Against the identification of assertoric content with compositional value

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Abstract   This essay investigates whether the things we say are identical to the things our sentences mean. It is argued that these theoretical notions should be distinguished, since assertoric content does not respect the compositionality principle. As a paradigmatic example, Kaplan's formal language LD is shown to exemplify a failure of compositionality. It is demonstrated that by respecting the theoretical distinction between the objects of assertion and compositional values certain conflicts between compositionality and contextualism are avoided. This includes the conflict between eternalism and the semantics of tense, the embedding problems for contextualism about epistemic modals and taste claims, and the conflict between direct reference and the semantics of bound pronouns (and monstrous operators). After presenting the theoretical picture which distinguishes assertoric content from compositional semantic value, some objections to the picture are addressed. In so doing, the objection from King (Philos Perspect 17(1):195–246, 2003) stemming from apparent complications with the interaction of temporal expressions and attitude reports is assessed and shown to be non-threatening.

Keywords   Assertoric content · Compositionality · Contextualism · Propositions · Direct reference · Monsters · Embedding · Semantics

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The best theory of compositional semantics should cohere with the general theory of speech acts, including the theory of assertion, and the broader systematization of linguistic communication. This is so, even though the way in which these disciplines fit together and interact is not always clearly articulated. Something would clearly have gone wrong if our theory of what our sentences *mean* didn't fit naturally with our theory of the things we *say* by the act uttering those sentences.

Roughly speaking, when someone makes an assertion by uttering a sentence ϕ, they offer up some information for their audience to consider.[1] This information that is offered up is the content of the utterance, i.e. it is *what is said* by the act of uttering the sentence ϕ. Let's call what is said by the utterance of a sentence the *assertoric content* of a sentence. I intend "the assertoric content of a sentence (in a context)" to mean roughly the same thing as the following phrases[2]:

- der von einem Satz ausgedrückte Gedanke (Frege 1892)
- the proposition expressed by an utterance (Moore 1927)
- "what is said" by an utterance (Kaplan 1989a)
- what an assertion adds to the common ground (Stalnaker 1978[3])
- the propositional content of an utterance (Lewis 1980)
- the information content contained in a sentence (Salmon 1986)
- the proposition expressed by a sentence (King 2007).

The assertoric content of a sentence somehow depends on the expressions that are its syntactic constituents. For example, an utterance of 'Some monkeys have tails' asserts something very different from an utterance of 'Some *donkeys* have tails'—and anyone who knows what an utterance of 'Some monkeys have tails' asserts and understands 'donkey', will thereby know what an utterance of 'Some donkeys have tails' asserts. So by systematically substituting meaningful words into grammatical forms we are able to produce infinitely many novel sentences, the utterances of which are understandable by members of our linguistic community.

These phenomena call for an explanation. The hypothesis that our natural languages are compositional is standardly thought to be the best explanation. The *principle of compositionality* can be glossed as the principle that the meaning of any complex expression is determined by the meanings of it parts and the way they are put together. This is more carefully defined as follows.

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[1] I want to stay neutral on the nature of assertion here—except for the claim that assertions have *content*. One can substitute in their favorite theory of assertion, e.g. to make an assertion is to propose to add information to the common ground, or it is to undertake a commitment to the truth of a proposition, or it is to express an attitude toward a propositional content. For a theorist who denies a role for the theoretical notion of *the content of assertion*, the questions raised in this essay regarding the relationship between compositionality and assertoric content will not be so pressing. Nevertheless, there is still the question about how compositional semantics relates to the act of assertion.

[2] Likewise, this is what Yalcin (2007) means by "the informational content of an assertion" and what Egan (2007) means by "the content of an assertive utterance" and what Stanley (1997) and Ninan (2010) mean by "assertoric content".

[3] Roughly, the *common ground* of a conversation is the set of mutually (and knowingly) presupposed propositions. And the speech act of assertion has the effect of updating the common ground of the conversation by *adding* the content of the assertion.

Principle of Compositionality.[4] Let m be the function that maps an expression α to its *meaning*. Then for every syntactic rule R there is a semantic operation f_R such that $m[R(\alpha_1, \alpha_2, \ldots, \alpha_n)] = f_R[m(\alpha_1), m(\alpha_2), \ldots, m(\alpha_n)]$.[5]

But what do we *mean* by "meaning" in this definition? Assume we understand the "meaning" of a sentence to be *what is said* by utterances of it. Is the assertoric content of a sentence determined by the assertoric contents of its parts and the syntax?[6] *Prima facie*, that seems right. Consider some examples: (i) What is said by an utterance of 'Oregon is south of Washington and Oregon is north of California' seems to depend on the assertoric contents of 'Oregon is south of Washington' and 'Oregon is north of California'; (ii) What is said by an utterance of 'Atticus believes that mirrors are windows into an alternate universe' seems to depend on the assertoric content of 'Mirrors are windows into an alternate universe'.

Surveying a wider array of examples, however, casts doubt on this initial appearance. In fact, there is a general tension between various contextualist theories of assertoric content and this compositionality principle. In slogan form we can say that the problem arises when *expressions that say the same thing embed differently*. Or to be a bit more precise the problem arises when the following conditions are met.

Failure of compositionality of assertoric content. (i) ϕ and ψ have the same assertoric content at c and, (ii) there is a linguistic environment Σ such that $\Sigma(\phi)$ and $\Sigma(\psi)$ do not have the same assertoric content at c.[7]

To get a common example of this type of failure on the table consider the following two sentences.

(1) It is raining.
(2) It is raining now.

Many theorists will insist that these two sentences *say the same thing* in the sense that at time t they both express the eternal proposition to the effect that it is raining

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[4] This is the formulation of basic compositionality, Funct(μ), provided in Pagin and Westerståhl (2010).

[5] To define *syntactic rule* let Γ be the set of well-formed expressions of $\mathcal{L}$ (including the atomic expressions). Each syntactic rule R is a partial function that maps tuples of members of Γ to a member of Γ, e.g. R_{NP} maps the nominal 'monkey' and the determiner 'the' to the noun phrase 'the monkey'.

[6] Do subsentential expressions even have assertoric content? It is usually assumed that they do. This is what is often called their "content", "semantic content", or "propositional contribution". For example, this is what is being invoked when theorists ask "What do names contribute to the propositions expressed by sentences they occur in?". This issue, of course, is tied up with issues surrounding compositionality, so I don't want to prejudge the issue. If one insists that the notion of assertoric content only makes sense for sentences, note that everything in this paper can be done in terms of the assertoric contents of *sentences* (which occur as syntactic constituents of complex sentences, e.g. in Sect. 1 I could talk about the sentence 'Fx' instead of the variable 'x'). For the purpose of the paper I will talk as if non-sentences have assertoric contents but my official position is that we can, if we want to, assign assertoric contents to non-sentential expressions—even though with respect to issues surrounding compositionality we need not.

[7] To be more careful let A be the function that takes an expression ϕ and a context c and gives the assertoric content of ϕ in c. The compositionality of assertoric content fails iff it is not the case that for every syntactic rule R there is a semantic operation f_R such that $A[R(\phi_1, \phi_2, \ldots, \phi_n), c] = f_R[A(\phi_1, c), A(\phi_2, c), \ldots, A(\phi_n, c)]$. See Pagin and Westerståhl (2010) for various formulations of the compositionality principle, including principles like this which accommodate context-sensitivity.

at t.[8] But now consider sentences (1) and (2) embedded under the past tense operator PAST.[9]

(3) [[PAST] [it is raining]]
(4) [[PAST] [it is raining now]]

It is clear that (3) and (4) do not have the same assertoric content at t. While the truth of what is said by an utterance of (3) at t depends on the weather situations of times prior to t, the truth of (4) at t only depends on the weather situation at t. So we have a conflict between the eternalist commitments about assertoric content and the compositionality principle in terms of assertoric content.[10]

This general pattern crops up all across semantic theorizing, since certain commitments about assertoric content do not always play nice with the semantics of embedded clauses. I will now briefly rehearse some of the most discussed cases. The reader should keep these cases in mind throughout the paper and I will return to these at the end when summing up the general methodological lessons. In each of the examples below, the contextualist commitment on assertoric content comes into conflict with the compositionality principle, when the context-sensitive expressions are embedded in a more complex sentence.

