1. Introduction

Here are some pieces of wood. I nail them together and make a stylish yet comfortable chair. Here is some flour, yeast, salt, and water. I mix them together and make a delicious loaf of bread. In both cases I have made something, although there are clearly a lot of differences in how I have done so. For example, in the first case I mess around with nails and glue, in the second I don’t; in the second case I have to do dishes afterward, and in the first I don’t. But I think the differences go deeper. I think that the sense in which the nails, glue, and wood compose the chair is different from the sense in which the flour and so forth compose the bread.

That is, I think that there is more than one composition relation. More accurately, I think that our compositional concepts are messy, and tangled up with causation and persistence in ways that have gone unnoticed by contemporary metaphysicians. Although defending that latter claim is my real goal here, I am going to sneak up on it by spending the bulk of the paper defending the former. That is, I will devote most of the paper to convincing you that there is a conceptually important notion of making that is genuinely compositional, though distinct from the composition relation that contemporary metaphysicians usually discuss. However, I will eventually argue that once we recognize that this ‘new’ notion really is compositional, we must also recognize that compositional notions shade off into clearly noncompositional notions.

Composition is not as independent from causation and persistence as usually thought.

2. Standard Composition

The basic idea behind this paper arose in a graduate seminar I co-taught with Richard Boyd, and in particular upon reading some papers by Joseph Earley (2005, 2006). I do not agree with many of his claims, as will become clear in section 5. Further, Earley does not believe in what I call ‘Standard Composition’, and consequently cannot agree with many of my claims. Nonetheless, his influence upon this paper should be evident. I received extremely useful feedback on an early draft at the Leeds Ontology Conference, and on slightly less early drafts at Notre Dame, Indiana University, the University of Konstanz, and the NYU-Columbia Graduate Conference. I would particularly like to thank Jason Turner, my commentator at the Leeds conference, and Thomas Krödel, my commentator at Konstanz, as well as Ralf Bader, Katherine Brading, Tad Brennan, Ross Cameron, Gary Ebbs, Liz Harman, John Hawthorne, David Liebsman, Timothy O’Connor, Michael Rea, Ted Sider, Peter Simons, Jeff Speaks, Peter van Inwagen, Jessica Wilson, and Rega Wood.

Note ‘contemporary’. I am no historian, but issues in the ballpark of this paper were addressed both by Aristotle and by various medieval thinkers. Indeed, when this paper was in near-final draft, I discovered that Peter Abelard even uses an example similar to the bread case with which I began: *Dialectica* 575.18-36, cited in Arlig 2008. Thanks to Tad Brennan for help with the Latin.
In order to say anything about the ‘new’ kind of composition that I want you to recognize, I must first sketch the ‘old’ kind. Here, then, is what I take to be the core idea of composition as typically understood by metaphysicians—henceforth, ‘Standard Composition’:

It is a synchronic—or perhaps atemporal\(^3\)—many-one relation: \(x \text{ and } y\)
(alternatively, the \(xxy\)) \(z\) at \(t\).\(^4\)
Composition and parthood are cognate notions: if \(x \text{ and } y\) compose \(z\), then \(x\) and \(y\) are proper parts\(^5\) of \(z\).

It is not itself reflexive, transitive, or symmetric—it’s hard to see how a many-one relation could be—but the associated notion of parthood is usually taken to be reflexive and anti-symmetric; there is controversy over whether it is transitive.

This is a bare bones characterization, in two important respects. First, it does not purport to be an answer to what van Inwagen calls the ‘General Composition Question’ (1990, 38-39). That is, it does not purport to say what composition is by providing a full-blown analysis in nonmereological terms (Markosian 1998, 213). Second, it does not even include much material from within what van Inwagen calls the “mereological circle” (1990, 51). In particular, I have not assumed that composition is the same relation as fusion as defined by any particular version of formal mereology (see Varzi 2006 for a nice overview). For example, the characterization above is silent both on the question of whether composition is unrestricted (whether, for any \(x\) and \(y\) whatsoever, there is a \(z\) that they compose), and on the question of whether it is extensional (whether it is possible for distinct objects to share all of their parts).

The thinness of my sketch of Standard Composition is intentional. I want the minimally controversial characterization that is substantive enough to differentiate it from the other form of

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\(^3\) Some four-dimensionalists rely on an atemporal notion of parthood. They will say, for example, that a certain rambunctious-toddler-time-slice is a part of me—not just at a particular time quite a while ago, but \textit{simpliciter}. This notion requires, as Sider puts it, “tak[ing] an ‘atemporal perspective’ and contemplat[ing] the whole of time” (2001, 56). Note, however, that it is perfectly possible—and for certain dialectical purposes desirable—to instead characterize four-dimensionalism in terms of a synchronic notion, parthood-at-\(t\) (see Sider 2001, 55-60). Note further that it is much easier to see how to define the atemporal notion of parthood in terms of a fundamental notion of parthood-at-a-time than it is to see how to define parthood-at-a-time in terms of a fundamental atemporal notion. Parthood can be defined as an abstraction out of parthood-at-a-time: \(x\) is part of \(y\) iff there is some time \(t\) such that \(x\) is part of \(y\) at \(t\). But one cannot simply say that \(x\) is part of \(y\) at \(t\) iff \(x\) exists at \(t\), \(y\) exists at \(t\), and \(x\) is part of \(y\).\(^4\) By ‘many-one’, I mean that it is a binary relation that takes a plural argument into its first argument place and a singular argument into its second argument place. (There is an alternate use of the phrase according to which a relation is many-one just in case for all \(a\) and \(b\) such that \(aRb\), things other than \(a\) bear \(R\) to \(b\), but \(a\) bears \(R\) to nothing but \(b\).) van Inwagen calls composition a multigrade relation. If that is correct, though, it has to be a multigrade relation with a privileged argument place (for the composed object).

\(^5\) Why not drop the ‘proper’? Because in any case in which \(x\) and \(y\) compose \(z\) despite being improper parts of \(z\), \(xRy\). That thus involves also dropping a) the claim that composition is many-one, and b) the claim that composition is irreflexive. Yet it is surely central to the concept of composition that it is many-one. Indeed, even both Donald Baxter’s (1988a, b) and Theodore Sider’s (2007) sympathetic discussions of what Sider calls “strong composition as identity” assume that composition is many-one while identity is not.
composition that is the topic of this paper. What I have just laid out is enough to do that job for me.⁶ My characterization of Standard Composition, then, is intended to pick out certain central features of composition without pretending to be exhaustive. All it provides, and all it is intended to provide, is a gesture towards the right concept. It’s not a definition; it’s an ostension.

Note too that I have not said, and will not say, anything to establish that Standard Composition ever holds—that there really are any composite objects. For the most part, I will simply assume that it does, though I will revisit the issue briefly later on. Clearly not everyone shares this assumption. Notable recent deniers (well, near deniers)⁷ include Peter van Inwagen (1990) and Trenton Merricks (2001). You can consider the claim of this paper to be conditional: if you believe in Standard Composition, you should believe in another variety as well.

3. Composition as a Process

So what is this other form of composition that interests me? Perhaps the best way to introduce the notion is by attending to an important distinction that Kit Fine has pointed out with respect to Aristotle’s puzzles about the possibility of mixture:

there are two rather different aspects to the puzzles, one dynamic and the other static. We may ask what mixing is, or what mixture is. The one concerns the nature of the process by which mixtures are formed and relates to what happens over time. The other concerns the nature of the results of mixing and relates to what is true at a time (1998, 280; see also 1996, 86).

This distinction doesn’t just illuminate Aristotle; it is also—or at least should be—important to contemporary discussions of composition. We can ask what composing is, or we can ask what a compound object is. Unfortunately, the literature either treats the two questions as though they were the same, or else ignores the process question altogether.

