

**Monsters and communication:
The semantics of contextual shifting and sensitivity**

by

Brian Douglys Rabern

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Committee:

Professor David Chalmers, Chair

Professor Jonathan Schaffer

Professor Daniel Nolan

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Brian Rabern

11-07-2012

Date

The dissertation of Brian Douglys Rabern is approved:

Professor David Chalmers, Chair

Date

Professor Jonathan Schaffer

Date

Professor Daniel Nolan

Date

The Australian National University

July 2012

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Brian Douglis Rabern

Abstract

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This thesis argues for two main points concerning the philosophy of natural language semantics. Firstly, that the objects of assertion are distinct from the entities appealed to in the compositional rules of natural language semantics. Secondly, natural languages contain context-shifting operators known as “monsters”. In fact, it will be shown that these theses are simply two sides of the same coin.

Professor David Chalmers, Chair

Date

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The shortcomings of this dissertation are all too obvious to me and are not the fault of those who I have acknowledged—there are not too distant possible worlds where these shortcomings are absent. And I hope that my actual sentences prompt the reader to imagine those sentences (written in merely possible versions of this dissertation), which better express my thoughts.

for Rhiannon, Adisyn, and Olivia

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Introduction

I had originally decided to write a thesis on modal epistemology, philosophical methodology and the broadly rationalist approach to such issues provided by two-dimensionalism. Although I found (and continue to find) these issues interesting and exciting, I also found it very difficult to find my way about. Or if a philosophical problem is supposed to have the form “I don’t know my way about”, then the problem I encountered at the time had the form “I don’t know where I’m try to go”. I found it difficult to turn philosophy on itself—it’s difficult to jump the hierarchy straight to metaphilosopher without first achieving the rank of philosopher.

But there was a strand in the two-dimensionalist literature that I latched onto. The various two-dimensionalist analyses of the Kripkean contingent apriori and necessary aposteriori involve semantic treatments of attributions of apriority or epistemic necessity (e.g. Stalnaker 1978, Evans 1979, and Davies and Humberstone 1980). If these proposals are taken as theses about natural language locutions (or philosophical extensions thereof) such as ‘It is a priori that’, ‘It is conceptually necessary that’, ‘By reason alone it follows that’ or ‘It must be that’, then the proposals must be assessed as empirical theses—or at least their status could be greatly informed by empirical linguistics. And here there is an obvious connection to issues raised in Kaplan (1989a). Kaplan too gave a two-dimensionalist treatment of the Kripkean contingent apriori and necessary aposteriori but he very explicitly denies that in the natural language semantics ‘It is a priori that’ or ‘It is a logical truth that’ should be treated as two-dimensional operators.

This claim about the semantics of ‘It is a priori that’ is tied up with Kaplan’s famous prohibition of *monsters*: the claim that there are no natural language semantic operations at the level of semantic representation that Kaplan calls the “character”. So it may seem that there is at least a distant threat to broadly two-dimensionalist approaches to modal epistemology and analyses of the contingent

a priori, stemming from issues surrounding Kaplan’s ban on monsters. Or so I vaguely thought.

The monster issue is a linguistic issue, so I turned away from the epistemic and methodological issues that motivate the two-dimensionalism of Chalmers (2006), and I focused instead on the properly linguistic issues. But by focusing on the linguistic issues concerning context, meaning, and communication, I ended up finding motivation for and defending a kind of two-dimensionalism. This is a linguistic brand of two-dimensionalism defended by Michael Dummett (Dummett 1973), which is motivated by issues in the metatheory of linguistics—we might call it *Dummettian two-dimensionalism* to distinguish it from the other two-dimensionalisms.¹

This two-dimensionalist picture is motivated by thinking about the relationship between natural language semantics and the broader theory of communication. And this, not the contingent a priori nor the epistemology of philosophy, is the primary focus of this dissertation. Hence the issues I am concerned with here are issues in the philosophy of natural language semantics, or *semantic metatheory*.

There are two seemingly disparate theses in semantic metatheory that I think are essentially equivalent.

Thesis 1. The objects of assertion are the entities that the compositional rules of natural language semantics must appeal to.

Thesis 2. There are no context-shifting operators (i.e. monsters) in natural languages.

One of my aims, then, is to demonstrate that these are in essence the same thesis and that they stem from the same picture of the relationship between semantics and communication. Another aim is to demonstrate that this picture is mistaken and that both of the commonly held theses are, in fact, false.

Thesis 1 is a mainstream view about the semantic content of declarative sentences. One might state the view as the claim that propositions are the arguments to sentential operators. For example, in the sentence ‘It is necessary that

¹I actually prefer to not call the kind of two-dimensionalism that I defend in this thesis “two-dimensionalism” at all, given that “two-dimensionalism” has come to connote certain epistemic and methodological commitments and certain views on the Kripkean contingent a priori and necessary a posteriori (e.g. Chalmers 2006). Dummettian two-dimensionalists can and do have things to say about the Kripkean contingent a priori and necessary a posteriori (cf. Evans 1979, Stanley 1997a and § 4.2) but the motivation is purely linguistic and, in any case, prior to epistemological considerations.

kangaroos have tails’ it is commonly thought that the necessity operator takes the proposition expressed by ‘Kangaroos have tails’ as argument and checks whether or not it is true in all accessible worlds. Likewise, it is commonly said that propositional attitude reports relate an individual to a proposition. For example, the sentence ‘Olivia believes that kangaroos have tails’ says that Olivia stands in the believing relation to a certain proposition, namely the proposition expressed by the embedded sentence ‘Kangaroos have tails’.

