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PROPOSITIONS AND COMPOSITIONALITY[1]

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A *semantic value assignment* for a language L is a function $[\![\,]\!]$ from the expressions of L to entities of some kind. A semantic value assignment is said to be *compositional for* a particular n-place syntactic operation O just in case the following condition holds.

> There is a function h such that, for all $X_1, \ldots, X_n$ such that $O(X_1, \ldots, X_n)$ is defined, $[\![O(X_1, \ldots, X_n)]\!] = h([\![X_1]\!], \ldots, [\![X_n]\!])$.

A semantic value assignment for L is said to be *compositional* just in case it is compositional for every syntactic operation in L.[2] Whatever else syntactic operations may be, it is assumed here that, if O is an n-place syntactic operation and $O(X_1, \ldots, X_n)$ is defined, then $O(X_1, \ldots, X_n)$ is a complex expression whose immediate constituents are $X_1, \ldots,$ and X_n. A *semantic theory* (or a *semantics*) for a language can be said to be compositional in a derivative sense: it is compositional iff the semantic value assignment it defines is compositional.

It is a common view in the philosophy of language that the assignment of propositions (semantically) expressed by natural language sentences in contexts of utterance is compositional, in the sense that it can be extended to a compositional semantic value assignment for the language.[3] To accurately express this view, we need a context-of-utterance-relativized notion of semantic value assignment: because natural languages contain indexicals—words like 'I', 'here', and 'now', whose contribution to the propositions expressed by sentences in which they occur varies with the context of utterance—natural language sentences do not express propositions absolutely, but only relative to contexts of utterance. Accordingly, if the semantic value of a natural language sentence is to be the proposition it expresses, the semantic values of natural language expressions must also be allowed to vary with context of utterance. Let us write "$[\![X]\!]_c$" for the semantic value the expression X has in context c. $\lambda c.\lambda X.[\![X]\!]_c$ is a function from contexts of utterance to semantic value assignments in the usual sense. What the common view says is that, for each natural language L, and for each context c, there is a compositional semantic value assignment $\lambda X.[\![X]\!]_c$ for L such that, for each L-sentence ϕ, $[\![\phi]\!]_c$ is the proposition ϕ expresses in c.[4] By metonymic extension, I will also call any function associated with a language L from contexts of utterance to semantic value assignments for L a *semantic value assignment for L*, and I will call such a function *compositional* iff its value at each context is a compositional semantic value assignment in the original sense; I will call such a function *propositional* iff its value at each context of utterance is a semantic value assignment that assigns to each sentence the proposition it expresses in that context. In fewer words, what the common view says is that every natural language has a semantic value assignment that is both propositional and compositional. The common view will henceforth be referred to as the *Naïve View*.

In recent years, the Naïve View has become something like an orthodoxy in the philosophy of language. The main challenge to the view so far has been an influential attack by Lewis (1980) (as well as a closely related argument by Kaplan, which I will not discuss here[5]), which is now widely thought to admit of a simple reply. Lewis argued that the presence of certain "shifty phenomena"—roughly, non-variable-binding sentential operators that "shift" alethic parameters other than the world of evaluation—in natural languages was inconsistent with the Naïve View. Lewis's idea was that a compositional semantic value assignment for a language containing (e.g.) a time-shifting or tense operator **O** would have to assign to **O**'s operand sentences semantic values whose truth values vary with time; but propositions do not have different truth values at different times; so a language that has time-shifting operators, as natural languages do, cannot have a semantic value assignment that is both propositional and compositional. King's (2003) reply to Lewis's challenge is now widely thought to have been successful. King granted Lewis his conditional—that if natural languages have non-variable-binding sentential operators that shift parameters other than the world of evaluation, then the Naïve View is false—but denied its antecedent. Focusing on the case of alleged time-shifting operators like 'some day' and tenses, King made a powerful case that these were syntactically nothing like tense logic operators, but were instead restricted quantifiers binding time variables, and he suggested, plausibly, that a similar quantificational syntax was present also in other natural language constructions that Lewis had assumed were non-variable-binding sentential operators that shifted parameters other than the world of evaluation.

King's reply to Lewis's challenge to the Naïve View has been so popular that it is difficult to find a discussion of Lewis's challenge published in the last decade that does not either advance a similar criticism of Lewis (1980) or simply cite King (2003) as a successful rebuttal to it.[6] The advocates of King's reply seem to have missed something rather important, however: while King's reply may succeed as a rebuttal to Lewis's original challenge to the Naïve View, there is a closely related challenge to the Naïve View that the reply leaves untouched. Lewis's challenge relies on the questionable assumption that natural languages contain *non-variable-binding* sentential operators that shift parameters other than the world of evaluation. The presence of such operators in a language is thought to rule out the existence of a semantic value assignment for the language that is both propositional and compositional.[7] But if so, why does the presence of *variable-binding* sentential operators that shift a parameter other than the world of evaluation in a language not rule out the existence of a semantic value assignment for the language that is both propositional and compositional? *Prima facie* it does. On the standard syntax and semantics of quantification, a quantifier is syntactically a variable-binding sentential operator and semantically a variable assignment-shifting sentential operator, and a variable assignment, obviously, is a parameter other than the world of evaluation. When the standard syntactic-semantic treatment of quantification is combined with standard possible worlds (or intensional) semantics in the standard way, the result is a theory that defines a semantic value assignment that is propositional but not compositional (as I will show in §2.1)—or at least is propositional if propositions are sets of worlds or other kinds of circumstances of evaluation. Neither standard possible worlds semantics nor alternative theories of propositions, on which propositions have structure (such as the theory of the Appendix to King 2007), have succeeded in producing a compositional semantic treatment of quantification in natural languages. It is therefore very much an open question whether natural languages—which clearly have quantifiers—do have semantic value assignments that are both propositional and compositional. The most pressing task for advocates of the Naïve View should be to make the case that quantified sentences are not counterexamples to their view. For if they cannot show that the Naïve View can handle a phenomenon as familiar and presumably well understood as quantification, there is no reason to put any stock at all in their much more ambitious claim that it can handle every construction in every natural language. So far, the Naïve View's partisans have not acknowledged in print the problem the phenomenon of quantification poses for their view. My goal in this paper is to present that problem in a general form that is neutral with respect to competing theories of propositions, and to begin to map the space of options available to the Naïve View's partisans for responding to it. My conclusion will be pessimistic: the least costly responses that will be surveyed involve significant revisions of our current conception of natural language syntax. On the other hand, it is unclear whether there is any cost at all to abandoning the Naïve View: it would appear that whatever is worth saving about the idea of semantic compositionality—which the Naïve View is only one way of making precise—can be saved by insisting on the existence of a compositional assignment of Kaplanian characters (functions from contexts to propositions and their constituents) to all expressions of all natural languages while rejecting the Naïve View and choosing not to revise our conception of natural language syntax.

This paper is structured as follows. §1 contains some preliminary observations about compositionality and syntax that will be presupposed by the later discussion. §2 sets out the quantificational challenge to the Naïve View by first showing that the usual treatment of quantification in classical intensional semantics (in which propositions are identified with their intensions or truth conditions) is not compositional; then by presenting a more direct argument against the Naïve View which shows that the presence of quantification in natural languages is inconsistent with the Naïve View and pre-theoretically attractive assumptions that are neutral between competing conceptions of propositions; and finally by offering a diagnosis of the apparent incompatibility of natural language quantification with the Naïve View that draws on a paradigm of the failure of compositionality from §1. §3 considers objections to the arguments of §2. §4 considers the question, "What motivates the Naïve View?" and suggests that its motivation is, on balance, outweighed by the costs incurred by saving it from apparent counterexamples involving quantification.

1. Preliminaries

A semantic value assignment for a language L is compositional if and only if it is compositional for every syntactic operation in L. It is assumed here that, for each n-place syntactic operation O, whenever $O(X_1, \ldots, X_n)$ is defined, $O(X_1, \ldots, X_n)$ is a complex expression whose immediate constituents $X_1, \ldots,$ and X_n. The syntactic operations of a language are those by which the language "builds" complex expressions out of their immediate constituents (at the level of syntax that matters to semantics: logical form).[8] I have defined a semantic value assignment for a language L as *any* function that assigns some entity to each expression of L. In this sense, it is clear that every natural language has a compositional semantic value assignment. To see this, note first that a semantic value assignment f for a language L is compositional if and only if substitutions of constituents of complex L-expressions that have the same f preserve the f of the complex expression.[9] Now consider what I will call *Lagadonian semantic value assignments*, which assign expressions of a language to themselves. Clearly, the Lagadonian semantic value assignment of each natural language is compositional, because there are no Lagadonian semantic value-preserving substititions of constituents of expressions other than the substitutions of those constituents for themselves.

The claim that every natural language has a semantic value assignment that is both compositional and propositional is not trivially true—in fact, it appears to be false for reasons that will be outlined in §2. However, in order to see that the claim that a natural language has a compositional and propositional semantic value assignment is non-trivial, one has to adopt a realistic view of syntactic operations. On an instrumentalist view of syntax, such as Quine's (1970), on which any set of operations that generates the set of sentences of a language L has an equal claim to being the syntactic operations of L—and the syntactic theorist is free to designate any of them "the syntactic operations of L"—the claim that a given natural language has a semantic value assignment that is both compositional and propositional is no less trivial than the claim that the language has a compositional semantic value assignment. To illustrate, consider the following example of a non-compositional semantic value assignment in a standard possible-worlds-theoretic setting where the semantic values of sentences-*cum*-propositions are thought of as subsets of a non-empty set of worlds W. Let L^* be a language otherwise just like English, except in that it contains a *znegation* operator 'znot' such that, whenever ϕ is a sentence, $\ulcorner$znot $\phi\urcorner$ is a sentence, and

$$\text{(Zneg)}\ [\![\ulcorner\text{znot } \phi\urcorner]\!] = W - [\![\phi]\!] \text{ if } \phi \text{ begins with a vowel, and otherwise}$$

$$[\![\ulcorner\text{znot } \phi\urcorner]\!] = [\![\phi]\!].$$

In other words, semantically znegation does what negation does when applied to a vowel-initial sentence, and it does nothing when applied to a non-vowel-initial sentence.

Given that there is a single syntactic operation that builds all znegations out of their immediate constituents, it is easy to show that the semantic value assignment just described is not compositional. For example, if ϕ is a vowel-initial contradiction and ψ a consonant-initial contradiction, $[\![\phi]\!] = [\![\psi]\!] = \varnothing$, but $[\![\ulcorner\text{znot } \phi\urcorner]\!] = W$ whereas $[\![\ulcorner\text{znot } \phi\urcorner]\!] = \varnothing$.

But suppose that, following Quine, we give ourselves a free hand in which of the operations that generate the sentences of L^* to designate "the syntactic operations of L^*". Then we may stipulate that L^* has no syntactic operation that builds all znegations, but that it has instead two syntactic operations that between them do: Z_V, which combines 'znot' with a vowel-initial sentence, and Z_C, which combines 'znot' with a consonant-initial sentence. With this stipulation, we will have made the semantic value assignment compositional: the semantic operation of complementation corresponds to Z_V, and the identity map corresponds to Z_C.

Any apparent counterexample to the compositionality of a semantic value assignment can be explained away by stipulatively multiplying syntactic operations. And the strategy of stipulatively multiplying syntactic operations can be taken to an extreme at which it ensures the compositionality of any semantic value assignment whatsoever: by stipulating that, whenever two complex L-expressions are distinct, they are built up by distinct syntactic operations, one stipulates away the possibility of the kinds of substitutions that might present counterexamples to the compositionality of any semantic value assignment for L.

For the debate over the truth of the Naïve View to have any substance, then, we must adopt, and we must assume that all participants to it have adopted, a non-Quinean, realistic stance on syntactic operations. We must assume that the syntactic operations by which natural language sentences are formed are what they are independently of linguistic theorists' ways of describing them, and that we cannot stipulate facts about them in the way we (perhaps) can stipulate syntactic facts about formal languages. The defensive maneuvers for the partisans of the Naïve View that involve syntactic revisionism (discussed in §§3.3, 3.4, and 3.5) must be understood as empirical hypotheses about natural language, not as stipulations.