There is a conflict between contextualism about epistemic modals and the semantics of embedded modals. The contextualist holds that, in a given context, utterances of sentences (5.1) and (5.2) assert the same thing.[11] But this conflicts with the compositional semantics of sentence (5.3) where (5.1) occurs as a syntactic constituent.

(5.1) Dave might be in Oxford.
(5.2) It is consistent with what I know that Dave is in Oxford.
(5.3) Leon said that *Dave might be in Oxford*.

Likewise, there is a conflict between perspectivialism about taste claims and the semantics of embedded taste claims. The perspectivalist holds that, in a given context, utterances of sentence (6.1) and (6.2) assert the same thing.[12] But this causes trouble for the compositional semantics of sentence (6.3).

(6.1) Licorice is tasty.
(6.2) Licorice is tasty to me.
(6.3) According to Jonathan *Licorice is tasty*.

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[8] The many theorists include (e.g.) Richard (1982), Salmon (1986), King (2003) among many others (and we could plausibly include Frege (1892)).

[9] PAST has the same semantics as Prior's tense operator P = 'It has been the case that': "…the past-tense statement 'It has been the case that Professor Carnap is flying to the moon', that is, 'Professor Carnap has been flying to the moon' *is* true if and only if the present-tense statement 'Professor Carnap is flying to the moon' *has been* true" (Prior 1957, p. 9).

[10] There are many important subtleties that I am glossing over here. See Weber (2012) for a careful and detailed analyses of the conflict between eternalism and the compositional semantics of tense. See also King (2003) and Schaffer (2012).

[11] See Egan et al. (2005) and Weatherson (2008) for a discussion of contextualism about epistemic modals and the problems of embedding.

[12] See Schaffer (2011).

For a final illustration of the conflict consider the direct reference theory of indexicals and the semantics of bound pronouns.[13] The direct reference theorist holds that, in a given context, utterances of sentence (7.1) and (7.2) assert the same thing. But this causes trouble for the compositional semantics of sentence (7.3).

(7.1) He is mortal.   (where Socrates is the salient male)
(7.2) Socrates is mortal.
(7.3) Every man is such that *he is mortal*.

I do not mean to suggest that there is no way to resolve these conflicts.[14]

There are, in fact, many strategies to pursue. Below are the main options in broad outline.

Deny compositionality. Give up or significantly alter the compositionality principle.

Deny contextualism. Give up the relevant "contextualist" commitment on assertoric content.[15]

Deny embedment. Deny that the sentences (or expressions generally) syntactically embed in the relevant environments.[16]

Deny innocence. Deny semantic innocence and opt for an occurrence-based semantics or a multi-valued semantics.[17]

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[13] The problem is even more acute, if we consider the semantics of "shiftable pronouns" (see Schlenker 2003) and monstrous operators or the semantics of free variables and variable-binding. Consider Heim-sentences like "Only I got a question I understood" or "Foxes have holes, and every bird its nest, I, only I, must wander wearily, And bruise My feet, and drink wine salt with tears" (from Oscar Wilde's poem *Easter Day*).

[14] The tension arises for other contextualist theories as well, e.g. contextualism about gradable adjectives ('tall'), epistemic contextualism, moral contextualism, etc. Another case which doesn't have much to do with contextualism is from Dummett (1991, p. 48): ϕ and TRUE(ϕ) say the same thing. But in a three valued logic $\neg\phi$ and $\neg$TRUE(ϕ) can differ in truth-value, since if ϕ is neuter so is $\neg\phi$ but $\neg$TRUE(ϕ) is true.

[15] For example, if one denies contextualism about epistemic modals and instead adopts a relativistic conception of assertoric content along the lines of Egan (2007) the tension dissolves. Likewise, in the tense case, if one gives up the relevant contextualist commitment (i.e. eternalism) and instead follows Kaplan (1989a) by adopting temporalism the problem disappears.

[16] For example, in the tense example above King (2003) insists that sentences (1) and (2) do not actually occur as syntactic constituents of the past tense versions of the sentences. (This is what Lewis (1980) calls *the schmentencite strategy*.) In this way, the assertoric content/compositional value of (1) and (2) can be said to be the same eternal proposition (see Weber 2012). Is it plausible that the true nature of the objects of assertion is decided by the correct syntactic representation of tense?

[17] By occurrence-based semantics I mean a view on which we don't assign semantic values to expressions in isolation but only relative to a linguistic environment (cf. Salmon 2006). Also included here are semantic theories influenced by Frege's machinery of referential shift, where the semantic value of an expression shifts when embedded in certain environments (e.g. ungerade environments). Depending on how this option is actually carried out it will most likely also fall under *Deny compositionality*. David Chalmers (p.c.) has suggested the related option of having semantic values/assertoric contents be e.g. tuples consisting of both an eternal proposition and a temporal proposition. In this way the assertoric content of 'It is raining' would be an entity consisting of an eternal and temporal proposition and temporal operators could operate on this complex entity. This idea is worth pursuing but notice that it brings with it certain controversial commitments on assertoric content, i.e. the things we say are ordered pairs of temporal and eternal propositions. See Chalmers (2011) for some related ideas.

Deny identification. Give up the identification of assertoric content with compositional semantic value.

It is not my primary aim in this paper to argue that most of these options are untenable. I will, however, just mention that if one wants to keep certain theoretical commitments about the contents of assertion, which aren't held hostage to certain syntactic theories, while retaining semantic innocence and a strong form of the compositionality principle, then denying the identification thesis is the preferred option. This is the option I want to explore. Since I will often be referring to this thesis and its denial, let's explicitly state it.

Identification thesis. The compositional semantic value of an expression is identical to its assertoric content.

An underlying motivation for this paper is this insight: "by denying the identification thesis we can free up the theoretical notion of assertoric content from the confines of compositionality and free up compositional semantics from the confines of the theory of assertion".

The overall plan for the essay is to outline the theoretical picture that results from denying the identification thesis and to see if there are any devastating objections to such a view. I will argue that there are not. But first in Sect. 1 I will present in more detail a paradigmatic example of a failure of compositionality. I will show that Kaplan's formal language *LD*—*the logic of demonstratives*—exemplifies a failure of the compositionality of assertoric content (i.e. it is not compositional at the level of Kaplanian content). This failure is due to a tension between the compositional semantics of quantification and Kaplan's direct reference commitments on the assertoric content of variables. In Sect. 2 I will then present the picture of semantic theorizing that denies the identification thesis—a picture explicated and endorsed by Lewis (1980). From this theoretical perspective the apparent tensions—outlined above—between the various contextualist theories and compositionality dissolves. Finally, in Sect. 3 I will address a worry about such a view having to do with the semantics of speech reports (and attitude reports generally) raised in King (2003)—*the mismatch worry*. I will show that this type of worry is not in the end threatening. In so doing, I will address King's charge (aimed at Salmon 1986) that denying the identification thesis gives rise to complications with the interaction of temporal operators and attitude reports.

