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Does Compositionality Entail Complexity?

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1. Introduction

Structured Propositionalism — the view that propositions are mereologically complex structured entities — is the regnant paradigm in the philosophy of language. As Steven Schiffer says, "Virtually every propositionalist accepts [compositionality] and rejects unstructured propositions" (2003: 18), and even the "new" theories of propositions defended by Peter Hanks, Jeffrey King, Scott Soames, and Jeff Speaks take propositions to be complex, structured entities.[1]

Schiffer's linking of structured propositions and compositionality is no accident: compositionality is the basis for one of the most influential arguments for Structured Propositionalism. It is argued, in brief, that if language is compositional, the meanings of complex expressions must themselves be complex. Let **Compositionality** refer to the claim that language is compositional, and let **Complexity** denote the thesis that compositionally determined semantic values are mereologically complex structured entities.[2] Then we can say that, according to the Compositionality Argument, *Complexity follows from Compositionality*. This argument dates back at least to Gottlob Frege and Bertrand Russell and has influenced theorizing about propositions ever since. The argument can be formulated deductively (Compositionality *entails* Complexity) or non-deductively (Compositionality is *evidence for* Complexity). I argue in this paper that the deductive argument is unsound, the non-deductive argument is weak, and arguments of the form 'Complexity follows from Compositionality + *X*' are unconvincing, for various substitution instances of '*X*' (call these Compositionality+

1. See, e.g., Hanks (2015) and King, Soames, and Speaks (2014), although Speaks only claims that propositions are structured in a "lightweight" sense that is neutral about their true nature.

2. If expressions have semantic values of different kinds, Complexity should be glossed as the thesis that the kind of compositionally determined semantic value that propositions fall under must be mereologically complex and structured. Frege, for example, accepted both the compositionality of sense and reference but didn't think that compositionally determined *referents* needed to be complex. On Frege's view, however, propositions are the senses, not referents, of sentences.

Arguments).[3] It is worth stressing that the conclusion of this paper is not that Complexity is false, but merely that it does not follow from Compositionality.

2. The Frege-Russell Thesis

The most worked-out and influential argument for Structured Propositionalism is an argument against its main rival, **Intensionalism**: the view that propositions are functions from possible worlds to truth values (or the characteristic sets of those functions). The key premise of this argument is that propositions are individuated more finely than by necessary equivalence.[4] But that doesn't support Structured Propositionalism over versions of non-structural **Primitivism** that also individuate propositions finely. The remaining arguments for Structured Propositionalism are often enthymematic. Of these, the Compositionality Argument is among the most influential. Trenton Merricks claims that Compositionality is one of three "standard motivations for structured propositions" (2015: 130), Jennifer Wang says that a "main motivation for [Structured Propositionalism is] an explanation of the compositionality of language" (2016: 465), and Matt Duncan claims that issues about "the compositionality of meaning…are front and center in debates about the metaphysics of propositions" (2017: 1). The Compositionality Argument dates back at least to Frege, who presented it as follows:

> It is remarkable what language can achieve. With a few sounds and combinations of sounds it is capable of expressing a huge number of thoughts, and, in particular, thoughts which have not hitherto been grasped or expressed by any man. How can it achieve so much? By virtue of the fact that thoughts have parts out of which they are built up, and these parts, these building blocks, correspond to groups of sounds, out of which the sentence expressing the thought is built up, so that the construction of the sentence out of parts of a sentence corresponds to the construction of a thought by which they are expressed. (1979: 225)[5]

Russell also gave an influential version of the argument:

> One prima facie mark of complexity in propositions is the fact that they are expressed by several words. I come now to another point …. You can understand a proposition when you understand the words of which it is composed even though you never heard the proposition before. That seems a very humble property, but it is a property which marks it as complex and distinguishes it from words whose meaning is simple. (1985: 53)

Russell goes on to say:

> [I]n a logically correct symbolism there will always be a certain fundamental identity of structure between a fact and the symbol for it; and … the complexity of the symbol corresponds very closely with the complexity of the fact symbolized by it. (57–8)[6]

3. Some apparent instances of the Compositionality Argument are perhaps best interpreted as Compositionality+ Arguments. Readers who think that *all* plausible versions of the Compositionality Argument are Compositionality+ Arguments may wish to skip §3.

4. See, e.g., Soames (1989).

5. A similar passage appears in Frege (1984: 390). Both passages can be plausibly interpreted as suggesting that Frege thought that Complexity was required by something more than mere Compositionality. See §4 for discussion.

6. Of course, interpreting such passages is challenging, due to the idiosyncratic way in which Russell used 'proposition' and 'fact'. He says, "What I call a fact is the sort of thing that is expressed by a whole sentence" (1985: 41) and goes on to say that "[a] proposition is … a complex symbol in the sense that it has parts which are also symbols" (44). In light of such passages, it is common to take Russell's "facts" to be propositions and Russell's "propositions" to be sentences. Whatever the case may be, the quoted passages support the view that Russell thought that compositional considerations require what *we* call 'propositions' to be complex.

These arguments suggest that while propositions (are taken to) play many roles, something about the role *compositionally determined semantic value* requires its occupants to be complex. If propositions are in fact the compositionally determined semantic values of (non-idiomatic, declarative) sentences, it would follow that propositions are complex.[7] The idea that Compositionality and Complexity are related goes back to at least the Middle Ages, when (a primitive version of) compositionality was glossed in terms of *building* or *summation*. According to Peter Pagin and Dag Westerståhl (2010) (drawing on King 2007), philosophers in the late Middle Ages largely accepted:

> **Additivity**: The signification of a complex expression is the *sum* of the signification of its non-logical terms.

Pagin and Westerståhl suggest that this and other proto-compositional principles were expressed in terms of building or summation at least partly because medieval thinkers lacked the general concept of a function. Whatever the reason may be, for anyone who thinks of compositionality in terms of building or summation, the inference from Compositionality to Complexity becomes almost trivial.[8] Building conceptions of compositionality, with their concomitant commitment to Complexity, remain ubiquitous. According to Michael Dummett, for Frege, "The sense of a complex sentence is thus actually composed of the senses of its constituents" (1973: 152–3), and according to Hanks, a compositional "theory has to assign [semantic values] to subsentential expressions and show how to combine these component [semantic values] into the [semantic values] associated with sentences" (2017: 245). Hanks goes on to say that "the [semantic value] assigned to a sentence is composed out of the [semantic values] assigned to its parts and mood" (246–7). Along similar lines, Joseph Almog says that "[n]ames are simple, structureless signifiers. Descriptions, definite or indefinite, are syntactically complex signifiers. This has semantic repercussions. Consider definite descriptions. At generation, the description induces a *complex* as its propositional constituent" (1986: 221). Almog goes on to assert that "[a] complex singular term should (does!) induce a complex propositional constituent" (224).[9]

A final indication of the influence of the building conception of compositionality is the fact that almost every Structured Propositionalist holds that the constituents of a proposition p expressed by a sentence s are the compositional semantic values of s's meaningful parts and that p's structure mirrors that of s (on some level of analysis). This thesis is so widely accepted that it deserves to be called **Standard Structured Propositionalism**.[10] But if Structured Propositionalists are not assuming that compositionality involves building, what explains their almost unvarying acceptance of Standard Structured Propositionalism? Such uniformity of philosophical opinion is striking and demands an explanation. Acceptance, perhaps implicit, of the building conception of compositionality seems like the most obvious candidate.

Taken together, these considerations suggest that many Structured Propositionalists accept:

7. Lewis (1980) argues that propositions are *not* the compositional semantic values of sentences. If Lewis is right, the Compositionality Argument obviously fails. King (2003) is the canonical response to Lewis, but see Rabern (2012), Yli-Vakkuri (2013), and Glanzberg and King (2020) for further discussion.

8. Only almost, since one could hold that while the meaning of a complex expression e is built out of the meanings of e's parts, the meaning of e doesn't have the meanings of e's parts as constituents: the meanings of e's parts are "lost" or "dissolved" in the building process. (E.g., cakes often have eggs as ingredients but don't have eggs as parts.)

9. And Nathan Salmon says, "'Frege is clever' shares certain syntactic components with the sentences 'Frege is busy' and 'Russell is clever'. These syntactic components—the name 'Frege' and the predicate 'is clever'—are separately semantically correlated with the corresponding component of the [proposition] encoded by the sentence" (1989: 332–3). See also Cresswell (1985: 25–7).

10. See Hodgson (2013), Keller (2019), and Pickel (2020) for critical discussion. The debate about "unarticulated constituents", going back to Perry (1986), presupposes that the constituents of structured propositions are at least *normally* the semantic values of some meaningful part of the sentences that express them.