2. Quantification Versus the Naïve View

Prima facie, quantificational contexts are counterexamples to the Naïve View. The standard semantic treatment of quantification in possible-worlds (or, more generally, intensional) semantics defines a semantic value assignment that is propositional—given that propositions are sets of worlds or of circumstances of evaluation—but not compositional; alternative theories on which propositions have structure also define semantic value assignments that are propositional—given that propositions are structured in the ways that those theories claim—but not compositional. Additionally, and more worryingly for the Naïve View's advocates, highly plausible general principles relating propositions, truth conditions (intensions), contexts, and variables—principles that are independent of any particular conception of propositions or any particular style of doing semantics—are inconsistent with the Naïve View. This section presents the quantificational challenge to the Naïve View in three parts. First, in §2.1, I show that classical intensional semantics for a language with quantifiers is not compositional. In §2.2, I show how a contradiction may be derived from the Naïve View and the platitude that natural languages have quantifiers, together with plausible assumptions that are independent of any particular theory of propositions. In §2.3, I offer a diagnosis of the troubles that arise for the Naïve View in §2.1 and §2.2.

Except where I explicitly consider departures from this idealization, I will assume both in this section and throughout the paper that each natural language has the syntax of first-order predicate logic. Each natural language will be assumed to have an infinite stock of first-order variables v_0, v_1, v_2, ...—thought of as deictic pronouns in their free occurrences[10]—a finite number of singular constants—thought of as proper names—a finite number of predicates of various arities, the existential quantifier $\exists$, the negation operator $\sim$, the conjunction operator $\wedge$, and the usual formation rules (other truth-functional connectives and $\forall$ can be introduced by the usual definitions). Needless to say, this is not exactly what natural language syntax is like, but the respects in which natural language syntax plausibly differs from this idealized syntax are irrelevant to my arguments (as I will argue in §3.1 and §3.2). And in any case, the use of the idealization should be acceptable for dialectical purposes, because essentially the same idealized syntax is assumed used in the most prominent defense of the Naïve View (King 2007: ch. 6 and Appendix).[11]

2.1 Classical Intensional Semantics is not Compositional

In *classical intensional semantics* (e.g., Kaplan 1977, Cresswell 1994, Heim and Kratzer 1998: ch. 12), the semantic values of sentences in contexts are identified with propositions thought of as sets of *circumstances of evalutation*—or, equivalently, with functions from circumstances of evaluation to truth values—and quantification is treated in the traditional, Tarskian way, using variable assignments. Circumstances of evaluation may be simply possible worlds (as in Cresswell 1994), or they may be world-time pairs (as in Kaplan 1977), or centered worlds, n-tuples that include at least a world, a time, and an agent (as in Lewis 1979[12]), and possibly further coordinates as well (as in Ninan 2012b). On any version of classical intensional semantics, a circumstance of evaluation includes at least a world. Below I will assume that a circumstance of evaluation just *is* a world, as nothing in the argument will turn on the nature of the entities of which propositions are taken to be sets.

Practitioners of classical intensional semantics generally agree that contexts, whatever else they may include, at least include a variable assignment—a function from the variables of the language to the domain of quantification.[13] Variables in their free occurrences are *deictic pronouns*, i.e., pronouns whose reference varies with context (e.g., the 'she' in 'She [pointing at someone] is a philosopher'), and in their bound occurrences they are simply devices of generalization, although typically ones ranging over a restricted domain (e.g., the 'she' in 'Someone believes that she [i.e., she herself] is a philosopher', which ranges over female persons).[14] Because the variable assignment is the only feature of context that features in the argument, I will assume for now that the context just is a variable assignment, and I will write "$[\![X]\!]_g$" for the semantic value of X under variable-assignment-*cum*-context g.

A classical intensional semantics is given using the following clauses, or something (nearly enough[15]) equivalent to them, where D is the domain of quantification and W the set of worlds (or circumstances).

(1) If c is a singular constant, $[\![c]\!]_g \in D$.
(2) If v_n is a variable, $[\![v_n]\!]_g = g(v_n)$.
(3) If F is an n-place predicate, $[\![F]\!]_g$ is a function from W to D^n.
(4) If $Ft_1 \ldots t_n$ is an atomic sentence where F is an n-place predicate and $t_1, \ldots, t_n$ are singular terms (variables or constants), $[\![Ft_1 \ldots t_n]\!]_g = \{w \in W \mid \langle [\![t_1]\!]_g, \ldots, [\![t_n]\!]_g \rangle \in [\![F]\!]_g(w)\}$.
(5) If ϕ is a sentence, $[\![\sim\phi]\!]_g = W - [\![\phi]\!]_g$.
(6) If ϕ and ψ are sentences, $[\![\phi \wedge \psi]\!]_g = [\![\phi]\!]_g \cap [\![\psi]\!]_g$.
(7) If v_n is a variable and ϕ a sentence, $[\![\exists v_n \phi]\!]_g = \{w \in W \mid w \in [\![\phi]\!]_{g'}$ for some g' that differs from g at most in what it assigns to $v_n\}$.

The proof that the semantic value assignment just defined is not compositional is simple. Suppose for a contradiction that $[\![\,]\!]$ is compositional, i.e. compositional in every context. Select a sentence $\phi(v_n)$ in which v_n occurs free, a context g such that $[\![\phi(v_n)]\!]_g \neq [\![\exists v_n \phi(v_n)]\!]_g$, and an $m \neq n$ such that $g(v_n) = g(v_m)$. (Clearly there will be such contexts—for example, any context in which $v_m = v_n \wedge \sim\phi(v_n) \wedge \exists v_n \phi(v_n)$ is true will fit the bill.) By (2), $[\![v_n]\!]_g = [\![v_m]\!]_g$, so by the compositionality of $[\![\,]\!]_g$, $[\![\exists v_n \phi(v_n)]\!]_g = [\![\exists v_n \phi(v_m)]\!]_g$. By (7), $[\![\exists v_n \phi(v_m)]\!]_g = [\![\phi(v_m)]\!]_g$. But $[\![\phi(v_n)]\!]_g = [\![\phi(v_m)]\!]_g$ because $[\![v_n]\!]_g = [\![v_m]\!]_g$ and $[\![\,]\!]_g$ is compositional, so $[\![\phi(v_n)]\!]_g = [\![\exists v_n \phi(v_n)]\!]_g$—a contradiction.[16]

2.2 The General Argument

The above argument shows that classical intensional semantics is not compositional. This does not, of course, show that the Naïve View is incorrect—not least because classical intensional semantics assumes that propositions are coarse-grained, i.e., are (or are individuated no more finely than) their intensions: the sets of circumstances of evaluation in which they are true. The view that propositions are coarse-grained is perhaps a minority view, and it would certainly be tendentious to leave the whole challenge to the Naïve View to rest on it. Many philosophers accept a *structured propositions* view on which propositions have structures similar to the syntactic structures (at the level of logical form) of the sentences that express them. Semantic theories in which the semantic values of sentences in contexts are structured propositions have been defended by Salmon (1986), King (2007, Appendix), and Soames (2010), in each case using essentially the same syntactic idealizations adopted here. In fact, each of these theories is non-compositional[17]—a fact that underscores the difficulty of devising a compositional and propositional semantic value assignment for a natural language even on the assumption that propositions have structure. However, with the exception of King's semantics (which will be discussed in §3.3.2 because it is the only structured-propositions semantics whose author puts it forward in the context of a defense of the Naïve View), I will not discuss particular examples of structured-propositions semantics for natural languages in any detail (except in the rough detail provided in note 17). Instead, I will give an argument against the Naïve View that is neutral on all issues on which competing theories of propositions differ. I will not assume that propositions are structured, or that they are unstructured. I will not assume that contexts are variable assignments, or even that they determine variable assignments (even though this is almost universally assumed). Nor will I assume anything about what kind of entities the semantic values of variables are. I will rely on four assumptions, the first two of which are truisms relating propositions, intensions, and logical equivalence, and the latter two of which, while not quite truisms, seem to me to be considerably more certain than the pre-theoretic motivation for the Naïve View itself (which will be discussed in §4).

The first assumption requires little comment. Using "$\langle\phi\rangle_c$" to designate the proposition expressed by ϕ in c and "$\{\phi\}_c$" to designate the intension ϕ has in c, it is:

Propositions Determine Intensions (PDI)
If $\langle\phi\rangle_c = \langle\psi\rangle_c$, then $\{\phi\}_c = \{\psi\}_c$.

PDI is clearly acceptable to lovers of coarse-grained propositions: it is simply an entailment of the claim that propositions are coarse-grained, i.e., individuated no more finely than sentence-intensions. Just as clearly, PDI is acceptable to anyone who thinks that propositions are not coarse-grained: if propositions are individuated *more* finely than intensions, then, obviously, if two sentences express the same proposition in a context, they are also associated with the same intension in that context.

The second assumption also requires little comment:

Logical Equivalence (LE)
If ϕ and ψ are logically equivalent, then $\{\phi\}_c = \{\psi\}_c$.

If two sentences are logically equivalent, they are, for any context, true at the same circumstances with respect to that context and so, by definition, are associated with the same intension in every context.

The third assumption requires more comment but is nevertheless, I think, highly plausible.

Instances of Universal Non-Vacuity (IUNV)
For some monadic predicate F, for some n, for all c, $\{Fv_n\}_c \neq \{\exists v_n Fv_n\}_c$.

In other words, some monadic predication with a free variable has, in every context, a different intension than its existential closure. For example, 'smokes' certainly seems to be such a predicate. No matter what value a context assigns to a deictic 'he', 'He smokes' and 'Someone (is such that he) smokes' will have different intensions in that context. It is difficult to deny that

(*) It is necessary that he smokes if and only if someone smokes

is false in every context when the 'necessary' is given a metaphysical reading. (*) has the logical form $\Box(Fv_n \leftrightarrow \exists v_n Fv_n)$, and $\Box(Fv_n \leftrightarrow \exists v_n Fv_n)$ is false in a context c only if $\{Fv_n\}_c \neq \{\exists v_n Fv_n\}_c$. Thus, if (*) is false in every context, IUNV is true.

Finally, the least obvious assumption:

Anti-Orthography (AO)
If Fv_n and Fv_m are atomic sentences, then, for some context c, $\langle Fv_n \rangle_c = \langle Fv_m \rangle_c$.

Anti-Orthography is so named because it gives expression to the idea that the metalinguistic orthography of variables—in particular, the numerical subscripts we use for talking about them—has no bearing on the way in which variables contribute to the propositions expressed by atomic sentences in which they occur as the only singular term. This should be especially clear when one reflects on the fact that the numerical subscripts are not even part of the orthography of the variables themselves (both 'it'$_{78}$ and 'it'$_{45}$ are spelled 'it'); they are part of their *metalinguistic orthography*, i.e., of the orthography of *our names for variables*. It would be rather far-fetched to suggest that the numbers that we, as theorists or natural language, use to represent variables somehow constrain what can be expressed by atomic sentences containing free occurrences of those variables (and no occurrences of any other singular terms). Whatever proposition I express now by 'He$_{78}$ is a philosopher' can also be expressed by 'He$_{45}$ is a philosopher'. And if so, what's to stop that proposition from being expressed by both sentences in the same context? If you think the answer is "Nothing!" then you should accept AO.

A reader who is dead-set on resisting the particular objection to the Naïve View that will follow might well want to dig in his or her heels at this point and resist the step from the claim that any proposition Fv_n expresses in some context is also expressed by Fv_m in some context to the claim that there is a single context in which Fv_n and Fv_m express the same proposition. I think this would be a mistake,[18] but in any case I note that a *reductio* of the Naïve View can be constructed using much weaker and more plausible assumptions: we need not assume AO in its full generality—all that is required is that some atomic sentences Fv_n and Fv_m ($n \neq m$) express the same proposition in some context c, and that F and n are also instances of IUNV. This is difficult to deny. For suppose that Cian asserts 'He$_{45}$ is a philosopher', referring to Tim, in context c_{Cian}, and that John asserts 'He$_{78}$ is a philosopher', also referring to Tim, in context c_{John}, and suppose that c_{Cian} and c_{John} are identical except for the *speaker* or *agent* coordinate: c_{Cian} and c_{John} have the same world, the same time, the same variable assignment (if a variable assignment is a coordinate of a context), and agree also with respect to all other coordinates that enter into contexts, whatever they may be.[19] We may suppose further that Cian is in exactly the same qualitative mental state in c_{Cian} as John is in c_{John}, and even that Cian in c_{Cian} is a perfect qualitative duplicate of John in c_{John} in other respects as well. In fact, we may suppose that the world of c_{Cian} and c_{John} is a Max Black-style mirror world that is perfectly qualitatively symmetric along a plane that bisects Tim. It would be bizarre to deny that, in this scenario, 'He$_{45}$ is a philosopher' expresses in c_{Cian} the same proposition that 'He$_{78}$ is a philosopher' expresses in c_{John}. ('He'$_{45}$ and 'He'$_{78}$ are intrinsic qualitative duplicates—recall that the indices 45 and 78 are parts of our names for the pronouns, not of the pronouns themselves. And, in the scenario just sketched, the utterances of 'He$_{45}$ is a philosopher' and 'He$_{78}$ is a philosopher' are not merely intrinsic qualitative duplicates; they are perfect qualitative duplicates.) Whatever properties of utterances the propositions they express supervene on, it is hard to deny that, in this scenario, those properties are duplicated in c_{Cian} and c_{John}, and, furthermore, that 'He$_{45}$ is a philosopher' is an instance of IUNV. If so, this example can be used in a *reductio* of the Naïve View, and I recommend it as a fallback to any reader who balks at the strength of AO. I will, however, continue to assume AO because it lends itself to a more straightforward *reductio* of the Naïve View.