1 Kaplanian content and compositionality

1.1 Kaplanian content

The *Kaplanian content* of an expression at a context c is the propositional contribution that the expression makes in c. For Kaplan (1989a) this means two things:

(T1) The content of an expression in a context c is "what is said" or *expressed* by an expression in c.
(T2) The content of any complex expression in c is determined by the contents (in c) of its syntactic constituents and the way they are put together.

Kaplan is very explicit about (T1) but he is not as explicit about (T2).[18] It is clear, however, that he endorses both theses. A commitment to (T2) is implicit both when discussing what is known as *the operator argument* in connection with temporal and locational operators and when he is discussing monstrous operators.

When discussing his notion of content Kaplan insists that contents cannot be specific with respect to time, since if they were this would give the wrong result for the compositional semantics of temporal operators.

> If we built the time of evaluation into the contents…, it would make no sense to have temporal operators. To put the point another way, if *what is said* is thought of as incorporating reference to a specific time…it is otiose to ask whether what is said would have been true at another time…Temporal operators applied to eternal sentences (those whose contents incorporate a specific time of evaluation) are redundant. (Kaplan 1989a, p. 503)

The argument here is that if the contents of sentences (in context) are specific with respect to time then all temporal operators would be vacuous—but not all temporal operators are vacuous. Thus, the contents of sentences (in context) are neutral with respect to time. A premise in this argument is the thesis that the content of a sentence in a context (i.e. what is said by the sentence) is what temporal operators operate on.[19]

One could resist the conclusion that the things we say are temporally neutral by denying the premise that temporal operators operate on the contents of their embedded sentences. Instead, one could insist that temporal operators operate on functions from times to assertoric contents.[20] But to do so would be to give up the identification thesis (T2)—that the assertoric content of a sentence in a context *c* is a function of the assertoric contents (in *c*) of its syntactic constituents. Kaplan does not opt for this maneuver even though he notices that his commitments on content (what is said) are in tension with a classical eternalist conception of content.[21] Since he accepts the argument from premises about compositionality to conclusions about asserted content, it seems he must be assuming that the semantic composition rules are defined over assertoric contents.

We can also see Kaplan's commit to (T2) is in his famous discussion of *monsters*. Monsters are operators which take characters as argument, e.g. "To the left" is

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[18] Kaplan never actually uses the term "compositionality", instead he talks about what kinds of "semantic operations" exist in the language.

[19] This premise is explicitly stated a few lines earlier when he says: "Operators of the familiar kind treated in intensional logic (modal, temporal, etc.) operate on *contents*. (Since we represent contents by intensions, it is not surprising that intensional operators operate on contents)". Kaplan (1989a, p. 502), emphasis added.

[20] Cf. Salmon (1986) and Richard (1982).

[21] He says, "This functional notion of the content of a sentence in a context may not, because of the neutrality of content with respect to time and place, say, exactly correspond to the classical conception of a proposition. But the classical conception can be introduced by adding the demonstratives 'now' and 'here' to the sentence and taking the content of the result. I will continue to refer to the content of a sentence as a proposition, ignoring the classical use" (Kaplan 1989a, p. 504). Its not clear what he means by "introduce" but here he comes very close to making the distinction between compositional content and assertoric content where the assertoric content of a sentence is the same as what its compositional content would be if 'now' and 'here' operators were added to it.

monstrous, on the assumption that "To the left, I am hungry" is true in a context c just in case the agent to the left of the speaker in c is hungry.[22] Kaplan claims that there are no monsters in English.[23]

> Operators like 'In some contexts it is true that', which attempt to meddle with character, I call monsters. I claim that none can be expressed in English…And such operators could not be added to it. (Kaplan 1989a, p. 511)

The monster prohibition can be understood as a thesis about the compositional mechanisms of the language. Within the Kaplanian framework it is equivalent to the claim that all operators in the language are either extensional or intensional operators—that is there are no hyperintensional semantic operations.[24]

> **Monster prohibition (Compositionality Formulation).**[25] There is no operator (or quantifier) Σ of a natural language $\mathcal{L}$ such that $[\![\Sigma\phi]\!]^{c,i}$ fails to be a function of $\lambda i.[\![\phi]\!]^{c,i}$.

Kaplan himself glosses his monster prohibition as the thesis that "all operators that can be given an English reading are *at most* intensional [i.e. content operators]" (Kaplan 1989a, p. 502n27). Assuming composition is functional application in the manner of Heim and Kratzer (1998), the claim that all operators are "at most" intensional can be understood as the thesis that natural language semantics need not include the following semantic composition rule.

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[22] This example is due to Gareth Evans. See Evans (2004) (which is a letter dated 14 July, 1979, written to Martin Davies in response to a draft of "Two notions of necessity") and Evans (1985, pp. 357–358), where Evans discusses what he calls *a hitherto unknown form of embedding*: "Suppose that there is a language exactly like English, save that it possesses two additional operators, 'To the right', and 'To the left', which can be prefixed to sentences in the first person. A sentence like 'To the left (I am hot)' as uttered by a speaker x at t is true iff there is at t on x's left someone moderately near who is hot."

[23] This has been challenge by some recent empirical linguistics, see, for example, Schlenker (2003), Anand and Nevins (2004), and Sauerland and Schenner (2009).

[24] By a "hyperintensional operator" I mean operators which map intensionally equivalent expressions to different values. Within the Kaplan framework intensions are function from circumstances (i.e. tuples of worlds and times (and perhaps locations)) to extensions. For Kaplan the only hyperintensional operators on his radar are character-operators. But, of course, one could modify Kaplan's framework such that there where operators, which were non-monstrous, in the sense of not being character-operators, but were also hyperintensional operators. For example, quotational operators or operators that operate on the syntax of their embedded clause—perhaps "___ is so-called because of his size". Also included here are operators on *structured meanings* (cf. Lewis 1970)—whether these operate on structures of intensions or structures of characters, they will not be "merely intensional" in Kaplan's sense but they will also not be monstrous, strictly speaking. So when I say that the monster prohibition is equivalent to the claim that composition goes down at the intensional level, this is a claim made within the restricted Kaplanian framework where the only hyperintensional meanings floating around are characters. Thanks to Wolfgang Schwarz and Daniel Nolan for discussion here.

[25] Throughout this article I will use the standard notation from linguistic theory, where "$[\![\phi]\!]^i$" is used to mean "the extension of ϕ at i". I will also employ lambda notation to talk about functions and properties. In this way "$\lambda x.x + 1$" refers to the function from objects x to the successor of x. I will often use lambdas prefixed to denotation brackets to talk about functions from various parameters to extensions, e.g. "$\lambda w.[\![\phi]\!]^{c,w}$" refers to the function from worlds w' to the extension of ϕ at context c and world w' and "$\lambda c, w.[\![\phi]\!]^{c,w}$" refers to the function from contexts c' and worlds w' to the extension of ϕ at context c' and world w'.

MONSTROUS FUNCTIONAL APPLICATION.
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any context c and index i: if $[\![\beta]\!]^{c,i}$ is a function whose domain contains $\lambda c, i.[\![\gamma]\!]^{c,i}$, then $[\![\alpha]\!]^{c,i} = [\![\beta]\!]^{c,i}(\lambda c, i.[\![\gamma]\!]^{c,i})$.

Kaplan's monster prohibition, then, is most naturally understood as supported by a thesis about compositionality, namely the thesis that the semantic composition rules are defined over Kaplanian content. This thesis about compositonality combined with the thesis that assertoric content of an expression is never the character of an expression, entails the thesis that the language fails to contain monstrous operations. Although Kaplan does not provide an explicit argument against the existence of monsters, we can give a rational reconstruction of an argument that is implicit in Kaplan (1989a), since he holds premises that entail the monster ban.