> **The Frege-Russell Thesis**: Compositionally determined semantic values must be mereologically complex.[11]

The Frege-Russell Thesis is named for the philosophers most associated with it — an association that exists even if it shouldn't. Some might question whether Frege accepted the Frege-Russell Thesis, given that Frege accepted the compositionality of reference, and the compositionally determined *referents* of complex expressions are often not complex. It is relatively clear, however, that Frege accepted the Frege-Russell Thesis as applied to sense, and Frege held that propositions are the compositionally determined *senses* of sentences.[12] (Recall fn.2: throughout this paper, 'semantic value' should be taken to refer to the type of semantic value under which propositions fall.) But what the point about reference may show is that Frege didn't think that Compositionality, in and of itself, entailed Complexitythat his argument is really a Compositionality+ Argument.

3. The Compositionality Argument

The primary reason that natural languages are thought to be compositional is that they are productive and systematic. **Productivity** refers to the fact that we have the capacity to produce and understand an indefinite, perhaps infinite, number of expressions, including expressions we've never encountered before. Evidently, we gain this capacity by learning a few rules and the meanings of a relatively small number of words. This capacity would be a mystery if the meanings of most complex expressions were not determined, in *some* sense, by the meaning and arrangement of their parts.[13] **Systematicity** refers to the fact that anyone who understands the sentences 'Mary is tall' and 'Joe is short' will also understand the sentences 'Joe is tall' and 'Mary is short'.[14] And again, what seems to be the only *possible* explanation for this is that the meanings of complex expressions such as 'Mary is tall' and 'Joe is short' are determined by the meanings and arrangement of their parts.

Let **C-Expressions** be the class of expressions that (are normally thought to) have a compositional semantics — i.e., complex non-idiomatic expressions that can be produced and understood by competent speakers who are unfamiliar with them. Slightly more carefully, call an expression *e* a C-Expression in a language *L* just in case:

- Competent speakers of *L* can **understand and produce** *e* in appropriate circumstances even if they have never before encountered it.
- Competent speakers of *L* can **understand and produce systematic grammatical permutations** of the components of *e* even if they have never before encountered them.

Given this definition, the Frege-Russell Thesis is that C-Expressions must have complex semantic values. We can now formulate the Compositionality Argument as follows:

> 1. C-Expressions must have complex semantic values. (The Frege-Russell Thesis)

11. Structured Propositionalists often speak of 'constituents' rather than 'parts', but Gilmore (2014) fails to find any Russellian Structured Propositionalists who deny that constituency is a kind of parthood, and he provides examples (fn.2) of Structured Propositionalists affirming that constituency *is* parthood or a kind of parthood. He goes on to note that (in non-set-theoretic contexts), if 'constituency' doesn't mean parthood, it's hard to know *what* it means. Frege, however, often refers to propositional constituents as parts ('Teile') and is commonly interpreted as holding that propositions have senses as parts. If Frege and Russell were not equivocating when they argued about whether Mont Blanc, or the sense of 'Mont Blanc', was a "component part" ('Bestandteil') of the proposition *that Mont Blanc is more than 4,000 meters high*, both held constituents to be parts. See Keller (2013) for additional discussion.

12. He says, "the possibility of our understanding sentences which we have never heard before rests evidently on this, that we can construct the sense of a sentence out of parts that correspond to words" (1914: 79). I've followed the common practice of substituting 'sentence' for 'proposition' in this translation of the quote. The German is ambiguous, but Frege clearly means to be talking about sentences: the next line of the translation begins "If we find the same word in two propositions…"

13. See Dever (2006) and Szabó (2000, 2012b) for critical discussion, however.

14. Similarly with sentences of other forms: e.g., anyone who understands 'Mary loves Joe' will understand 'Joe loves Mary'. See §4.2.2 for further discussion.

2. Most sentences are C-Expressions.

so, 3. Most sentences have complex semantic values.

4. Propositions are the semantic values of sentences (in context).

so, 5. Propositions are (at least sometimes) complex.

Premise (2) is uncontroversial, and (4) is relatively uncontroversial (but recall fn.8). So the success of the Compositionality Argument seems to hinge on the truth of the Frege-Russell Thesis. And the truth of *that* hinges on how we think about compositionality.

3.1 Compositionality

Compositionality is often glossed as:

> **Naïve Compositionality**: The semantics for a complex expression *c* in a language *L* is compositional iff the semantic value of *c* in *L* is determined by the arrangement and individual meanings of *c*'s meaningful parts (in *L*).[15]

While this definition is widely accepted, there are significant worries about whether it manages to be non-trivial (to put substantive constraints on semantic theorizing).[16] There is wide disagreement, however, about both what form a non-naïve principle of compositionality should take and whether one is needed. Compositionality — the fact that the meaning of complex expressions is determined by the meanings of their parts — is supposed to explain how language is productive and systematic;[17] the debate is about what form of "determination" is

15. Szabó says of a similarly formulated principle that it "is both the strongest and most natural" understanding of compositionality and that it "deserves to be called the principle of compositionality" (2012b: 72).

16. See, e.g., Szabó (2000).

17. There are dissenters who deny that natural languages have a compositional semantics, but *that* debate is irrelevant for our purposes: if language is not compositional, the Compositionality Argument obviously fails.

involved. The truth of the Frege-Russell Thesis, and hence the success of the Compositionality Argument, seems guaranteed if it is true that:

> **Building**: The semantic values of C-Expressions are built from the meanings of their meaningful constituents.[18]

If, however, compositionality involves only some non-mereological form of determination (such as functional determination), the Frege-Russell Thesis will not be supported on the basis of compositional considerations alone.

3.2 Compositionality Does Not Entail Complexity

The first step in any response to the Compositionality Argument is, then, to argue that Building is false.[19] Consider the Roman and decimal systems of numerals. Since there are infinitely many numbers, it behooves us to have a system of number expressions that is productive and systematic — i.e., for (most) numerals to be C-Expressions. And both the Roman and decimal systems of numerals satisfy this desideratum. It's quite likely that you have never previously encountered the numeral '6,346,191'. But you know more or less immediately what number it denotes. And it's trivial to produce numerals we've never encountered before (I just did). So, numerals are productive. They're also systematic — anyone who knows what number '68' denotes (in virtue of her competence with decimal numerals) knows what '86' denotes.

Numerals, then, are C-Expressions. Consider a standard Russellian semantics, according to which the semantic value of a numeral is the number it denotes. Are numbers mereologically complex? If so, Roman and decimal numerals won't be counterexamples to the Frege-Russell Thesis. But the claim that numbers are complex is doubtful — out of

18. Some might add: according to a graspable set of rules linking the structure of C-Expressions with the structure of their meanings. See Szabó (2000) for further discussion.

19. The argument in this section builds on that of Keller and Keller (2013), but §4 and §5 cover versions of the Compositionality Argument not discussed there.

what would they be built?[20] And even if numbers are complex, their complexity does not correspond to the complexity of the numerals that denote them: '60' and 'LX' have the same semantic value (the number sixty), but the semantic values of the parts of '60' are six and zero, while the semantic values of the parts of 'LX' are fifty and ten. And, of course, one and the same number can be expressed by simple and complex numerals in different (perfectly adequate, productive, and systematic) numeral systems: e.g., the number ten is expressed by both 'X', which is simple, and '10', which is complex. The semantic values of complex numerals are thus *determined by* the (arrangement and) semantic values of their parts without being *built from* them.

Of course, the falsity of Building doesn't strictly entail the falsity of the Frege-Russell Thesis: perhaps complex numerals must have complex semantic values for some other reason. For example, if all numbers are complex, complex numerals couldn't help but have complex semantic values. But if that were true, the complexity of a numeral's semantic value would have nothing to do with the complexity of the numeral itself or the semantics governing it, thus undermining the *inference* from Compositionality to Complexity. Cases like 'X' and '10' show that the (semantic) complexity of an expression and the complexity of its semantic value are completely unrelated.

This argument against the Frege-Russell Thesis works just as well on a Fregean semantics where the (relevant) semantic values of numerals are senses rather than numbers — at least if co-denotational Roman and decimal numerals have the same senses. But that seems entirely plausible: if any expressions are mere notational variants, '10' and 'X' are.

It might be objected that senses are supposed to track cognitive significance, and '10' and 'X' don't have the same cognitive significance, since '10=10' is uninformative and uninteresting, whereas '10=X' might be: e.g., someone might accept the first without accepting the latter. But that doesn't show that '10' and 'X' have different senses, unless those for whom '10=X' is interesting and informative are competent with both '10' and 'X'. After all, if someone speaks English but not German, she might accept 'the author of *Waverly* is the author of *Waverly*' but decline to accept 'the author of *Waverly* is der Autor von *Waverly*'. This wouldn't show, or even suggest, that 'the author of *Waverly*' and 'der Autor von *Waverly*' have different senses. And just as it's hard to see how someone competent with 'the author of *Waverly*' and 'der Autor von *Waverly*' could reject 'the author of *Waverly* is der Autor von *Waverly*', so it's hard to see how someone competent with both decimal and Roman systems of numerals could find '10=X' interesting or informative.