The four assumptions just made—PDI, LE, IUNV, and AO—together with the simplified theory of syntax I have assumed, are inconsistent with the Naïve View. For suppose for a contradiction that the Naïve View is correct. There is, then, a semantic value assignment for the object language that is both compositional and propositional; let us use the usual symbol "$[\![\,]\!]$" for that assignment. By IUNV, there is a variable index n and a monadic predicate

F such that $\{Fv_n\}_c \neq \{\exists v_n Fv_n\}_c$, for all c. Call the predicate in question 'P' and the variable index 'j', and let $k \neq j$. By AO, there is a context—call it 'c^*'—such that $\langle Pv_j\rangle_{c^*} = \langle Pv_k\rangle_{c^*}$. Because $[\![\,]\!]$ is propositional, $[\![Pv_j]\!]_{c^*} = [\![Pv_k]\!]_{c^*}$, and because $[\![\,]\!]$ is compositional, $[\![\exists v_j Pv_j]\!]_{c^*} = [\![\exists v_j Pv_k]\!]_{c^*}$. By LE, $\{\exists v_j Pv_k\}_{c^*} = \{Pv_k\}_{c^*}$, and by PDI, $\{\exists v_j Pv_j\}_{c^*} = \{\exists v_j Pv_k\}_{c^*}$ and $\{Pv_j\}_{c^*} = \{Pv_k\}_{c^*}$, so $\{\exists v_j Pv_j\}_{c^*} = \{Pv_j\}_{c^*}$—a contradiction.

2.3 A Diagnosis

What is beyond dispute is that PDI, LE, IUNV, AO, and the syntax assumed in §2.1 are inconsistent with the Naïve View. PDI, LE, IUNV, and AO all come with strong intuitive motivation—motivation that is far more compelling, I think, than whatever speculative considerations can be advanced in favor of the Naïve View (these will be addressed in §4). A more promising strategy for the Naïve View's partisans than to deny these assumptions will be to reject the theory of syntax I have assumed, and I will focus exclusively on variants of this strategy in §3, which anticipates and replies to objections to the argument of §2.2. Before I consider the alternatives, however, I will offer a diagnosis of the troubles that just emerged for the Naïve View, which I think undercuts the motivation for those alternatives.

Consider again the case of znegation from §1. Quantification, according to the usual semantic treatments of it, is relevantly like znegation: the semantic clause one normally writes down for the existential quantifier, whether one is doing semantics in the coarse-grained or the structured-propositions way, results in the existential quantification of a sentence ϕ with respect to the nth variable corresponding to different operations on semantic values depending on whether, and where, the nth variable has a free occurrences in ϕ. Although at most one of these competing theories can be correct if we take them as proposals about the way in which propositions are assigned to sentences in contexts, there is widespread agreement that they succeed in assigning the correct truth-conditions to quantified sentences in contexts. Why should we expect a language with sentences whose truth-conditions-in-context are correctly captured by this kind of semantic clause to have a semantic value assignment that is both compositional and propositional? I think we should not expect it—any more than we should expect a language with sentences whose truth-conditions-in-context are correctly described by (Zneg) to have a semantic value assignment that is both compositional and propositional. In the case of znegation, the non-existence of a compositional and propositional semantic value assignment for the language containing 'znot' is evident as soon as one reads the semantic clause (Zneg)—one hardly needs an argument to see it. The problem is that, according to (Zneg), the way in which the (coarse-grained) proposition expressed by a znegation is determined by the semantic values of its immediate constituents depends on what sound the sentence that is the operand of 'znot' begins with, and it is rather obvious that this kind of information about a sentence is not encoded by the proposition it expresses in a context, whether we think of propositions as structured or not. The initial sound of a sentence—a matter that depends on regionally and temporally variable pronunciation conventions that seem to have nothing to do with syntax, in the sense of logical form, or with semantics—simply is not recoverable from the propositions that sentence expresses in contexts. (Of course, one can conjure up semantic values for sentences from which the initial sound is recoverable—the "interpreted logical forms" of Larson and Ludlow (1993) would fit the bill—but such semantic values are not propositions.) Is it any more plausible to suggest that whether the *n*th variable occurs free in a sentence, and where it occurs free in it, is information that can be recovered from the propositions the sentence expresses in any given context? Perhaps the information that a sentence contains a free occurrence of some variable or other is recoverable from the proposition the sentence expresses in any given context; perhaps also the number of free occurrences of variables in a sentence is so recoverable (someone who believes in structured propositions and has been convinced by Kaplan that free occurrences of variables are directly referential[20] but does not believe that any other expressions are might well believe this). But the usual semantic clauses for the existential quantifier require much more than this of propositions if the Naïve View is correct: they require that the *index* of the variable be recoverable from the proposition expressed by a sentence in any given context. This, I think, is no more plausible than the suggestion that the initial sound of a sentence is recoverable from the proposition expressed by the sentence in any given context.

3. Objections and Replies

3.1 Separating Quantification from Binding

Objection: "You're getting the syntax wrong. In natural languages, quantifiers combine with complex predicates formed by lambda-abstraction, not with other sentences, to form sentences, so they are not sentential operators; but the argument of §2.2 assumes that quantifiers are sentential operators."

Reply: The thought is that (e.g.) 'Someone smokes' does not have the logical form $\exists v_n F v_n$, but rather $\exists \lambda v_n F v_n$, where $\exists$ is not a variable-binding sentential operator but a "pure" quantifier that takes a predicate and forms a sentence.[21] This makes no difference, as long as the semantic assumptions used in §2.2 are granted. Replace $\exists v_n F v_n$ in the argument of §2.2 with $\exists \lambda v_n F v_n$, and use the compositionality and propositonality of the relevant semantic value assignment to infer from the identity of $\langle F v_n \rangle_c$ and $\langle F v_m \rangle_c$ to the identity of $\langle \exists \lambda v_n F v_n \rangle_c$ and $\langle \exists \lambda v_n F v_m \rangle_c$. The rest of the argument proceeds just as before.

3.2 A Ban on Vacuous Quantification (or Binding)?

Objection: "You're still getting the syntax wrong. The argument of §2.2 makes use of vacuous quantification (or vacuous binding), but there is no vacuous quantification (or binding) in natural language."

Reply: This objection has an impressive pedigree: according to Noam Chomsky, "Formal systems [which allow vacuous quantification] are designed for ease of description and of computation, but the design of human language is different", adhering to the principle that "there can be no superfluous symbols in representations"; one "consequence of this is that vacuous quantification should be forbidden" (Chomsky 1995: 151).

I have two things to say about this.

The first is that Chomsky's claim appears to be false. There is vacuous quantification, at least, in the variety of English I speak, which includes the vacuously quantified sentence:

Someone is such that John smokes.

But this is, perhaps, too contentious to be dialectically useful. The stripe of philosopher who would go along with Chomsky's denial that natural languages have vacuously quantified sentences would also be likely to deny that the variety of English I speak is a natural language.[22]

Less contentiously, although the availability of vacuous quantification allows the point of §2.2 to be made using a simple example, the availability of vacuous quantification is not required for making the point. Nearly everyone agrees, I take it, that natural languages allow for both free and bound occurrences of pronouns within the scopes of non-vacuously occurring quantifiers. Consider, for example, the syntactic ambiguity in 'Every philosopher believes that he is an elegant writer'. There is a disambiguation of this string of sounds on which the occurrence of 'he' in it is free and refers to some contextually specified individual, and one on which the occurrence 'he' is bound by the occurrence of 'every philosopher'. The details of the logical form need not concern us here—the only relevant bit of detail is that, on the standard treatment of these sentences,[23] the index of the 'he'-occurrence in the bound reading—call it '*n*'—is the same as the index associated with the occurrence of 'every philosopher', whereas the index of the 'he'-occurrence in the free reading—call it '*m*'—is distinct from *n*:

(Bound) [Every philosopher]$_n$ believes that he$_n$ is an elegant writer

(Free) [Every philosopher]$_n$ believes that he$_m$ is an elegant writer

Now it is highly plausible that (Bound) and (Free) have different intensions in every context. If so, we can derive a contradiction by applying AO to show that there is a context in which the simple sentences 'He$_n$ is an elegant writer' and 'He$_m$ is an elegant writer' express the same proposition.[24] In this context, call it '*c**', by the Naïve View, (Free) and (Bound) will express the same proposition, so, by PDI, (Free) and (Bound) will also have the same intension in c^*—a contradiction.

3.3 Schmentencism

Objection: "You're still getting the syntax wrong! The *sentence* 'He is an elegant writer' (no matter what the index of 'he') does not occur as a constituent in 'Every philosopher thinks that he is an elegant writer', on its bound reading, at all. The constituent of the bound reading of 'Every philosopher thinks that he is an elegant writer' that sounds and looks like the sentence 'He is an elegant writer' is a *schmentence*, a non-sentence homonymous with that sentence."

Reply: This is "the schmentencite way out" (Lewis 1980: 39). I will consider two schmentencite strategies: first, a variant of the one suggested by Lewis himself, applied to quantifiers; then several variants of a schmentencite strategy inspired by the theory of King (2007, Appendix), none of which is clearly endorsed by King, although King takes himself to be implementing *a* schmentencite strategy—perhaps with more limited goals.[25]

3.3.1 Sentencization

One of the simplest schmentencite strategies is discussed in Lewis (1980: 32f): for each sentence, posit a homonymous schmentence, let the syntax of schmentences be exactly as you believed the syntax of sentences to be—except in that it generates the set of schmentences, rather than of sentences—and add to this syntax one further syntactic operation—*sentencization*—which takes a schmentence and outputs the homonymous sentence. Thus we end up with a syntax of English, or any other natural language, that generates all of its sentences by first generating homonymous schmentences, and then generating the sentences by applying to the corresponding schmentences an operation that outputs a homonym of a different syntactic category: a sentence. On this syntax, a sentence never occurs as a constituent of another sentence or indeed of anything—sentences are syntactically inert. Call this syntactic proposal *Sentencization*.[26]

If Sentencization is correct, then quantification is not a counterexample to the Naïve View—provided that schmentences are assigned something other than propositions as semantic values. The following is an example of a classical intensional semantics that is both compositional and propositional (conditional on the assumption that propositions are coarse-grained) for a language in which the syntax of schmentences is exactly as the syntax of sentences was assumed to be in §2, but which has the additional syntactic operation of sentencization. I will assume that, although sentences are pronounced and spelled just like their homonymous counterpart schmentences, at the level of logical form a sentence is the result of concatenating an unpronounced sentence-making expression σ with a sentence—thus, each sentence has the form $\sigma\phi$, where ϕ is schmentence. For an explicitly compositional semantics, it is useful to think of sentencization as a two-place operation that concatenates σ with a sentence. The semantic values of schmentences will be *propositional functions*—functions from the set of variable assignments on the domain of quantification D to propositions—and the semantic value σ in a context g (thought of as a variable assignment) will be just g itself. The semantic operation paired with the syntactic operation of sentencization will be the operation of applying the semantic value the sentencized schmentence has in the relevant context to the semantic value σ has in it. In more detail:[27]

(1′) $[\![\sigma]\!]_g = g$.
(2′) If c is a singular constant, $[\![c]\!]_g \in D$.
(3′) If v_n is a variable, $[\![v_n]\!]_g$ = the function f such that, for each g, $f(g) = g(v_n)$.
(4′) If F is an n-place predicate, $[\![F]\!]_g$ is a function from W to D^n.
(5′) If $Ft_1 \ldots t_n$ is an atomic schmentence where F is an n-place predicate and $t_1, \ldots, t_n$ are singular terms (constants or variables),

$[\![Ft_1 \ldots t_n]\!]_g$ = the propositional function f such that, for each g, $f(g) = \{w \in W|$ $\langle Eval([\![t_1]\!]_g, g), \ldots, Eval([\![t_n]\!]_g, g)\rangle \in [\![F]\!]_g(w)\}$,

where $Eval([\![t_i]\!]_g, g')$ is defined as follows: $Eval([\![t_i]\!]_g, g') = [\![t_i]\!]_g(g')$ if $[\![t_i]\!]_g$ is a function from variable assignments to D, and otherwise $Eval([\![t_i]\!]_g, g') = [\![t_i]\!]_g$.