KAPLAN'S MASTER ARGUMENT AGAINST MONSTERS

Premise 1. The compositional semantic value of a sentence (in a context c) is identical to "what is said" by the sentence (in c).

Premise 2. What is said by a sentence (in c) is never the character of the sentence.

Conclusion. Therefore, the compositional semantic value of a sentence (in a context c) is never the character of the sentence. And so a sentential operator never takes as argument the character of its embedded subsentence in a context, i.e. no *monsters*.

Premise 1 of this argument is just another way to state the identification thesis (T2), thus if Kaplan does not endorse (T2), then his implicit master argument against monsters is undercut. So here, again, I think we have sufficient reason to conclude that Kaplan does indeed endorse (T2): that the Kaplanian content of any complex expression in c is determined by the Kaplanian contents (in c) of its syntactic constituents and the way they are put together.

1.2 Composition failure in LD

What I will now argue is that Kaplan's formal language LD, *the logic of demonstratives*, is not compositional at the level of Kaplanian content. The basic problem is a tension between Kaplan's direct reference commitments on the contents of variables and the compositional semantics for the quantifiers of predicate logic. To demonstrate the problem I will focus only on the fragment of Kaplan's LD that has to do with variables and quantification.[26]

In the syntax we have a set of variables, $\{x_i\}_{i\in\mathbb{N}}$, a set of predicates $\{F_i^n\}_{i,n\in\mathbb{N}}$ (where F_i^n is an n-place predicate), the truth-functional connectives $\wedge$ and $\neg$ and the quantifiers $\forall$ and $\exists$. For these we have the following (relevant) formation rules:

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[26] The formal system LD is presented in Kaplan (1989a, §XVIII, pp. 541–553). In what follows I make a few notational changes to ease the exposition.

- If π is an n-place predicate and $\alpha_1, \ldots, \alpha_n$ are variables, then $\pi(\alpha_1, \ldots, \alpha_n)$ is a formula.
- If ϕ is a formula and α is a variable, then $\forall\alpha\phi$ and $\exists\alpha\phi$ are formulae.

For the semantics of LD we have a structure $\{C, W, T, U, I\}$, where C is the set of contexts, W is the set of worlds, T is the set of times, U is the set of individuals, and I is an interpretation function (which gives extensions to predicates at circumstances $j \in T \times W$).

A point of evaluation is a quadruple $\langle c, f, t, w \rangle$ where $c \in C, t \in T, w \in W$ and f is an assignment function. An assignment function f is a function from variables to individuals, $f : \{x_i\}_{i\in\mathbb{N}} \to U$. We write $f[\alpha := i]$ to denote the assignment function that is just like f except that it assigns the individual i to the variable α. And, as usual, for an expression β we write $[\![\beta]\!]^{c,f,t,w}$ for "the extension of β at the point $\langle c, f, t, w \rangle$" (we omit mention of the structure). Given this setup we can recursively define 1 (or "truth") at a point of evaluation as follows:

- $[\![\alpha]\!]^{c,f,t,w} = f(\alpha)$
- $[\![\pi\alpha_1, \ldots, \alpha_n]\!]^{c,f,t,w} = 1$ iff $([\![\alpha_1]\!]^{c,f,t,w}, \ldots, [\![\alpha_n]\!]^{c,f,t,w}) \in I_\pi(t, w)$.
- $[\![\forall\alpha\phi]\!]^{c,f,t,w} = 1$ iff for all $i \in U$, $[\![\phi]\!]^{c,f[\alpha:=i],t,w} = 1$.
- $[\![\exists\alpha\phi]\!]^{c,f,t,w} = 1$ iff there is an $i \in U$, $[\![\phi]\!]^{c,f[\alpha:=i],t,w} = 1$.

Notice that the semantic entries for the quantifiers here are syncategorematic, so it is left implicit what the exact compositional values and rules are. But what the compositional mechanisms must be is in direct conflict with Kaplan's commitments on the contents of variables.

Kaplan insists that a "variable's first and only meaning is its value" and that they are the paradigms of directly referential terms (Kaplan 1989a, p. 484; 1989b, pp. 571–573). Kaplan gives an explicit account of the contents of variables and open formulae in the section called "Remarks on the Formal System". Here he introduces the notation $\{\alpha\}_{c,f}$ to mean "the content of α in the context c under the assignment f" and tells us that the content of a variable is as follows.

- If α is a variable, then $\{\alpha\}_{c,f} = $ that function which assigns to each $t \in T, w \in W$, $[\![\alpha]\!]^{c,f,t,w}$ (Kaplan 1989a, p. 546).

That is, the content of α at a context c and assignment f is the function $\lambda t, w.[\![\alpha]\!]^{c,f,t,w}$, which for any input $\langle t', w' \rangle$ outputs $f(\alpha)$, i.e. $\{\alpha\}_{c,f}$ is a constant function from circumstances to $f(\alpha)$. The content, then, of a variable (or an open formula) is only given relative to an assignment function.

Now consider the following two formulae.

(8) Fx
(9) Fy

According to Kaplan, these formulae only have content relative to a context c and an assignment f. The context parameter c is of no significance in this case as there are no indexicals present. But the contents of these formulae can vary across assignment functions. Let's assume f assigns the same individual to 'x' and 'y', so f('x') = f('y'). It follows that the content of (8) at $\langle c, f \rangle$ is identical to the content of (9) at $\langle c, f \rangle$—in Kaplan's notation we have: $\{Fx\}_{c,f} = \{Fy\}_{c,f}$. Now consider the following more complex formulae.

(10) $\forall x\,Fx$
(11) $\forall x\,Fy$

Clearly it could be that $f(\text{`}y\text{'})$ is F without everything being F. But then the content of (10) at $\langle c, f \rangle$ should not be the same as the content of (11) at $\langle c, f \rangle$—that is $\{\forall x\,Fx\}_{c,f} \neq \{\forall x\,Fy\}_{c,f}$. But, of course, if the content of (10) and (11) at $\langle c, f \rangle$ are functions of the contents of the quantifier '$\forall x$' and (8) and (9) at $\langle c, f \rangle$ respectively, then the contents of (10) and (11) at $\langle c, f \rangle$ must be identical. Something has to give. There is a clash between the claim that the content of a quantified sentence is compositionally determined by the contents of its parts and Kaplan's commitments on the contents of variables and open formulae (i.e. the claim that variables are directly referential). Let's explicitly state these conflicting claims.

> **KapCM.** The Kaplanian content of any complex expression at a context and assignment $\langle c, f \rangle$ is determined by the contents at $\langle c, f \rangle$ of its syntactic constituents and the way they are put together.

> **KapDR.** The Kaplanian content of a variable α, $\{\alpha\}_{c,f}$, is that function which assigns to each circumstance, $f(\alpha)$.

Giving up either of these will resolve the tension. KapDR is explicitly stated in Kaplan (1989a), so I conclude that Kaplan's LD fails to satisfy KapCM. If LD has a compositional semantics (and it does), then it cannot be given in terms of Kaplanian content.[27]

Kaplan's LD is not compositional, under the two Kaplanian assumptions that semantic composition is *content* composition and that the *contents* of variables are constant functions.[28] There are, however, some maneuvers (analogous to those outlined above), which one might be tempted to make at this point.