So, if '10' and 'X' have a sense rather than a number as their semantic value (of the relevant type — the type under which propositions fall), it is hard to see why that sense would have to be complex unless one thought that *all* senses are complex. Of course, if all senses are complex, and propositions are the senses of sentences, it follows that propositions are complex. But this would have nothing to do with sentences being C-Expressions: on this view, the senses of *non*-C-Expressions such as 'Izzy' will be just as complex as the senses of C-Expressions such as 'Izzy is incredible'.

We saw above that Building is widely presupposed by Structured Propositionalists.[21] If Building were true, that would explain why C-Expressions are productive and systematic and entail the Frege-Russell Thesis. But Building is false for both the compositionality of sense and reference: '60' and' 'LX' are both C-Expressions, but even if sixty (or the sense of '60' and 'LX') is complex, it cannot be built out of the

20. Numbers have set-theoretic "constituents" according to the standard set-theoretic reductions of numbers going back to Zermelo and von Neumann, but (a) this isn't the relevant kind of constituency (recall that the main *competitor* to structured proposition views holds that propositions are mereologically *simple* sets of possible worlds), and (b) Benacerraf's (1965) dilemma is widely taken to be fatal for such reductions.

21. Or at least by the things they say. A final example: Hanks writes, "The structured propositions framework identifies propositions with more finely grained structured entities, *built up compositionally* from the contents of subsentential expressions" (2011: 11–2).

semantic values of the meaningful parts of '60' *and* the semantic values of the meaningful parts of 'LX', since they are not the same.

Such examples show that Building is false. Given plausible auxiliary assumptions (e.g., that the semantic values of numerals are mereologically simple numbers), they show that the Frege-Russell Thesis is false as well. Other examples seem to show the same thing. Cartesian coordinates are C-Expressions: we can understand and produce an indefinite if not infinite number of Cartesian coordinates, and if you know what point (2, 6) denotes (in virtue of your competence with Cartesian coordinates), you know what point (6, 2) denotes. But it's plausible that the semantic values of Cartesian coordinates are points on the Cartesian plane — paradigms of non-complexity.

4. Is Compositionality Good Evidence for Complexity?

Compositionality does not, then, *entail* Complexity. But one might still think that Compositionality is *good evidence for* Complexity. This idea can be fleshed out in two ways:

4.1 Induction

First, consider:

> **Induction**: That something is a C-Expression is *strong inductive evidence for* the hypothesis that it has a complex semantic value.

Is Induction true? Are all or most of the *observed* semantic values of C-Expressions complex, where 'observed semantic value' means something like 'known semantic value'? Hardly! After all, *infinitely many* numerals and Cartesian Coordinates are C-Expressions, and they plausibly lack complex semantic values. Of course, there are also C-Expressions that plausibly have complex semantic values. But even infinitely many such C-Expressions would not be enough to make Induction true.

Induction could perhaps be defended if most *kinds* of C-Expression have complex semantic values, even if most *particular* C-Expressions don't.[22] But is there a principled way to delimit kinds of C-Expressions? We want to find out about the semantic values of *sentential* C-Expressions, and the distinction between sentential and non-sentential C-Expressions is a natural one. But if this distinction is important, it would *block* any inductive inference from the complexity of the semantic values of non-sentential C-Expressions to the complexity of propositions. (And, in any case, we saw above that the claim that non-sentential C-Expressions must have complex semantic values is false.) But the existence of such a difference in kind might be thought to undermine my argument above: numerals (and coordinates) are non-sentential C-Expressions, and perhaps there is something special about *sentential* C-Expressions that requires their semantic values to be complex. This idea is discussed in §5.

4.2 Abduction

Consider next the idea that Complexity *best explains* Compositionality. One might hold that numerals and coordinates are *atypical* C-Expressions and that *in general* the best way to make sense of (the properties of) C-Expressions involves their having complex semantic values. Call this:

> **Abduction**: The fact that something is a C-Expression is (usually) *best explained* by the hypothesis that it has a complex semantic value.

The notion of abduction — inference to the best explanation — is notoriously slippery, but our pre-theoretic grasp is sufficient to see that a straightforward reading of Abduction is implausible. The best explanation for the fact that something is a C-Expression has to do with *how* its semantic value is determined, not the nature of *what* is

22. Note, however, that there may be other "kinds" of counterexamples to the Frege-Russell Thesis: e.g., Braun (2008) argues that complex demonstratives such as 'that electron' are singular terms (their semantic values are their denotations). If we (somewhat controversially) allow that the meaning of 'that electron' on such views is compositionally determined, it will be a C-Expression with a non-complex semantic value.

determined: 'Mathematics is reducible to logic' is a C-Expression because its semantic value is determined by the meanings of its parts and how they are arranged, *not* because it has a *complex* semantic value. After all, it (plausibly) has the same semantic value as 'Logicism', which isn't a C-Expression at all.

Does Complexity explain *why languages contain C-Expressions*? Well, if it's contingent that languages contain C-Expressions, then the reason that languages contain C-Expressions is that languages without them would be significantly less useful and harder to learn. That is, languages are human constructs, and languages have C-Expressions because that's how they're constructed — to satisfy specific human needs — not because of the nature of propositions.

However, perhaps it's analytic (and so necessary) that anything that's truly a *language* is compositional. But obviously Complexity isn't needed to explain the truth of anything analytic. Could Compositionality be a *synthetic* necessary truth? Some synthetic necessary truths can plausibly be explained: e.g., the Peano axioms plausibly explain certain (necessary) arithmetical theorems. But in such cases, the *explanantia* logically *entail* the *explandanda*. We've seen that Compositionality does not entail Complexity, but does Complexity entail Compositionality? Obviously not — or at least, if it did, we would have a powerful argument against Complexity. For it's possible for the sentential semantic values of English sentences to be expressed non-compositionally (by non-C-Expressions): e.g., propositions can be named ('Logicism') or expressed idiomatically. So if Compositionality is necessary, synthetic, and explained in the way that synthetic necessary truths are typically explained, it is explained by something that entails it. Complexity doesn't explain Compositionality in this way. That leaves open the possibility that Compositionality is necessary, synthetic, and explained by Complexity in some *sui generis* way. But the burden would be on anyone who held that view to elucidate this *sui generis* type of explanation.

Is there some other abductive route from Compositionality to Complexity? Wang argues that her (structured) view "provides part of an explanation for why language is compositional, whereas…primitivism cannot" (2016: 468). But what is this explanation? She says only that on her view, "the logical form of sentences more or less mirrors the structure of propositions…In contrast, on…primitivism, there is no such story." The reasoning here is highly compressed, but one plausible interpretation is that Wang is arguing that Structured Propositionalism (but not Primitivism) is able to explain *why sentences express the propositions they do*. Let's turn now to a couple of arguments along similar lines.

4.2.1 Building Again

Richard Heck and Robert May (2011) argue that Frege accepts

> **Sense Building**: The *senses* of C-Expressions are built from the *senses* of their meaningful constituents.

since it is the best explanation of

> **Sense Difference**: If *a* and *b* are expressions with different senses, then substituting *b* for *a* in any C-Expression in which *a* occurs will result in a C-Expression with a different sense.[23]

But since only Fregeans could feel any need to explain Sense Difference, we may be able to generate a stronger argument — an argument for *Building* rather than Sense Building — by abandoning explicit mention of senses:

> **Difference**: If *a* and *b* are expressions with different semantic values, then substituting *b* for *a* in any C-Expression in which *a* occurs will result in a C-Expression with a different semantic value.

23. Heck and May say, "we can earn a right to [Sense Difference] if we regard compositions of senses in a more structural light. So suppose that, rather than merely helping to determine the sense of the whole, the senses of the parts were themselves *parts* of the sense of the whole" (2012: 144–5).

It might seem inappropriate to use Difference in an argument for Structured Propositionalism, given that Difference is so clearly incompatible with the most popular form of *un*structured propositionalism, Intensionalism. But most Structured Propositionalists accept Difference, and it would certainly be explained by Building, since Building entails it. *Why* do many Structured Propositionalists accept Difference? Heck and May appear to accept Difference on the basis of generalization: typically, if *a* and *b* are expressions with different semantic values, then substituting *b* for *a* in any C-Expression in which *a* occurs will result in a C-Expression with a different semantic value. But why think this is more than just typically true? (Even Intensionalists admit that!) It's tempting to think that antecedent (perhaps implicit) acceptance of Building is part of Difference's appeal. If so, the above arguments against Building should undermine our confidence in Difference. Likewise, one might worry that implicit acceptance of Standard Structured Propositionalism is (perhaps unconsciously) playing a role in motivating Difference. But if Structured Propositionalism is motivating Difference, Difference can hardly be used to motivate Structured Propositionalism. To assess Heck and May's Argument, then, we need to ask two questions:

(Q1) Does Difference need to be explained?