The key idea behind Thesis 1, then, is that sentential operators such as ‘It is necessary that’ or ‘Olivia believes that’ operate on the proposition expressed by their embedded sentence (in a context). It may seem that this view, which is so entrenched, needs no defense. But it is challenged by Dummett-inspired two-dimensionalism (Evans 1979; Stanley 1997a) and a complimentary observation made in Lewis (1980). In light of these challenges Thesis 1 has recently been defended by, e.g. King (2003) and Cappelen and Hawthorne (2009). Cappelen and Hawthorne call this mainstream view on sentential content *Simplicity*—in particular, Thesis 1 amounts to the second conjunct of *Simplicity*, which is the thesis that “The semantic values of declarative sentences relative to contexts of utterance are propositions” (p. 1).

But no matter how platitudinous Thesis 1 sounds, it is simply false. I demonstrate this in a variety of ways. The most compelling arguments here stem from the quantificational powers of natural language, i.e. the semantics of pronominal binding (see § 1.2 and § 2.3), and multiple indexing for tense and modality (see § 2.4).

Thesis 2—that there are no monsters—is also a common philosophical view. To get a grip on what a “monster” is, it helps to provide an example. Consider this nice example from Gareth Evans:

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” (Evans 1985 pp. 357-358).

In this case, ‘To the left’ and ‘To the right’ would be monsters. The interesting thing about monsters is that they have the ability for a radical kind of

displacement—they have the ability to uproot an utterance from the context in which it occurred. In this way monsters dissociate the “context of interpretation” from the context of the utterance, where the *context of interpretation* determines what is said by an utterance. More familiar intensional devices (such as the modal operator \Box) are displacing devices but their kind of displacement retains the equivalence between the context of interpretation and the context of the utterance. In this way we could say that a monster is an expression, which when affixed to a sentence, requires that the sentence be reinterpreted *as if it were uttered in a different context*—this is the radical displacement that dissociates the context of interpretation from the actual context of the utterance. I insist that there are monsters in natural language. The essential point is simply this: natural languages are compositional but not compositional in terms of assertoric content, thus the composition rules will require reinterpretation of embedded clauses at contexts of interpretation distinct from the context of utterance (see § 6.4).

Given the two-dimensionalism I advocate here, where one respects the distinction between the objects of assertion and compositional values, one should expect that Thesis 1 and Thesis 2 are false. It is only when one is in the grip of the traditional picture, where “what is said” has a privileged compositional role, that monsters and non-propositional composition would appear to be exceptions to the semantic norms.

In general, then, this thesis centers on the notions of context, meaning, and communication: it concerns how sensitivity to—and shifts of—the context of utterance affect the meanings expressed and the information communicated.

In chapter 0, I first place the discussion in its historical context by tracing out the development of indexical and intensional semantics for natural language from Richard Montague, through David Kaplan and David Lewis, to the present. I argue that Montague (1968) and “the early index theorists” do not fall victim to the influential objections raised by Kaplan (1989a) and Lewis (1980). This revives the old idea that semantic theory can provide a unified treatment of both context-sensitivity and intensional displacement by means of a single mechanism (i.e. a pure point of reference) and reveals the genuine motivations for the character/content distinction.

In chapter 1, I lay out the orthodox conception of the relationship between semantic theory and the theory of communication, which is inherited primarily from Kaplan (1989a). I elaborate the standard interpretation of Kaplan’s frame-

work, whereby the compositional level of semantic representation is identified with “what is said” or “the proposition expressed” by an utterance. I then argue that the foundational assumptions of this framework are corrupt by showing that Kaplan’s formal language, *the logic of demonstratives*, exemplifies a failure of the compositionality principle.

In chapter 2, I provide a more general challenge to the philosophically entrenched conception of *propositions*, i.e. the view that propositions are both the meaning of a sentence and the content of an assertion. I explore various linguistic constructions, where expressions that “say the same thing” embed differently: (i) eternalism and the semantics of tense, (ii) contextualism and embedded epistemic modals, (iii) indexicals and pronominal binding, and (iv) possible worlds and multiply-indexed semantics. These cases demonstrate that the philosophically entrenched conception of “semantic content” is equivocal.

In chapter 3, I discuss various repair strategies that one might pursue to retain the identification of assertoric content with compositional value. The two main strategies, *Assertoric Relativism* and *Linguistic Environmentalism*, are outlined and assessed. I argue that the costs of pursuing these strategies are much higher than it may at first appear.

In chapter 4, I provide a brief historical survey of the distinction between two kinds of sentential content: compositional meaning and assertoric content. I survey the reasons that this distinction between what sentences ‘mean’ and what they ‘say’ arose in the works of Dummett (1973), Evans (1979), Stalnaker (1978), and Lewis (1980).