Someone might respond by insisting that I've conflated Kaplan's commitments about "free" variables with his commitments about "bound" variables. In response, I need only point out that there is no such distinction between different kinds of variables in LD. There are simply the members of $\{x_i\}_{i\in\mathbb{N}}$, which can occur both free and bound and there is no semantic/syntactic distinction made between them. So my argument, which is an argument about LD is undeniable on this score. It is true, however, that Kaplan seems to assume a semantic/syntactic distinction between the *free* and *bound* occurrences of a variable (note the similarity here to his treatment of the semantics of deictic and bound uses of pronouns). It is not at all transparent how this distinction is to be implemented, so a simple appeal to a distinction between free and bound uses of variables is just a label for the problem. And, of course, there are

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[27] The semantic account of Heim and Kratzer (1998) is also not strictly compositional and for a related reason. This failure is due to their *Predicate Abstraction Rule* (see Heim and Kratzer 1998, p. 186). On this theory there are lambda terms in the object language syntax such as '$\lambda x.Fx$' but there is not a lexical entry for the lambda binder 'λx' itself. And the semantic value of '$\lambda x.Fx$' isn't (and can't be) calculated by composing the semantic value of 'λx' with the semantic value of 'Fx' but instead such lambda terms are handled by the non-compositional PREDICATE ABSTRACTION RULE: Let α be a branching node with daughters β and γ, where β dominates only a lambda binder λx. Then, for any variables assignment g, $[\![\alpha]\!]^g = \lambda z.[\![\alpha]\!]^{g[x:=z]}$. Cf. Stanley (2000, p. 395n7).

[28] As far as I know this problem has not been pointed out in the literature on Kaplan, although a similar problem relating to Kaplan and the semantics of bound pronouns is discussed in Zimmerman (1991, §4.1).

various modifications to Kaplan's syntax and/or semantics that result in compositional and tenable semantic theories.[29]

From the perspective of compositional semantics it is obvious what has gone wrong: we have assigned semantic values of the wrong *type* to variables and open formulae. So, the most conservative fix would be to give up the claim that the content of a variable is a constant function and have the content of a variable instead be a function from assignments to individuals. This move, however, would be to give up the thesis KapDR (i.e. that variables are directly referential). Yet, there doesn't seem to be any reason stemming from issues in compositional semantics that motivates the claim that variables are directly referential— and reasons stemming from intuitions about "what is said" by free variables seem suspect. A good question, then, is this: *What motivated the thesis that variables are directly referential?*[30]

If there are good reasons to hold onto KapDR, then the other salient strategy here would be to deny KapCM by holding onto the commitments on the (assertoric) contents of variables but giving up the claim that LD is compositional at the level of (assertoric) content. Instead one might insist that there is another level of "content" that does the relevant compositional work. This, however, conflicts with another pillar of Kaplanian semantics, as it amounts to allowing monstrous operations into the language.[31] In order to assess which of these is the better option we would need to enter a long debate about the motivations for direct reference and the monster prohibition.

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[29] For example one could insist that there are two homographic expressions in the langauge, 'x', which only occurs free and 'x', which only occurs bound. This would allow Kaplan to hold onto the claim that *free* variables are directly referential. (This is the analogue of the *Deny embedment* option above.) Alternatively, one could modify the composition principle such that we do not assign semantic values to expressions *simpliciter* but only to expressions-in-linguistic-environments. (This is *Deny innocence* and probably *Deny compositionality*.) For an approach of this kind see Salmon (2006). And for a discussion of altering the composition principle in the required way see Pagin and Westerståhl (2010). Of course, without independent principled reason these moves are simply ad hoc.

[30] The motivation seems to derive from issues in quantified modal logic tied up with intuitions about "what is said" by open formulae and sub-formulae. Kaplan says if we have a formula $\exists x(Fx \wedge \neg\Box Fx)$, then in order to evaluate the truth-value of the component formula $\Box Fx$ (at an assignment) we must first determine what *proposition* is expressed by its component formula Fx (at an assignment). And Kaplan insists that such a proposition will be a singular proposition and 'x' will be directly referential. But this seems to me to be nothing more than a case of taking the metaphors of "aboutness" to literally. From the perspective of *semantics* there doesn't seem to be any motivation for the claim that free variables are directly referential. If we want to calculate the truth-value of $\exists x(Fx \wedge \neg\Box Fx)$ at a point $\langle g, w \rangle$ one simply proceeds as follows (where R_1 is an "accessibility" relation on assignments—the relation of begin an x-variant —and R_2 is the accessibility relation on worlds):

$[\![\exists x(Fx \wedge \neg\Box Fx)]\!]^{g,w} = 1$ iff

there is a $g' R_1 g$ such that $[\![Fx \wedge \neg\Box Fx]\!]^{g',w} = 1$ iff

there is a $g' R_1 g$ such that $[\![Fx]\!]^{g',w} = 1$ and $[\![\neg\Box Fx]\!]^{g',w} = 1$ iff

there is a $g' R_1 g$ such that $[\![Fx]\!]^{g',w} = 1$ and $[\![\Box Fx]\!]^{g',w} = 0$ iff

there is a $g' R_1 g$ such that $[\![Fx]\!]^{g',w} = 1$ and there is a $w' R_2 w$ such that $[\![Fx]\!]^{g',w'} = 0$.

[31] See Rabern (forthcoming) for a defense of the claim that if Kaplan's LD is compositional, then it is monstrous. Soames (2011) endorses this strategy when discussing the Tarskian semantics for quantification but does not note the threat of monsters.

The lesson I want to draw from this discussion of Kaplan's LD is that certain things may motivate a theorist to make claims about the assertoric content of an expression, which turn out to be in conflict with the thesis that the assertoric content of a complex expression is compositionally determined by the assertoric contents of its parts. While I am happy to admit that there are various contortions that we could go through to avoid the conflict, I want to insist that we need not. The fact that such a conflict might arise should neither surprise us nor worry us, since at the outset we should not expect assertoric content to do the work of compositional semantic value.

2 Compositionality and assertoric content

We've just seen a conflict between the compositionality principle and Kaplan's theoretical commitments on assertoric content. This type of conflict is not constrained to certain idiosyncrasies of Kaplan's formal system LD—as I mentioned at the outset this case is structurally analogous to a general tension between various contextualist theories and the compositional semantics of embedded clauses. Remember the slogan: *expressions that say the same thing embed differently*. In the case of LD, we saw that there are contexts where 'Fx' and 'Fy' *say the same thing* but embed differently under quantifiers.[32] I think the lesson to draw from looking at the embedding behavior of context-sensitive (and assignment-sensitive) expressions is that the assertoric content of an expression need not be identified with the compositional semantic value of an expression, i.e. we should deny the *identification thesis*.

Such a picture of the relationship between compositional semantics and the contents of assertion has been advocated by Stanley (1997, 2002), and most recently by Ninan (forthcoming a, b), and Yalcin (2007). The classic statement of the view was explicated and defended by Lewis (1980) as part of an objection to the semantic theories of Kaplan (1989a) and Stalnaker (1970).[33] Lewis sums up the situation as follows, where what he calls "propositional content" and "semantic values" are what I've been calling is *assertoric content* and *compositional values*, respectively.

> It would be a convenience, nothing more, if we could take the *propositional content* of a sentence in a context as its *semantic value*. But we cannot. The prop-

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[32] Here I include the assignment function as a parameter of the context as suggested in Kaplan (1989b, p. 591): "…context is a package of whatever parameters are needed to determine the referent, and thus the content, of the directly referential expressions of the language"…"Taking context in this more abstract, formal way, as providing the parameters needed to generate content, it is natural to treat the assignment of values to free occurrences of variables as simply one more aspect of context". Where compositionality is concerned I have been insisting that it was a mistake for Kaplan to put the assignment function in the context rather than in the index. But, of course, putting the assignment in the index seems to undermine some important Kaplanian doctrines about direct reference, which may have more to do with "what is said" than with compositionality.