(Q2) If Difference needs to be explained, is Building the best explanation of it?

The answers to these questions are both plausibly 'no'.

First, it is unclear that Difference needs to be explained, since it's unclear that Difference is even true to begin with. After all, it's hardly a pre-theoretic datum: as noted above, Difference is incompatible with Intensionalism, the main rival to Structured Propositionalism.[24] Indeed, the contradiction between Difference and Intensionalism is so manifest that any argument for Structured Propositionalism on the basis of Difference would be on delicate dialectical ground. But it isn't just Intensionalism: Russellian theories violate Difference as well. According to David Kaplan (1978), '*dthat* butcher is a bartender' and '*dthat* builder is a bartender' express the same proposition whenever '*dthat* butcher' and '*dthat* builder' co-refer, even though 'butcher' and 'builder' have different semantic values. Along similar lines, David Braun (2008) argues that ordinary complex demonstratives are directly referential, and so complex demonstratives such as 'that butcher' and 'that builder' have the same semantic value whenever they co-refer. Since Kaplan's *dthat* operator and Braun's theory of complex demonstratives are live Russellian positions, Difference can't be a constraint on semantic theorizing in the Russellian tradition.[25] Hence, moving from Sense Difference to Difference doesn't actually give rise to a more inclusive argument: as a general rule, only Fregean theories satisfy Difference. *Why* do Fregean theories satisfy Difference? Plausibly, just because they were designed to: as Heck and May note, the fact that Frege's original *Begriffsschrift* theory didn't was one of the reasons he abandoned it. So we have good reason to think that the answer to (Q1) is 'no': Difference isn't a pre-theoretic datum but rather a principle that Frege's mature theory was carefully constructed to satisfy, presumably because of Frege's views about the connection between meaning and cognitive significance.[26]

24. Ironically, it's not even clear that Difference is true according to Fregeanism: Hodes (1982) argues that Frege rejects Difference; Pickel (2021) argues that Frege vacillates about Difference; and (Sense) Building itself is notoriously *prima facie* inconsistent with core aspects of Frege's logicism, such as that 'the *F*s and *G*s are equinumerous' and 'the number of *F*s = the number of *G*s' express the same proposition. Further concerns about Difference are raised explicitly in Pickel (2020) and are suggested by the concerns about individuating sense found in Speaks (2013).

25. Co-referring angle measurements such as '3π rad', '5π rad', '180°', '540°', etc. will be straightforward counterexamples to Difference for Russellians who hold that their semantic values are the quantities to which they refer.

26. It's plausible that cognitive significance must satisfy Difference: if *a* and *b* are expressions with different cognitive significance, then substituting *b* for *a* in any C-Expression in which *a* occurs will result in a C-Expression with a different cognitive significance.

But even if, contrary to fact, the answer to (Q1) turned out to be 'yes', there is good reason to think that the answer to (Q2) is 'no'. As we've seen, there is good reason to think that Building is false: numerals and coordinates are counterexamples to it.[27] And if Building is false, it can't be the best explanation of anything. Those cases also suggest an alternative explanation of Difference, since Difference is *true* of numerals and coordinates.[28] What explains Difference in those cases are the semantic *rules* governing numerals and coordinates, rather than anything about their semantic *values*. Thus, *pace* Heck and May, Difference can be explained semantically, without metaphysical assumptions about the nature of propositions.

Of course, not every semantic approach will entail or explain Difference: there's nothing about semantic theorizing that *requires* Difference to be true. That's because Difference *isn't* required to be true: as we've seen, Intensionalism, the *Begriffsschrift* semantics, and the above-mentioned Russellian theories are counterexamples to it! What I've argued is just that *if* some restricted or revised Difference principle were true, and so needed explaining, it *could* be semantically explained, without Building. And so, given the problems with Building, it should.

4.2.2 Reverse Compositionality

One might, however, argue that Building is needed to explain

> **Metaphysical Reverse Compositionality (MRC)**: The semantic values of the meaningful parts of C-Expressions are determined by the semantic values of the C-Expressions themselves.

which is needed to explain

> **Epistemological Reverse Compositionality (ERC)**: Anyone who knows the meaning of a C-Expression will know the meanings of its meaningful parts.

If Building is the best explanation of MRC, and MRC is the best explanation of ERC, and ERC is *true*, we have an argument from reverse compositionality to Complexity. Jerry Fodor and Ernest Lepore seem to give a version of this argument, contending that "the meanings of 'dogs' and 'bark' must be contained in the meaning of 'dogs bark' because people who understand the sentence likewise understand the words" (2001: 366).

Note, however, that ERC is only true of phrases that we understand *compositionally* (in virtue of the meaning and arrangement of their parts). It's clearly possible to understand (know the meaning of) C-Expressions without understanding the words out of which they are built. After all, C-Expressions can be learned as idioms. An American tourist might learn the C-Expression 'Je ne parle pas français' from a phrasebook (effectively as an idiom) and know that it means 'I don't speak French' without knowing what 'Je' or 'ne' or 'parle' means. Likewise, she might learn the meaning of 'Je ne parle pas français' and 'Parlez anglais s'il vous plaît' from her phrasebook without knowing the meaning of 'Je ne parle pas anglais'. So the only people who are guaranteed to know the meanings of 'dogs' and 'bark' given that they know the meaning of 'dogs bark' are people who have a *compositional* understanding of 'dogs bark': those who derive the meaning of 'dogs bark' from the meanings of 'dogs' and 'bark' and the syntax of English. But the claim that people who derive the meaning of 'dogs bark' from the meanings of 'dogs' and 'bark' (and the syntax of English) must know the meanings of 'dogs' and 'bark' is trivial: MRC isn't required to explain it, and Building isn't either.

One might object that the American tourist isn't *really* competent with (doesn't *really* know the meaning of) 'Je ne parle pas français' or 'Parlez anglais s'il vous plaît', precisely because she only knows them

27. And Building has further problems: e.g., it's incompatible with the plausible thought that 'It's raining' expresses the same proposition as 'It's raining now' and 'It's not the case that it's not raining', and with the phenomenon of unarticulated constituents more generally (see Hodgson 2013).

28. Difference is also true, and Building is also false, of Bealer (1998)'s "algebraic" theory of propositions, a form of Primitivism, as well as at least some "Hyperintensionalist" theories along the lines of Ripley (2012).

as idioms without grasping the meanings of their parts. As Zoltán Gendler Szabó says, "Linguistic competence with a sentence requires competence with its constituent words and with the way those words are combined" (2012a: 119). We can define 'know the meaning of' this way, but this is just to make ERC analytic. That's something we might want to do for certain purposes, but we obviously don't need MRC (or Building) to explain the truth of something that's true by definition.[29]

4.2.3 The Communication Problem

Pagin and Westerståhl (2010) argue that structured propositions may be needed to solve what Pagin (2003) calls the **Communication Problem**: explaining how communication is possible. As Pagin puts it, for *A* to communicate a thought to *B*, we need to explain "both how *B* finds the right interpretation [of what *A* says], and how *A* finds an appropriate linguistic item, i.e., an expression that enables *B* to find the right interpretation" (2003: 292). Pagin argues that while compositionality may explain how *B* is able to complete her task, for *A* to *effectively* complete hers — i.e., without simply searching through and interpreting a vast stock of candidate sentences — a principle like the following must be true:

> **Functional Expression**: A sentence *s* that expresses a proposition *p* is a function of the phrases that express *p*'s parts and of *p*'s mode of composition.[30]

Functional Expression supports

> **Inverse Compositionality**: If *p* is a proposition such that we are able to effectively find a C-Expression that has *p* as its semantic value, then *p* must be complex.

To see the appeal of Functional Expression, consider the proposition *that Maggie loves Izzy*. I believe that proposition, but it is implausible

29. See Johnson (2006) and Robbins (2005) for more extended critiques of ERC and MRC.

30. Compare the IPCF principle in Pagin (2003: 292).

that I find an appropriate English sentence to communicate it — e.g., 'Maggie loves Izzy' — by searching through English sentences one by one and interpreting them to see if they mean *that Maggie loves Izzy*. Pagin suggests that the only plausible alternative is for *that Maggie loves Izzy* to have parts that I can look up in a kind of mental "reverse dictionary" in order to find English words or phrases that express them. Let's assume that the parts of propositions are objects, properties, and relations — here, presumably, Maggie, Izzy, and *loving*. Such a reverse dictionary would then be a function, essentially, from (among other things) Maggie, Izzy, and *loving* to 'Maggie', 'Izzy', and 'loving' — and from the structure of *that Maggie loves Izzy* to the structure of 'Maggie loves Izzy'.

Functional Expression supports Inverse Compositionality, and Inverse Compositionality supports Structured Propositionalism. But is Functional Expression true? Pagin's argument is ingenious and interesting, but there are reasons for skepticism.

