of the mereologists, according to which and occupied region of space-time, no matter how scattered of gerrymandered, will determine a material object. But this is nothing compare to the ontology of [hylomorphism]. For to each such object of the mereologist, there will correspond a multitude of [objects for the hylomorphist]. (Kit Fine 1999, 73)

⁴ Both Fine and Koslicki seem to implicitly acknowledge that the motivation for hylomorphism seems to depend on the success of this argument.

1. In the background, behind this objection to (CEM), the hylomorphist has a picture of materiality on which there are two very different kinds of material objects: structured and unstructured. Unstructured objects are mere collections of their parts. For example, let STYROFOAM be the aggregate of all of the bits of Styrofoam in the universe ever. STYROFOAM is a paradigmatic unstructured object, a mere collection.

There are many objects that appear to be more than mere collections of their parts, objects such as: animals, plants, cars, tables, chairs, galaxies, atoms, ham sandwiches, and so on. A chair, for instance, is not merely a collection of bits of wood in the way that STYROFOAM is a collection of bits of Styrofoam. The bits of wood have to be arranged in the right sort of way, chair-wise, in order that they compose a chair. Objects that are not merely a collection of their parts, as in the chair, are structured objects.

The hylomorphist gives a complicated account of structured objects, the details of which are afield from our present discussion.⁵ More or less, the hylomorphist conceives of a structured object as a coming together of matter and form. The parts of a structured object bear a *sui generis* embodying relation to the form of the structured object. The form acts as both the unifier of the parts and the source of the identity/essence of the structured object. The important thing to understand for our purposes is this: the argument against (CEM) is essentially a hylomorphist contention that any metaphysics of parts and wholes that ignores the formal aspect of (structured) objects will be unable to properly account for structured objects—their spatiotemporal locations, their existence conditions and their part-whole structures.

⁵ For the details of hylomorphism see: (Fine 1999), (Koslicki 2006), (Johnston 2007), and to a lesser degree (Fine 2006).

We will focus our attention on non-simple structured material objects that do not undergo a change in their parts. Objects that are akin to an isolated water molecule composed of the very same hydrogen atoms and the very same oxygen atom throughout its entirety. These are the kinds of objects that the hylomorphist thinks are most problematic for (CEM). We will follow Fine (1999) and use the rather apt example of a ham sandwich as our stand-in for these kinds of structured objects.

With regards to the distinction between structured and unstructured objects, the mereologist has two choices. One option is to deny that there is any meaningful distinction to be made, in which case the debate between the mereologist and hylomorphist reduces to the question of whether there are any structured objects. I will prefer the other option on which the mereologist acknowledges the distinction between structured and unstructured objects, but maintains that there is a way of making this distinction within the (CEM) framework and thus without the formal component that the hylomorphist champions.

2. The hylomorphist's argument⁶ against (CEM) is an attempted reductio by cases starting from two assumptions; assumptions whose status as controversial is perhaps at first a bit surprising.

(ASSUMPTION 1)

The ingredients of the ham sandwich—the two slices of bread and the piece of ham—are parts of the ham sandwich

⁶ It's original presentation is in (Fine 1999), though hints of a similar argument appear in (Fine 1994); (Koslicki 2007) also endorses this argument against (CEM) and uses it to motivate hylomorphism specifically, and a structured theory of objects more generally.

(ASSUMPTION 2)

The ham sandwich exists for more than an instant.

The mereologist seems to have three options in regards to what kind of object the ham sandwich is: (i) a 4D object composed of the two slices of bread and the piece of ham, what Fine calls an *aggregate*, (ii) a 3D object composed of the two slices of bread and the piece of ham, what Fine calls a *compound*, and (iii) a 4D object composed of the two slices of bread and the piece of ham restricted to a particular interval of time, what Fine calls a *time-restricted aggregate*. Here I take 4D-ism to be the view that objects are distributed part-wise through time, and 3D-ism to be the view that objects are distributed whole-wise through time (my interpretation of being wholly present at each moment it exists).