In chapter 5, I ask how the project of natural language semantics relates to the general theory of speech acts, including the theory of assertion, and the broader systematization of linguistic communication. I explicate the key notions of ‘what is said’ and ‘semantic content’ as they relate to communication and compositional (and truth conditional) semantics, respectively. Drawing on Dummett’s ingredient sense/assertoric content distinction (Dummett 1973), I outline and motivate a non-standard conception of the relationship between natural language semantics and the theory of linguistic communication, where the semantic value of an expression is sharply distinguished from its assertoric content.

In chapter 6, I build on the earlier chapters to resolve a controversial issue in semantic theory: Kaplan’s monster prohibition. I explain and rigorously define the prohibition before surveying various areas where monsters appear to dwell.

After elucidating Kaplan's motivation for prohibiting monsters, I present a new challenge to the prohibition on grounds of a more theoretical nature, by looking at the standard compositional semantics of variable binding. I conclude that Kaplan's prohibition ultimately rests on the common conception of the relationship between compositional semantics and the theory of communication, that has been shown false in the preceding chapters.

Chapter 0

Historical preliminaries

I believe... that the investigation of indexical languages and the erection of indexical language-systems are urgent tasks for contemporary logicians.

Yehoshua Bar-Hillel (1954)

0.1 Early index theory

Modal and tense logic saw great advances in mid-twentieth century works such as Carnap (1947), Prior (1956), Hintikka (1957), Kripke (1959), and Montague (1960).¹ The general upshot of this work is that the semantics of modality can be analyzed in terms of quantification over possible worlds (or state-descriptions) and that the semantics of tense can be analyzed in terms of quantification over times (or moments).² Where \Box is the modal necessity operator and F is the temporal futurity operator, the respective semantic clauses are standardly given as follows.

- $\Box\phi$ is true in model \mathcal{M} at world w iff for all worlds w' (accessible from w), ϕ is true in model \mathcal{M} at world w' .
- $F\phi$ is true in model \mathcal{M} at time t iff there is a time $t' > t$ such that ϕ is true in model \mathcal{M} at time t' .

¹Other important early papers in intensional logic include Carnap (1946), Meredith and Prior (1956), Prior (1957), Hintikka (1961), Kripke (1963a) and Kripke (1963b). See Copeland (2002) for a detailed account of the genesis of possible world semantics.

²A further important feature of this general approach to the logic and semantics of modality/tense is the inclusion of a binary *accessibility relation* between worlds (and times).

A novel feature of this semantics is that a sentence is not just true or false relative to a model (as in e.g. propositional logic) but also relative to a *point of reference* (e.g. a world or a time) within a model. The modal and tense operators shift and quantify over these points of reference and evaluate their embedded sentence with respect to those shifted points. We can put this by saying that, in these semantic frameworks, sentential truth is *sensitive* to points of reference and that modal/temporal sentential operators *shift* points of reference. Since English has both modal and temporal modifiers (e.g. ‘must’, ‘was’) the semantics for natural language would plausibly appeal to points of reference that include both worlds and times. And for other shifty phenomena (e.g. locative operators) the points of reference should include further parameters.

By the 1960’s, theorists began applying the resources of this type of model-theoretic semantics to the study of languages involving “context-sensitivity”, “indexicality” or “deixis”—the phenomenon whereby the *meaning* (or referent) of an expression depends on the context of use. Richard Montague (in Montague 1968 and Montague 1970a) called such languages “pragmatic languages” and suggested that a systematic treatment could be achieved by extending the tools of possible world semantics.

It seemed to me desirable that pragmatics should at least initially follow the lead of semantics—or its modern version, model theory, which is primarily concerned with the notions of truth and satisfaction (in a model, or under an interpretation). Pragmatics, then, should employ similar notions, though here we should speak about truth and satisfaction with respect not only to an interpretation but also to a context of use. (Montague 1970a, p. 1)

With this approach in mind early theorists, e.g. Montague (1968), Scott (1970), and Lewis (1970), proposed that we simply expand the points of reference used for languages with modal and tense operators to include the relevant contextual coordinates.³ For example, Dana Scott advised as follows:

³Davidson (1967) also suggested that for natural language semantics, truth should be relativized to times and persons in order to accommodate tense and demonstratives (see Davidson 1967, pp. 319–320)—relativization to worlds, however, was not explicitly considered. Also notable in this regard is the “egocentric logic” developed in Prior (1968a): “If I say, not ‘Brown is ill’ but ‘I am ill’, the truth of this depends not only on when it is said but on who says it. It has been suggested, e.g. by Donald Davidson 1967 that just as the former dependence has not

For more general situations one must not think of the [point of reference] as anything as simple as instants of time or even possible worlds. In general we will have

$$i = (w, t, p, a, \dots)$$

where the index i has many coordinates: for example, w is a world, t is a time, $p = (x, y, z)$ is a (3-dimensional) position in the world, a is an agent, etc. All these coordinates can be varied, possibly independently, and thus affect the truth-values of statements which have indirect references to these coordinates. (Scott 1970, p. 151)

Consider a sentence that contains the first person pronoun.