Here is an example. In Material Beings, van Inwagen famously asked what he called the “Special Composition Question”—a question he took to be more tractable than the “General Composition Question” mentioned above. His first formulation is “in what circumstances is a

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⁶ That does not mean that it is substantive enough to do the job for just anyone. There are other people who wish to claim, for quite different reasons, that there is more than one composition relation—indeed, there are people who wish to claim that there is more than one fundamental composition relation (see note 22). Whether any of these other people can use my bare-bones characterization of Standard Composition to illustrate their distinctions is an open question.

⁷ I will engage in the fairly common pretense that both van Inwagen and Merricks are full-blown compositional nihilists. Neither is; van Inwagen believes in composite living organisms, and Merricks believes in composite conscious beings.
thing a (proper) part of something?” (1990, 20), and his “official formulation” is “when is it true that ‘∃y the xs compose y’?” (30). In light of the tight connections between parthood and composition, those are indeed the same question. But a page later, van Inwagen offers what he calls a “practical version” of the question: “Suppose one had certain (nonoverlapping) objects, the xs, at one’s disposal; what would one have to do—what could one do—to get the xs to compose something?” (31). And Ted Sider has recently offered a tongue-in-cheek paraphrase that reflects that practical version: “[van Inwagen] asked: what do you have to do to some objects to get them to compose something—to bring into existence some further thing made up of those objects? Glue them together or what?” (2009, 384).

But those are not the same question. van Inwagen’s official formulation is a question about a synchronic relation that holds between a composite and its parts at a particular time. It’s a question about a static state of affairs. But the ‘practical’ version is a question about the dynamic process of composition. It’s a diachronic question about how to do something to some things at time $t_1$ that causes some composite to exist at $t_2$.

You might not think that this difference comes to much. I mean, it hardly strikes us as egregious that van Inwagen and Sider failed to notice the slight shift in the question. In particular, you might think that the process question, though obviously diachronic, is just a question about how to get some things to stand in the Standard Composition relation to a composite. There are some xxs. Put them together in some way or other—perhaps van Inwagen’s Contact, or Ned Markosian’s Fastenation (1998), or perhaps one need do nothing at all—and then the xxs will Standardly Compose y. According to this line of thought, the diachronic question is answered as follows:

the xxs exist at $t_1$, y exists at $t_2$, and at $t_2$ the xxs Standardly Compose y.

This is presumably what Sider and van Inwagen were thinking. If that answer were right, then it would be acceptable to ignore Fine’s distinction, and the difference between the two formulations of the special composition question really would be negligible.

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8 If you are thinking along the lines sketched in this paragraph, and you believe in unrestricted composition—if you are what van Inwagen calls a universalist—you will not think that you either have to do or can do anything. The composite already exists; the best you can do is change the relations among its parts.

9 Indeed, both Sider and van Inwagen in fact phrase the diachronic question so that it can be answered in this manner. In asking ‘what do you have to do to the xxs to get them to compose y?’, they assume that the xxs will remain around to stand in Standard Composition to y. Strictly speaking, then, I should not say that Sider and van Inwagen’s ‘practical version’ of the Special Composition Question cannot be answered by diachronizing Standard Composition—it can—but rather that they are not asking the diachronic question in full generality. The real, fully
But it isn’t right. Answering the diachronic question requires more than just adding a
temporal dimension to Standard Composition; it also requires thinking about what, if anything,
the process of composing does to the initial components. That issue simply does not arise when
thinking statically about composition—i.e., when thinking about Standard Composition, which is
a synchronic (or at least atemporal) relation. But once we start thinking about composition as a
diachronic, unfolding process, we must confront the question of whether and how the parts—as
we’ll see, ‘parts’ is actually no longer a good term here—are changed.

There are three ways the ‘parts’ can be changed by the process of composition. First,
sometimes things only undergo relational changes when they come to compose something else.
In such cases, composition is basically just stacking. Consider, for example, putting some
Legos® together to make a castle. Legos® have little nubs and holes that slot into each other, but
they undergo no intrinsic change when they come to compose a larger thing. The second case is
what I will call skewering: to get a nail to stick in a board, you must get it to pierce a hole in the
board, presumably with the help of a hammer. When the nail goes into the board, the board is
intrinsically changed, but it continues to exist. That’s because the intrinsic changes are only to
the board’s accidental features. (‘Skewering’, of course, is only a metaphor; accidental intrinsic
change need not literally involve piercing.) Third and finally, there are cases in which the parts
undergo intrinsic change to their essential features. I will call this type of composition blending.
Blending is what happens when you put two blobs of mercury together to get a larger blob—the
initial two blobs go out of existence. A better example might be the creation, at fertilization, of a
zygote, at least if it seems right to say that the sperm and egg do not survive the process. This
kind of composition involves the destruction of the initial components.10

If we are thinking purely synchronically about composition, we will think of composition
as stacking. It is only once we start thinking about composition as a process that unfolds over
time that either the skewering or blending models of composition begin to make sense. But once

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10 Notice that the phrase ‘come to compose’ can only properly be used to characterize stacking and skewering, not
blending, because it betrays an assumption of continued existence and identity. I can’t come to be in better shape, or
come to be an accomplished musician, unless it’s me who winds up fit or talented. Similarly, one cannot say that the
xxs come to compose y if it is not the xxs that at some time Standardly Compose y. So the phrase is not apt for cases
of blending, in which the initial components are destroyed in the process of composition, and never exist at the same
time as the resulting composite. Compare note 9: van Inwagen’s actual ‘practical version’ of the question can be
asked by means of the phrase ‘come to compose’; the real diachronic question cannot be.
we do start thinking about composition as a process, it is obvious that both the skewering and blending versions are possible. (Indeed, it’s not entirely clear that the stacking model ever actually occurs. My example was spurious; even Legos® deform a bit when they are put together.) And it is the need for blending that shows that the process question cannot be answered simply by diachronizing Standard Composition in the manner proposed above—i.e., by saying that the $xx$s at $t_1$ undergo some process resulting in composite $y$ at $t_2$ iff at $t_2$ the $xx$s Standardly Compose $y$. Although that proposal permits both stacking and skewering, it does not permit blending; it assumes that the $xx$s survive the process. And that assumption is false. It is not always the case that the $xx$s exist at $t_2$.

4. Diachronic Composition

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11 I have mentioned in passing Aristotle’s puzzles about the possibility of mixture (On Generation and Corruption I.10 327a33-327b10). Consequently, it is perhaps reasonable to ask whether and how his own positive view—his purported answer to those puzzles—fits into my taxonomy. Take what follows with a grain of salt, however, for Aristotle’s notion of mixing is decidedly narrower than the notion of Diachronic Composition that I am exploring. (For example, Aristotelian mixtures are homoeomerous: that every part of the mixture must be the same kind as the mixture. Water only has water as parts. No such constraint is in play in my discussion in the main text.)

Aristotle does not believe that stacking qualifies as mixing, because he thinks that if the things being mixed are not altered in the process, “they are no more mixed than they were before” (327b1). And he also apparently does not believe that blending qualifies as mixing, because if the things being mixed are destroyed in the process, “they cannot be things that have been mixed if they cannot be said to be at all” (327b6-7). In this passage, he does not consider what I call skewering—that the things being mixed continue to actually exist, but undergo intrinsic change. What Aristotle does believe is that the things being mixed cease to actually exist, but continue to potentially exist.

What does that mean? It apparently does not mean that they cease to exist simpliciter, for Aristotle denies that mixing can involve the destruction of the things that are mixed. Rather, potential existence is a form of existence: “each of the things which were, before they were mixed, still is, but potentially, and has not been destroyed” (327b25-26). This is not stacking (actual existence, relational change), or skewering (actual existence, intrinsic change), or blending (destruction). Thus my schema does not allow room for this interpretation of Aristotle’s view. There are other interpretations of Aristotle’s view, of course—I claim no expertise here—but let us assume for the sake of argument that this is the correct one. How should I respond?