(6′) If ϕ is a schmentence, $[\![\sim\phi]\!]$ = the propositional function f such that, for each g, $f(g) = W - [\![\phi]\!]_g(g)$.
(7′) If ϕ and ψ are schmentences, $[\![\phi \wedge \psi]\!]$ = the propositional function f such that, for each g, $f(g) = [\![\phi]\!]_g(g) \cap [\![\psi]\!]_g(g)$.
(8′) If v_n is a variable and ϕ a schmentence, $[\![\exists v_n\phi]\!]$ = the propositional function f such that, for each g, $f(g) = \{w \in W|\ w \in [\![\phi]\!](g')$ for some g' that differs from g at most in what it assigns to $v_n\}$.
(9′) If ϕ is a schmentence, $[\![\sigma\phi]\!]_g = [\![\phi]\!]_g([\![\sigma]\!]_g)$.

The above semantics for Sentencization deals with examples like the syntactically ambiguous ‘Every philosopher believes that he is an elegant writer’ in the usual way: on the bound reading of ‘he’, the sentence has the form $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_n))$, and on the free reading of ‘he’, it has the form $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_m))$, with $m \neq n$. By clauses (3′) and (5′), the constituent schmentences Ev_n and Ev_m have different semantic values, so we cannot use a §3.2-style argument to derive a counterexample to the Naïve View from the fact that $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_m))$ is the result of substituting Ev_m for Ev_n in $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_n))$. Furthermore, the σ at the beginning of these sentences not only ensures that their semantic values are propositions, but also ensures that the sentence with the free occurrence of v_m cannot occur as a constituent in another sentence in which that occurrence gets bound, thus avoiding further counterexamples to the compositionality of the semantic value assignment.[28]

The semantic value assignment defined by (1′)–(9′) is compositional as well as propositional—if propositions are coarse-grained. A similar exercise can be carried out in a structured propositions-semantics (although I will not do so): assign to schmentences functions from variable assignments to structured propositions as sematic values, and leave clause (9′) as it is. Whether one is a fan of coarse-grained or structured propositions, one can construct a propositional and compositional semantic value assignment for a fragment of a natural language that includes quantifiers by the method outlined above (conditional on the correctness of one's view about the structure of propositions). Has the Naïve View been vindicated?

The answer to this question, of course, depends on whether Sentencization gets the syntax of natural languages right. Arguably, it doesn't: there is no reason whatsoever to believe that, in each natural language, each sentence has a homonym that is schmentence—an expression that looks and sounds exactly like a sentence but has a different kind of semantic value—or that each natural language has a phonologically unrealized syntactic operation that turns a schmentence into the corresponding sentence and semantically corresponds to the application of a propositional function to a variable assignment.

However, even if the implausible syntactic assumptions of Sentencization turned out to be true, this would be a small comfort for the adherents of the Naïve View. For notice how Sentencization, if true, vindicates the Naïve View: the semantic value assignment is compositional in the case of sentences only because the semantic values of sentences *never compose*—the semantic values of sentences in contexts are indeed propositions, but sentences are syntactically inert; no syntactic operations ever operate on them. Compositionality for the case of sentences is vacuously true: because there is no syntactic operation that operates on sentences, it is vacuously true that for each syntactic operation O that operates on sentences, there is a semantic operation that takes the sematic values of the inputs of O and outputs the semantic value of the output of O. Sentencization conforms to the letter but not the spirit of the Naïve View.

King's structured-propositions semantics can be used as a springboard for less disappointing forms of schmentencism. I will turn to it next.

3.3.2 King's schmentencism

In his reply to Lewis's attack on the Naïve View, King (2003, 2007: ch. 6 and Appendix) advocates a kind of schmentencism about tense, which he intends to generalize to the other "shifty" natural language phenomena Lewis (1980) uses to attack the Naïve View.[29] The idea is that tenses are not (non-variable-binding) sentential operators, but rather restricted quantifiers which bind time variables in the non-sentence clauses (schmentences) they operate on. Thus, e.g., 'Mary will be happy' does not have a logical form like 'F(Mary is happy)' but a logical form something like

(M) $(\exists t{:}\ t > t^*)$(Mary be happy(t)),

where 't' is a time variable and 't^*' a deictic expression—an indexical singular term with a Kaplanian character something like that of 'now'—that is incapable of being bound. Tense is obligatory—bare clauses like 'Mary be happy(t)' are not sentences and only occur embedded in the scopes of tense phrases, the application of which forms a sentence out of a bare clause (schmentence). Both features are required for securing the Naïve View against counterexamples involving tense. The combination of the fact that (M) is a sentence—and therefore has a proposition as its semantic value—with the idea that the free 't^*' in (M) is available for binding would prove lethal to the Naïve View, as we saw in §2.2, §3.1 and §3.2. 't^*', then, must not be available for binding. And the idea that the tense phrase in (M) operates on a sentence would prove lethal to the Naïve View for the same reason, for if 'Mary be happy(t)' were a sentence, its semantic value in context would be a time-specific proposition, and there would be no operation by which the proposition that is the semantic value of (M) in a context could be obtained from the proposition of the semantic value of 'Mary be happy(t)' (plus the semantic value of '$(\exists t{:}\ t > t^*)$') in that context.

Of course, King must do something similar across the board—not only for tense and the other "shifty phenomena" discussed by Lewis, but also for ordinary, uncontroversially quantificational sentences—if he hopes to defend the Naïve View against the apparent counterexamples involving quantification. In fact, the Appendix to King (2007) could be read as advocating a comprehensive schmentencite approach to quantification. It is not clear if King intended this, because neither the Appendix nor the rest of the book contains any explicit acknowledgement of the problem the phenomenon of quantification poses for the Naïve View,[30] but in any case, I will read King's book as if he were trying to solve this problem. I will outline what King actually says, and I will suggest ways in which what he says could be harnessed to serve schmentencite ends. I will consider three ways of so harnessing it: alternative A stays closest to the letter of King's proposal, but is unsuccessful. Alternative B departs further from what King has written, and alternatives C and D are clearly not endorsed by King.

A. Structured propositions with blanks and links In King's theory, the syntax of what King calls "formulas" is effectively the same as the syntax of the formulas of first-order logic,[31] but there is a semantic distinction between formulas with free occurrences of variables—which I will call *schmentences*—and formulas without them—which I will call *sentences*. The semantic values of sentences are structured propositions, and the semantic values of schmentences are *propositional frames*—entities otherwise like structured propositions except in that they contain *blanks* in argument position that are not *linked* to a blank in any quantifier prefix; such blanks correspond to free occurrences of variables in formulas. The semantic values of predicates are properties or relations, the semantic values of singular constants are objects in the domain, and all variables have the same semantic value: the *blank* (spelled "_").[32] *Linking* is a primitive semantic relation in King's theory: it is a symmetric and transitive relation that is part of the structure of a proposition; whenever a formula contains multiple occurrences of the same variable, the semantic value of the formula contains, in corresponding locations, linked occurrences of the blank.

Three features of King's theory make it look promising for schmentencite advocates of the Naïve View. The first feature is that King's theory assigns different kinds of semantic values to sentences and schmentences—as any schmentencite approach that has any hope of success must do. The second feature is that sentences may occur as constituents both in schmentences and in sentences—the theory, then, does not trivialize compositionality for the semantic values of sentences, unlike Sentencization. The third feature is that, because sentences never contain free occurrences of variables, the theory forces us to treat bindable pronouns and their deictic homonyms as distinct expressions. Thus, on the deictic reading of the 'he' in

(**) Every philosopher thinks that he is an elegant writer,

the constituent occurrence of 'he' cannot be a freely occurring variable—because (**) is a sentence and expresses a proposition, but in King's theory formulas with free occurrences of variables are not sentences (they are schmentences) and do not express propositions (they express propositional frames). Just as in King's treatment of tense we distinguished bindable time variables from the unbindable time indexical 't^*', we must in general distinguish between bindable pronouns and their unbindable, deictic homonyms: there are the bindable *variables* 'he_0', 'he_1', 'he_2', ... 'she_0', 'she_1', 'she_2',..., 'it_0', 'it_1', 'it_2', ... and so on; and there are the unbindable *schmariables* 'he*_0', 'he*_1', 'he*_2', ... 'she*_0', 'she*_1', 'she*_2',..., 'it*_0', 'it*_1', 'it*_2', ... and so on. The word spelled 'he' that occurs in (**) on its bound reading is a variable; the word spelled 'he' that occurs in (**) on its deictic reading is a homonymous schmariable.

(In King's semantics, semantic values are not explicitly relativized to contexts. I will follow him in this and assume that his statement of the theory is meant to be read as a generalization over the semantic value assignments obtained in all contexts. The deictic schmariables, then, are not interpreted by a variable assignment. A variable assignment enters into the theory, if at all, in the interpretation of the variables. I will assume that the schmariables have their semantic values supplied by context, which we may think of as a *schmariable assignment*—a function exactly like a variable assignment except in that it assigns members of the domain of quantification to schmariables rather than variables—but which is not mentioned in the theory.)

King's semantics, however, is not compositional.[33] The first semantic clause in King's theory that introduces a violation of compositionality is the clause for atomic formulas (p. 219). According to this clause (for example), whenever $n \neq m$, $[\![Fv_n v_m]\!] \neq [\![Fv_n v_n]\!]$, because the latter includes a link between the blanks contributed by the two occurrences of v_n, whereas the former includes no link at all; however $[\![v_n]\!] = [\![v_m]\!] = \_$ (the blank)—a counterexample to the compositionality of the semantic value assignment.

B. Multiplying syntactic operations An alternative theory could be read into footnote 3 to King's Appendix, in which he apparently acknowledges the failure of compositionality of the theory just outlined. In that footnote, King comments on his semantic clause for conjunction as follows.

> This may appear to violate some notion of compositionality. For '[[Fx]&[Gx]]' and '[[Fx]&[Gy]]' express different propositional frames according to this clause [for conjunction] (since the argument positions in the propositional frame expressed by '[[Fx]&[Gx]]' corresponding to the occurrences of 'x' are linked, but those in the propositional frame expressed by '[[Fx]&[Gy]]' corresponding to the occurrences of 'x' and 'y' are not). But '[Gx]' and '[Gy]' express the same propositional frame. So the left and right conjuncts of the two conjunctions express the same propositional frames, but the conjunctions express different propositional frames. But I don't think this does violate compositionality, because the propositional frame expressed by a conjunction should be a function of the propositional frames expressed by its conjuncts, the semantic value of '&', and the syntax of the conjunction. But the syntax of '[[Fx]&[Gx]]' is different from the syntax of '[[Fx]&[Gy]]' in virtue of the different patterns of occurrences of variables. Hence, that the two formulae express different propositional frames does not violate compositionality (King 2007: 220, n. 3).

This passage is open to several interpretations, but I will focus on the one that is relevant to the dialectic of this paper (and to the dialectic between Lewis (1980) and King).[34] On the relevant interpretation, what King means when he claims that the syntax of the two conjunctions is not the same is that the conjunctions are built up by different syntactic operations from their immediate constituents. (Clearly, if they were built up by the same syntactic operation, then, because the operation is applied in each case to expressions with the same semantic values, we would have a violation of compositionality.) On the relevant interpretation, then, the proposal is that whenever two conjunctions ϕ and ψ have in other respects the same apparent syntactic structure, and have corresponding constituents with the same semantic values, if ϕ and ψ have different patterns of occurrence of variables, ϕ and ψ are constructed by distinct syntactic operations. But this is extremely implausible. If the proposal is correct, then there are denumerably infinitely many syntactic operations by which conjunctions are constructed: because there is no upper bound to the number of distinct variables that may occur in a conjunction, there is also no upper bound to the number of different patterns of occurrence of variables that may occur in a conjunction. For the same reason, there will have to be denumerably infinitely many syntactic operations that form quantified formulas. Perhaps there need not be denumerably infinitely many syntactic operations that form atomic sentences (arguably there is an upper bound—perhaps three—to the number of arguments a natural language predicate may take), but in any case the number will be implausibly high: for a two-place predicate, there are two possible patterns (linked or not linked); for a three-place predicate, there are five (all arguments linked, no arguments linked, first argument linked to second argument, first argument linked to third argument, second argument linked to third argument). This theory of syntax is uncomfortably close to the strategy of trivializing compositionality by stipulation considered in §1. Apart from Quinean instrumentalism about syntax, which would trivialize the whole debate over the truth of the Naïve View, and which was rejected in §1 for that reason, it is difficult to find any reason to take it seriously.