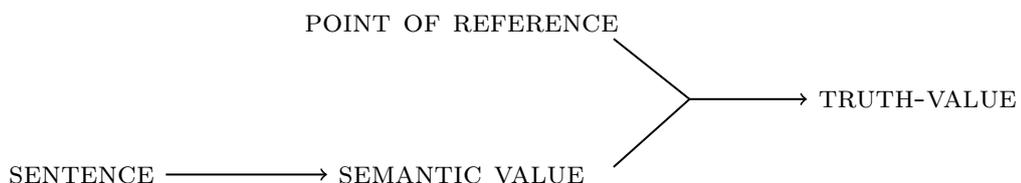
(0) I am a spiteful man

Since the truth of this sentence depends crucially on who utters it, truth should be relativized to agents in addition to worlds and times.

- (0) is true in model \mathcal{M} at (w, t, a) iff a is in the extension of ‘spiteful man’ in model \mathcal{M} at world w and time t .

The essential idea was to generalize the techniques of intensional semantics to sentences containing context-sensitive expressions: Given that theorists already had the points of reference (i.e. worlds and times) used for the semantics of modality and tense, a straightforward way to incorporate context-sensitivity was to expand the reference points (or indices) to include other contextual features (e.g. speaker, place, addressee, etc.). A model-theory that made use of these expanded indices was thought to afford a formal unified treatment of both intensionality and indexicality.

Figure 1: Early index theory.



prevented the development of a systematic logic of tenses, so the latter should not prevent the development of a systematic logic of personal pronouns.”, p. 193.

Call the semantic framework that generalizes the points of reference (or indices) used for the treatment of “intensional” phenomena to include additional contextual parameters for the treatment of “indexical” phenomena *early index theory*.

0.1.1 A happy coincidence?

This picture looks quite elegant, since it purports to provide a treatment of context sensitivity and intensionality by use of the same mechanism. The picture can be further motivated by considering the relationship between (i) the contextual dependence of reference and truth and (ii) the compositional semantics of intensional operators.

Start with context-sensitivity. Sometimes an utterance of ‘It is raining’ is true and sometimes it’s not. In some possible worlds an utterance of ‘the inventor of bifocals’ refers to Franklin and in some it does not. In general, the extension of an expression depends not merely on the meanings and order of its constituent expressions but also on the exact situation in which the expression occurs—call this *context-sensitivity*. The extension of an expression depends on the time and world in which it occurs but changing the time or world are not the only ways to vary the extension of an expression. Sentence (0) is sensitive to the *speaker* of the context in addition to the time and world. And, other contextual features are relevant for the expressions that are commonly called *indexicals*: ‘you’, ‘he’, ‘she’, ‘this’, ‘that’, ‘here’, ‘there’, ‘now’, ‘today’, ‘yesterday’, ‘tomorrow’, ‘actual’, ‘present’, etc. These will depend on further features of context, e.g. place, audience, indicated-object, etc. In this way, the extensions of expressions are sensitive to the many various aspects of context.

What is it that determines the referent or truth of an expression in a context? It seems that it is the *meaning* of an expression that determines how its extension depends on the context of use—that is, meaning determines the extensions of expressions across contexts. One aim, then, of semantic theorizing with respect to context-sensitive languages should be to assign “meanings” of this kind to sentences. Since the extensions of expressions are sensitive to the many various aspects of context, these meanings should be functions from contexts of use to extensions. Accordingly, each expression of the language should get associated with a function from contexts to extensions.⁴

⁴There is a slight subtlety here as to whether semantic theory is concerned with English expressions or with the representation of such expressions at the level of *logical form* (LF), which

Turning to the semantics of intensional operators, consider again what is involved in the semantics of such expressions. The sentence ‘Yesterday, John yawned’ contains the sentence ‘John yawns’ as a constituent. And the first sentence is true just in case the second sentence is true with respect to the day prior. This is the phenomenon that David Lewis called *shiftiness*.

Often the truth of a sentence in a context depends on the truth of some related sentence when some feature of the original context is shifted. . . the value of [the latter] must provide information about how [it] varies in truth value when the relevant feature of context is shifted. (Lewis 1980, p. 27)

An intensional operator looks to the profile of its embedded subsentence across points of reference, e.g. $\Box\phi$ is true if and only if ϕ is true across all (accessible) worlds. These operators operate on the “intensions” of their complement clauses, where an intension is understood to be a function from points of reference to extensions. Intensions look to be structurally isomorphic to the functions from contexts to extensions we discussed above in relation to context-sensitivity. So much so that we might conclude that it is simply *extension-at-a-context* profiles, which both determine the extensions of expressions across contexts and serve as the inputs to intensional operators.