I see no reason why my schema could not be modified to allow a fourth category—fading?—and I encourage Aristotelians to go ahead with that project. However, I will not do so here. First, it complicates matters unnecessarily; for the purposes of this paper, little harm is done by treating Aristotle as a believer in blending. Second, I don’t believe in potential existence—or, at least, I don’t believe that it is a genuine form of existence. Existing (only) potentially is not like existing happily, or pleasantly, or up in the attic. (For some further discussion of that idea, see Bennett 2005; for contemporary defenses of the view that there is more than one fundamental form of existence, see McDaniel 2009; Turner ms). Third, I am unconvinced by his argument that a fourth category is required. Aristotle ignores the possibility of skewering altogether, and his reason for denying that blending counts as mixing is controversial. It has nothing to do with mixing per se, but rather with the truth of past tense propositions that attribute properties to objects that no longer exist: not just ‘$a$ and $b$ were mixed,’ but also ‘Abe Lincoln was tall’. The proper treatment of such propositions depends on complicated issues in the philosophy of time and modality that are well beyond the scope of this paper. Simply note that it is very far from clear that the right move is to claim that Abe Lincoln now potentially exists.
In a moment, I’ll provide some more examples to further convince you of that claim. But let’s pause here to introduce some terminology. I will use the label ‘Diachronic Composition’ to refer to a relation that

• is like Standard Composition in that it is a many-one relation that is not itself reflexive, transitive, or symmetric.
• is diachronic and causal.
• is such that the initial components must exist before the compound does.
• is such that the initial component need not exist once the compound does.
• does not bring with it any cognate notion of parthood. That is, there is no notion of parthood such that if \( x \) and \( y \) Diachronically Compose \( z \), \( x \) and \( y \) are parts of \( z \).

Some remarks about the final three points are in order.

The third point has been implicit in the foregoing. Whether a compound is made by stacking, skewering, or blending, the things from which it is made must pre-exist it. Putting things together requires the existence of, well, some things to put together.

But, as the fourth point states, those things need not persist through the making of the compound. Note that this does not say that the initial components cannot exist once the compound does, but simply that they need not. Diachronic Composition subsumes stacking, skewering, and blending. We have already seen that a diachronized version of Standard Composition can handle stacking and skewering. This means that the most interesting case is blending, and I will thus give it the most attention. It also means that Standard and Diachronic Composition are not exclusive; some things stand in both composition relations to a composite. The Legos®, for example, stand in both Diachronic and Standard Composition to the castle. Let \( t_1 \) be a time before the castle is assembled, and let \( t_2 \) be a time after it has been assembled. The Legos® at \( t_1 \) Diachronically Compose the Lego® castle at \( t_2 \) and the very same Legos® at \( t_2 \) Standardly Compose the Lego® castle at \( t_2 \). Of course, at \( t_1 \) they do not Standardly Compose the Lego® castle; at \( t_1 \) they are still scattered on the floor.

Still, the fact that Diachronic Composition allows for the destruction of the initial components entails the fifth point, that it has no cognate notion of parthood. This is because it is presumably a necessary condition on one thing’s being part of another that there be some time at which both exist.\(^{12}\) I will revisit this assumption in section 9, but for now, I will say that the fact that \( x \) and \( y \) can Diachronically Compose \( z \) even though \( x \) and \( y \) do not exist once \( z \) does entails that \( x \) and \( y \) can Diachronically Compose \( z \) though neither \( x \) nor \( y \) is part of \( z \).

\(^{12}\) This is true of both the synchronic and atemporal notions of parthood mentioned in note 3.
Some of you will not like that claim. Do note, though, that there is a part-like notion in the ballpark here; \( x \) and \( y \) at \( t_1 \) are… something-or-others of \( z \) at \( t_2 \), even though ‘part’ is the wrong word. I’m not sure that we have a clear way of expressing the concept in English. ‘Ingredient’ is tempting, though it carries a synchronic flavor. I have already used ‘initial components’ several times for this idea, but that phrase, too, leaves something to be desired. The best option, I think, is ‘makings’.\(^{13}\) I have the makings of chocolate chip cookies in the pantry; this box contains the makings of an awesome Lego\(^\circ\) castle; this pile of old-fashioned thermometers contains the makings of a large blob of mercury.

Let us take stock. What do we know so far? I have not yet said much to convince you that Diachronic Composition deserves its name—that is, that it is genuinely compositional. Still, we do already know that it is not identical to Standard Composition. Even the minimal sketches that I have offered reveal that they have incompatible features, and I have given several examples that reveal that they are not extensionally equivalent. Some things stand in the Diachronic Composition relation to composites to which they do not stand in the Standard Composition relation. The blobs of mercury Diachronically Compose the larger blob, but there is no time at which they Standardly Compose it. They are makings but not parts of the larger blob. And the notions come apart in the other direction as well. Some things stand in the Standard Composition relation to composites to which they do not stand in the Diachronic Composition relation. That is, not only can there be makings that are not parts, but there can also be parts that are not makings.\(^{14}\) Consider any case in which a composite has parts that come to be parts after the composite came into existence: perhaps the parts only come into existence after the composite does, or perhaps they only come to be \textit{parts} after the composite already exists. For example, the ship of Theseus in its final state has lots of parts that are not among its makings. Another example might be qualitative parts, if there are such things: if this ripe peach has a yellow part and a red part, they are definitely not among its makings.\(^{15}\)

So that much, at least, is reasonably straightforward: Standard and Diachronic Composition are not extensionally equivalent. It follows—at least bracketing some tricky issues

\(^{13}\) Thanks to Peter Simons for the suggestion.
\(^{14}\) Thanks to Jeff Speaks here.
\(^{15}\) There are any number of tricky cases, largely due to the fact that many kinds of composites have vague existence and identity conditions. If I replace my car’s engine, the new engine is a part of the car that is not one of the car’s makings. But if I \textit{add} an engine to a car—car body?—that does not have one, it probably is one of the car’s makings. The existence of tricky cases, though, does nothing to moot the point in the main text.
about the notion of extensional equivalence and the identity conditions for relations—\(^{16}\) that Diachronic Composition and Standard Composition are not the same relation. But much else is not so straightforward. A variety of questions remain about the notion of blending, whether Diachronic Composition is conceptually unified or whether it is a gerrymandered beast, and how Diachronic Composition and Standard Composition relate to each other.

In particular, I have four main tasks remaining. First, I need to say more to convince you that Diachronic Composition—particularly blending—is an important and ubiquitous concept. I will do this in sections 5 and 6. Second, I need to convince you that Diachronic Composition really is a kind of composition; I will do this in sections 6 and 7. However, I also think there are countervailing factors that muddy the water significantly. These will come to light as I undertake the third task in section 8, and attempt to provide a unified analysis of Diachronic Composition. The fourth task is the usual—in an appendix, I will address a handful of objections.

5. Of Soup and Science: Further Examples of Blending

I don’t think it will be hard to convince you to take blending seriously. I’ve already given a couple of examples: fertilization, and blobs of mercury coming to form larger blobs. Nonetheless, I want to take a minute to emphasize that these are not isolated phenomena. There are examples of blending all over the place; the notion is a central piece of our conceptual repertoire. When I make a loaf of bread, or a creamy butternut squash soup, or compost for the garden, I take myself to be—and am—putting some things together to make something else. Yet by ordinary standards of persistence, in none of those cases do the things I do something to survive what I do to them. The squash, sage, and onions that were on the counter? Gone. I made them *into* soup. But if my soup is nice and creamy, they are not part of the soup. That particular squash is no more. And once the compost has composted enough—i.e., once it is *compost* and not a pail full of vegetable scraps—the squash rinds will definitely not be in it any longer. That is more or less definitive of the difference between a pail of compost and a pail of scraps.