[33] Michael Dummett makes a similar distinction between the 'assertoric content' and 'ingredient sense' of an expression in terms of knowing the meaning of an expression 'in the sense of grasping the content of an assertion of it' and 'in the sense of knowing the contribution it makes to determining the content of a complex statement in which it is a constituent', Dummett (1973, p. 447); see also Dummett (1991, pp. 47–50), Stanley (1997, 2002).

ositional contents of sentences do not obey the composition principle, therefore they are not semantic values. (Lewis 1980, p. 39)

If there is no a priori constraint on semantic theorizing that a single type of entity plays both of these roles, we should not be worried when the demands of compositional semantics shape "content" in a way that is different from our best theory of assertroic content.[34] Nevertheless, the things we say and the meanings of our words must stand in a intimate and theoretically important relationship. After all, we utter words with certain meanings (and certain syntax) in order to say the things we say. This platitude, however, does not call for the *identification* of the two notions—all it calls for is that the assertoric content of a sentence in a context should be systematically *determined* by its compositional value. Addressing just this point Lewis states:

> It is enough that the semantic value of a sentence in context should somehow determine the assignment of propositional content. And it does…we have the relation: sentence s is true at context c at index i. From that we can define the propositional content of a sentence s in context c as that proposition that is true at world w iff s is true at c at the index i_c^w that results if we take the index i_c of the context c and shift its world coordinate to w. (Lewis 1980, pp. 37–38)

The idea is to start with the compositional value of an expression at a context and then for all parameters of the index except the world parameter, fix its value to the value provided by the context—this leaves us with a function from worlds to truth-values, i.e. the assertoric content. Whether or not Lewis is right about the exact nature of assertoric content doesn't matter here—it's the more general picture that I want to outline and endorse. Just as the *extension-in-a-context* of an expression is determined by its compositional semantic value, the *assertoric-content-in-a-context* of an expression is determined by its compositional semantic value. In an important sense, then, we only need to assign expressions a *single* semantic value, from which the other values can be derived.[35] With respect to assertoric content, then, we adhere to the following principle.

Determination principle. The compositional value of an expression α in context c determines the assertoric content of α in c.[36]

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[34] Soames (2011) seems to endorse this general point when he says, "…the technical demands on the semantics of temporal operators tell us nothing about whether the semantic contents of sentences—the propositions they express—are time-neutral, or time-specific. That issue must be resolved on independent philosophical grounds".

[35] King (2003) gives the opposite impression when glossing the view which denies the identification thesis, he says: "…in addition to assigning sentences propositions relative to contexts, [such a view] must assign sentences semantic values relative to those contexts…" But there is nothing really *additional* to do, since once we have assigned semantic values everything else is determined.

[36] Once we make the distinction between compositional content and assertoric content there is little reason to have compositional values be relative to contexts. And if the language contains context-shifting operators (monsters), then there is good reason to *not* have compositional values relative to contexts. For this reason, I would ultimately prefer to take what Lewis (1980) described as "constant but complicated" semantic values instead of "variable but simple" semantic values. In what follows I will discuss compositional values as relative to context but only for the sake of continuity with the discussion of Kaplan and most contemporary theorists.

Table 1 From semantics to postsematics

Compositional value in c	Assertoric content in c	Extension in c
$\lambda g, t, w.[\![\phi]\!]^{c,w,t,g}$	$\lambda w.[\![\phi]\!]^{c,w,t_c,g_c}$	$[\![\phi]\!]^{c,w_c,t_c,g_c}$

If we assume for illustration that compositional values are functions from worlds, times and assignments to extensions and that assertoric contents are functions from worlds to extensions, the relation between assertoric content and compositional value is the relation of function to output as in Table 1.

For example consider the case of open formulae from Sect. 1 (and ignore the time parameter). The compositional value of 'Fx' is $\lambda g, w.[\![Fx]\!]^{c,g,w}$, which is a function from assignments and worlds to truth-values. But intuitively what is said by an utterance of 'It is F' is *about* a certain object o (the thing assigned to 'it'). And the information contained in that utterance seems to be the set of worlds where o is F. The picture here accounts for this. This object specific-content is determined by the compositional value by saturating the assignment parameter with the assignment determined by the context. If g_c is the assignment generated by the context such that g_c ('x') $= o$, then $\lambda w.[\![Fx]\!]^{c,g_c,w}$ is the assertoric content of 'Fx' in c, i.e. the set of worlds where o is F. The picture also aviods the conflict from Sect. 1, since it could be that the assertoric content of 'Fx' and 'Fy' are the same in c, while the assertoric content of '$\forall x\, Fx$' and '$\forall x\, Fy$' are not the same in c. This is because the compositional semantic values of 'Fx' and 'Fy' in c are not the same.

The picture that emerges is a view in which the primary job of semantic theory is to assign to each atomic expression type of the language a semantic value and to specify the recursive composition rules such that the rules together with the values determine for each sentence of the language its semantic value. This semantic value, in turn, determines the assertoric content and truth value that the sentence would have if uttered in a given context. Following the terminology of MacFarlane (2003), we can call the primary job of semantics the *semantics proper* and the downstream involvements the *postsemantics*.

The conflict between direct reference and compositionality outlined in Sect. 1 can now be seen as arising from a conflation of issues in the semantics proper and the postsemantics. Variables might be directly referential in the sense that their assertoric content in a context is simply the object that they are assigned (or a constant function to that object) but this is consistent with their compositional value being a non-constant function from assignments to objects. Completely analogous considerations hold for the conflict between the direct reference theory of indexicals and the compositional semantics of bound pronouns. Under the current framework there is room for a view on which indexicals are both directly referential in terms of "what is said" but also shiftable in the sense that there are semantic operations that operate on their characters—that is *a monster friendly direct reference view*.[37] Likewise, the apparent conflict between the eternalist about propositions and the temporalist motivated by the compo-

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[37] Cumming (2008) has a theory where names are treated as variables and attitude verbs are treated as assignment shifting operators, which is very similar to such a view.

sitional semantics of tense is dissolved, since the eternalist may well be right about the nature of information and the objects of assertion, while the temporalist is right about what entities are needed for a compositional semantics of tense.[38] When the theoretical distinction between assertoric content and compositional value is respected, we see that contextualism broadly construed (i.e. including eternalism, direct reference, etc.) is primarily a theory about *assertoric content*, whereas the alleged embedding problems for contextualism primarily concern *compositional values*.

As attractive and natural as this picture may seem it is fair to say that it is not the orthodox view. Is this due to certain sociological contingencies? Or is there some devastating objection to the view? I will now turn to one potential problem.

3 Mismatch and the semantics of speech reports

3.1 The mismatch worry

I will now address some potential problems with the view just outlined having to do with the semantics of speech reports (and attitude reports generally). The alleged problem starts from the intuitive idea that speech reports should provide a theoretical bridge between the semantic value of the sentence embedded in the report and the ascribed speech content. Since on the view above the assertoric content of a sentence can come apart from the compositional semantic value this link is broken. And trouble, it is claimed, will inevitably ensue. In what follows, I will attempt to make this *mismatch worry* more explicit and then demonstrate that it is harmless. In so doing I will address the objection from King (2003) stemming from apparent complications with the interaction of temporal expressions and attitude reports. I will argue that there is no unique problem for the view from the stand point of the compositional semantics of attitude reports.