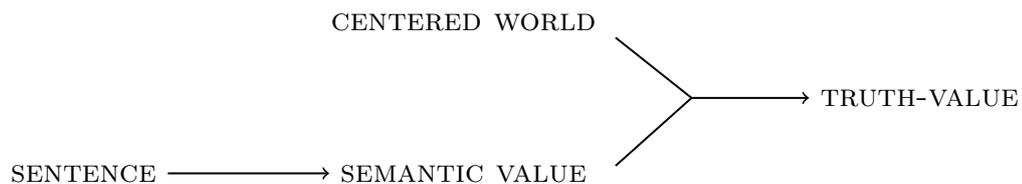
Lewis observes that this situation—the situation in which the functions that encode patterns of context-dependency and those that serve as argument to the intensional operators turn out to be the same thing—is an apparent happy coincidence.

We seem to have a happy coincidence. To do their first job of determining whether truth-in-English would be achieved if a given sentence were uttered in a given context, it seems that the semantic values of sentences must provide information about the dependence of truth on features of context. That seems to be the very information that is also needed, in view of shiftiness, if semantic values are to do their second job of helping to determine the semantic values of sentences with a given sentence as constituent. How nice. (Lewis 1980, p. 28)

I will ignore for now.

Since early index theory provides a treatment of context sensitivity and intensionality by use of the same mechanism (i.e. a point of reference) it might seem that this picture is exactly what the early index theorists had in mind. But it is merely one implementation of the general picture and it seems that neither Montague (1968) (see pp. 104–108), Scott (1970) (see pp. 148–150) nor Lewis (1970) (see pp. 22–25, 62–65) actually held the view that *extension-at-a-context* profiles serve as arguments to the intensional operators—that is, they did not actually hold the *happy-coincidence view* described in Lewis (1980). The index theory that we find in these authors is simply the view that points of reference serve as inputs to the semantic values. But there was no requirement that the points of reference correspond to possible speech situations.⁵ We must take care to not run these two versions of index theory together. Diagrammatically, the happy coincidence view can be represented as follows.

Figure 2: Happy-coincidence view.



Although it seems that no one actually endorsed the happy-coincidence view and after mentioning it Lewis (1980) quickly rejected it, it still has its attraction. On this view the semantic values of sentences are functions from contexts to truth-values—they tell us whether or not truth would be achieved if a given sentence was uttered in a given context. And these very same semantic values are the entities appealed to for the semantics of intensional devices, e.g. ‘It was raining’ is true at context c iff there is a context c' before c where it is raining.

Neither the early index theory nor the happy-coincidence version of it are standard in contemporary discussions of semantics. I will now turn to the reasons that the standard framework came to have the shape that it does—there are a few interesting points where a certain route was taken but not forced.

⁵Cf. the discussion in Kaplan (1989a), pp. 507–510.

0.2 Kaplan's dilemma

In “Demonstratives” David Kaplan presents an apparent knock down objection to early index theory in the form of a dilemma. It seems that sociologically Kaplan (1989a) has had the most influence in the move away from the early index theory.⁶ Kaplan's basic charge is that the early index theory cannot provide an adequate account of *validity* (or logical truth) and that this failure exposes that the view is not only “technically wrong” but also “conceptually misguided”.

Kaplan begins his attack by setting up the early index theory in much the way we did above. As Kaplan tells the story, the early index theorists had the following picture: there were the familiar intensions, which were functions from *circumstances of evaluation* (possible worlds) to extensions and when “it was noticed that contextual factors were required to determine the extension of indexicals, a still more general notion was developed and called an *index*. . . The intension of an expression was that function which assigned to every index, the extension at that index” (Kaplan 1989a, p. 508). This is exactly the view advocated by the early index theorists, e.g. Montague (1968), Scott (1970), and Lewis (1970).⁷

In order to fully appreciate Kaplan's argument against the early index theory and the potential responses, we must first get clear on the key concept at issue in the argument, namely *validity* or *logical truth*. As a first pass, let's say that a *logical validity* is a sentence that is true in virtue of its logical vocabulary alone. That is, if no matter how one interprets the non-logical vocabulary a sentence is true, then the sentence is valid. Consider a tautology of propositional logic: $P \supset (Q \supset P)$. No matter what combination of T's and F's one assigns to the P 's and Q 's, the formula as a whole gets a T. When we consider more discerning and sophisticated languages we add more expressions to the stock of “logical” vocabulary, e.g. quantifiers, the identity predicate, intensional operators, tenses, etc. Each of these languages will contain sentences such that their truth is guaranteed by a privileged subset of the expressions in the language, i.e. no matter how one re-intepretes the non-privileged vocabulary the sentence remains true.

⁶Kaplan (1989a) notes that much of the material eventually published as “Demonstratives” was originally presented as lectures at the 1971 Summer Institute in Philosophy of Language at Irvine and printed versions of the material were in circulation shortly thereafter.

⁷Interestingly, Kaplan quotes Scott (1970) at length when outlining the early index theory but makes no mention of Montague (1968) or Lewis (1970). And it is very surprising that Montague is not explicitly mentioned anywhere in Kaplan (1989a), since his influence is clear throughout much of the manuscript.