But it’s not just at home that we rely upon the notion of blending. There is a case to be made that the concept is scientifically important too. So let’s leave the kitchen and enter the

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\(^{16}\) See [reference deleted for blind review]
lab—in particular, the chemistry lab. Like cooking and composting, chemistry unquestionably requires that we recognize that composition sometimes involves intrinsic change, and arguably requires that we recognize that it sometimes involves the destruction of the initial components. To see this, recall the notion of a chemical compound. The formation of a chemical compound like NaCl involves the donation and sharing of electrons, as well as other more complicated things. One of the marks of a compound as opposed to a mere mixture is that in a compound, it is either difficult or impossible to recover the original ‘makings’, or even things of the same sort as the original ‘makings’. The processes by which chemical compounds—and even some mere mixtures—are formed involves intrinsic change to the entities from which they are made.

Consequently, it requires understanding the process of composition as at least skewering—and, arguably, as blending. In an interesting series of papers, Joseph Earley has argued that it does. (Not by that name, of course.) He thinks that there is no salt in the sea (2005), and that there is neither hydrogen nor oxygen in H$_2$O. He thinks that “the parts of chemical molecules are not, strictly speaking, ‘atoms’. The more massive components of molecules would be better designated as ‘elemental centers’” (2006, 842). That is, he thinks that \textit{atoms go out of existence when they bond in certain ways.}\footnote{Chemical compounds contrast with chemical mixtures, such as salt water, spice blends, and alloys of metal. The ‘makings’ that go into mixtures are combined in ways that do not involve chemical reactions. Consequently, they can thus be decomposed relatively easily, by “physical” or “mechanical” means alone (such as decanting, filtering, or evaporation). Some, like spice blends, can be thought of according to the Lego model. But others, like salt water, seem to involve intrinsic change. Apparently, the “salt react[s] with the solvent water to generate…hydrated ions…and all the water is strongly influenced by those reactions” (Earley 2005, 95). There is a kind of reversible electron donation going on.}

Let me be clear that I am not at all convinced that we should agree with Earley.\footnote{I certainly don’t think that he has made his case. He is not very clear about \textit{why} he thinks the atoms go out of existence rather than merely undergoing certain sorts of intrinsic change. He says, for example, that the word ‘atom’ is primarily used in physics and chemistry to refer to an unattached and electrically neutral unit containing a nucleus and extranuclear electron density just sufficient to balance the positive charge of that nucleus (2006, 842). But even if that is true, it doesn’t follow that atoms are \textit{essentially} “unattached” or electrically neutral. And, indeed, if Earley does think that atoms are essentially “unattached”, it would be question-begging for him to appeal to that idea in an argument for the claim that they go out of existence when combined. Further, Earley is in general not very careful about the notion of persistence and the difference between qualitative and numerical sameness.} (Paul Needham isn’t either; see 2005.) Nonetheless, his question is an interesting one, whether or not his answer is right. The important lesson for my purposes is that the notion of blending \textit{might} turn out to be as important for certain empirical purposes as it is in our everyday lives. Without blending, we would have to say that the atoms do survive in molecules, and the squash that was on the counter is quite literally in the soup.
6. Our Linguistic Practice

Hopefully, you agree that Diachronic Composition in general, and blending in particular, are conceptually ubiquitous and important. In this section, I want both to underscore that point, and to start moving towards some reasons to think that Diachronic Composition counts as a form of composition. I will do this by drawing your attention to the ways in which our compositional concepts are reflected in what we say. There are two interesting pieces of linguistic data here. Though the first will take longer to explain and defend, they are equally important.

The first interesting piece of linguistic data is that English marks the difference between Standard Composition and Diachronic Composition. It’s the distinction between ‘made of’ and ‘made from’. Consider the following cases. It is correct to say that

This wine is made from grapes.

But not to say that

* This wine is made of grapes.

This is not a subtle or theory-laden point. I have conducted extensive (and completely unscientific) research that indicates that the linguistic intuitions of non-philosophers are univocal here. Here is another example:

Grits are made from kernels of corn.

*Grits are made of kernels of corn.

Grits are not made of kernels of corn. A child’s art project might be, or the Corn Palace in Mitchell, South Dakota. But not grits. And, if you will humor me for one last example:

The cheerleader pyramid is made of people.

But

Soylent Green is made from people.

I think the difference in meaning is clear.

The explanation is straightforward. ‘y is made of xxs’ means that, at the time of utterance, the xxs are parts of y—that y is Standardly Composed of the xxs, and therefore that the xxs exist when y does. Though the “folk” may not be able to articulate it, the reason that ‘wine is made of grapes’ strikes them as clearly false is that they know that grapes are destroyed in the process of winemaking, and that no grapes are ever part of wine. In contrast, ‘y is made from the

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19 Amusingly, the only reference to this that I’ve been able to find is on an online discussion board for people learning English as a second language. [http://www.usingenglish.com/forum/frequently-asked-questions/1559-made-made.html](http://www.usingenglish.com/forum/frequently-asked-questions/1559-made-made.html)
*xxs*’ means that the *xxs* came together to make *y*, that the *xxs* figure in the causal history of *y* in a certain special way. In short, while ‘*y* is made of the *xxs*’ can only mark Standard Composition, ‘*y* is made from the *xxs*’ marks Diachronic Composition.²⁰

The ‘made from’ locution often, as in the above examples, marks the blending form of Diachronic Composition. But it is important to see that it can mark stacking and skewering as well. Stacking and skewering, recall, are versions of Diachronic Composition in which the *xxs* persist through the process and themselves come to Standardly Compose *y*. In such cases, *y* is both Standardly and Diachronically Composed of the *xxs*. So, if I am right that ‘made of’ marks Standard Composition and ‘made from’ marks Diachronic Composition, in cases of stacking and skewering it should be correct to say that *y* is both made of and made from the *xxs*. This prediction is borne out. Recall the castle which is both Standardly and Diachronically Composed of Lego®s. Both

The castle is made of Legos®

and

The castle is made from Legos®

are perfectly apt. ‘Made from’ marks any version of Diachronic Composition, not just blending.

Now, a complete analysis of the rules of usage for ‘made of’ and ‘made from’ would require considerable care with the details. Here are two points worth noting. First, the count noun/mass noun distinction complicates matters. (Hence my use of ‘kernels of corn’ rather than corn’.) The clearest cases are like the wine example above, when a count noun follows the composition term. When a mass noun occurs in that position, ‘made of’ tends to sound more acceptable. For example, it does not sound particularly wrong to say that bread is made of yeast, salt, water, and flour—not as bad as it sounds to say that wine is made of grapes, anyway. But this is neither surprising, nor a problem for the hypothesis. The issue is just that it isn’t clear what mass nouns refer to—stuffs?—and it also isn’t clear what the persistence conditions of stuffs are. The fact that we don’t have clear metaphysical intuitions about the persistence

²⁰ Beware of fictional, metaphorical, and noncontemporary uses. My claim is not threatened by putative counterexamples such as the early nineteenth century nursery rhyme:

Snips and snails, and puppy-dogs’ tails,
That’s what little boys are made of

Nor these famous lines from Shakespeare’s _Tempest_:

Full fathom five thy father lies;
Of his bones are coral made;
Those are pearls that were his eyes…. (Act I Scene 2).
conditions of flour, as opposed to a bag of flour, helps explain the fact that we don’t have clear linguistic intuitions about the well-formedness of sentences like ‘this bread is made of flour, water, yeast, and salt’. (For relevant discussion of mass terms and stuffs, see Cartwright 1965, Sharvy 1983b, Needham 1993, Zimmerman 1995, and Koslicki 1999.)

Second, tense complicates matters as well. Suppose that the ship of Theseus was originally made of pine, and is now made of aluminum. What ‘made from’ claims of Diachronic Composition are true? The ship clearly was made from pine, but is it now made from pine? I am not sure. I am not sure that any present tense ‘made from’ claims are true of the ship. But I shall set this aside, apart from passing mention in section 8.