It is unclear whether the notion of a time-restricted 3D object is intelligible. We will discuss this possibility briefly and towards the end of the paper. If so, it amounts to a fourth option available to the mereologist.

3. The hylomorphist argues that taking the ham sandwich to be an aggregate of the two slices of bread and the piece of ham results in misassigning its spatiotemporal location.

[O]_n [CEM], [an aggregate] of material things is regarded as being spread through time in much the same way as a material thing is ordinarily regarded as spread out in space. Thus the [aggregate] $a + b + c + \dots$ will exist *whenever* any of its components a, b, c, \dots exist (just as it is located, at any time, *wherever* any of its

components are located). It follows that under the proposed analysis of the ham sandwich, it will exist as soon as the piece of ham or either slice of bread exists. Yet surely this is not so. Surely the ham sandwich will not exist until the ham is actually placed between the two slices of bread. After all, one *makes* a ham sandwich, and to make something is to bring it into existence something that formerly did not exist. (emphasis is Fine's, Fine 1999, 62)

It will be helpful to have a name for the aggregate of the piece of ham and the two slices of bread; call that aggregate: $h+b1+b2$. The ham and the two slices of bread are themselves 4D objects, on the supposition of 4D-ism that we are under, so they are themselves composites of many temporal parts. $h+b1+b2$ should thus be thought of as the object composed of all of the temporal parts of all three: the two slices of bread and the piece of ham.

The hylomorphist argues that the ham sandwich cannot be identical to $h+b1+b2$, because the ham sandwich and $h+b1+b2$ differ in their locations. If the two slices of bread come into existence before the piece of ham does, then $h+b1+b2$ is partly located before the piece of ham comes into existence. Indeed, if the pieces of bread predate the right pig, $h+b1+b2$ might come into existence before even the birth of the pig from whence the piece of ham derives! The ham sandwich, however, cannot be located at a time before the piece of ham exists. Hence the ham sandwich and $h+b1+b2$ are distinct. Call this the *Aggregative-Objection*.⁷

⁷ (Koslicki 2007) calls this the Aggregative-Objection, I am here following her.

4. The hylomorphist's argument that the ham sandwich is not a compound of the two slices of bread and the piece of ham—a 3D object—is similar to the Aggregative-Objection:

If we take the sandwich to be [a]...compound...we do not have the difficulty that the sandwich begins to exist as soon as any of the ingredients exist. [A compound such as the ham sandwich cannot exist when one of its parts does not.]⁸ But we do have a related difficulty. For the sandwich will exist as long as all of the ingredients exist. And again, surely this need not be so. If the sandwich is to exist, it is not sufficient for the ingredients merely to be around. They must be appropriately assembled. (Fine 1999, 63)

Name the compound of the two slices of bread and the piece of ham: $h*b1*b2$. Again because $h*b1*b2$ and the ham sandwich differ in their locations, the ham sandwich cannot be $h*b1*b2$. Call this the *Compound-Objection*.

Together the Aggregative-Objection and Compound-Objection form the wrong-spatiotemporal-location horn of the dilemma facing the mereologist.

5. It is worth interjecting that if the mereologist is willing to reject ASSUMPTION 2, then the wrong-spatiotemporal-location horn of the hylomorphist's argument against (CEM) is easily evaded. In fact, some mereologists have rejected ASSUMPTION 2.

Consider Sider's (1996) Stage View of material objects on which things like the piece of ham, the two slices of bread and the ham sandwich are momentary objects—stages. At one instant there is a ham sandwich on your plate, and then a moment later, there is a

⁸ What I mean by this is that a structured compound object that does not change its parts cannot exist when one of its parts does not.

non-identical ham sandwich on your plate (actually a non-identical plate belonging to a non-identical you).