There is a natural thought in this vicinity that goes like this: speech reports relate an agent to an asserted content by the use of a sentence of the form $\ulcorner \alpha$ says $\phi \urcorner$, where the semantic value of ϕ is the proposition that α says. So the semantic value of ϕ must "line up" with or be the same as the proposition that α said. For example, in the sentence 'Bill says that snow is white' the metaphysics calls for a relation between Bill and a proposition. But if we deny the identification thesis and distinguish compositional values from asserted content, then the semantics will only see a relation between Bill and a compositional value. So it can't be that the objects of assertion are distinct from the compositional values of sentences.

First notice that the mere mismatch between the semantic values of expressions and the metaphysical things that the expressions refer to cannot be the problem. Consider the sentence 'John loves Mary' and assume that the semantic values of proper names are functions from worlds to individuals (intensions). In this case, it seems that the semantics "sees" a relation between two functions, whereas the metaphysics "calls

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for" a relation between lovers—but no one should object to such a semantics on those grounds.[39]

The mere mismatch between entities isn't the worry, instead it must be that the view is unable to get the semantics right, e.g. the semantics gives a relation between a sayer and a semantic value, whereas metaphysically there is a relation between a sayer and a proposition and thus the semantics fails to *capture* the metaphysics. This is to make the claim that sentences embedded in speech reports *must* have propositions as their compositional semantic values—other entities will not do. But this is clearly false. Constructions such as ⌜α says φ⌝ may well *be* compositional at the level of propositional content but this, of course, does not establish that propositions are *needed* for the compositional semantics. Since if propositions (qua sets of worlds) can do the job, then so can various finer-grained entities (e.g. sets of centered worlds). Compare: some constructions are compositional at the level of truth-value but they are also compositional at the level of intension. Someone would be badly mistaken if they claimed that we need the compositional semantic values of sentences to be truth-values because of truth-functional operators. Our compositional semantic values and assertoric contents stand in a vary similar relation (function/output) to each other as do functions from worlds to truth-values and truth-values. If there is anything to it, then this inchoate mismatch worry must be getting at something more sophisticated.

3.2 King's objection from tensed reports

King (2003) criticizes both Richard (1982) and Salmon (1986) for agreeing with Lewis (1980) that the semantic values of sentences in context cannot be propositions (qua sets of worlds) and that one must assign sentences compositional semantic values in addition to assigning them propositions (i.e. assertoric content).[40] The problems King (2003) raises here are very much in the spirit of the mismatch worry described above— the things we say and believe are not what temporal (or modal) operators operate on. I will focus on the problem raised for Salmon (1986).[41] I will give a condensed explication of Salmon's motives and his semantics and then explain King's objection to it. My assessment will provide a partial defense of Salmon (1986) but since my main aim here is to defend the general picture, which denies the identification thesis, I will demonstrate that this style of objection does not even get off the ground for the most straightforward implementation of the general picture.

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[39] Similar remarks apply to a semantics which treats proper names on a par with quantifier noun phrases as functions from functions from individuals to truth-values to truth-values (e.g. Montague). One might object that such a view misconstrues the assertoric content of names but there should be no objection to the *semantics* per se.

[40] In opposition to this King (2003) wants to defend the claims that "sentences can be assigned semantic values relative to contexts in such a way that propositions are compositionally assigned to sentences relative to context and are the [compositional] semantic values relative to those contexts of the sentences in question. And we need not assign sentences any second sort of semantic value." See footnote 39.

[41] I think that a similar assessment applies to King's criticism of Richard. In short, it is completely consistent to say that 'Shannon believes φ' is true just in case the compositional semantic value of 'φ' is *so-and so*, while also maintaining that the semantic value of 'φ' is not even a candidate object of Shannon's belief—the things believers believe are distinct from the semantic values of sentences in a compositional semantics.

Salmon (1986, 1989, 2003) sets out to modify Kaplan's semantic framework in order to accommodate the eternal nature of information content, while at the same time providing an adequate semantics for the temporal operators.[42] Salmon summarizes the tension that Kaplan is confronted with as follows:

> Claiming that temporal operators operate on contents, and having defined the content of a sentence as the proposition asserted by someone in uttering the sentence, or *what is said*, Kaplan is forced to construe the proposition expressed by a sentence like ['I am writing'] as something that may change in truth-value at different times and in some cases even at different places. But this yields an incorrect account of propositions. Propositions, qua objects of assertion and belief, are eternal. (Salmon 2003, p. 385)

Salmon insists that Kaplan (1989a) has drawn the wrong lesson from the fact that temporal operators need temporally neutral operands. He says, "Contrary to Kaplan, what follows from this is that temporal operators do not operate on propositions" (Salmon 2003, p. 386). So, whereas Kaplan concludes that an adequate semantics of temporal operators requires that propositions be temporally neutral, Salmon concludes that since propositions are not temporally neutral they must not be what temporal operators operate on. As Salmon states in an earlier paper:

> Since they are not generally vacuous or redundant, temporal operators must operate on some aspect of their operands other than the information content, something other than *what is said* in uttering the operand. (Salmon 1989, p. 373)

On the one hand Kaplan defines 'content' to be *what is said* or the information asserted by a sentence in a context—something that does not vary in truth-value across times; while on the other hand 'content' is supposed to be what operators (including temporal operators) operate on—something that must vary in truth-value across times. Commenting on this tension in Kaplan, Salmon states, "Kaplan's notion of what he calls the 'content' of an expression is in fact a confused amalgamation of the information content and the information-content base" (Salmon 1989, p. 373). So according to Salmon, Kaplan is unnecessarily conflating the objects of assertion with the arguments to the temporal operators.

Salmon sets forth to pull these apart. His strategy is to complicate the Kaplanian framework by adding a temporally neutral level of "meaning" intermediate between character and (eternal) content, this he calls the *content base* (or the "information-value base"). A *content base* can be understood as being (or determining) a function from times to contents (where *contents* themselves are (or determine) functions from worlds to extensions). In this way, the compositional values relevant for temporal operators are content bases, whereas the objects of assertion are (eternal) contents. At this level of abstraction, this view is very much in the spirit of the view of Lewis (1980) outlined in Sect. 2.

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[42] Salmon (2003) is in many respects the purest, clearest and most general explication of the Salmonian view in this vicinity as it attempts to be neutral with respect to the structured Russellian propositions versus circumstantialist style semantic theories. But I will often simply refer to Salmon (1986) as that is the work which King (2003) mainly focuses on.

King insists that following Lewis (1980) in this regard leads to certain undesirable consequences. King's criticism of Salmon is that since the things that temporal operators, like 'sometimes', operate on are different from the objects of the attitudes (e.g. the things we say and believe), Salmon's theory requires "*ad hoc* definitions and special semantic clauses to handle the interaction of temporal expressions and verbs of propositional attitude" (King 2003, p. 210). It is not entirely clear what methodological principles King is appealing to here, e.g. why it is undesirable to have special semantic clauses to handle the interactions of various types of linguistic environments? But let's grant that the correct truth-conditions of tensed attitude reports should just "fall out" of the correct semantics of the tense operators and the relevant attitude verbs. King's objection, then, is that Salmon's semantics lacks this virtue—and he implies that any view which shares the feature that temporal operators operate on entities distinct from the objects of the attitudes will also fail in this respect.

What I will show is that while it may be true that there is a certain inelegance to Salmon's semantic theory, this is not forced upon him due to the fact that temporal operators operate on entities distinct from the objects of the attitudes—instead the alleged vice of Salmon's semantics is a feature of his idiosyncratic *structuralist propositional semantics*.

King (2003) sets up a conflict between the claim that the temporal operator 'sometimes' operates on the content base of its embedded sentence and the claim that a belief ascription relates an individual to the content of the sentence embedded in the ascription. King considers what happens when we combine the temporal operator with a belief ascription such as in the following.