As I noted above, in intensional logics the extensions of expressions are not only relativized to interpretations but also to points of reference (or indices) within an interpretation. In general, one must specify three things (i) a (non-empty) domain of discourse D , (ii) a set of reference points or indices I , which are the entities that expressions have extensions relative to, e.g. worlds, times, sequences of individuals, etc., and (iii) an interpretation function g , which assigns to each expression of a language \mathcal{L} an appropriate extension relative to an index. Call such an entity a *structure* for the language \mathcal{L} . For particular languages certain restrictions will be put on what tuples count as structures for that language. But in the abstract we can say that a structure \mathcal{A} for an intensional language \mathcal{L} is a tuple consisting of a domain, a set of indices, and an interpretation function, i.e. $\mathcal{A} = \langle D, I, g \rangle$.⁸ Validity, then, can be understood as *truth at every index with respect to every structure* (of the language).

With this conception of validity in place Kaplan's argument proceeds as follows. Consider the sentence

(1) I am here now

There are many indices (i.e. tuples of contextual features) at which (1) is false.⁹ Assume that indices are made up of a world, an agent, a location, and a time—that is quadruples $\langle w, x, p, t \rangle$. Then sentence (1) is only true with respect to the indices $\langle w, x, p, t \rangle$ such that in world w , agent x is located at p at time t . So there are many quadruples at which (1) is false. Kaplan, remarks that

... here we have missed something essential to our understanding of indexicals... (1) is deeply, and in some sense... universally true. One need only understand the meaning of (1) to know that it cannot be uttered falsely... *A Logic of Indexicals* which does not reflect this... has missed something essential to the logic of indexicals... We have ignored the special relationship between 'I', 'here', and 'now'. (Kaplan 1989a, p. 509)

⁸We could also add an accessibility relation (or multiple accessibility relations) on the set of indices—this further complication does not matter to the present discussion.

⁹Note that throughout Kaplan's argument talk of structures is suppressed for ease of illustration. But really the claims should always make reference to structures, e.g. in this case we should say that there are many structures such that within those structures there are (some) indices at which (1) is false.

Kaplan insists that sentences such as (1) should have the special status of being logical truths (or what we might call “indexical validities”, since we are here dealing with an indexical language). The truth of (1) seems to be guaranteed simply by the meanings of ‘I’, ‘here’ and ‘now’ but the straightforward implementation of index theory does not yield this result. The charge, then, is that this implementation of index theory undergenerates validities.

Kaplan, next, considers a proposed correction on behalf of the index theorist. The correction is to limit the class of indices to the *proper* ones—the $\langle w, x, p, t \rangle$ such that in world w , agent x is located at p at time t . (Note that this is the happy-coincidence version of index theory.) On this purposed correction (1) is true no matter what the index is, but so is

(2) Necessarily, I am here now

But (2) is far from having the special status that (1) enjoys—as Kaplan says “(2) should not be logically true, since it is false” (p. 509). By limiting the indices to proper ones we have ensured that (1) is valid but we have thereby overgenerated validities.¹⁰

If the class of indices is unrestricted we undergenerate validities and if the class of indices is restricted we overgenerate validities, therefore Kaplan insists that index theory is mistaken. Kaplan concludes his argument as follows.

The difficulty here is to assimilate the role of *context* to that of *circumstance*. The indices $\langle w, x, p, t \rangle$ that represent contexts must be proper in order that [‘I am here now’] be a truth of the logic of indexicals, but the indices that represent circumstance must include improper ones in order that [‘Necessarily, I am here now’] *not* be a logical truth. (Kaplan 1989a, p. 509)

He goes on to insist that the minimal requirement to avoid the dilemma is to move to a system of *double indexing* but he cautions that “mere double indexing, without a clear conceptual understanding of what each index stands for, is still

¹⁰It appears that Lewis (1980), p. 28–31 makes the same point in another guise, e.g. when he says “Dependence on contexts won’t do, since we must look at the variation of truth value under shifts of one feature only. Contexts are no substitute for indices because contexts are not amenable to shifting”. But I suggest in § 0.3.2 that Lewis’ argument is more complicated than it may at first appear.

not enough to avoid all pitfalls”.¹¹ For succinctness let Kaplan’s dilemma be summarized as follows.

Kaplan’s dilemma. *The semantic values of sentences cannot be sets of indices (both proper and improper), since a single set of indices (which includes improper indices) undergenerates validities. Alternatively, the semantic values of sentences cannot be sets of proper indices (i.e. contexts), since this overgenerates validities. Thus, we require semantic values to be sets of index pairs, i.e. members of $\{\text{proper indices}\} \times \{\text{indices}\}$.*

The lesson Kaplan draws is that there must be a fundamental distinction between the parameters that represent the *context of use* and those that represent *circumstance of evaluation*. Indexicality is treated by the former, whereas intensionality is treated by the latter. For this reason the early index theory—which attempted to treat indexicality and intensionality with the same semantic mechanism—was in Kaplan’s opinion “conceptually misguided”. This Kaplanian lesson has been echoed throughout the philosophical discussions of indexicality and intensionality ever since.