For Sider, there is no potential problem about misassigning the spatiotemporal location to structured objects like the ham sandwich. ‘The ham sandwich’ picks out a momentary object as do: ‘the parts of the ham sandwich’, ‘the two slices of bread’ and ‘the piece of ham’. At any instant at which the ham sandwich exists, it is not possible that the parts of the ham sandwich predate or postdate the sandwich since the parts of the sandwich are objects that exist at, and only at, the time at which the ham sandwich exists.

To the best of my knowledge, the hylomorphist has yet to level any particularly compelling arguments against a mereologist who, like Sider, rejects ASSUMPTION 2. But this news for the mereologist is only as good as the stage view is plausible.

6. We move on to the distorted-part-whole-structure horn of the hylomorphist objection to (CEM).

A natural suggestion for the 4D inclined mereologist, the suggestion of (iii) above, is that structured objects are parts of unstructured objects, and typically proper parts of unstructured objects. $h+b1+b2$ is composed of temporal parts. When we consider just some of those temporal parts, according to this suggestion, the object composed of only those temporal parts is the ham sandwich.⁹ Thus, the ham sandwich is a time-restricted aggregate of the two slices of bread and the piece of ham. If, for example, the ham

⁹ We have intentionally conflated a distinction for ease of understanding. A time-restricted aggregate need not be a part of the aggregate of which it is a time-restriction. It could be that the time-restricted aggregate is not part of the aggregate and instead just an object whose parts are all also parts of the aggregate object. I will continue to speak as if the time-restricted aggregate is part of the aggregate.

sandwich exists between T_2 and T_3 , the suggestion is that the ham sandwich is the object composed of the temporal parts of $h+b1+b2$ between T_2 and T_3 .

I think that this is the best option for the mereologist against the hylomorphist's attack.

The hylomorphist disagrees: how are we to maintain ASSUMPTION 1 if the ham sandwich is a time restricted aggregate? It would seem that only the object composed of some of the temporal parts of the piece of ham is part of the ham sandwich. The piece of ham restricted to the times at which the ham sandwich exists—a time-restricted aggregate itself—is clearly a part of the ham sandwich. But, asks the hylomorphist, how does this make *the piece of ham* a part of the ham sandwich? Fine suspects that the defender of (CEM) will turn to the following principle.

(PROFFERED PRINCIPLE)

Consider an extended sense of part-hood, according to which, for any two objects, O_1 and O_2 , O_1 is (in the extended sense) part of O_2 , if the restriction O_{1-REST} of O_1 to the times at which O_2 exists is (in the unextended sense) a part of O_2 .

(Koslicki paraphrasing Fine, Koslicki 2006, 141)

The PROFFERED PRINCIPLE vindicates the piece of ham being a part of the ham sandwich because the piece of ham restricted to the times at which the ham sandwich exists is a part in the unextended sense of the ham sandwich.

But the costs of accepting the PROFFERED PRINCIPLE are too high as Fine cleverly highlights in what we will call the *Monster-Objection*.¹⁰

¹⁰ “Monster-Objection” is Koslicki's term (Koslicki 2007).

[T]he [PROFFERED PRINCIPLE] will not deliver the correct results. Consider the [aggregate] of the ham sandwich and Cleopatra or, more dramatically, the [aggregate] of the ham and all objects that existed only before or after the ham sandwich exists. Then the restriction of this [aggregate] to the time the sandwich exists is the same as the restriction of just the ham and hence must also be part of the sandwich. But it is ludicrous to suppose that this monstrous objects—of which Cleopatra and all merely past and future galaxies are parts—is itself a part of the ham sandwich. (Fine 1999, 63)

Thus, according to hylomorphist, if the mereologist is going to construe the ham sandwich as a time-restricted aggregate, she will distort the notion of part-hood so viciously that monster objects, such as *Cleopatra+ham*, will be parts of ordinary material objects, such as the ham sandwich.