C. Lagadonian semantics for variables There is a simple trick that would turn King's semantics into a compositional semantics: instead of having every variable have the same semantic value, ensure that $[\![v_n]\!] \neq [\![v_m]\!]$ whenever $n \neq m$. The most straightforward way to ensure this is to let every variable be its own semantic value—the Lagadonian trivialization strategy applied only to variables. A Lagadonian semantics for variables makes the links in King's structured propositions redundant: two argument places in a proposition will be linked if and only if they are occupied by the same variable. A philosopher who is attracted to the combination of standard structured propositions with a Lagadonian semantics for variables would do well to get rid of the ideology of linking entirely.

Whether or not it is combined with linking, however, the Lagadonian solution has implausible consequences in a standard structured-propositions semantics like King's, in which the semantic values of all of the primitive constituents of a sentence occur as constituents in the semantic value of the sentence: it entails that $[\![\exists v_n F v_n]\!] \neq [\![\exists v_m F v_m]\!]$ whenever $n \neq m$. But, again, it is highly implausible that the indices of variables—especially when they occur bound—are recoverable from the propositions expressed by the sentences in which they occur. Intuitively, $\exists v_0 F v_0$, $\exists v_1 F v_1$, $\exists v_2 F v_2, \ldots$, all express the same proposition.

D. Hybrid approaches What the schmentencite needs is a combination of a Lagadonian semantics for variables with a conception of the structure of propositions on which the semantic values of the primitive expressions out of which a sentence is composed do not (all) occur as constituents in the proposition expressed by the sentence. The most straightforward such conception is one on which propositions have no structure at all, but are simply sets of worlds. Let us call a theory that combines a Lagadonian semantics for variables with a conception of propositions as sets of worlds *unstructured Lagadonian schmentencism*. The most straightforward form of unstructured Lagadonian schmentencism, one might hope, is capable of assigning propositions (thought of as sets of worlds) to sentences and propositional functions (functions from variable assignments to propositions) to schmentences. But this is a vain hope—for unstructured Lagadonian schmentencites, the syntactic distinction between sentences and schmentences will turn out to cross-cut the semantic distinction between propositions and propositional functions, as we will see as soon as we consider the details of the proposal.

So let us have a look at the details. As long as we leave quantification out of the picture, we can assign unstructured propositions as semantic values to sentences and propositional functions as semantic values to schmentences. These semantic clauses do not look pretty—several subcases must be distinguished for atomic formulas, negations, and conjunctions—but they get the job done:[35]

(1*) If c is a singular constant, $[\![c]\!] \in D$.
(2*) If v_n is a variable, $[\![v_n]\!] = v_n$.
(3*) If F is an n-place predicate, $[\![F]\!]$ is a function from W to D^n.
(4*) If $Ft_1 \ldots t_n$ is an atomic formula where F is an n-place predicate and $t_1, \ldots, t_n$ are singular terms (constants or variables),

(i) $[\![Ft_1 \ldots t_n]\!] = \{w \in W | \langle [\![t_1]\!], \ldots, [\![t_n]\!] \rangle \in [\![F]\!](w)\}$ if $\langle [\![t_1]\!], \ldots, [\![t_n]\!] \rangle \in D^n$; and otherwise
(ii) $[\![Ft_1 \ldots t_n]\!]_g =$ the propositional function f such that, for each g,

$$f(g) = \{w \in W | \langle Eval^*([\![t_1]\!]_g, g), \ldots, Eval^*([\![t_n]\!]_g, g) \rangle \in [\![F]\!]_g(w)\},$$

where $Eval^*([\![t_i]\!]_g, g')$ is defined as follows: $Eval^*([\![t_i]\!]_g, g') = g'([\![t_i]\!]_g)$ if $[\![t_i]\!]_g$ is a variable, and otherwise $Eval^*([\![t_i]\!]_g, g') = [\![t_i]\!]_g$.

(5*) If ϕ is a formula,

(i) $[\![\sim\phi]\!] = W - [\![\phi]\!]$ if $[\![\phi]\!]$ is a proposition; and otherwise
(ii) $[\![\sim\phi]\!] =$ the propositional function f such that, for each g, $f(g) = W - [\![\phi]\!](g)$.

(6*) If ϕ and ψ are formulas,

(i) $[\![\phi \wedge \psi]\!] = [\![\phi]\!] \cap [\![\psi]\!]$ if both $[\![\phi]\!]$ and $[\![\psi]\!]$ are propositions,
(ii) $[\![\phi \wedge \psi]\!] =$ the propositional function f such that, for each g, $f(g) = [\![\phi]\!](g) \cap [\![\psi]\!]$ if $[\![\phi]\!]$ is a propositional function and $[\![\psi]\!]$ is a proposition,

(iii) $[\![\phi \wedge \psi]\!]$ = the propositional function f such that, for each g, $f(g) = [\![\phi]\!] \cap [\![\psi]\!](g)$ if $[\![\phi]\!]$ is a proposition function and $[\![\psi]\!]$ is a propositional function, and

(iv) $[\![\phi \wedge \psi]\!]$ = the propositional function f such that, for each g, $f(g) = [\![\phi]\!](g) \cap [\![\psi]\!](g)$ if $[\![\phi]\!]$ and $[\![\psi]\!]$ are both propositional functions.

The existential quantifier poses a problem. We would like to consider three cases: first, how $[\![\exists v_n\phi]\!]$ is determined by v_n and $[\![\phi]\!]$ when ϕ is a sentence; second, how $[\![\exists v_n\phi]\!]$ is determined by v_n and $[\![\phi]\!]$ when ϕ is a schmentence and $\exists v_n\phi$ is a schmentence; third, how $[\![\exists v_n\phi]\!]$ is determined by v_n and $[\![\phi]\!]$ when ϕ is a schmentence and $\exists v_n\phi$ is a sentence. The clause for the first case is straightforward:

(i) $[\![\exists v_n\phi]\!] = [\![\phi]\!]$ if $[\![\phi]\!]$ is a proposition,

for when ϕ is a sentence, the initial quantifier occurs vacuously in $\exists v_n\phi$ and $[\![\phi]\!]$ is a proposition—provided that the clauses for the second and third cases can guarantee that $[\![\phi]\!]$ is a proposition when ϕ is a sentence. But for the second and third cases we want clauses

(ii) $[\![\exists v_n\phi]\!]$ = the propositional function f such that, for each g, $f(g) = \{w \in W|\ w \in [\![\phi]\!](g')$ for some g' that differs from g at most in what it assigns to $v_n\}$if $[\![\phi]\!]$ is a propositional function that – – – , and

(iii) $[\![\exists v_n\phi]\!] = \{w \in W|\ w \in [\![\phi]\!](g')$ for some g' that differs from g at most in what it assigns to $v_n\}$if $[\![\phi]\!]$ is a propositional function that . . . ,

in which the '- - -' is replaced by statement of a condition that a propositional function satisfies iff it is the semantic value of a schmentence in which a variable other than v_n occurs free, and the '. . .' is replaced by a statement of a condition that a propositional function satisfies iff it is the semantic value of a schmentence in which no variable other than v_n occurs free. There are no such conditions. For example, if $n \neq m$, $(Fv_n \vee {\sim}Fv_n) \wedge (Fv_m \vee {\sim}Fv_m)$ and $Fv_n \vee {\sim}Fv_n$ have as their semantic value the same propositional function—the function that takes every variable assignment to W.

There is, however, a way to ensure that every sentence gets assigned a proposition as semantic value. Call the semantic operation of existentially quantifying a propositional function with respect to the nth variable defined in (ii) above "E_n",[36] and define a propositional function f as *n-closed* iff the following condition holds.

For all m, $E_m(E_n(f)) = E_n(f)$.

In other words, f is n-closed iff, once f is existentially quantified with respect to n, any further existential quantification of the resulting function $E_n(f)$ with respect to any m gives back the same propositional function $E_n(f)$. The reader can check that, if f is the propositional function associated with a schmentence in which the nth variable is the only free variable, then f is n-closed. For this reason, the following clause, when combined with (1*)–(6*), has the desired result that the semantic value of every sentence is a proposition.

(7*) If v_n is a variable and ϕ a formula,

(i) $[\![\exists v_n \phi]\!] = [\![\phi]\!]$ if $[\![\phi]\!]$ is a proposition,
(ii) $[\![\exists v_n \phi]\!] = \{w \in W \mid w \in [\![\phi]\!](g')$ for some g' that differs from g at most in what it assigns to $v_n\}$ if $[\![\phi]\!]$ is an n-closed propositional function, and
(iii) $[\![\exists v_n \phi]\!] =$ the propositional function f such that, for each g, $f(g) = \{w \in W \mid w \in [\![\phi]\!](g')$ for some g' that differs from g at most in what it assigns to $v\}$ if $[\![\phi]\!]$ is a propositional function that is not n-closed.

However, on (1*)-(7*), it is not the case that the semantic value of every schmentence is a propositional function: because the semantic values of some schmentences in which variables other than v_n occur free are n-closed, (7*)(ii) will ensure that some schmentenes have propositions as their semantic values. For example, Fv_1 and $\exists v_3((Fv_3 \vee {\sim}Fv_3) \wedge (Fv_2 \vee {\sim}Fv_2))$ are both schmentences, but the former has as its semantic value a propositional function and the latter a proposition, because $[\![(Fv_3 \vee {\sim}Fv_3) \wedge (Fv_2 \vee {\sim}Fv_2)]\!]$ is 3-closed.

Something similar can be done in a structured-propositions setting, if one is willing to depart from the usual constraint that the semantic values of all of the primitive constituents of a sentence occur as constituents of the sentence's semantic value. The following proposal, which I will call *structured Lagadonian schmentencism*, departs from King's theory in three important respects. First, like (1*)-(7*), it treats variables as their own semantic values. Second, in structured Lagadonian schmentencism, the only semantic operation that introduces links into structured propositions is the one corresponding to existential quantification. Third, in structured Lagadonian schmentencism, the semantic operation that introduces links *erases* the semantic values of all of the linked expressions, replacing them with blanks.[37] In more detail, the semantics is given as follows. (Here, as in the Appendix to King (2007), the bracket notation is used to represent tree structures in the usual way: "$[X_1, \ldots, X_n]$" designates the tree whose daughter nodes are $X_1, \ldots, X_n$.)

(1″) If c is a singular constant, $[\![c]\!] \in D$.
(2″) If X is $\sim$, $\wedge$, $\exists$, or a variable, $[\![X]\!] = X$.
(3″) If F is an n-place predicate, $[\![F]\!]$ is a function from W to D^n.
(4″) If $Ft_1 \ldots t_n$ is an atomic formula where F is an n-place predicate and $t_1, \ldots, t_n$ are singular terms (constants or variables), $[\![Ft_1 \ldots t_n]\!] = [[\![F]\!], [\![t_1]\!], \ldots, [\![t_n]\!]]$.
(5″) If ϕ is a formula, $[\![{\sim}\phi]\!] = [[\![{\sim}]\!],[\![\phi]\!]]$.

(6″) If ϕ and ψ are formulas, $[\![\phi \wedge \psi]\!] = [[\![\phi]\!], [\![\wedge]\!], [\![\psi]\!]]$.
(7″) If ϕ is a formula and v_n a variable, $[\![\exists v_n\phi]\!] =$ *Link-and-Erase*$([[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]])$.

The operation of Linking-and-Erasing is defined as follows:

Link-and-Erase$([[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]])$ = the structure that results from linking all pairs of distinct occurrences of v_n in $[[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]]$ together and then replacing each occurrence of v_n in the resulting structure with an occurrence of the blank, while preserving the links introduced between the argument places previously occupied by occurrences of v_n.