0.2.1 The Montagovian response

Nevertheless, the index theorist has an easy way to safely navigate out of this dilemma. They can safely occupy the first horn by defining *validity* as truth at every *proper index* of every structure instead of truth at every index of every structure. This involves rejecting the rule of necessitation: if $\models \phi$, then $\models \Box\phi$ —since there will be sentences that are true at every proper point of every structure but which are not true at every point (or every shifted world point) within a structure. But this does not distinguish the early index theory from the Kaplanian theory, since Kaplan also rejects this rule. In fact, as I will argue below, Kaplan also avoids the problem he raises in exactly the way that the early index theorist should. Thus, Kaplan’s move away from early index theory and to his doubly indexed context-circumstance semantics is completely orthogonal to the problem posed by the dilemma.

The key move on behalf of the index theorist is found as early as Montague (1968), which was a few years before Kaplan first presented his dilemma. It is

¹¹The pitfalls he alludes to here are the *monsters* that pure versions of double indexing allegedly give rise to. See § 6.3.

correctly attributed to Montague both in Bennett (1978) and Israel and Perry (1996). Michael Bennett summed up the situation as follows.¹²

Possibly Scott falls victim to this argument, cf. Scott (1970); but a close examination of Montague (1968) reveals that Montague does not. For Montague allows for structures with *improper* points of reference. Further he defines *logical truth* as being true at every *proper* point of reference in every structure. This guarantees that (1) is logically true. But (2) is not logically true because there is a structure with an improper point of reference. Montague rejects the principle: if $\models \phi$, then $\models \Box\phi$. (Bennett 1978, p. 3)

Montague (1968) does give a generic definition of indexical validity (or what he calls “logical validity in the sense of general pragmatics”) which would fall victim to Kaplan’s dilemma but he goes on to develop a more sophisticated definition later in the article. Here is the first generic definition of indexical validity. (Note that Montague uses the label “interpretation” for what we have called a structure.)

Definition VII. We say that ϕ is a *logical consequence* of a set Γ (in the sense of general pragmatics) if and only if there is a pragmatic language \mathcal{L} such that ϕ and all members of Γ are sentences of \mathcal{L} , and for every possible interpretation \mathcal{A} for \mathcal{L} and every point of reference i of \mathcal{A} , if all members of Γ are true at i under \mathcal{A} , then ϕ is true at i under \mathcal{A} ; and ϕ is *logically valid* (again in the sense of general pragmatics) if and only if ϕ is a logical consequence of the empty set.¹³

This essentially says that a sentence ϕ is indexically valid if and only if for every interpretation \mathcal{A} and every point of reference i of \mathcal{A} , ϕ is true at i under \mathcal{A} . Using this definition we run into Kaplan’s dilemma, i.e. if the interpretations are not restricted in certain ways, then we will miss certain validities, but if we restrict the interpretations to make certain indexical sentences valid, we will overgenerate

¹²Israel and Perry (1996), p. 4 make basically the same point: “There is a way around this dilemma. It involves dropping the standard principle of modal generalization, and Montague (arguably) avails himself of it in Montague (1968). There he allows structures with improper indices, but defines logical truth as truth at every proper index in every structure—thereby guaranteeing the logical truth of (1). As for (2), it is not logically true, because there is a structure with improper indices, that is, a structure such that (1), though logically true, is not (just plain) true at every index in that structure.”

¹³Montague (1968) reprinted in Montague and Thomason (1974), p. 103. See also Montague (1970a), p. 75 where he gives basically the same definition with slight notational difference.

validites. But this is only a generic definition upon which Montague adds certain qualifications and refinements. On the very next page he says the following.

When we come to consider special disciplines comprehended by pragmatics—disciplines such as tense logic, modal logic, the logic of personal pronouns—the notions of logical validity and consequence in Definition VII are seen to require refinement. For instance, we shall frequently be interested not in *all* possible interpretations for a given language \mathcal{L} , but only in a certain class K of possible interpretations. The choice of K will depend on the special discipline under consideration, and the member of K will be regarded as the *standard* interpretations for \mathcal{L} in the sense of that discipline. . . we shall sometimes find it necessary to *restrict the points of reference* as well as the possible interpretations to be considered.¹⁴

There are two types of restrictions here. The first puts certain conditions on the class of interpretations (structures) on which indexical validity is defined. For example, for tense logic if we want to model continuous time we may require that the points of reference be real numbers.¹⁵ The second type of restriction doesn't impose an additional condition on the class of interpretations but instead restricts the points within an interpretation on which indexical validity is defined. For this, Montague introduces the function J which assigns to each standard interpretation \mathcal{A} a designated set of its points of reference $J_{\mathcal{A}}$ —these are understood as constituting the interpretation's *standard points of reference*. So we define indexical validity with respect to both a restricted class of interpretations K and a restricted set of points—the function J restricts which set of points within each interpretation is relevant. We should, then, understand *indexical validity* as taking into account these refinements, i.e. as a certain type of what Montague (1968) calls *(K, J)-validity*.

Definition IX. Let K be a class of possible interpretations for a pragmatic language \mathcal{L} , let J be a function assigning to each member of \mathcal{A} of K a set of points

¹⁴Montague (1968), p. 104, my emphasis. He goes on to say: “Construction of the exact notions, which involve assigning to each standard interpretation a designated set of its points of reference (regarded as constituting its *standard* points of reference), is due chiefly to my students Dr. J.A.W. Kamp and Mr. Perry Smith and myself.”