7. The mereologist who thinks that, like other structured objects that do not undergo a change in their parts, the ham sandwich is a time-restricted aggregate can do better than the PROFFERED PRINCIPLE, it seems to me. I prefer the following:

(PARTS OF PARTS)

If a (temporal) part of an object O_1 is a (mereological) part of a (temporal) part of an object O_2 , then a (temporal) part of O_1 is (mereological) part of O_2 .

Note that it is solely for ease of reading that we parenthetically differentiate temporal parts and mereological parts. For the envisioned mereologist, there is but a single relation of part-hood.

By PARTS OF PARTS, in the usual case in which the piece of ham predates the ham sandwich, only a proper part of the piece of ham is part of the ham sandwich. In the usual case, that is, the whole of the piece of ham is not a part of the sandwich.

Consider the spatial analogy. We all put our right hands in a stack, and together the right hands form a composite object: RIGHTY. The whole of me is not part of RIGHTY because I have parts that are not parts of RIGHTY—like my head or my left hand. Still, a part of me is part of RIGHTY, namely, the part of me which is my right hand. Here I am analogous to the piece of ham, and RIGHTY is analogous to the ham sandwich.

8. An immediate potential objection arises: “This is just a denial of ASSUMPTION 1, a principle which states a Moorean fact about which things are parts of a ham sandwich.”

But the objection is mistaken. My suggestion for the mereologist by way of PARTS OF PARTS is a denial of ASSUMPTION 1 only if we take the rather quotidian, “the piece of ham is part of the ham sandwich” to mean the rather metaphysically laden, “the whole of the piece of ham is part of the ham sandwich,” a dubitable suggestion in its own right. But more to the point, when we interpret ASSUMPTION 1 to concern the whole of the piece of ham, far from being a Moorean fact, it becomes a highly contentious thesis in metaphysics.

Whether “the piece of ham” means “the whole of the piece of ham” in ‘the piece of ham is part of the ham sandwich’ is a tricky issue in the philosophy of language that I would rather blink. Part of the reason for thinking that it doesn’t is that when there is a ham sandwich on a plate before us it seems totally obvious that the piece of ham before

us is part of the ham sandwich. But in staring at the sandwich it is not totally obvious that a temporally extended object part of which is located in a now-dead but then-living pig's body is wholly a part of the ham sandwich. Some mereologists might dig their heels in here and try to argue that 'the piece of ham' picks out the present temporal part of the piece of ham and thereby avoid denying ASSUMPTION 1. My personal view is that 'the piece of ham' can be used to pick out several different objects including both the whole of the piece of ham and just the present temporal part of the piece of ham. Though, typically, 'the piece of ham' picks out the whole of the piece of ham. However, it does appear to me that if 'the piece of ham' does not pick out the whole of the piece of ham, then it picks out the present temporal part of the piece of ham.

But consider ASSUMPTION 1 interpreted as saying: in every case, the whole of the piece of ham is part of the ham sandwich.¹¹ This is tantamount to affirming 3D-ism. For consider the usual case in which the piece of ham comes into existence before the ham sandwich. If the piece of ham is distributed part-wise through time, then there are parts of the piece of ham that are not parts of the ham sandwich—namely the (temporal) parts of the ham that predate the sandwich. Hence, the whole of the piece of ham is not part of the ham sandwich.

Now I suppose that one could try denying that if a part of object O_1 is not a part of O_2 , then the whole of O_1 is not a part of O_2 . But what could "the whole of O_1 is a part of O_2 " mean other than "every part of O_1 is itself a part of O_2 ?"

It is thus only if the piece of ham is distributed whole-wise through time that in every case the whole of the piece of ham is part of the ham sandwich. As a result, we should be utterly unsurprised that the mereologist who construes the ham sandwich as a

¹¹ The interpretation that I strongly suspect the hylomorphists intend.

time-restricted aggregate must reject ASSUMPTION 1 as understood to be about the whole of the piece of ham. Such a rejection amounts to nothing more than a rejection of 3D-ism about the ham sandwich, and a 4D-ist must reject 3D-ism.