First, note that the Communication Problem only arises if thought is prior to language: if there is some proposition *p* that we *first* grasp and then need to find some linguistic vehicle to express. But if the Language of Thought Hypothesis (LOT) is true, propositional thought occurs in a mental language: "Mentalese". And if thinking a proposition *p* involves the use of a Mentalese sentence *m* that expresses *p*, then we can find (say) an English sentence that expresses *p* simply by translating *m* into English. That might require *m* to be complex, but it's hard to see how it could require *p* to be. So the Communication Problem only gets off the ground if LOT is false.

Second, the process of finding sentences to express one's thoughts doesn't work as smoothly or algorithmically as Functional Expression suggests. For example, it's often difficult for us to put our thoughts into words: we often produce sentences that don't express what we are actually thinking. (If you yourself speak with the tongues of angels, consider your students' writing.) And, in general, we are much better at reading than writing — much better at deriving the content of a given sentence than finding a sentence that expresses a given

content. But if Functional Expression were true, these two processes would be parallel: reading would be a matter of translating sentences into propositions and writing a matter of translating propositions into sentences. The fact that reading is much easier than writing suggests that these processes are not so similar. Pagin's story, then, explains our ability to "find the right sentence" *too* well: it would make that process easier than it in fact is.[31] Conversely, it makes various common grammatical mistakes inexplicable. I just picked a random paper submitted by one of my students, and the first paragraph contains the sentence "The product of this paper will argue this view through the use of Leibniz's argument for dualism." The proposition that sentence is supposed to express is, I think, *that the purpose of this paper is to defend dualism using Leibniz's argument*. It's hard to see how that proposition could be "translated" into that sentence if Pagin's solution to the Communication Problem were correct: 'product' and 'purpose' have completely different meanings, which would have widely separated entries in Pagin's "reverse dictionary". And such grammatical mistakes are completely ubiquitous: think about 'to' *vs* 'too', 'their' *vs* 'they're' *vs* 'there', 'affect' *vs* 'effect', etc. Such common mistakes seem inexplicable on the "reverse dictionary" picture of how we find sentences to utter.

A third reason to be skeptical about Pagin's account is that it seems incompatible with "illusions of thought": cases where we (falsely) take ourselves to be having a thought with propositional content.[32] Illusions of thought are widely (although not universally) thought to exist and to be difficult to detect by those suffering from them. If Pagin's were the correct story of how we find words to express our thoughts, however, a telltale sign of illusions of thought would be that we find it unusually difficult to find words with which to express ourselves, since there would be nothing there (no proposition) we were trying to express. Sadly, this is not the case: we can't detect illusions of thought just by trying to speak what we (think we are) thinking.

A final reason for skepticism about Pagin's account is that there are alternative explanations for how we "find the right sentence" that don't require propositions to be complex. Note that in order to *grasp* propositions in the first place, we have to know something about them. If I grasp the proposition *that Maggie is strong*, I know that it represents Maggie as being strong (and has as its truth condition Maggie's being strong). Given that knowledge, I can then use something like Pagin's "reverse dictionary" to determine that 'Maggie' refers to Maggie and 'is strong' expresses *being strong*, and I can use my knowledge of English grammar to determine that the subject comes before the predicate, yielding 'Maggie is strong'. Likewise, if I grasp the proposition *that Maggie loves Izzy*, I know that it represents Maggie as standing in the relation of *loving* to Izzy. I can then use my "reverse dictionary" to determine that 'Maggie' refers to Maggie and 'Izzy' refers to Izzy and 'loves' expresses *loving*, and I can use my knowledge of English grammar to determine that the agent comes before the patient, yielding 'Maggie loves Izzy'. And so on. This process isn't quite as simple as Pagin's, but that's a *good* thing. As stressed above, we more or less *constantly* speak and write ungrammatically, but there aren't "ungrammatical propositions" of which our ungrammatical speech and writing could be translations. If writing was the converse of reading, it would be unclear why the former process is so much less reliable than

31. It's as if we explained our ability to do arithmetic by postulating that our brains contain modules that are functionally equivalent to calculators. That would explain our ability to do arithmetic, but *too* well, since calculators are much better at arithmetic than we are. An anonymous referee suggested that processes are often much more difficult in one direction than another: building a mosaic is much more difficult than destroying one, saying the ABCs forward is much easier than saying them backward, etc. This may be true in general, but not for translation: it might be *somewhat* easier to translate, say, English into German than to translate German into English, but that difference in difficulty pales in comparison to the difference in difficulty between identifying the exact proposition expressed by a given sentence and identifying a sentence that exactly expresses a given thought. We are *much* better at the former than at the latter. We almost always interpret grammatical speech and writing correctly, but we speak and write ungrammatically *all the time*.

32. See Cappelen (2013) and Keller and Keller (2021) for discussion.

the latter: why we often struggle to find sentences that express our thoughts but rarely struggle to understand sentences we read.

5. Composite Explanations

Compositionality, then, does not provide good evidence for, much less entail, Complexity. Still, perhaps Compositionality *in conjunction with some other fact* yields a persuasive Compositionality Argument. But what might this "other fact" be? In §4.2 we considered Difference, Reverse Compositionality, and Functional Expression and found the resulting arguments wanting. But there are other possibilities.

5.1 Sentences and Truth

A natural suggestion would be that there is something special about *sentential* C-Expressions such that:

> **Sentential**: The semantic values of C-Expressions *that are sentences* must be complex.

But Sentential, even if true, is an implausible candidate for a *brute* truth. What is special about sentences? What is the relevant difference between sentences and numerals or coordinates? An obvious answer is that sentences, but not numerals or coordinates, are *capable of being true or false*. If that is the difference that matters, the (purported) truth of Sentential derives from a more fundamental connection between *truth* and Complexity:

> **Alethic**: The semantic values of C-Expressions *that are true or false* must be complex.

Of course, not all sentences are true or false. But some are, and we are assuming that they (at least sometimes) have propositions as their semantic values. So Alethic would explain the truth of Sentential without entailing that numbers or points are complex.

So far, so good. But why think that Alethic is true? A natural line of thought is encapsulated by the **Correspondence Argument**:

> 1. Truth is correspondence.
>
> 2. Correspondence is (a form of) isomorphism.
>
> 3. The things (facts) that truths correspond to are mereologically complex.
>
> *so*, 4. Truth-bearers must be mereologically complex.

As natural as this line of reasoning is, the Correspondence Argument is more controversial than it appears. Many philosophers reject (1) and accept coherentism, pragmatism, the verifiability theory, certain forms of the identity theory,[33] deflationism, or truthmaker theory. Others accept (1) but reject (2). While some correspondence theories aren't compatible with Primitivism, the fundamental idea that truth is correspondence clearly is. It is common to attribute the correspondence theory to Aristotle, citing Metaphysics Γ 7.25: "To say of what is that it is not, or of what is not that it is, is false, while to say of what is that it is, or of what is not that it is not, is true." But this claim requires only that truths *represent* the world as it is and so does not even suggest that truths are complex — at least unless complexity is required for representation (on this, see §5.2). And in any case, there are conceptions of correspondence that reject (2): Austin's *referential* theory of correspondence, as well as most other correlational or otherwise non-isomorphic theories.[34]

Finally, some philosophers reject (3) and deny that facts are mereologically complex. For example, E. J. Lowe (1998), William F. Vallicella (2000), and Wolfgang Künne (2003) argue that facts do not have objects, properties, and relations as proper parts.[35] Others think facts

33. Some identity theorists hold that truth is correspondence is identity and thus accept (1).

34. See, e.g., Austin (1950) and Vision (2004). Even Russell's Congruence Theory seems compatible with Primitivism. Tweaking the proposal so that it applies to propositions rather than beliefs, Russell's theory is that p is true if and only if there is an x, y, and R such that p is the proposition that x stands in R to y, and x stands in R to y. See Kirkham (1992: 124) and Rasmussen (2014a: 121).

35. Indeed, Armstrong himself thinks facts have a "*nonmereological* mode of

are (property and relation) exemplifications, but it's unclear that such exemplifications are mereologically complex. Finally, some think that facts are obtaining states of affairs, and it is likewise unclear whether we should think that states of affairs are complex or whether states of affairs can be reduced to propositions, properties, or events.

Soames (1989) contains a second argument for Alethic:

> 1. A proper semantics compositionally assigns both propositions to sentences (in context) *and* truth-conditions to propositions and then "derive[s] the truth conditions of sentences from those propositions" (591).
>
> 2. The only way to compositionally assign truth-conditions to propositions is if propositions are structured entities with constituents.
>
> *so*, 3. A compositional semantics requires propositions to be structured entities with constituents.