Details aside, though, the first piece of linguistic data is clear: ordinary English has different terminology for Standard Composition and Diachronic Composition. The lesson is twofold. First, the availability of the ‘made from’ locution to express blending—which, unlike stacking and skewering, cannot be expressed via ‘made of’—is further evidence that we both have and use the blending concept. Second, the fact that ‘made from’ bridges the differences between stacking, skewering, and blending helps show that Diachronic Composition is conceptually unified.

However, something even stronger is true: we also have a phrase that bridges the difference between Diachronic Composition in any of its forms and Standard Composition. This is the second interesting piece of linguistic data. We also have a shared phrase, a phrase that is used for both relations: namely, ‘made out of’. As far as I can tell, ‘made out of’ is completely neutral between Standard Composition and Diachronic Composition, including blending. Grits are made out of kernels of corn. The child’s art project is made out of kernels of corn. Indeed, we can conjoin the subjects of those sentences:

Both grits and the child’s art project are made out of kernels of corn.

Elliptical constructions are also perfectly fine:

Bobby’s art project is made out of kernels of corn, and grits are too.

If y is made out of the xxs, it might be either made from them or made of them—or both. ‘Made out of’ can mark either Diachronic or Standard Composition.

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21 Another possible neutral expression is ‘is F’, where F is a kind term. For example, I guess one can say that both grits and the child’s art project are corn. And in Soylent Green, Charleston Heston does not usually say that Soylent Green is made from people. He says at least once that it is made out of people, and frequently says that it is people. I am less certain of the rules for this usage, however, at least in part because of the associated issues about mass terms discussed in the main text.
7. *Is Diachronic Composition Really a Kind of Composition?*

These two pieces of linguistic data propel me into my next task: to argue that Diachronic Composition really is a kind of composition. The most salient reason for believing this is the second piece of linguistic data that I just provided. The simple fact that English has a phrase that can be used to mark both Diachronic and Standard Composition strongly suggests that they are conceptually related. ‘Made out of’ does not appear to be homonymous or in some other way ambiguous; it appears to genuinely apply to both cases.

But let us push further. We can gain additional justification for taking Diachronic Composition to be genuinely compositional by breaking the question into two parts. First, why should we take stacking and skewering to be compositional concepts? Second, why think that blending genuinely belongs with them—why think that Diachronic Composition is conceptually unified rather than a gerrymandered mess?

The first question is relatively easy. Stacking and skewering are clearly compositional concepts. As we saw back in section 3, they are just cross-time versions of Standard Composition, correctly analyzed by the easy answer to the diachronic question:

the xxs exist at \(t_1\), \(y\) exists at \(t_2\), and at \(t_2\) the xxs Standardly Compose \(y\).

And it is the very fact that stacking and skewering are only one time variable away from Standard Composition that explains van Inwagen’s slide between the “official version” and the “practical version” of the special composition question. As I argued in section 3, that slide is a mistake—but it is an extremely natural mistake.

On to the second question. Is it correct to lump blending together with stacking and skewering? Yes. Here are three reasons to think so. The first is the first piece of linguistic data canvassed in the previous section. We have a phrase—‘made from’—that expresses *either* stacking or skewering or blending. The fact that it applies uniformly across the different versions of Diachronic Composition is reason to believe that Diachronic Composition is internally conceptually unified. Here, again, the phrase does not appear homonymous or otherwise ambiguous, as the second and third reasons help show.

Second, think about the issue from the perspective of practical agency, in terms of what we are doing when we engage in various activities, when we *put things together*. I, for one, have a strong sense that what we do when we put things together by blending is in some important
sense the same as what we do when we put things together by stacking or skewering. What I do when I make peanut butter feels strongly akin to what I do when I make peanut butter crackers. I do not feel as though I am undertaking a radically different activity. And since my point here is largely about the relations among the various concepts, that seems like a good reason to consider blending to be just as compositional as stacking.

Third, a lot of our thought and talk about composition as an unfolding process is neutral with respect to the persistence conditions of the ‘makings’. If that suspicion is right, it follows that a lot of our thought and talk about composition as an unfolding process is neutral between stacking-skewering-blending, and thus that those three concepts are tightly linked. Here are two reasons for thinking that it is right. For one thing, we can and do make cross-time composition judgments without having explicit views about those persistence conditions. Ordinary cooks do not have strong opinions about whether the particular squash on the counter continues to exist after it has been made into soup, and scientists are quite possibly using the concept of chemical composition in advance of settling Earley’s questions about the persistence conditions of atoms.22 For another thing, our diachronic composition judgments do not always change when we change our minds about the persistence conditions of the makings. If we decide that Earley is right after all, we will decide that atoms never stand in Standard Composition to molecules, and thus that atoms are never parts of molecules. But we will not decide that we were wrong to think that atoms come together in certain ways to make molecules. And if you come to agree with me that really, that misshapen squash that used to be on the counter no longer exists—that it was destroyed either upon chopping, cooking, or pureeing—you will not decide that you are wrong to think that the squash came together with other ingredients to make dinner. Those two thoughts together suggest that when we think and talk diachronically about the process of composition, we often do not commit ourselves to substantive claims about the persistence conditions of the

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22 Indeed, Rega Wood and Michael Weisberg claim that modern chemistry really is pretty neutral—or at least undecided—about the persistence conditions of atoms, and other related metaphysical matters of the sort that bothered Aristotle. They take the following questions to be unanswered by contemporary science:
If we know that water is made up of molecules, is it correct to say that all the parts of water are still water? Once oxygen and hydrogen are combined, is it possible to recover numerically the same atoms that existed prior to combination, given that the atoms share electrons in the molecule? Do distinct molecules continue to exist when they act together to form a substance, which has properties as a whole that no single molecule possesses? (Wood and Weisberg 2004, 683).
things we start with. We rely on a concept that permits but does not require that the makings be destroyed; we rely on a concept that is neutral.

These are compelling reasons to think that blending naturally belongs with stacking and skewering. The concept of Diachronic Composition is internally unified. And, since stacking and skewering are undoubtedly compositional notions, this gives us compelling reason to believe that Diachronic Composition as a whole is a compositional notion. All of this backs up the initial impression given by the availability of the neutral phrase ‘made out of’: Diachronic and Standard Composition are both kinds of composition. However, matters are more complicated than I am thus far letting on, as will emerge in the next section.

8. An Analysis of Diachronic Composition?

Let’s assume that you agree with me that the concept of Diachronic Composition is important, internally unified, and genuinely compositional. What else, if anything, can we say about it? We know that the relation is not identical to Standard Composition. But that leaves several options open. Here are the most prima facie plausible. First, perhaps Diachronic Composition reduces to Standard Composition, or to Standard Composition plus some other notions. Second, perhaps Diachronic Composition is fundamental. If so, we have at least two further options. Perhaps Standard Composition reduces to Diachronic Composition (or to Diachronic Composition plus some other notions); perhaps both Standard and Diachronic Composition are fundamental. This last option is the view that Kris McDaniel has called compositional pluralism (2004, forthcoming)—that there is more than one fundamental composition relation. A number of people endorse this view for a wide variety of reasons, none of which is particularly relevant to my argument here.

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23 The less plausible options include ones according to which neither relation is fundamental and neither figures in the reductive base of the other.