9. There is no threat of the wrong-spatiotemporal-location horn of the dilemma facing the mereologist, if the mereologist opts for the ham sandwich as a time-restricted aggregate. During the times when the ham sandwich exists, $h+b1+b2$ has the same spatiotemporal locations as the ham sandwich. One might still worry about the Monster-Objection, though.

What was most unattractive about the PROFFERED PRINCIPLE was that it implied that the whole of monster objects, like *Cleopatra+ham*, are in every case parts of ordinary material objects, like the ham sandwich. That is ludicrous. According to PARTS OF PARTS, in benign contrast, only parts of monster objects, like *Cleopatra+ham*, are parts of ordinary material objects. PARTS OF PARTS has this consequence because there are (temporal) parts of *Cleopatra+ham* that are (mereological) parts of (temporal) parts of the ham sandwich.

Of course, it is only ham parts, if we may speak that way, of *Cleopatra+ham* that are parts of the ham sandwich. If we divide *Cleopatra+ham* into temporal parts of human cells and temporal parts of pig cells, we can still maintain (as we should) that there are no temporal parts of human cells that are part of the ham sandwich. But there are temporal slices of pig cells that are parts of the ham sandwich. We cannot deny this. And if *Cleopatra+ham* exists, then these temporal slices of pig cells are also parts of *Cleopatra+ham*. Thus, parts of *Cleopatra+ham*—those temporal slices of pig cells—are

parts of the ham sandwich. Likewise for other monster objects. Part of the monster object which is the aggregate of the ham and all merely past and future galaxies is part of the ham sandwich. But this does not mean that there are any asteroids or supernovas in our Dagwood! Of this gigantic monster object, it is but the small part of it composed of such-and-such temporal slices of Earthly pig cells that is part of the ham sandwich.

10. We are still faced, however, with a more subtle variation on the Monster-Objection.

By PARTS OF PARTS, in the usual case, both the piece of ham and *Cleopatra+ham* are partly parts of the ham sandwich. But this can't be the whole story because it fails to capture that the part-whole relationship between the piece of ham and the ham sandwich is different from and more intimate than the part-whole relationship between *Cleopatra+ham* and the ham sandwich. The hylomorphist captures the difference by contending that the piece of ham is a part of the sandwich while *Cleopatra+ham* is not. This seems to me mistaken, for part of *Cleopatra+ham* is part of the ham sandwich, surely, and the whole of the piece of ham is (in every case) a part of the ham sandwich only if the piece of ham is a 3D object. But the hylomorphist is correct to demand that the mereologist find some difference between the way or sense in which the ham is partly part of the sandwich and the way or sense in which *Cleopatra+ham* is partly part of the sandwich. This desired difference may be thought of as the motivating sentiment for the Monster-Objection.

In response, the difference is modal. A ham sandwich can have as a part a whole of a piece of ham, but a ham sandwich cannot have as a part a whole of a monster object,

such as the whole of *Cleopatra+ham*. Indeed, any object composed of even a single part of Cleopatra (or a single part of a far-off galaxy or a single part of a merely future person) cannot be wholly a part of a ham sandwich. But imagine a ham sandwich conjured into existence by a sorcerer only to disappear several seconds later. That so-conjured piece of ham is wholly a part of the so-conjured ham sandwich because every (temporal) part of the piece of ham is a (mereological) part of the corresponding (temporal) part of the ham sandwich.