One obvious concern about **Soames's Argument** is that its first premise is highly controversial: it's accepted by Structured Propositionalists but (almost?) nobody else — it's straightforwardly incompatible with Intensionalism — making it less than an ideal premise in an argument *for* Structured Propositionalism.[36] Less obviously, there are reasons to doubt (2) even if (1) is granted. We saw in §4.2.3 that propositions can be systematically "translated" into English on the basis of their representational properties — what they are *about* — as opposed to their constituents. Similarly, truth-conditions can be systematically assigned to propositions on the basis of their representational properties. Braun says that "an atomic proposition is true…iff its constituent objects exemplify the proposition's constituent attribute" (2015: 74). But we might equally well say that an atomic proposition is true iff the objects it is about exemplify the attribute it is about. Both principles face problems, of course, but they face similar ones. It remains an open question whether the problems facing one principle will be more tractable than the problems facing the other. So Soames's Argument doesn't seem to offer much support for Alethic.

Is there yet some other reason to accept Alethic? A final thought ties the truth of Alethic to the nature of representation.[37] After all, if it's possible for there to be *non-derivative (truth-apt) representation* by a non-complex entity, it's difficult to see how such non-complex entities could fail to be true or false, according to whether they represent things correctly or incorrectly. As Soames says, "the proposition that snow is white…is true because (a) it represents snow as white, and (b) snow is white" (King, Soames, and Speaks 2014: 104). It seems, then, that the idea that (non-derivative) *truth* requires complex truth-bearers depends on the idea that (non-derivative) *representation* requires complex representational entities. It is to this idea that we now turn.

5.2 Representation

Consider, then:

> **Representational**: The semantic values of C-Expressions *that non-derivatively and truth-aptly represent complex states of affairs* must be complex.

According to Representational, complexity is required to non-derivatively represent complex states of affairs in a truth-apt way. It is commonly assumed that propositions represent in this way; if so, it follows that propositions are complex. As Michael Jubien says,

composition" (1997: 122), as does Hudson (2006) with respect to exemplification facts at least. See Mulligan and Correia (2013) for discussion.

36. I should note that Soames does give an argument for (1). It's too complicated to adequately address here, but it relies on the assumption that truth-conditions are sets of possible worlds (or their characteristic functions). That's a fair assumption when arguing against Intensionalism, but just as advocates of Primitivism (generally) individuate propositions finely, so they (can) individuate truth conditions finely (perhaps along the lines of Ripley 2012). See Wiggins (1992) for a similar criticism of Soames's argument and Pickel (2020) for an important independent critique.

37. Indeed, this is plausibly what's ultimately motivating the thought that correspondence requires Complexity.

> Any real evidence for the existence of … propositions — indirect though it must surely be — is evidence for entities that, by their intrinsic natures, represent. Because it is implausible to think that such representing could be achieved *via* the intrinsic features of metaphysical simples, evidence for…propositions is therefore evidence for certain complex entities. (1991: 266–7)[38]

Of course, this argument doesn't have much to do with compositionality — it assumes only that propositions are non-derivatively true or false and would work even if propositions were not the compositional semantic values of sentences. Still, it is worth pointing out some of Representational's weaknesses as a premise in an argument for Structured Propositionalism.

First, "new propositionalists" such as Hanks, King, Soames, and Speaks deny that propositions non-derivatively represent. So this argument can't be used to support those important forms of Structured Propositionalism.[39] But second, and more important, it isn't clear that Representational is true. What reason is there to think that non-derivative truth-apt representation requires complex representational vehicles? *Why* does Jubien think the idea of simples representing is "implausible"? He says,

> Now, if we agree that propositions *are* simples, then it certainly does seem far-fetched to think that their intrinsic properties could be such as to represent ways the world might be. Perhaps there could be enough [simples] … but it does not seem that the nature of their intrinsic features would make any one of them flat-out *be*, say, the proposition that a donkey talks. (1991: 266)

Jubien is arguing that while there may be enough abstract metaphysical simples for us to "code them up" to play the role of propositions, they still wouldn't *be* propositions, since a metaphysical simple couldn't non-derivatively, in and of itself, represent. We can formulate this idea a little more precisely and generally as:

> **Jubien's Principle**: Mereological simples cannot non-derivatively and truth-aptly represent complex states of affairs.

Jubien's Principle entails Representational, but is Jubien's Principle true? While there's no *general* correlation between the complexity of what's represented and the complexity of what represents it — e.g., the universe is vastly more complex than 'the universe' — Jubien's Principle is restricted to *non-derived* representation, so examples such as 'the universe' are not to the point. Given our weak understanding of non-derived truth-apt representation, however, it's hard to identify uncontroversial cases and thus hard to identify examples that either clearly support or cast doubt upon Jubien's Principle. This lack of uncontroversial cases means that an argument for Structured Propositionalism that took Jubien's Principle as a premise would be relatively weak and unconvincing — at least unless Jubien's Principle was obvious or analytic. But the principle has no such status. Consider two views with impressive pedigrees: Cartesian Dualism and Classical Theism. Many intelligent people have accepted these views, and both entail the falsity of Jubien's Principle. This strongly suggests that Jubien's Principle is neither obvious nor analytic.

According to Cartesian Dualism, human persons are simple, immaterial substances.[40] According to Classical Theism, God is a simple, immaterial substance. On both views, simple immaterial substances

38. Merricks (2015: Ch.6 §V) contains a nice discussion of this argument, which is endorsed by King (2007: 6, 2011), Salmon (1989: 332–3), Buchanan (2012: 3), and Braun (1993: 461). See also the discussion of "magical ersatzism" in Lewis (1986: §3.4).

39. Indeed, some Propositionalists deny that propositions represent at all — see, e.g., Speaks's contribution to King et al. (2014), as well as Richard (2013) and Stalnaker (2012).

40. Descartes was hardly unique in thinking that human persons are simple: in addition to Plato (at least in the *Phaedo*), recall Leibniz's monads and Chisholm's "simple substances".

represent states of affairs correctly or incorrectly, truly or falsely.[41] Perhaps these views are false — they're currently widely rejected. But if Jubien's Principle were analytically or obviously true, they would be non-starters: these views would be decisively refuted by the following arguments.

Anti-Theism

1. If Classical Theism is true, mereological simples can non-derivatively and truth-aptly represent complex states of affairs.

2. Mereological simples cannot non-derivatively and truth-aptly represent complex states of affairs.

so, 3. Classical Theism is false.

Anti-Dualism

1. If there are Cartesian souls, mereological simples can non-derivatively and truth-aptly represent complex states of affairs.

2. Mereological simples cannot non-derivatively and truth-aptly represent complex states of affairs.

so, 3. There are no Cartesian Souls.

The fact that such arguments didn't dissuade people from Classical Theism or Cartesian Dualism — intelligent and philosophically sophisticated people — is evidence that Jubien's Principle is neither analytic nor obvious. This verdict is further supported by the fact that these are *bad* arguments: if you're an atheist because of Anti-Theism, you're an atheist for bad reasons. Likewise with anti-Cartesians and Anti-Dualism. But the arguments' first premises are clearly true, and the

41. Some classical theists hold that divine knowledge is non-representational. However, it is unclear that they would deny that God represents things in the watered-down sense at play here: "truth-apt representation" is basically whatever makes something capable of being true or false, and divine knowledge must be *true*.

arguments are clearly valid. So Jubien's Principle must be the problem. I conclude, then, that Jubien's Principle is neither analytic nor obvious: there is nothing incoherent about mereological simples non-derivatively representing complex states of affairs in a truth-apt way. As Juhani Yli-Vakkuri and John Hawthorne state, "While it may seem difficult to imagine a rich mental life occurring entirely in a point-sized location, in fact, such a mental life is no more difficult to describe than a rich mental life that occurs in a human-sized location" (2018: 78).

Perhaps the attractiveness of Jubien's Principle flows from the thought that (non-derived) representation must be a form of (structural) isomorphism. But this natural thought is difficult to sustain — isomorphism is everywhere, and representation isn't. Nonetheless, it *is* hard to understand how mereological simples could non-derivatively represent. But that doesn't mean that only mereologically *complex* things can non-derivatively represent, since it's *also* hard to understand *that*. Whether *we* non-derivatively represent and if so how are major open questions in the philosophy of mind.[42]

5.2.1 Explaining Aboutness

Joshua Rasmussen argues that while Complexity isn't required for representation, it does enable us to *explain aboutness*: "by thinking of propositions as ordered unities of properties, we can analyze aboutness" (2014b: 173). Rasmussen goes on to say, "a proposition p is about a thing x if and only if p contains a property that is necessarily unique to x" (179). If containment is the inverse of parthood, Complexity might seem to allow us to reduce aboutness to the antecedently necessary and well-understood ideology of mereology.[43]

42. Some readers might think I am missing a rather obvious point: that Jubien is invoking David Lewis's famous argument against "magical ersatzism"(see Lewis 1986). But that's not right: Jubien's paper is a critique of that argument! See also van Inwagen (1986).