Because v_n occurs as a constituent in $[\![\phi]\!]$ if and only if v_n has a free occurrence in ϕ, *Link-and-Erase*$([[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]]) = [[\![\exists]\!], \_, [\![\phi]\!]]$ if v_n has no free occurrences in ϕ,[38] and otherwise *Link-and-Erase*$([[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]])$ is a structure in which links are present between two or more blanks that have replaced all occurrences of v_n in $[[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]]$. Thus, when $\exists v_n\phi$ is a sentence and ϕ a schmentence, no variables occur as constituents in $[\![\exists v_n\phi]\!]$ while variables do occur as constituents of $[\![\phi]\!]$; when $\exists v_n\phi$ and ϕ are both schmentences, variables occur as constituents in both $[\![\exists v_n\phi]\!]$ and $[\![\phi]\!]$; and when $\exists v_n\phi$ and ϕ are both sentences, no variables occur as constituents in either $[\![\exists v_n\phi]\!]$ and $[\![\phi]\!]$. Quantified variables, while serving as their own semantic values, are not incorporated into the semantic values of sentences as constituents, and we have the desired result that $[\![\exists v_n\phi(v_n)]\!] = [\![\exists v_m\phi(v_m)]\!]$, for all n and m, whenever $\exists v_n\phi(v_n)$ is a sentence—and, more generally, that sentences that are alphabetic variants of each other (in the standard sense of Bell and Machover 1977: 61) express the same proposition. We also have the desired result that sentences and schmentences have different types of semantic values: a formula is a schmentence if and only if its semantic value contains a variable as a constituent; otherwise it is a sentence and its semantic value is what King thinks of as a proposition: a structure in which every occurrence of a blank in argument position is linked to an occurrence of a blank in a quantifier prefix. If the schmentencite syntax assumed here is correct, and if King is right about what propositions are like, the semantic value assignment defined by (1″)-(7″) is both compositional and propositional.

Structured Lagadonian schmentencism succeeds in getting the syntactic distinction between sentences and schmentences to line up with a distinction between two kinds of semantic values, and, on account of that, it is a less gruesome theory than unstructured Lagadonian schmentencism. It is hard, however, not to sympathize with the kind of purist who would claim that, on account of its appeal to the gruesome semantic operation of linking-and-erasing, structured Lagadonian schmentencism, like the semantics for Sentencization, conforms to the letter but not the spirit of the Naïve View. It is not difficult to make the appeal to linking-and-erasing look like cheating. The source of the trouble for the Naïve View was that the semantic operation associated with existentially quantifying ϕ with respect to the nth variable depends on whether, and where, the *n*th variable occurs free in ϕ—information that could not plausibly be recovered from semantic values of expressions if semantic values are propositions *or their constituents*. Structured Lagadonian schmentencism's solution to this problem is a view on which propositions have structure—so have constituents—yet on which the semantic values of some constituents of sentences *are not the constituents they contribute to propositions*, but are themselves. On this view, the semantic value of a variable v_n is v_n, yet the constituent v_n contributes to a proposition is not v_n but _. This is achieved by appeal to a kind of semantic value-scrubbing operation that, so to speak, looks inside the semantic value of a formula, makes replacements and introduces links. The operation, furthermore, replaces the semantic values of expressions with the constituents of propositions to which they correspond—with the very entities that, on a normal approach to structured-propositions semantics,[39] ought to be their semantic values.

Worries about the spirit of the Naïve View aside, the main question before us is whether the Naïve View is true (in its "letter"). The two hybrid schmentencite approaches just reviewed, which combine Lagadonian semantics for variables with an assignment of either coarse-grained or structured propositions to sentences in contexts, are only as true as the syntax they assume. Both entail that pronouns are, contrary to textbook syntax, incapable of both bound and free occurrences in sentences, and that the familiar category of pronouns is a chimera—a syntactically and semantically heterogeneous class of accidental homonyms. These are surprising claims.

3.4 Variable-Free Semantics

Objection: "Your arguments in §2, §3.1, §3.2, and §3.3 assume that there are variables in natural languages, but there aren't!"

Reply: Any philosopher who both claims that there are no variables in natural languages and attempts to use this claim to rescue the Naïve View has a serious explanatory duty to discharge. Although I do not know of any philosophers who combine these characteristics, it may be useful to set out the challenge pre-emptively. Such philosophers—*Naïve variable-free semanticists*, to give them a label—must provide a plausible semantics for binding phenomena that is both propositional and compositional. As we saw in §3.2, the phenomena that make trouble for the Naïve View are visible at the surface of natural language, and we do not need to use the theoretical apparatus of variable-binding to explain why they pose a *prima facie* problem for the Naïve View. Consider again the sentences:

(a) [Every philosopher] believes that she is an elegant writer
(b) Every philosopher believes that she is an elegant writer
(c) She is an elegant writer,

where, in (a), the link drawn between 'every philosopher' and 'she' represents the fact that the former is semantically bound by the latter—however the syntax may work out exactly—and the absence of such a link in (b) represents a free reading for 'she'. Because (a) and (b) plausibly have different intensions in every context, the trio (a)-(b) is a *prima facie* counterexample to the Naïve View. The task of the naïve variable-free semanticist is to give a semantics for English in which the trio is not a counterexample to the Naïve View. So far, as far as I know, no one has done so. *Prima facie*, there are only two options for a variable-free treatment of the trio:

Option 1: Deny that (c) occurs as a constituent in both (a) and (b).

Option 2: Construct a semantics that is either not compositional or not propositional.

In fact, these are the only two ways of treating binding that one finds in the variable-free semantics literature. Szabolcsi (1992) chooses Option 1 and endorses the rampant homonymy thesis (i.e., for each bindable pronoun there is a homonymous deictic pronoun) that King is—or ought to be—committed to. This form of the schmentencite strategy has already been discussed. Jacobson (2003) rejects Szabolcsi's proposal on the grounds that "it would be suspicious to treat free and bound pronouns as accidental cases of homonymy", and pursues Option 2—Jacobson's semantics is compositional but not propositional.[40] The only form of variable-free semantics currently on offer that is hospitable to the Naïve View is a form of schmentencism.

3.5 Linked Syntax

Objection: "You're getting the syntax wrong. Natural languages have variables—expressions that double as bound and deictic pronouns—but each natural language has only one variable, or, in any case, only one variable of each sort. For example, there is, in English, only one pronoun spelled 'he', only one pronoun spelled 'she', and only one pronoun spelled 'it'. In a sentence containing multiple occurrences of any of these pronouns, some occurrences of the pronoun may be *syntactically linked* with some other occurrences without being syntactically linked with all other occurrences of it. In particular, an occurrence of a pronoun in a sentence is *bound* if and only if it is linked to an occurrence of a quantifier phrase within whose scope it is located."

Reply: The idea that natural language syntax implements binding using *syntactic links*, which are the syntactic analogues of the semantic links in King's structured propositions, is highly unorthodox. Yet it has certain advantages over the texbook conception of binding, on which binding just is match of index between an occurrence of a quantifier phrase and an occurrence of a variable (of the appropriate sort) within its scope. In particular, it gives straightforward and pre-theoretically attractive answers to certain questions that prove awkward for the textbook conception, such as: “Are $\exists v_n F v_n$ and $\exists v_m F v_m$ the same sentence when $n \neq m$?” On the textbook conception, the answer is pretty clearly “No”, which leads to further awkward questions, such as: “What makes it the case that the index associated with the word spelled ‘he’ that occurred in my utterance of the sentence spelled ‘He is a philosopher’ today is the same as (or different from) the index associated with the word spelled ‘he’ in my utterance of the sentence spelled ‘He is a philosopher’ yesterday?” Or: “What makes it the case that the index associated the word spelled ‘he’ that occurred in my utterance of the sentence spelled ‘He is a philosopher’ today is the same as (or different from) the index associated with the word spelled ‘he’ in another speaker’s simultaneous utterance of the sentence spelled ‘He is a philosopher’?” The unorthodox conception of syntax on which syntactic links do the job of variable indices—*linked syntax*, to give it a name—regards the alphabetic variants $\exists v_n F v_n$ and $\exists v_m F v_m$ as the same sentence, and it recognizes only one English sentence spelled ‘He is a philosopher’; if linked syntax is correct, then there are no puzzles about the conditions under which a single speaker has uttered that sentence twice, or about the conditions under which two distinct speakers have uttered it, additional to puzzles that concern the intra-speaker and inter-speaker identification of words and sentences generally. Furthermore, it is easy to get the feeling, when confronted with the idea of linked syntax, that the troubles that were shown to arise for the Naïve View in §2 and subsequently are to be blamed on the mainstream, index-theoretic syntax assumed there.

While it is clearly true that the *reductio* of the Naïve View in §2.2, and subsequent variants of it, relied essentially on the mainstream assumption that binding in natural languages is to be understood in terms of coindexing and scope, we should not conclude that the Naïve View could be saved—without trivializing it—by rejecting this mainstream assumption in favor of linked syntax.

First note that linked syntax appears to come close to trivializing compositionality in the manner of the proposal considered in §3.3.2(B). According to linked syntax, natural language sentences do not have tree structures but linked tree structures: they are trees in which terminal nodes occupied by variables may be linked with each other and with higher nodes occupied by quantifier phrases. According to linked syntax, furthermore, there is just one variable (of any given sort) in any natural language—(fix a sort and) call that variable ‘x’. If there are n occurrences of x in ϕ, then there are 2^n distinct linked trees-*cum*-sentences that can be obtained by combining $\exists$, x, and ϕ, in that order. If so, there are denumerably infinitely many syntactic operations that take $\exists$, x, and a sentence and output a sentence—and, for similar reasons, there are denumerably infinitely many syntactic operations that take a sentence, $\wedge$, and a sentence, and output a sentence.

Furthermore, linked syntax does not have an easier time than mainstream syntax dealing with free occurrences of variables in sentences. In fact, it has a harder time with it, as free occurrences of variables in sentences all by themselves—without any quantifiers present—will be apparent counterexamples to the Naïve View. For consider an unlinked sentence $x \neq x$ (e.g., 'He $\neq$ he'). The absence of a link between the two occurrences of x should ensure that the sentence is true in some contexts—the unlinked sentence is the single sentence that, for the linked syntactician, does the job that $v_0 \neq v_1$, $v_0 \neq v_2$, $v_0 \neq v_3$, and other variants do for the mainstream syntactician, and the latter are certainly true in some contexts. But whatever the linked syntactician's favorite semantic value assignment assigns to x in a given context, it obviously must assign the same entity to x and itself in that context (semantic value assignments assign semantic values to expressions, not to expression-occurrences in larger expressions). Given the reasonable assumption that any semantic value assignment that is both compositional and propositional assigns to each expression in each context a semantic value that determines its extension or referent in that context, it follows that, if the Naïve View is correct, the occurrences of x in the unlinked sentence $x \neq x$ (as well as in the corresponding linked sentence) have the same referent in every context, wherefore the unlinked (and linked) $x \neq x$ will be false in every context, contrary to what was assumed.

There are proposals in the vicinity of linked syntax which, if correct, would resolve both of the difficulties just surveyed. But they are so inelegant that it is difficult to have any confidence in their correctness.

First, to avoid trivializing compositionality, we can posit an unpronounced constituent in all quantified sentences: a finite set σ of natural numbers (or of numerals, if you prefer). Suppose that the syntactic operation of existentially quantifying a sentence (or formula, if you prefer a neutral term) is a four-place operation that takes $\exists$, x, σ, and ϕ, and outputs a linked tree formed out of $\exists x \sigma \phi$ by, for each $j, k \in \sigma$, syntactically linking the jth and the kth unlinked occurrences of x in ϕ with each other (except when at least one of them occurs in a quantifier prefix) and with the occurrence of x in the initial quantifier prefix.[41] Suppose further that no other syntactic operations introduce links into sentences. We then have a finite number of syntactic operations. We also have denumerably infinitely many primitive expressions (each finite set of natural numbers is one)—but then, we also had denumerably infinitely many primitive expressions on the standard approach (for each natural number n, v_n was one). Defining a compositional assignment of King-style propositions with semantic links for this syntax is left as an exercise for the reader.