Indeed when thinking about the part-whole structure of structured objects it seems that we are especially aware of the things which could be wholly parts of the structured object. For instance, when asked to list the parts of a kite, one might naturally offer: a string and a sail. Both a kite-string and a kite-sail could be wholly parts of a kite. Of course, in the usual case, the kite-string and kite-sail predate the kite, and are therefore only partly parts of the kite (if 4D-ism is true). Perhaps in our thoughts about kites and other structured objects, the things which most readily appear to us as the parts of the structured objects are those things we could decompose the structured object into. We can decompose a ham sandwich into two slices of bread and a piece of ham, for example, but not into two slices of bread and *Cleopatra+ham*; and we can decompose a kite into a string and a sail but there is no way to decompose a kite into *Einstein+sail* and something else. The things we can decompose a structured object into are precisely the things that could be wholly parts of the structured object.

But we should not let our awareness of those things that could be wholly parts of structured objects lead us away from the truth. Namely, that there are many, many things which are partly parts of structured objects; and, in the usual cases, even the things which

could be wholly parts of the structured objects are also actually just partly parts of the structured object.

We should note that not every thing that could be wholly a part of a structured object immediately jumps out at us as the parts of a structured object. For example, take the aggregate of the left-half of the piece of ham and the right-half of one of the slices of bread; call it: HB. HB is an object that could be wholly a part of the ham sandwich, but we are less apt to think that HB is a part of the sandwich than we are apt to think that the piece of ham is part of the ham sandwich. Still, a ham sandwich could be decomposed into HB and other gerrymandered bits. I contend that there is no metaphysically substantial difference between the way or sense in which HB is part of the ham sandwich and the way or sense in which the piece of ham is part of the ham sandwich. Though, to repeat, HB and the piece of ham differ substantially from *Cleopatra+ham* in that they could both be wholly parts of the ham sandwich while *Cleopatra+ham* cannot.

11. At this point, the mereologist may reply to the hylomorphist with two objections of her own. First, as we have noted, the hylomorphist believes that in every case the whole of the piece of ham is part of the ham sandwich. This requires 3D-ism to be true. The mereologist can rightly complain that it would be better if our theory of parts and wholes did not require a solution to the 3D-ism vs. 4D-ism debate.

Second, consider four-dimensional volume. For the hylomorphist, the whole of a thing O_1 can be a part of the whole of a thing O_2 even though the four-dimensional volume of O_1 exceeds the four-dimensional volume of O_2 . Again we can use the ham sandwich illustratively. We can imagine a piece of ham that exists for 1000 years, which

in its last few days is used to make a ham sandwich. The four-dimensional volume of the piece of ham is far greater than the four-dimensional volume of the ham sandwich. It is at least perplexing how there could be two things of which the more four-dimensionally voluminous is a proper part of the less voluminous. How does the more voluminous fit inside the less voluminous as a part fits inside the whole?

12. Has the hylomorphist at least established the conditional claim: if 3D-ism is true, then (CEM) fails?

Perhaps, and if so, we have reduced the hylomorphism vs. (CEM) debate to the well discussed 3D-ism vs. 4D-ism debate. But the mereologist may have a way to embrace 3D-ism yet resist the hylomorphist's objection: construing the ham sandwich as a time-restricted compound. I will try to quickly sketch a defense of the ham sandwich as a time-restricted compound.

Suppose that the compound $h*b1*b2$ exists from T_1 to T_4 , and that the ham sandwich exists for only some of that interval, say from T_2 to T_3 . The suggestion has it that ham sandwich is $h*b1*b2$ restricted to the times between T_2 and T_3 , a time-restricted compound.

Though one might be tempted to think as much, a time-restricted compound is neither identical to nor a part of the compound of which it is a time-restriction. For example, the ham sandwich has a different spatiotemporal location than $h*b1*b2$. $h*b1*b2$ is located at T_1 , for instance, but the ham sandwich is not. We can put this point another way by borrowing a term from Parsons (2007). While both the ham sandwich and $h*b1*b2$ are wholly located at every moment they exist, the ham sandwich is *entirely*

located¹² between T_2 and T_3 , but $h*b1*b2$ is not. Thus the ham sandwich cannot be identical to $h*b1*b2$.