24 For example, David Armstrong believes in a nonmereological composition relation that generates states of affairs from particulars and universals and structural universals from simpler universals, and which is distinct from the relation that which generates more complex objects from simpler ones. (Armstrong 1986, 1997, §8.2; McDaniel forthcoming). Kris McDaniel argues that the defender of modal realism with overlap should believe that “each ontological category has its own parthood relation” (2004, 142)—and, in particular, should believe that regions of space do not stand in the same composition relation as material objects. Peter Simons argues that “mereological concepts apply not in one but in [at least] three analogous senses, corresponding to the three categories of concrete particular: individuals, classes, and masses” (1987, 166). Richard Sharvy claims that there are two fundamental parthood relations, being a part of and being part of (or being some of). The plural of ‘is a part of’ is ‘are parts of’; the plural of ‘is part of’ is ‘are part of’. The former involves a count/singular sense of ‘part’, and the latter a mass/plural sense (1983b, esp 230, 235-236). (Whether or not Sharvy is right about this, I rather suspect he overstates the case when he says that “absolutely every apparent oddity about the so-called ‘part-whole’ relation can
I vote for the first option. Against the first version of the second option, I simply note that I cannot see how such a reduction would go.\(^{25}\) As for the second version of the second option, I am increasingly suspicious that not even Standard Composition is fundamental.\(^{26}\) But the more important point is against \textit{either} version of the second option. The claim that Diachronic Composition is fundamental can only be on the table if we have ruled out the first option. We need to investigate this possibility, for it certainly looks like Diachronic Composition can be analyzed in terms of Standard Composition, causation, and persistence.\(^{27}\)

Before I start trying to spell out this reduction, though, let me be clear about what it is that I am—and am not—aiming at. I have already mentioned van Inwagen’s distinction between the special and the general composition question for standard composition. A similar distinction applies here. The analogue of the special composition question for Diachronic Composition is:

\[
\text{Under what conditions do some things at some time } t_n \text{ (or times } t_1 \ldots t_n) \text{ Diachronically Compose something at } t_{n+m}\text{?}
\]

And the analogue of the general composition question is:

\textit{What is} Diachronic Composition, in non-Diachronically-Compositional terms?

In this section, I am only after an answer to the \textit{general} question. Providing a precise set of necessary and sufficient conditions to answer the special question is surely just as hopeless in the diachronic case as in the synchronic one. But answering the \textit{general} question, at least in broad outline, just got a lot easier. Here, our answer can appeal to Standard Composition. Without an

\(^{25}\) One might leave Diachronic Composition undefined, and try something like

\[
\text{The } xx\text{s Standardly Compose } y \text{ at } t \text{ just in case the } xx\text{s Diachronically Compose } y \text{ and both the } xx\text{s and } y \text{ exist at } t.
\]

But that clearly will not do. And any additional clauses designed to block obvious counterexamples—requiring that the \textit{xxs} and \textit{y} be colocated, for example—will be moves in the direction of defining Standard Composition.

\(^{26}\) I am starting to suspect, instead, that it is but one determinate of a highly determinable, “\textit{very abstract}” (van Inwagen 1990, 20) relation. Other determinates include constitution, property realization, emergence, set membership, grounding—and Diachronic Composition. But although I am certain that all these “building relations”, as I call them, are conceptually related and bear family resemblances to each other, I am not certain of that stronger claim that they are all determinates of a single more fundamental determinable. And I’m certainly not taking up that question here (see ms).

\(^{27}\) Thanks to Jason Turner for discussion here.

\(^{28}\) I have thus far been assuming that all of the makings exist together. But, as Ted Sider pointed out to me, the definition should allow for sequential diachronic composition: imagine making sugar syrup by throwing sugar cubes, one by one, into a pot of boiling water.
answer to the general composition question for Standard Composition, that of course will not be a fully reductive, non-mereological answer, but it’s better than nothing—and all one can expect, if Standard Composition is indeed fundamental.

Let’s get started. Part of the account is easy, so let’s get that part out of the way. The xx$s Diachronically Compose y iff

1. At \( t_n \) (or \( t_{1-t_n} \)), the xx$s exist
2. At \( t_{n+m} \), y exists and is Standardly Composed of the zz$s
   Either 
3. the xx$s = the zz$s, or
4. ??

The third clause covers both stacking and skewering. But what shall we say about the blending case, which is precisely when the xx$s are not identical to the zz$s? Blending is to be covered by the as-yet-unformulated fourth clause. We might try something simple like

(4.1) the xx$s are causally connected to the zz$s in the right sort of way,

but that is hopeless without spelling out what “the right sort of way” is. We do not want the spoon with which I mixed the bread dough, or the blender in which I pureed the soup, to count as Diachronically Composing the bread or the soup. As it stands, then, (1) through (4.1) is not sufficient for the xx$s to Diachronically Compose y.

We can make some progress by considering the following imaginary case: suppose a wizard waves his magic wand at some vegetables sitting on the counter. They disappear and are (almost) instantaneously replaced by a steaming pot of smoothly puréed soup. Do the vegetables Diachronically Compose the soup? Surely the right answer to this question is, “it depends on what the wizard did”. If the wizard somehow got rid of the matter on the counter, and replaced it with new matter—either by teleporting matter to and from different locations, or by destroying what was there and creating new particles out of thin air—then the answer is ‘no’. But if he simply rearranged and heated the particles that were already in that location, Standardly Composing the onions and so forth, then the answer is plausibly ‘yes’. The vegetables do Diachronically Compose the soup; the soup is indeed made from those very ingredients.\(^{29}\)

The “right sort of causal connection” of (4.1) can now be more carefully spelled out. It involves the persistence, not of the vegetables themselves (they are destroyed by blending), but of that which Standardly Composes them. The key is to appeal to underlying continuity of

\(^{29}\) This example helps “clarify the difference between mixing and coming to be or ceasing to be,” as Aristotle wanted (De Generatione 1.10 327b8-10).
matter. In blending cases of Diachronic Composition, the \( xx \)s aren’t identical to the \( zz \)s, and never Standardly Compose \( y \), but they are themselves Standardly Composed of things that compose the \( zz \)s. So replace (4.1) with

\[
\text{(4.2) There are some } pps \text{ such that the } xx \text{ and the } zz \text{ are both (partially? largely?) Standardly Composed of the } pps.
\]

The reason the second version of the wizard’s soup is Diachronically Composed of the vegetables on the counter is that there are proteins, fats, carbohydrates, and so forth that were once part of the vegetables but are now part of the soup. The reason that (this) wine is made from (those) grapes is that there are sugars and acids and water molecules and so forth that were once part of the grapes but are now part of the wine.\(^{30}\) The underlying constituents have undergone various causal processes resulting in changes at the macrolevel.

The (1)-(4.2) characterization of Diachronic Composition is, I think, basically correct, subject to a couple of instructive caveats. I will begin with a small(ish) concern, in order to set it aside and focus on the more interesting issues that the characterization raises.

The small(ish) concern is that the (1)-(4.2) characterization may not be necessary for Diachronic Composition. Consider again the ship of Theseus. By now it is fully aluminum; it has no matter in common with the pine planks of which it was originally built. Is the ship Diachronically Composed of those pine planks? If not, there is no puzzle here. But if so, then (1)-(4.2) is not necessary for Diachronic Composition. I myself occasionally feel a bit of pressure to say that Theseus’ ship is Diachronically Composed of the planks, though I find that this intuition is not widely shared. Those who do not share the intuition can read on; those who do share it will find a relatively simple fix in this footnote.\(^{31}\)

\(^{30}\) The claim is not that the \( xx \)s and the \( zz \)s share fundamental constituents, but simply that there is some level of decomposition at which they share constituents. Thus the analysis is consistent with the hypothesis that there is no fundamental level, that the world is ‘gunky’, and that nothing has fundamental constituents (à la Schaffer 2004).

\(^{31}\) To accommodate Thesus-style gradual replacement of the things that compose the \( xx \)s, we should move to a two-stage definition that allows for stepwise chains. First, replace (4.2) with

\[
\text{(4.3) There are some } pps \text{ that (partially? largely?) Standardly Compose the } xx \text{ and some } qqs \text{ that (partially? largely?) Standardly Compose the } zz \text{, such that either}
\]

(a) the \( pps = \) the \( qqs \), or
(b) the \( pps \) and the \( qqs \) significantly overlap.

Call (1)-(4.3) a definition of Direct Diachronic Composition. Second, say that the \( xx \)s Diachronically Compose \( y \) iff Either the \( xx \)s Directly Diachronically Compose \( y \), or

There is a stepwise chain of Direct Diachronic Composition between the \( xx \)s and \( y \).