To deal with the second problem—that of finding contexts in which (e.g.) the English sentence spelled 'He $\neq$ he' is true—we can resort to a form of schmentencism: distinguish the bindable and index-free variable 'he' from the homonymous schmariables 'he$_0$', 'he$_1$', 'he$_2$', ... We can say that any *sentence* spelled 'He $\neq$ he' that is true in some context contains two occurrences of two schmariables with different indices, and is to be distinguished from the many schmentences spelled 'He $\neq$ he', which contain one or two occurrences of the index-free variable 'he', and which are not truth-evaluable because they do not express propositions but (e.g.) propositional frames in contexts.[42]

Positing a syntactic relation of linking does not appear to be helpful to the Naïve View, although the idea of linked syntax can be elaborated in ways that are consistent with the Naïve View—however unlikely the results of such elaboration are to be true. Yet positing a syntactic relation of linking may be the right thing to do for other reasons: the non-compositional semantics of Fine (2007) requires such a relation,[43] and the considerations that motivate Fine to give up the idea that semantic theories should be compositional[44] are not very distant from the challenge to the Naïve View presented in §2.

4. Why the Naïve View?

The Naïve View has turned out to be costly to maintain. The least costly ways of maintaining it reviewed here—unstructured Lagadonian schmentencism, structured Lagadonian schmentencism, and Option 1 from §3.4, which is yet another form of schmentencism—involved positing what Jacobson reasonably considers to be a "suspicious" homonymy between bound 'he's and free 'he's, bound 'she's and free 'she's, bound 'it's and the free 'it's, and so on, and assigning different types of semantic values to sentence-like constituents that are *prima facie* of the same syntactic type (such as an embedded and bound occurrence of 'She is an elegant writer' and an embedded and free occurrence of 'She is an elegant writer'). These are significant costs. Why should we accept them? What, if anything, do we gain by accepting the Naïve View?

The question turns out to be surprisingly difficult to answer. Apart from the brute authority of Kaplan, whose prohibition on "monsters" is presumably derived from the more general requirement that the assignment of propositions (or Kaplanian "Contents") to sentences in contexts must be compositional,[45] I can think of only one reason why philosophers might have found the Naïve View attractive: it is thought to be some part of the explanation of the learnability of natural languages and the ability of human speakers to "make infinite use of finite means"—by producing and understanding sentences they have never before encountered—of which introductory linguistics textbooks, often following Chomsky, like to remind us.[46] The idea that "semantic compositionality", in some sense, is required to explain the learnability or productivity of natural languages is often traced back to Frege.[47] But as soon as this motivation becomes salient, it also becomes salient that it is not a motivation for the Naïve View, which states that the assignment of *propositions* to natural language sentences is compositional *in each context*, but for the principle of the *compositionality of meaning*: the principle that the context-invariant assignment of *meanings* to natural language expressions is compositional.[48] The meanings of sentences are not the propositions they express: a context-sensitive sentence like 'I am writing' expresses infinitely many propositions in different contexts, but it has one meaning, and its meaning is what determines the proposition it expresses in each context. If we think of the meaning of a sentence ϕ, following Kaplan, as its "character", i.e., the function $\lambda c.\langle\phi\rangle_c$ that takes each context to the proposition ϕ semantically expresses in it, and if we further think of contexts as including variable assignments, as is customary in natural language semantics, then neither quantification nor variable-binding is a counterexample to the compositionality of meaning.[49]

In view of the difficulties posed by the phenomena of quantification and binding for the Naïve View, that view's advocates at least owe us a story about why we should expect to find compositionality in natural languages at the level of content (propositions and their constituents), as opposed to merely at the level of character. They also owe us a plausible semantics for a fragment of a natural language including both bound and deictic (occurrences of) pronouns that is both compositional and propositional. In the absence of such a story and such a semantics—which may well exist, for all that has been said here—the balance of evidence is against the Naïve View.

Notes

1. This paper has been kicking around, in various forms, since I was a graduate student at McGill University in Spring 2009. I owe thanks to Cian Dorr, John Hawthorne, and Tim Williamson for encouraging me to write a longer version of it that ended up as a chapter of my 2012 Oxford dissertation (Yli-Vakkuri 2012); the present version of the paper is a revised version of that chapter. I would like to thank John Hawthorne, Cian Dorr, Tim Williamson, Jason Turner, and Jon Litland for providing detailed comments on earlier drafts. Thanks also to Brit Brogaard, Herman Cappelen, Noam Chomsky, Peter Fritz, Michael Glanzberg, Jeremy Goodman, Benj Hellie, Ilhan Inan, Jeff King, Sten Lindström, Mark McCullagh, Dilip Ninan, Brian Rabern, Gil Sagi, Jeff Speaks, Rob Stainton, Arthur Sullivan, Folke Tersman, Lucas Thorpe, and audiences at the University of Uppsala, the Centre for the Study of Mind in Nature (CSMN) at the University of Oslo, Boğaziçi University in Istanbul, SOPHA 2012 in Paris, and the 2012 Canadian Philosophical Association Congress at the University of Waterloo for helpful discussions; and Richard H. Tomlinson, the Alfred Kordelin Foundation, the Finnish Cultural Foundation, and the Analysis Trust/Oxford University Press for financial support.
2. This, or something equivalent to this, is the usual notion of compositionality discussed in the technical literature on compositionality: see, e.g., Janssen (1997) and Dever (2006: §§1.1, 1.2). In Appendix A ("Related Principles"), Janssen discusses several alternative notions of compositionality, the first of which is the "main theme of this chapter" and the "version one mostly finds in the literature": "The meaning [semantic value] of a compound expression is a function of the meanings [semantic values] of its parts and the syntactic rule by which they are combined" (p. 462). It is also rather clear that this is the notion Lewis has in mind in his (1980), in which he characterizes compositionality as follows: "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" (Lewis 1980: 25). I take the "ways" of building expressions that Lewis is quantifying over here to be syntactic operations.

In (1980: 35, 39), Lewis seems to take semantic value assignments for languages to be compositional by definition: " 'Semantic value' is my term", he insists (p. 39), and: "The less I have said about what so-called semantic values must be, the more I am entitled to insist on what I *did* say. If they don't obey the compositional principle, they are what I call semantic values" (p. 35). Of course, 'semantic value' is no longer just Lewis's term—it has taken on a life of its own in the literature. The definition of 'semantic value assignment' adopted here is not one on which every semantic value assignment for every language is compositional by definition. I find this practice natural because the semantic value assignments—in my sense—that we are most familiar with through standard philosophical training are not compositional: namely, assignments of extensions—which in the case of sentences, including sentences with freely occurring variables, are truth values—relative to variable assignments, or of intensions—which in the case of sentences, including sentences with freely occurring variables, are sets of worlds or more fine-grained circumstances of evaluation, relative to variable assignments (see §2.1 for the latter case). The claim that Lewis would make using the words 'The semantic values of natural language sentences (in contexts) are not the propositions they express (in those contexts)' translates into the language adopted in this paper as: 'It is not the case that every natural language has a semantic value assignment that is both propositional and compositional' (see below).

3. I will assume the mainstream view that exactly one proposition is *semantically* expressed in each context by each (declarative) sentence (and I will tend to omit 'semantically' and 'declarative' when discussing propositions semantically expressed by declarative sentences below). This view is consistent with the view that utterances of sentences often express multiple propositions (conventional and conversational implicatures, etc.); according to it, exactly one of the propositions expressed is of interest to semantics (as opposed to pragmatics), and that proposition is the proposition semantically expressed. The mainstream view is not obviously consistent with versions of supervaluationism about vagueness on which utterances of vague sentences always semantically express multiple propositions, each of which is an admissible precisification of the utterance. Readers who like such views are advised to read talk of "the proposition (semantically) expressed" in this paper as making schematic claims that are intended to be true on any admissible precisification of any natural language, and to reinterpret the Naïve View, which will be introduced below, as the claim that, on each admissible precisification $\sharp$ of each natural language L, L has a semantic value assignment f that is both compositional and propositional, in the sense that f assigns to each L-sentence ϕ in each context c the unique proposition that is, according to $\sharp$, semantically expressed by ϕ in c.
4. It is likely that most advocates of this view are also committed to a stronger claim: that, for each natural language L, there is a function h and a semantic value assignment $\lambda c.\lambda X.[\![X]\!]_c$ such that, for each n-place syntactic operation O in L, all $X_1, \ldots, X_n$ for which O is defined, and for each context c,

$[\![O(X_1, \ldots, X_n)]\!]_c = h([\![X_1]\!]_c, \ldots, [\![X_n]\!]_c)$, and, if $O(X_1, \ldots, X_n)$ is a sentence, then $[\![O(X_1, \ldots, X_n)]\!]_c$ is the proposition expressed in c by $O(X_1, \ldots, X_n)$. This view does not allow the operations on semantic values that are paired with syntactic operations to vary with context, whereas the view stated in the text does. It is consistent with the latter but not the former, for example, that there is, in some natural language, a two-place sentential connective that has the same semantic value in all contexts and yet, in some contexts, forms a sentence that expresses the conjunction of the propositions expressed by its operands in that context, and, in others, forms a sentence that expresses their disjunction. Of course, if the weak view that allows such connectives has trouble handling quantification, as I will argue it does, then so does the stronger view that does not allow them.

5. But I do in Yli-Vakkuri (MS).
6. See, e.g., Cappelen and Hawthorne (2009: ch. 3), Zimmerman (2007: 345: n. 14), Stanley (2008: n. 43), Glanzberg (2007: 2), (2009: 285, n. 2), and (2011), and Ninan (2012a) (Ninan obseves that King's position on tense is consistent with the view that the "compositional semantic value of a sentence in a context is something richer than a proposition" [p. 402], but does not contest the consensus view that King's position on tense is unproblematically compatible with the Naïve View). Most recently, echoing much other literature, Brogaard (forthcoming) sums up the current consensus by stating that "one obvious way to refute the argument for them would be to maintain that the tenses are quantifiers and not [non-variable-binding sentential] operators (see King 2003)". Here Brogaard is referring to the use of the syntactic assumptions of Lewis's argument against the Naïve View in an argument for temporalism (the view that propositions vary in truth value over time), but clearly this reply, if it is any good, is equally good against Lewis's original argument against the Naïve View.
7. This is far from obvious, however. In fact, I think it's false: in Yli-Vakkuri (MS), I argue that the presence of non-variable-binding sentential operators that shift parameters other than world of evaluation in a language rules out the existence of a propositional and compositional semantic value assignment for the language only if propositions are coarse-grained.
8. I do not take any position on whether natural languages have multiple "levels" of syntax or not. 'Logical form' here designates whatever level of natural language syntax is relevant to semantics: if there is just one level (as in, e.g., Jacobson 2003), then logical form is it; if Chomsky (1995) is right, then logical form is what he calls 'LF'. Whatever else logical form may be, I will assume (except in §3.5, where a departure from this assumption is considered) that the logical forms of natural language sentences are tree structures that encode relations of immediate constituency. The notion of a syntactic operation used here does not rule out the view that the logical forms of sentences are related by transformations to syntactic structures at other levels (cf. Heim and Kratzer 1998: 187-8): relations of immediate constituency can be read off the trees produced by transformations.
9. See Dever (2006: 640) for a proof.
10. Deictic pronouns that are not capable of being bound (such as 'I') are not in the picture at all.
11. The only difference between the syntax used here and the syntax used in the Appendix to King (2007) is that the latter has restricted quantifiers. Some but

not all restricted quantifiers can, of course, be given contextual definitions using $\exists$, $\sim$, and $\wedge$, but in any case the presence in natural languages of restricted quantifiers is irrelevant to my arguments.

12. In fact, Lewis (1979) says that on his view the contents of belief and assertion are "properties" rather than "propositions": they are "properties" of agents and times—which may be represented as sets of centered worlds—but subsequent work in semantics has taken up his arguments (correctly, I think) as arguments for the view that propositions either are sets of centered worlds or have agent-relative and time-relative truth values: see, e.g., Ninan (2012a) and (2012b).
13. E.g., according to Kaplan, "it is natural to treat the assignment of values to free variables as simply one more aspect of context" (Kaplan 1989: 591). In the standard textbook in natural language semantics, Heim and Kratzer (1998), variable assignments are explicitly included in contexts (p. 243)—in fact, for all that Heim and Kratzer say, contexts may simply be variable assignments. See also Chierchia and McConnell-Ginet (1994: 130).
14. According to Heim and Kratzer:

> The only thing that distinguishes referring pronouns from bound-variable pronouns is that they happen to be *free* variables. In other words, the difference between referential and bound-variable pronouns resides in the larger surrounding LF [logical form] structure, not in the pronouns themselves (Heim and Kratzer 1998: 242, emphasis in the original).