The ham sandwich is not part of $h*b1*b2$ because the only parts of $h*b1*b2$ are the two slices of bread and the piece of ham. $h*b1*b2$ has no temporal parts.

The difficult task for the 3D mereologist is to get the part-whole structure of the time-restricted compound correct without violating Uniqueness of Composition. The parts of $h*b1*b2$ are the two slices of bread and the piece of ham, so the parts of the ham sandwich cannot also be the two slices of bread and the piece of ham. I suggest to the 3D mereologist that the parts of the ham sandwich are themselves time-restricted compounds: the time-restrictions of the two slices of bread and the time-restriction of the piece of ham to between the times of T_2 and T_3 . In fact, the only parts of the ham sandwich are the time-restrictions of the two slices of bread and the time-restriction of the piece of ham.

If the parts of the ham sandwich are time-restricted compounds themselves, then we avoid the wrong-spatiotemporal-horn of the dilemma. The parts of the ham sandwich will by definition exist only when the ham sandwich does and clearly exist only where the ham sandwich exists. Nor does the distorted-part-whole-structure horn of the dilemma arise because monster objects are in no sense parts of time-restricted compounds.

I suspect that along these lines there is a plausible 3D-ist (CEM) account structured objects like the ham sandwich. Though ultimately its plausibility will depend on whether the notion of a time-restricted 3D object is clear-headed.

¹² My paraphrase of Parson's (Parson 2007) definition of entirely location: An object is entirely located in some region R_1 if the object is wholly located in R_1 and for any region R_2 , if the object is located at R_2 , then R_2 is a sub-region of R_1 .

13. I want to close with what it seems to me that the mereologist should say about the difference between structured and unstructured objects.

Consider a modally charged version of Uniqueness of Composition: it is impossible that the same objects have two different mereological sums. Or, as I prefer to put it: the identity of the whole supervenes on the identities of the parts. Coupled with Unrestricted Mereology, the modally charged version of Uniqueness of Composition says that in every world in which the Xs exist, they compose the O; and there is no world in which the Xs compose anything other than the O.

It seems to me that the mereologist can differentiate structured from unstructured objects by way of this modally charged version of Uniqueness of Composition.

Unstructured objects, such as STYROFOAM, are such that their identity supervenes on the identities of their parts. In any world in which such-and-such bits of Styrofoam exist—no matter how they are arranged spatiotemporally and no matter what else differs in the world around the bits¹³—they compose STYROFOAM. But structured objects, like the ham sandwich, are not such that their identity supervenes on the identities of their parts.

In fact, I venture that the hylomorphist's argument intended as an objection to (CEM) is at bottom merely an objection to the modally charged version of Uniqueness of Composition. The hylomorphist argument should be thought of as a contention that sometimes the Xs compose an object, but if, as is possible, the Xs were spatiotemporally

¹³ We add “and no what else differs in the world around the bits” to cover the following situation. We imagine grains of sugar arranged cube-wise in a region R that compose a sugar cube. Now we imagine that the very same grains of sugar are arranged in exactly the same way and in region R—so there is no difference in the spatiotemporal arrangements of the grains of sugar. But the would-be sugar cube is surrounded by other grains of sugar which fill a spherical super-region of R. The grains of sugar in the spherical super-region of R compose a sugar sphere. You might think that in this case the grains of sugar in region R do not compose a sugar cube even though there is no difference in the spatiotemporal arrangements of the grains of sugar in region R

arranged differently or if the world around the Xs were somehow different or both, the Xs would compose a non-identical object. Construed as an objection to the modally charged version of Uniqueness of Composition the hylomorphist's argument is successful. But the mereologist is not committed to the modally charged version of Uniqueness of Composition, and therefore the argument fails as an objection to (CEM).

What we have seen is that the 4D mereologist has an easier and more elegant time distancing herself from the modally charged version of Uniqueness of Composition than does the 3D mereologist.

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