That will handle the wine of Theseus case.
The other worries about this characterization of Diachronic Composition are both more interesting and more revealing. These are challenges to the sufficiency of the characterization, though the lesson I will eventually draw from them is somewhat different. Consider the following cases. First, suppose I make compost from a pail of vegetable scraps, take it out to the garden, and some ‘volunteer’ tomato plants grow from seeds that were in the compost. Second, suppose I take the flour, yeast, water, and salt, and bake it into bread—which I promptly rip into crumbs. Third, suppose I take all of those breadcrumbs, add some onion, celery, butter, and sage, and make a nice stuffing for Thanksgiving. All three of these cases meet at least the basic shape of the analysis: the tomato plants are largely Standardly Composed of the same underlying matter that Standardly Composed the vegetable scraps. The bread crumbs are Standardly Composed of the same matter as the flour and so forth—to precisely the same extent as the loaf was. And the stuffing? Now we are into ‘partial’ territory, of course, but the stuffing is indeed partially composed of the same underlying matter as the loaf and the crumbs. But are the tomato plants really Diachronically Composed of the vegetable scraps? Are the breadcrumbs Diachronically Composed of the flour and so forth? Is the stuffing?

On the one hand, the answer to these questions seems to be ‘no’. It does not sound quite right to say that the tomato plant is made from the compost. The relation between the loaf of bread and the crumbs is decompositional—it is a matter of taking things apart, not putting things together. And the stuffing has enough other ingredients that it does not seem quite right to say that it is Diachronically Composed from the flour, yeast, water and salt. On the other hand, however, these cases are very much of a piece with making a Lego castle or making soup. They involve the rearrangement of microlevel entities into new macrolevel shapes and entities. That is why they meet the basic shape of the (1)-(4.2) analysis.

Now, I could react to these cases by making judgment calls about what to rule in and out, and refining the analysis accordingly. I could try to precisify the purposely vague “(partially? largely?)” clause in (4.2). I could try to levy some restriction on how much time can pass between \( t_n \) and \( t_{n+m} \), or perhaps better, on how much macrolevel qualitative change can occur between \( t_n \) and \( t_{n+m} \). And I could insist more firmly on a feature that is already, in fact, in the official definition—that Diachronic Composition be many-one, rather than many-many or one-many. These are, after all, the three ways in which the troublesome cases push the boundaries of the Diachronic Composition concept. The breadcrumbs case is not many-one, the tomato plant
case involves a long time span and much qualitative change, and the stuffing is not wholly made from the flour and so forth.

But that response would be misguided. None of those three features should be expected to bear a lot of weight, and a tightened up definition designed around them would be artificial. Consider, for example, the idea that somehow the tomato plant case must be ruled out because there is too long a time lapse, or too much qualitative change, since the pail of scraps in the kitchen. That is nonsense. There is no real difference in kind between the amount of time and qualitative change involved in the change from scraps to tomato plant and the amount of time and qualitative change involved when grapes are made into wine—or, even further down the road, into cognac, Çiroc® vodka, or vinegar. Not all of our initial intuitions here are to be trusted, and we should take care to avoid endless and pointless ad hoc refinements. Further, recall that the goal here is not to refine and refine until we reach an extensionally precise account of the conditions under which Diachronic Composition occurs. The goal is to answer the general composition question, not the special composition question. What is Diachronic Composition? It is an amalgam of causation, persistence, and Standard Composition, along the lines that I sketched above.

In short, I suggest that we should not take the ‘troublesome’ cases as clear counterexamples to the sufficiency of the analysis, and we should not scramble to revise and repair the analysis in light of them. The proper response, instead, is to take them at face value, as somewhat fringe examples of the concept under investigation. It is a mistake to insist that there are hard and fast lines between the ‘troublesome’ cases and the ones I have been treating as canonical cases of Diachronic Composition. The fact is that these cases—and others—shade into each other. They all involve the rearrangement of underlying smaller bits; they all involve matter that composes one thing coming to compose other things. As soon as we get anywhere near an adequate answer to the question of what Diachronic Composition is, we cannot help but slide to a more general idea. The target of our investigation becomes something more like things turning into other things—becoming other things. The scraps eventually turn into the plants, just as the flour and so forth first becomes dough, then bread, then crumbs, then stuffing.

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32 We should not, for example, expect the fact that we say that cognac and Çiroc are made from grapes, but speak of ‘wine vinegar’ rather than ‘grape vinegar’ (and ‘cider vinegar’ rather than ‘apple vinegar’), to be reflected in a real metaphysical difference between the relation between these grapes and that bottle of cognac and the relation between those grapes and that bottle of vinegar. There is no relevant difference between the cases.
Earlier, I claimed—and rather painstakingly defended—that blending is a form of composition, that it belongs alongside stacking and skewering, that Diachronic Composition is conceptually unified. But remember that I also claimed that there are countervailing factors that muddy the water significantly. These are the countervailing factors. Blending does naturally belong with stacking and skewering. But it also naturally belongs with other notions of cross-time change and decomposition. There are multiple equally natural ways to carve up the conceptual territory here. There is a continuum, ranging from straight-up, synchronic Standard Composition at one extreme, through the diachronized versions I have called stacking and skewering, through blending, though to various other forms of becoming, change, and decomposition at the other extreme. We can categorize blending with cross-time versions of Standard Composition, or we can categorize it with these more straightforwardly causal notions. Once we start thinking diachronically, about composition as a process, the notion of composition gets tangled up with notions of causation and persistence.

9. Conclusion

This paper touches upon many controversial topics—composition, causation, identity, persistence—and it is hard not to tread on toes unnecessarily. But let me be very explicit, here at the end, about what I have not done. I have not argued that Standard Composition ever holds, nor that anything ever comes into or goes out of existence. I have not relied upon any substantive claims about the persistence conditions of any particular kind of thing, or any particular view about the mechanisms of persistence. (For more on these issues, see the appendix.) I also certainly have not attempted a unified analysis of all of our ‘making’ talk—a hopeless, metaphor ridden jumble if ever there was one. After all, we use ‘make’ in all kinds of ways, many of which are not compositional at all. We make mistakes, noises, beds, appointments, friends, love, time, trouble, work, merry…

What I have tried to do is convince you to take seriously a notion of Diachronic Composition. It is a certain central notion of making, which unfolds over time, and permits but does not require the destruction of the ‘makings’. It is clearly compositional, though not the same as the synchronic notion typically discussed by contemporary metaphysicians. Yet it is also clearly related to other, less compositional notions of change. It occupies a spot on a continuum; our compositional concepts are more complicated than usually recognized.
There is a frequent trope—in the literary rather than metaphysical sense—in the philosophical literature, in which ‘vertical’ determination relations like composition or supervenience are sharply distinguished from the ‘horizontal’ determination relation of causation. The metaphor is so commonplace that I have no idea to whom to attribute it. Think here of the standard diagram used to explain the problem of mental causation, or the pictures drawn by anyone explaining the different senses of ‘makes it the case that’. With that picture in mind, I can sum up my point succinctly: there is also a lot of interesting stuff going on along the diagonal.

Appendix: Objections

Objection 1: “But I don’t believe that Standard Composition ever occurs!”

Well, my primary response is that I did say that my claim was conditional: if you believe in Standard Composition, you should also believe in Diachronic Composition. But it is also worth pointing out that simply believing that Standard Composition occurs less frequently than I have assumed does nothing to relieve the pressure to believe in Diachronic Composition. Although van Inwagen and Merricks are sometimes treated as though they are compositional nihilists, they are not; van Inwagen believes in composite living organisms (1990), and Merricks believes in composite conscious beings (2001). These things are presumably ‘put together’ by means of Diachronic Composition. Indeed, van Inwagen explicitly says that a sperm and an egg undergo what I have called blending when they come together to make a zygote, and that cells undergo what might be called unblending when they undergo mitosis (1990, 151-153).