43. This line of argument is widely endorsed. Braun, for example, writes that
> Our intuitions concerning aboutness and what is said are among the strongest motivations for the structured proposition theory. The proposition I express by uttering 'Bush is taller than Reagan' is

Various problems with reductions along these lines are outlined in Lorraine Juliano Keller (2013) and Merricks (2015: Ch.4). But even setting those aside, Complexity will allow for no such parsimonious reduction of aboutness, since maps and pictures are about what they represent but do not contain (properties unique to) what they represent. Of course, Rasmussen's (2014b) analysis of aboutness applies only to propositions, but if a more general account of aboutness is required to account for maps and pictures, we haven't really analyzed aboutness. Rasmussen suggests that his account can apply to thoughts, since thoughts have properties as parts.[44] That seems rather unclear (see §5.5), but even if they do, that won't help with maps or pictures. And whatever the correct *general* analysis of aboutness may be — the one that applies to maps and pictures — we can plausibly account for propositional aboutness as an instance of this more general kind, thus nullifying the purported explanatory benefit of explaining propositional aboutness *via* Complexity.

5.3 Propositional Attitudes

According to King, "Structured proposition theorists…think precisely that the semantics of verbs of propositional attitude require structured propositions. Their arguments in favor of structured propositions have to my knowledge always invoked this claim" (2007: 119). King seems to be suggesting that while Compositionality doesn't *generally* require Complexity, a compositional semantics for propositional attitudes does. Call this:

> **Attitudinal**: The semantic values of C-Expressions *that can be embedded in propositional attitude contexts* must be complex.

about Bush, and Reagan, and the relation of being-taller-than. The structured proposition view recognizes this in a straightforward way, for on this view, Bush, Reagan, and the relation of being-taller-than are constituents of the proposition I express. (1993: 461)

44. On p.184, where he makes a similar claim about concepts.

Why accept Attitudinal? Belief reports, such as 'Maggie believes that 1+1=2', contain embedded sentences. If the semantic value of '1+1=2' was just the set of worlds where 1+1=2, and the semantic value of 'Maggie believes that *p*' was a function of the semantic value of *p*, then 'Maggie believes that 1+1=2' would have the same semantic value as 'Maggie believes that arithmetic is incomplete', since '1+1=2' and 'arithmetic is incomplete' are true at exactly the same worlds: all of them. This is clearly unacceptable, since Maggie might believe that 1+1=2 without believing that arithmetic is incomplete.

Thus, the semantics of verbs of propositional attitude seems to require that sentences have *fine-grained* semantic values, such that the semantic values of '1+1=2' and 'arithmetic is incomplete' are distinct. But that doesn't support Attitudinal! Primitivist theories are almost always fine-grained — see, e.g., Bealer (1998), Merricks (2015), Plantinga (1974), and van Inwagen (1986). Does an adequate semantics for languages with propositional attitude verbs require propositions to actually be *structured*, as opposed to fine-grained? The only argument for this conclusion of which I am aware is based upon the semantic processing of embedded sentences more generally.

5.4 Strong Compositionality

Verbs of propositional attitude embed sentences, but so do various other locutions. Call such locutions 'sentence operators'. If the semantic output of sentence operators sometimes depends on the *subsentential* semantic values of the sentences they embed, this would give us reason to think that the semantic values of those embedded sentences must *contain* those subsentential semantic values, at least if the following principle is true:

> **Strong Compositionality**: Semantic composition is *immediate*: the meaning of a complex expression is determined by its *immediate* structure and the meanings of its *immediate* constituents.[45]

45. Some authors *define* 'compositionality' in a way that requires it to be strong:

Strong Compositionality requires semantic composition to be immediate, or local. This idea can be visualized using tree diagrams: Strong Compositionality entails that the semantic value of a node is a function of, and *only* of, the semantic values of its daughters. As Szabó puts it,

> [Naïve Compositionality] says that the meaning of a complex expression is determined by its entire structure and the meanings of all its constituents. In assigning meaning to a complex expression [Naïve Compositionality] allows us to look at the meanings of constituents deep down the tree representing its syntactic structure, while [Strong Compositionality] permits looking down only one level. (2012b: 79)

If Strong Compositionality is true, and if the semantic output of sentence operators sometimes depends on the subsentential semantic values of the sentences that are their inputs, it might appear that the semantic values of those inputs must be structured propositions (i.e., *contain* those subsentential semantic values). As Szabó says, "If we are not allowed to look deep inside complex expressions to determine what they mean we better make sure that whatever semantic information is carried by an expression is projected to larger expressions in which they occur as constituents" (79).

Whether Strong Compositionality yields a successful argument for structured propositions depends on the answers to four questions:

> (Q1) Are there sentence operators whose outputs depend on the subsentential semantic values of their inputs?
>
> (Q2) Is all semantic composition immediate — is Strong Compositionality true?
>
> (Q3) Can the semantic values of expressions be "projected onto" the semantic values of expressions that embed them *without being contained by them*?
>
> (Q4) If the answers to (Q1) and (Q2) are both 'yes', are *propositions* the semantic values of sentences embedded by sentence operators?

The answer to (Q1) depends on what sentential semantic values are. If they're sets of possible worlds, the answer is clearly 'yes', since '1+1=2' and 'arithmetic is incomplete' are true in the same worlds, but 'Maggie believes that 1+1=2' and 'Maggie believes that arithmetic is incomplete' are not. Conversely, if sentential semantic values are very fine-grained, such that no two sentences have the same semantic value, the answer to (Q1) is clearly 'no', since every sentential semantic value would be associated with exactly one set of subsentential semantic values — the subsentential semantic values of the unique sentence that expresses it. What we really want to know is whether (Q1) is true given the *correct* theory of sentential semantic values. Since that's what's at issue in the debate about Structured Propositionalism, "operator arguments" for Structured Propositionalism are on delicate dialectical ground.

Properly answering (Q2) is beyond the scope of this paper, but it's noteworthy that Strong Compositionality is *much* stronger than Naïve Compositionality. As Szabó remarks, "There is nothing in the traditional arguments in favor of compositionality that yields support to [Strong Compositionality]" (2012b: 79).[46] Of course, this doesn't entail that there are no reasons to accept Strong Compositionality. But it seems clear that the truth of Strong Compositionality will depend on a variety of factors about our overall linguistic framework (e.g., whether we insist that all branching is binary) and hence that, at best, Strong

e.g., Lewis (1980) says, "the semantic value of any expression is to be determined by the semantic values of the *immediate* constituents from which it is built, together with the way it is built from them" (25).

46. Structured Propositionalists *themselves* often deny the closely related principle of **Functional Compositionality**, according to which the semantic value of a whole sentence is obtained by functional application of the semantic values of parts of that sentence to the semantic values of other parts (Cresswell 2002: 645). See King (2007: 111–20) and Pickel (2019) for discussion.

Compositionality would yield an argument for Structured Propositionalism with controversial premises.

Even that best-case scenario wouldn't yield a *straightforward* argument for Structured Propositionalism, however, since the answer to (Q3) is 'yes': the semantic values of subsentential expressions can be *projected onto* the semantic values of sentences without being *contained by* them. Bealer's (1998) "algebraic" conception of propositions, for example, holds that every proposition is mereologically simple but associated with a "decomposition tree" that specifies the subsentential semantic values of the meaningful parts of the sentence(s) that express it, thus making those subsentential semantic values recoverable from the proposition itself. More generally, if every sentence that expresses a proposition *p* has the *same* subsentential semantic values, information about those semantic values will be associated with and thus recoverable from *p* itself.[47] Soames says that "[i]n order for…propositions to serve as fine-grained objects of the attitudes they should encode both the structure of the sentences that express them and the semantic contents of subsentential constituents" (1989: 581). Even if this is true, what Bealer's view demonstrates is that propositions can *encode* the structure of the sentences that express them and the semantic contents of their subsentential constituents without themselves *having* structure or constituents.

Finally, it is worth pointing out that the answer to (Q4) is plausibly 'no', thus cutting the legs out from operator arguments for Structured Propositionalism. Yli-Vakkuri (2013), following David Lewis (1980), argues that if Strong Compositionality is true and there are sentence operators whose outputs depend on (or change) the subsentential semantic values of their inputs, propositions will not be the (compositionally determined) semantic values of sentences.[48] This wouldn't entail that there was no connection between Compositionality and Complexity, but it would contradict Premise 4 of the Compositionality Argument: even if (contrary to what's argued above) the compositional semantic values of C-Expressions were *built from* the meanings of their meaningful constituents, propositions might still be simple, since those semantic values wouldn't be propositions.

47. Note that operator arguments for Structured Propositionalism are drastically weakened if propositions can be expressed by sentences containing expressions with *different* subsentential semantic values, a possibility that is inconsistent with Standard Structured Propositionalism.