Similarly, according to Chierchia and McConnell-Ginet, "pronouns on their deictic use are assimilated to free variables in the syntax of PC [the predicate calculus] and get their value from an assignment function" (Chierchia and McConnell-Ginet 1994: 130). May (1985: 21) also treats pronouns as capable of both bound and referential/deictic occurrences: "A pronoun", he says, occurs as "a bound variable only if it is within the scope of a coindexed quantifier phrase".

15. Nearly enough because the clause for the existential quantifier makes the semantics given here a constant-domain semantics. The alternative, a variable domain semantics, associates each $w \in W$ with a domain D_w, thought of as the set of individuals existing in w, and replaces the quantifier phrase 'for some g' that differs from g at most in what g' assigns to v_n' in the clause for the existential quantifier with 'for some g' that assigns a member of D_w to v_n and differs from g at most in what g' assigns to v_n'. However, the proof that the semantics is noncompositional will be the same regardless of whether we choose to work with a variable-domain semantics or a constant-domain semantics.
16. Note that this result does not turn on the syncategorematic treatment of the existential quantifier in classical intensional semantics: assign $\exists v_n$ any semantic value you like, and the semantics is still non-compositional.
17. Salmon's semantics is non-compositional—as Salmon acknowledges—for reasons having nothing to do with quantification, but rather with his treatment of putative non-quantificational tense operators (see King 2003: 209 for discussion). However, Salmon's treatment of quantification—which follows §3.1 in separating quantification from binding—is also non-compositional. By semantic clause 1 of Salmon (1986, Appendix C, p. 144), the semantic value of a variable x relative to a variable assignment g is $g(x)$, yet the semantic clause for binding (p. 146,

clause 28) sometimes assigns different semantic values to $x\phi$ and $y\phi$ (Salmon's way of writing $\lambda x\phi$ and $\lambda y\phi$) relative to a variable assignment when either x binds vacuously in $x\phi$ and y does not bind vacuously in $y\phi$ or y binds vacuously in $y\phi$ and x does not bind vacuously in $x\phi$—a counterexample to the compositionality of the semantic value assignment. Contrary to the objection I consider in §3.2, vacuous binding is permitted in Salmon's language by syntactic clause 10 (p. 144). Soames also follows §3.1 in separating quantification from binding, and his semantic clause for λ (Soames 2010, p. 73, clause b) makes binding, as usual, a non-compositional syntactic operation. It bears emphasis that neither Salmon nor Soames claim that their semantic theories are compositional, nor do they represent themselves as defenders of the Naïve View. King (2007), on the other hand, does represent himself as a defender of the Naïve View, but his semantics is not compositional for reasons discussed in §3.3.2(A).

18. Some story is required as to why AO should be false, and it is difficult to think of any view about the semantics of pronouns that would rule out, say, 'He$_{78}$ is a philosopher' and 'He$_{45}$ is a philosopher' expressing the same proposition in some context that would not also rule out the possibility of these sentences expressing the same proposition in distinct contexts. For example, suppose that the semantic value of 'he'$_{45}$ is in a context is a Fregean sense or mode of presentation of its referent in that context. Many things could enter into that mode of presentation—gestures, visual appearances, descriptions, etc.—but it is difficult to see why those same gestures, visual appearances, descriptions, or whatever else might enter into it could also not enter into the mode of presentation associated with 'he'$_{78}$ in the same context—unless the expression 'he'$_{45}$ itself either is part of or is its own mode of presentation in that context, in which case the mode of presentation is not purely qualitative, as Fregean senses are commonly thought to be, but *de re*. And it would have to be *de re* not (or not only) with respect to its referent—as *de re* senses are commonly thought to be by those who believe in them—but with respect to the expression 'he'$_{45}$ itself. But if what accounts for the distinctness of the propositions expressed by 'He$_{45}$ is a philosopher' and 'He$_{78}$ is a philosopher' in every context is the fact that the semantic values of 'he'$_{45}$ and 'he'$_{78}$ in every context are *de re* senses about, respectively, 'he'$_{45}$ and 'he'$_{78}$, then it is hard to see how 'He$_{45}$ is a philosopher' and 'He$_{78}$ is a philosopher' could express the same proposition even in different contexts. In the absence of any plausible story about why AO should be false, I will assume that AO is true.
19. On some views, the distinctness of the agents of c_{Cian} and c_{John} entails the distinctness of some other coordinates of the contexts—e.g., location, if the location of a context is the location the agent of the context occupies in the world of the context at the time of the context. On such views, we cannot assume that the remaining coordinates of the two contexts are the same—but we can assume that the remaining coordinates are qualitatively the same, as they are in the scenario to be described.
20. See Kaplan (1989: 571-572).
21. This view is favored by many semanticists: e.g., Heim and Kratzer (1998: §7.4.1) and Keenan and Moss (2002). The objection is inspired by Cappelen and Hawthorne's similar objection to Kaplan's "operator argument" (Cappelen and Hawthorne 2009: 34, n. 31).
22. Noam Chomsky himself denied it, in conversation.

23. See note 14 for references.
24. The example is not optimal: 'He$_n$ is an elegant writer' is arguably not an atomic sentence, and if so, AO has nothing to say about it. No matter, replace it with 'He$_n$ smokes', and the application of AO is unproblematic.
25. "This is a version of what Lewis derisively called *the schmentencite strategy*", King says, referring to his preferred syntactic treatment of tense, 'somewhere', 'sometimes', and the like (King 2007: 194, italics in the original).
26. In Lewis's actual proposal, which is obviously tongue-in-cheek, a sentence is obtained from a schmentence by writing a period at the end. This proposal has the flavor of the kind of syntactic stipulation that we saw, in §1, the Naïve View's adherents cannot be allowed.
27. For an explicitly compositional semantics, we would, of course, have to assign semantic values to $\exists$, $\sim$, $\wedge$, and to quantifier prefixes, but I use the more standard, syncategoric presentation both here and in the discussion of King-style schmentencism below because is more reader-friendly. It does not matter much what the semantic values of the logical constants are—they can be their own semantic values, for example, or they can be the corresponding logical properties, and the semantic value of a quantifier prefix $\exists v_n$ under g could simply be the semantic value of v_n under g (because there is only one quantifier in the object language, the semantic value of that quantifier contributes nothing useful to the semantic value of a quantifier prefix). This solution would also work for (1*)-(7*).
28. For suppose that $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_m))$ could occur as a constituent in another sentence. Then we would have sentences $\sigma\forall v_m\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_m))$ and $\sigma\forall v_m\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_k))$, with $k \neq m$, which intuitively have different intensions in every context; yet on the semantics, $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_m))$ and $\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_k))$ express the same proposition with respect to any context (variable assignment) that assigns the same object to v_m and v_k, so in such a context $\sigma\forall v_m\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_m))$ and $\sigma\forall v_m\sigma\forall v_n(Pv_n \rightarrow Bv_n(Ev_k))$ would also have to express the same proposition if the semantic value assignment were compositional.
29. See note 25.
30. The closest King comes to explicitly acknowledging the problem is in footnote 3 to the Appendix (King 2007: 220), which, however, is a comment on the non-compositionality of his treatment of *conjunction*. The failure of compositionality here involves the *linking* of two free occurrences of variables in the immediate constituents of a conjunction.
31. With the exception, already noted, that King's syntax allows restricted quantifiers.
32. King (2007: 219) calls occurrences of _ "empty argument positions", but if the semantics is to be compositional, _ must be considered a semantic value rather than a way of representing the absence of a semantic value.
33. Indeed, it is difficult not to see King's semantics as an instance of the approach Fine (2007) calls *semantic relationism*, which, in Fine's presentation, is explicitly non-compositional: see note 44.
34. King's "on some notion of compositionality" might seem to suggest that he has in mind an alternative to the notion of compositionality employed here and in Lewis (1980) (see my note 2 above); however, no alternative is offered in King (2007). In any case, if King did have an alternative notion (or notions) of

compositionality in mind, that alternative notion (or those notions) would not be relevant to the dialectic between King and Lewis. Since King represents himself as replying to Lewis's attack on the Naïve View, the interpretation that is relevant to the dialectic between King and Lewis—whether or not it is correct—has him deploying the same notion of compositionality as Lewis.

35. Like the semantics for Sentencization above, this semantics is not explicitly compositional because it does not assign semantic values to all expressions of the object language, but it is a trivial matter to convert it into one that does: see note 27.
36. In standard algebraic terms, $E_n(f)$ is the *n*th projection of f.
37. A trivial change, which simplifies exposition, is that I also treat the logical operators as their own semantic values. One could also say, as structured-propositions theorists tend to do, that the sematic value of a logical operator is not the operator itself but the logical property it represents or expresses. This is an appropriate response to the objection that, e.g., an English negation and a Finnish negation may express the same proposition in spite of the English and Finnish negation words being distinct.
38. If v_n has no free occurrences in ϕ, v_n has no occurrences in $[\![\phi]\!]$, and consequently v_n has exactly one occurrence in $[[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]]$, so the *linking* stage of the *Link-and-Erase* is carried out with respect to $[[\![\exists]\!], [\![v_n]\!], [\![\phi]\!]]$ by doing nothing, and the *erasing* stage gives us $[[\![\exists]\!], \_, [\![\phi]\!]]$.
39. See Salmon (2003: 367-369).
40. To quote:

> Consider, for example, the case of a sentence with an unbound pronoun, such as
> (7) He lost
> Under the system here … its meaning [semantic value] is of type ⟨**e**, **t**⟩ rather than of type **t**. But we can assume that in order to extract propositional information from this, a listener will apply this function to some contextually salient individual …
> The important point is that we do not need to posit any kind of lexical ambiguity between free and bound pronouns—a happy result since the full set of such pronouns are morphologically identical, and it would be suspicious to treat free and bound pronouns as accidental cases of homonymy (Jacobson 2003: 62).

41. Why must σ be a constituent of the sentence? Because it was assumed in §1 that, the syntactic operations of a language are those that build its expressions from their immediate constituents: that is, for each syntactic operation O, $O(X_1, \ldots X_n)$, when defined, is an expression whose immediate constituents are $X_1, \ldots X_n$. The standard notion of compositionality requires this (see note 2). Of course, once we have σ as a constituent, we don't need linking as a syntactic relation at all—all of the information about which occurrences of x are syntactically linked to which others is already encoded by σ.
42. Note that one cannot combine indexed linked syntax with a form of schmentencism that allows variables to occur free in sentences. If ϕ is a sentence with a free occurrence of the *n*th variable, then, by the Naïve View, the semantic value of

$\exists v_n \phi$ in a context is determined by n and the proposition ϕ expresses in that context; but, again, this requires the positions of any free occurrences of v_n in ϕ to be recoverable from the proposition expressed by ϕ in a context, and propositions do not encode such information.

43. See Fine (2007: 30).
44. "Compositionality, as it is usually formulated, must be given up" (Fine 2007: 26). Compositionality, "as it is usually formulated", being the requirement that one's semantic theory define a semantic value assignment for its object language that is compositional in the sense of this paper, of Lewis (1980), and of the literature on compositionality (see note 2 above).
45. See Kaplan (1977: §VII) for the monster prohibition. Although it is not perfectly clear that Kaplan means this, I am assuming that a "monster" in Kaplan's sense is a sentential operator O such that the assignment of "Contents" (intensions as sets of world-time pairs) to sentences in contexts is not compositional for the syntactic operation of applying O to a sentence. Yet Kaplan's semantics contains monsters, in this sense, for the reason pointed out in §2.1: $\exists$ is a monster, in this sense, in Kaplan's semantics. See Rabern (2013) for a discussion of Kaplan's monsters.
46. The phrase "infinite use of finite means", which is frequently quoted by Chomsky (e.g. 1970: 405), is from Wilhelm von Humboldt.
47. See Janssen (1997: 419) and Dever (2006: 658).
48. In fact, Janssen (1997) and Dever (2006) both discuss compositionality as a property of assignments of meanings to expressions.
49. The principle of the compositionality of character-*cum*-meaning may well turn out to be costly to maintain as well—in fact, I suspect that it is, but not for reasons having to do with quantification or binding. The expressions we use for talking about vagueness (such as 'determinately' and 'It is borderline whether . . . ') and for introducing or increasing vagueness or weakness (such as 'roughly' and 'approximately') present an interesting test case. Litland and Yli-Vakkuri (MS) argue that 'determinately' and related expressions are *character-shifting operators*: devices used for generalizing over alternative assignments of characters, not merely contents, to the words occurring in their scopes. If that is correct, we should not expect even the assignment of characters to natural language sentences and their constituents to be compositional.

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