Objection 2: “I don’t believe in creation and destruction! I agree with Linsky and Zalta (1994, 1996) and Williamson (2001). I think that everything that exists necessarily exists—and, as a corollary, always exists.”

The idea here is this: if nothing is ever created or destroyed, then it is never the case that makings are destroyed as a composite comes to be, and there is no such thing as blending. If there is no such thing as blending, Diachronic Composition can be understood via the diachronized version of Standard Composition as discussed back in §3.

There are interesting arguments for the view that everything necessarily exists, and it would obviously take me too far afield to try to deflect them here. But all I need to point out is that everyone who believes the view relies upon some surrogate notion for nonexistence. Linsky
and Zalta use the notion of nonconcreteness this way, and Williamson talks of things that only exist in the logical sense. So, for example, although their opponents would say that Narnia does not exist, Williamson would say that it exists, but only in the logical sense, and Linsky and Zalta would say that it exists but is not concrete. Similarly the grapes from which this wine is made. They were not destroyed through the processes of crushing, filtering, and fermenting, they just…. lost a lot of properties, and went nonconcrete.

So is our Williamsonian objector correct to claim that, in order to make sense of the relation between the grapes and the wine, she only needs diachronized Standard Composition of either the stacking or skewering variety? No. The claim would have to be that at $t_1$, the grapes are concrete, and at $t_2$, the grapes are nonconcrete but Standardly Compose the wine. But none of the extant versions of the necessary-existents position allows this. Both Williamson (2001, 245-246) and Linsky and Zalta (1994, 446) deny that nonconcrete objects have properties or stand in relations, and they have good reasons for doing so. Nonconcrete objects therefore do not have spatio-temporal locations, and cannot stand in any causal or compositional relation. Thus if our Williamsonian objector wants to say anything about the relation between the grapes and the wine, it is going to have to be about the relation between the concrete grapes at $t_1$ and the wine that comes into existence later. That is, she will need some analogue notion of blending.

Objection 3: “OK, but what about four-dimensionalism? Doesn’t that moot the need for blending?”

How so? Four-dimensionalism is a view about the mechanisms of persistence, but it says nothing about the limits of change for any particular kind of thing. And as long as we hold fixed certain common sense views about persistence conditions—i.e., that at least some kinds of things can be destroyed—then issues about blending arise. (And, as we have just seen, they may arise even if we do not hold those views fixed.) So suppose for the sake of argument that grapes are space-time worms Standardly Composed of grape-ish time slices, and a quantity of wine is a space-time worm Standardly Composed of wine-ish time slices. It is of course a vague matter when the grapes cease to be and when the wine starts to be, and thus a vague matter which particular worm either of them is, but even so—the space-time worm that is the wine does not

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33 Linsky and Zalta’s view is a little more subtle than this, but the added complexity does not affect my basic point.
34 Or that a grape is a time-slice connected to other grape-ish time slices by counterpart relations. The point in the main text should go through, mutatis mutandis, for the “stage-view” version of four-dimensionalism defended by Sider (1996; 2001, §5.8) and Hawley (2001).
share any time-slices with the grapes. (With the sugars and acids that compose the grapes, yes. But not with the grapes themselves.) Further, conjoining four-dimensionalism with unrestricted composition does not help either. Doing so gives us a space-time worm that is the mereological sum of all of the time-slices of the grapes and the wine. But that is not the same as giving us a space-time worm that is *this quantity of wine* and contains the grape time-slices as parts.

**Objection 4:** “This requires eternalism!”

Maybe it does and maybe it doesn’t—I admit that much of the paper is written in eternalese—but there is no stable dialectical position from which there is an *objection* here. Eternalists won’t care if accommodating Diachronic Composition requires eternalism. Presentists will care, but they should not believe that it does. Presentists are often accused of having trouble accounting for cross-time relations, and they typically attempt to resist the accusation one way or another. Diachronic Composition is a cross-time relation, to be sure, but in that respect it is just like many others: admiring Lincoln, missing your dead grandmother, causation, motion. Whatever solution the presentist endorses in the other cases will be equally successful here. If there is no satisfactory solution, so much the worse for presentism.

**Objection 5:** “But so-called Diachronic “Composition” can’t be a genuine composition relation! It’s analytic to the term ‘composition’ that it has an associated notion of parthood, and Diachronic Composition does not have one.”

Both premises can be challenged. The argument relies upon assumptions that are not legitimate in this context.

First, I can accept the premise that every kind of composition has an associated notion of parthood, and deny that Diachronic Composition does not have one. When I claimed that it did not have one, back in §4, I explicitly assumed that parthood was synchronic (or atemporal; see note 3). But why assume that, given all that we have learned so far? If we instead allow parthood to be diachronic, Diachronic Composition *does* have an associated notion of parthood—namely, ‘making-hood’. Now, the committed objector may not be moved by this. But she needs to recognize that the claim that all parthood relations are synchronic is a further substantive claim, beyond the claim that every kind of composition has an associated notion of parthood. And without an independent argument for that further claim, she cannot rely on it in an argument for the claim that *composition* has to be synchronic—at least, not in an argument that is going to convince her opponent.
Second, and alternatively, I can instead grant that Diachronic Composition has no associated notion of parthood—i.e., I can grant that ‘making-hood’ does not count after all—and instead deny that all composition relations have one. This amounts to denying a very widely held assumption (a handful of citations from sources that happen to be within reach on my desk: McDaniel forthcoming, 1; van Inwagen 1990, 29; Simons 1987, 229). But it is not crazy to do so. Bear in mind that I have been using ‘composition’ in lowercase letters as an umbrella term for a notion of which both Diachronic and Standard Composition are subspecies. I can say that composition need not have an associated parthood relation while agreeing that Standard Composition does. Indeed, the argument that Diachronic Composition cannot be a kind of composition because it differs from Standard Composition this way is question-begging.

Compare the following case: Imagine that you are trying to convince someone that the is a brother of relation and the is a sister of relation are closely related, and that both are in fact versions of the is a sibling of relation. Further imagine that although your interlocuter believes in the is a brother of relation, he is having none of your argument. He insists, “the relation must take a male in the first slot!” Yet this is at best question-begging as a response to the claim that there is a different but similar relation that does not take a male in the first slot, and which falls under a common determinable. Similarly, the claim that Standard Composition has an associated parthood relation does nothing to show that all composition relations do. Just as both is a brother of and is a sister of are sibling relations, both Diachronic and Standard Composition are composition relations.

In short, I have two options: I can either claim that Diachronic Composition does have an associated notion of parthood, or I can deny that every form of composition brings with it a notion of parthood. The choice seems little more than a terminological choice about how to use ‘parthood’. Frankly, I think that resistance to either move is a symptom of the fact that the metaphysics literature has neglected Diachronic Composition in favor of Standard Composition.

Still, though, a few conciliatory remarks may be in order. For one thing, I am happy to cede the word ‘mereology’ to the study of Standard Composition and its associated synchronic part-whole relation. I am happy to say, that is, that Diachronic Composition is a form of non-
mereological composition.\textsuperscript{35} In fact, I may be willing to step backwards even further, and claim that although Diachronic and Standard Composition are indeed both determinates of a common determinable, that determinable is not best labeled ‘composition’. Instead, both are what I have elsewhere called ‘building relations’ (ms), a class which includes not only composition but also constitution, realization, set membership, grounding and other relations. Let me be clear: I do think that Diachronic Composition is a form of composition, and, \textit{ipso facto}, a building relation as well. But if I at least convince you that it counts as a different kind of building relation, I’ll be satisfied.

\textsuperscript{35} Armstrong also says that his structure-making relation is a “non-mereological mode of composition”, (1997, 122) but for a different reason. He takes mereological composition to be extensional, while his structure-making relation is not.


———. MS. Construction area: no hard hat required.


Turner, Jason. MS. Ontological pluralism.