48. The argument is not amenable to compression; see Yli-Vakkuri (2013) for details and Glanzberg and King (2020) for critical discussion.

5.5 Objects of Belief

Duncan (2018) argues that Complexity is required for propositions to be objects of belief. That might sound orthogonal to the question of whether Complexity is required for Compositionality, and Duncan himself claims that his argument is not a version of the Compositionality Argument. But the key premise of Duncan's argument is that "beliefs are productive and systematic" (2018: 351)—that belief is compositional—and so his argument deserves mention here. Duncan glosses belief productivity as the claim that we're "able to entertain indefinitely many of them" and belief systematicity as the claim that "our ability to entertain a belief with one propositional content is intrinsically connected to our ability to entertain other beliefs with other propositional contents, so that our ability to entertain the one automatically implies that we can entertain the others" (353). Here is **Duncan's Argument**:

> (1) Beliefs are productive and systematic.
>
> (2) If beliefs are productive and systematic, then the objects of beliefs are complex.
>
> *so,* (3) The objects of beliefs are complex (1, 2).
>
> (4) Propositions are the objects of beliefs.
>
> *so,* (5) Propositions are complex (3, 4). (2018: 356–7)

In support of (2), Duncan argues that Complexity is necessary to explain the productivity and systematicity of belief:

> [I]n order for beliefs to be productive and systematic, their objects — i.e., propositions — must be complex. For beliefs' productivity and systematicity is explained (at least in part) by our ability to combine and recombine the parts of our beliefs' propositional objects into different propositions that serve as the objects of different beliefs… it's our ability to grasp the parts of beliefs' objects, and apply rules of combination on those parts, that enables us to entertain indefinitely many beliefs with distinct propositional objects…Here's an analogy. Suppose I've got a bunch of ordinary Legos put together in some particular way. I can take apart and recombine those Legos and thereby make new constructions. On the other hand, if those Legos were fused together such that they couldn't be broken up into parts, then I wouldn't be able to make new and different constructions with those Legos. (354)

In addition to arguing that Complexity is *necessary* to explain the productivity and systematicity of belief, Duncan also claims that it is the *orthodox* explanation: "the crux of that explanation — specifically, the appeal to parts — is, and has always been, absolutely standard in the literature on this topic" (355).

How compelling is Duncan's Argument? The first thing to note is that Complexity is a less orthodox explanation than Duncan suggests. The waters are muddied by the fact that words such as 'thought' and 'belief' apply to both mental states and the contents of those states, but consider this passage Duncan cites in support of the orthodoxy of his explanation:

> There is a (potentially) infinite set of — for example — belief-state types, each with its distinctive intentional object and its distinctive causal role. This is immediately explicable on the assumption that belief states have combinatorial structure; that they are somehow built up out of elements and that the intentional object and causal role of each such state depends on what elements it contains and how they are put together. (Fodor 1987: 147)

This passage clearly implies that belief-*states* are complex, but does it imply that the *objects* of belief are complex? The only part of the passage that might suggest that is "the intentional object and causal role of each such state depends on what elements it contains and how they are put together". It seems clear, however, that 'it' here refers not to the intentional *object* of the belief-state, but to the state itself: the claim is that the contents (intentional objects) and causal roles of belief-*states* depend on the constituents and structure of those *states*. The claim that belief-*states* are complex *is* relatively standard, but that has no direct bearing on the claim that the *objects* of belief are complex.[49]

It is worth noting, however, that the uncontroversial complexity of belief-*states* is logical, not mereological. As Yli-Vakkuri and Hawthorne say,

> It is worth emphasis that our assumption that some thoughts [defined as representational events, states, or episodes] are formed by applying some logical operations to other thoughts does not commit us to the view that thoughts have structure in any sense more substantive than this: that there are some thoughts a, B1, … ,Bn, such that, for some *n*-place logical operation o, a = o(B1, … ,Bn). (2018: 23)

A final concern about the orthodoxy of Duncan's explanation is that it appears to be inconsistent with Intensionalism. The set of

49. I don't mean to suggest that philosophers of mind generally *reject* Structured Propositionalism; that's not true. Fodor and Lepore, for example, say that "[c]onnected to both productivity and systematicity is a further, apparently perfectly universal, feature of natural languages. The structure of sentences is, in the following sense, *isomorphic* to the structure of the propositions they express: *If a sentence S expresses the proposition that P, then syntactic constituents of S express the constituents of P*" (1993: 22). Here, Fodor and Lepore are *assuming* Standard Structured Propositionalism. That, however, undermines any attempt to *argue from* their view to Structured Propositionalism.

worlds where, e.g., dogs chase cats cannot be "decomposed" and "recombined" into the set of worlds where cats chase dogs: the latter is not a subset of, or in any way derivable from, the former, and nor are the semantic values (intensions) of 'dogs', 'cats', and 'chase'. Since Intensionalism has some rather prominent defenders, this gives the lie to the notion that Duncan's explanation is "absolutely standard".[50]

But even if Duncan's explanation isn't as standard as he suggests, if Complexity is necessary to explain our cognitive capacities, we'd better accept it. *Is* it necessary though? If the productivity and systematicity of *language* can be explained without Complexity, why can't the productivity and systematicity of *belief*? For example, consider a version of LOT according to which having the belief that p is having a Mentalese sentence that expresses p in one's "belief box". Since Mentalese is a language, its sentences have a compositional semantics. And so the productivity and systematicity of belief can be explained by our ability to combine and recombine the parts of Mentalese sentences, rather than the parts of the propositions they express. That is, just as we can *say* new things by decomposing and recombining parts of old English sentences, we can *think* new things by decomposing and recombining parts of old Mentalese sentences. As Michael Rescorla says,

> [LOT] straightforwardly explains productivity. We postulate a finite base of primitive Mentalese symbols, along with operations for combining simple expressions into complex expressions. Iterative application of the compounding operations generates an infinite array of mental sentences, each in principle within your cognitive repertoire. By tokening a mental sentence, you entertain the thought expressed by it. This explanation leverages the recursive nature of compositional mechanisms to generate infinitely many expressions from a finite base. (2019)

50. While it is standard to describe Intensionalism as a form of *un*structured propositionalism, Duncan (2018) claims that his argument doesn't target views according to which propositions have constituents of any kind, including set-theoretic constituents. If what I say above is correct, that isn't true.

According to Rescorla, similar considerations apply to systematicity. This explanation of the productivity and systematicity of belief is obviously compatible with the contents of Mentalese sentences being unstructured, since it doesn't mention the nature of those contents at all. Unfortunately, Duncan doesn't consider this rival explanation for the compositionality of belief. He talks about the possibility that thought occurs in a *natural* language, to which he (rightly) objects. But none of his objections carry over to the suggestion that thought occurs in a special, non-conventional, *mental* language.[51] Now, if Duncan's Argument forces us to accept LOT or Complexity, that might appear to be an important argument for Complexity, given the controversial status of LOT. But since the main alternatives to LOT are either compatible with this alternative explanation or deny Premise (1) of Duncan's Argument, this appearance is at least somewhat illusory.[52]

Finally, it's worth asking whether Complexity really has the explanatory merits Duncan claims for it. We don't, after all, *literally* decompose propositions and rearrange their parts to form new propositions: a proposition that had been literally decomposed wouldn't exist anymore, just as a LEGO construction that has been decomposed doesn't exist anymore. But if mental decomposition and recombination are non-literal, why would literal Complexity be needed to explain them?

51. This isn't quite true: one of Duncan's arguments is that if the productivity and systematicity of belief derived from the compositionality of mental *sentences*, then "it would seem that sentences, not propositions, are the entities better theoretically suited to play the role of objects of beliefs" (2018: 359). But why would the existence of LOT sentences obviate the need for propositions to serve as their contents any more than the existence of English sentences obviates the need for propositions to serve as *their* contents?

52. Two main alternatives to LOT are eliminative materialism (which denies that we have beliefs) and eliminativist connectionism (which denies that belief is productive and systematic). Both are inconsistent with Premise (1) of Duncan's Argument. Other alternatives include (non-LOT) versions of classical computationalism, which deny that the symbols the mind computes are properly described as linguistic. Such theories typically grant, however, that the meanings of complex symbols are determined by the meanings and arrangement of their parts. Considerations of space prevent me from saying more here, but see Rescorla (2019: §5) for discussion.

6. Conclusion

Compositionality, then, doesn't entail Complexity — and it doesn't provide strong inductive or abductive support for Complexity either. Nor does it provide much support for Complexity in conjunction with various other facts, such as that human languages contain verbs of propositional attitude. This is not to say that Complexity is false: there may well be other arguments that support it. But if so, Compositionality plays an unimportant role in them — the fact that language contains C-Expressions has no significant bearing on the metaphysics of propositions. Or at least, if it does, that bearing is in dire need of elucidation.[53]

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