(12) Sometimes, John believes Frege is happy.

We know that 'sometimes' operates on the content base of 'John believes Frege is happy'. But this involves the content base of 'Frege is happy', which is temporally neutral. So King charges that "unless something is done, (12) will assert that sometimes John stands in the belief relation to an entity that changes truth-value over time…and Salmon denies that the things believed change truth-value over time" (King 2003, p. 210). So it seems that if temporal operators operate on entities that are distinct from the objects of the attitudes, then we will get undesirable results with the semantics of tensed attitude reports. King sums up his objection as follows.

> The upshot is that because for Salmon the thing that 'Sometimes' operates on is different from the object of the believing relation, the semantics of sentences like (12) require special definitions and semantic clauses…That (12) requires such things appears to me *ad hoc*. It seems to me that on a proper theory, the right truth conditions for (12) should fall out of the semantics for 'Sometimes', 'believes' and the tenses. (King 2003, p. 210)

Let's see if this holds in general. We wish to encode the claims that (i) 'sometimes' operates on the temporally neutral semantic value of its embedded sentence and (ii) belief ascriptions relate an individual to the eternal propositional content of the sentence embedded in the ascription. I take it that these two claims can be fairly represented

as follows, where SOM is the temporal operator denoted by 'sometimes' and [[believes]] is the relation that holds between an individual and an eternal proposition:

> **Clause 1.** $[\![\text{Sometimes } \phi]\!]^{c,t,w} = 1$ iff $\text{SOM}(\lambda t, w.[\![\phi]\!]^{c,t,w}) = 1$ iff there is a t' such that $[\![\phi]\!]^{c,t',w} = 1$.

> **Clause 2.** $[\![\alpha \text{ believes } \phi]\!]^{c,t,w} = 1$ iff $([\![\alpha]\!]^{c,t,w}, \lambda w.[\![\phi]\!]^{c,t,w}) \in [\![\text{believes}]\!]^{c,t,w}$.[43]

Clause 1 has it that 'sometimes' operates on the (temporally-neutral) semantic value with respect to the context c of its embedded sentence. King insists that the semantic value of this embedded sentence must "include" only temporally neutral semantic values. Since the semantic value of 'Frege is happy' is an entity that changes truth-value over time, King concludes that (12) will be true if and only if there is a time t' such that John stands in the belief relation *to an entity that changes truth-value over time*. We can see that the argument must be mistaken with respect to the semantics provided by clause 1 and 2, since if we just crunch through the semantics it is very clear that nothing special nor *ad hoc* is needed. Calculate as follows:

> $[\![\text{Sometimes, John believes Frege is happy}]\!]^{c,t,w} = 1$ iff
> there is a t' such that $[\![\text{John believes Frege is happy}]\!]^{c,t',w} = 1$ iff
> there is a t' such that $([\![\text{John}]\!]^{c,t',w}, \lambda w.[\![\text{Frege is happy}]\!]^{c,t',w}) \in [\![\text{believes}]\!]^{c,t',w}$.

The right result just "falls out" of the simple clauses 1 and 2. Nothing here is *ad hoc* and we haven't had to posit special semantic clauses to "eternalize" semantic values. This demonstrates that the mere fact that temporal operators operate on entities distinct from the objects of the believing relation is unproblematic.[44]

4 Conclusion

There is a theoretical distinction between the objects of assertion and compositional values, which we should respect. Theorists working on the nature of assertoric content (or mental content and information) should welcome this distinction, as it allows them to theorize about the nature of content, somewhat liberated from the confines of

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[43] This could also be given in terms of a relation R between an individual and a time-neutral semantic value such that $R([\![\alpha]\!]^{c,t,w}, \lambda t, w.[\![\phi]\!]^{c,t,w})$ iff $([\![\alpha]\!]^{c,t,w}, \lambda w.[\![\phi]\!]^{c,t,w}) \in [\![\text{believes}]\!]^{c,t,w}$. R can also be analyzed in the style of Hintikka (1969): $R([\![\alpha]\!]^{c,t,w}, \lambda t, w.[\![\phi]\!]^{c,t,w})$ iff for all w' compatible with $[\![\alpha]\!]^{c,t,w}$'s beliefs in w at t, $\lambda t, w.[\![\phi]\!]^{c,t,w}(t, w') = 1$.

[44] The special definition of the *eternalization* of a content base is an artifact of the specific structuralist or Russellian framework that Salmon (1986) is developing. This is why when we calculate through the pure truth-conditional semantics—without taking the detour through structured contents—no issues arise. Salmon's semantic theory proceeds in two steps: (i) a recursive assignment of structured content bases (and structured contents) to every expression of the language with respect to a context, assignment (and time), and (ii) a recursive definition of the truth of a structured content base (and structured content) with respect to a circumstance (i.e. a world and a time). These together provide a recursive definition of sentential truth at a point of evaluation. Combining Salmon's definition of the associated structured contents and content bases for the problem sentence (12) with Salmon's definition of truth of a content and content base at a circumstance, provides the following overall definition of (12)'s sentential truth at a point of evaluation: (12) is true at a point (c, g, t, w) if and only if there is time t' such that John and the proposition expressed by 'Frege is happy' at c, g, t' stand in the belief relation at t' in w.

the strict compositionality principle. Likewise, theorists working in formal semantics should welcome this distinction as they need not worry if the semantic values they posit don't always cohere with the intuitive notions of "what is said". Of course, there is not total freedom, since the theories should still conform to the determination principle. But we have seen that certain puzzles in philosophy of language completely dissolve from this methodological perspective.

Return to the embedding problem for contextualism about epistemic modals. The contextualist holds that, in a given context, utterances of sentences (5.1) and (5.2) assert the same thing. But this allegedly conflicts with the compositional semantics of sentence (5.3) where (5.1) occurs as a syntactic constituent.

(5.1) Dave might be in Oxford.
(5.2) It is consistent with what I know that Dave is in Oxford.
(5.3) Leon said that *Dave might be in Oxford.*

We now see that sentences (5.1) and (5.2) may well have the same assertoric content as the contextualist insists but this doesn't cause a problem for the compositional semantics—since the semantic value of (5.1) isn't the same as its assertoric content. The compositional semantics of (5.3) can be given in terms of the semantic value of 'Leon said' applied to the agent-neutral semantic value of 'Dave might be in Oxford'.[45]

I challenge theorists who adhere to the identification thesis to give either a direct argument in its favor or a substantial objection to the views that deny it. Why should we think that the things we say are identical to the things our sentences mean?

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[45] To see how this works in detail we need semantic clauses for 'might' and 'says' (cf. Ninan 2010). Let $[\![\beta \text{ says } \phi]\!]^{c,w,t,a} = 1$ iff all w' compatible with what β says in w at t are such that $[\![\phi]\!]^{c,w',t,\beta} = 1$. And let $[\![\text{might } \phi]\!]^{c,w,t,a} = 1$ iff there is a world w' compatible with what a knows at t in w such that $[\![\phi]\!]^{c,w',t,a} = 1$. With these semantic clauses in place we can calculate the semantic value of (5.3).

$$[\![\text{Leon says Dave might be in Oxford}]\!]^{c,w,t,a} = 1 \text{ iff}$$

all w' compatible with what Leon says in w at t are such that $[\![\text{Dave might be in Oxford}]\!]^{c,w',t,Leon} = 1$ iff all w' compatible with what Leon says in w at t are such that there is a world w'' compatible with what Leon knows at t in w' such that $[\![\phi]\!]^{c,w'',t,Leon} = 1$.

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