¹⁵Montague (1968) mentions such restrictions when discussing $K_1(\mathcal{L})$ and $K_2(\mathcal{L})$, pp. 105–106.

of reference of \mathcal{A} , and let ϕ and the members of Γ be sentences of \mathcal{L} . Then ϕ is a (K, J) -consequence of Γ if and only if, for every \mathcal{A} in K and every i in $J_{\mathcal{A}}$, if all members of Γ are true at i under \mathcal{A} , then so is ϕ ; and ϕ is (K, J) -valid if and only if ϕ is a (K, J) -consequence of the empty set.

This, then, is Montague's considered notion of indexical validity which we can abbreviate as follows.

Montague Validity. ϕ is *indexically valid* if and only if for every interpretation \mathcal{A} and every standard point of reference $i \in J_{\mathcal{A}}$, $\llbracket \phi \rrbracket_{\mathcal{A}}^i = 1$.

In order to illustrate what languages will require such restrictions, Montague presents a simple language which contains the combination of tense operators and the first person singular. Let \mathcal{L} be a pragmatic language containing (at least) the truth-functional connectives, the temporal operator \mathbf{P} , the one place existence predicate E and a zero-placed operation symbol c , which represents the first person pronoun. Let $K(\mathcal{L})$ be the class of standard interpretations $\mathcal{A} = \langle D, (T, A), g \rangle$ for \mathcal{L} , where T is the set of real numbers (understood as moments of time), A is the set possible speakers, and g is an interpretation function. (Assume other standard constraints, see Montague 1968, pp. 107-108.) Let the syntax be given in the obvious way (in the style of modal predicate logic) and let the relevant part of the semantics of \mathcal{L} be given by the following definitions.

- $\llbracket c \rrbracket_{\mathcal{A}}^{t,a} = a$
- $\llbracket \mathbf{P}\phi \rrbracket_{\mathcal{A}}^{t,a} = 1$ iff there is a $t' < t$ such that $\llbracket \phi \rrbracket_{\mathcal{A}}^{t',a} = 1$
- $\llbracket E\alpha \rrbracket_{\mathcal{A}}^{t,a} = 1$ iff $\llbracket \alpha \rrbracket_{\mathcal{A}}^{t,a} \in \llbracket E \rrbracket_{\mathcal{A}}^{t,a}$

Notice that there will be points of reference (within an interpretation) at which Ec is false—there will be interpretations $\mathcal{A} \in K(\mathcal{L})$ within which there are pairs $\langle t, a \rangle$ where $a \notin \llbracket E \rrbracket_{\mathcal{A}}^{t,a}$. But since ‘I exist’ has the special property of being true upon any utterance it should be a valid formula of the pragmatic language.¹⁶

¹⁶I should flag that it is a very controversial issue what sentences should come out as indexically valid and it is disputed what we actually want to capture with the notion of “indexical validity” (see, e.g., Predelli 1998 and Predelli and Stojanovic 2008). Here I am just assuming along with both Kaplan and Montague that sentences such as ‘I exist’ or ‘I am here now’ should have this special status.

Montague states that we cannot “guarantee the validity of Ec (‘I exist’) by any reasonable diminution of the class of interpretations” (p. 108). Of course we could guarantee the validity of Ec by imposing the additional condition on the class $K(\mathcal{L})$ that $a \in \llbracket E \rrbracket^{\langle t, a \rangle}$, for all $\langle t, a \rangle$. This will ensure that Ec is valid but this will also result in making $\neg P(\neg Ec)$ (‘I always have existed’) valid. Here, again, we have hit upon the two horns of Kaplan’s dilemma. But at this point Montague does not opt for a system of double indexing nor does he posit a fundamental distinction between *context* and *circumstance*, as Kaplan would insist.

Remember the two refinements of the notion of indexical validity: (i) we shall sometimes find it necessary to restrict the possible interpretations to be considered and (ii) we shall sometimes find it necessary to restrict the points of reference to be considered. If we restrict the points of reference (of an interpretation) over which validity is defined to the points $\langle t, a \rangle$ at which $a \in \llbracket E \rrbracket^{\langle t, a \rangle}$, Montague rightly points out that ‘I exist’ comes out as valid and ‘I always have existed’ comes out as invalid.¹⁷

This same maneuver will apply directly to Kaplan’s dilemma presented in “Demonstratives”. The language under question contains (at least) the modal operator \Box , and the indexicals ‘I’, ‘now’ and ‘here’. For such an indexical language the points of reference will be quadruples of world, agent, location, and time; $\langle w, x, p, t \rangle$. And a natural restriction on the points of reference (of an interpretation) over which validity is defined, would be those $\langle w, x, p, t \rangle$ such that in the world w , x is located at p at time t . So in this case the function J should map each standard interpretation in K to its set of standard points. This ensures that ‘I am here now’ is valid (i.e. true at every standard point of every standard interpretation) while ‘Necessarily, I am here now’ is not valid (i.e. not true at every standard point of every standard interpretation). In this way, the index theorist avoids Kaplan’s dilemma.

But still there may be a problem in the vicinity. We have shown that Montague’s treatment doesn’t undergenerate validities (as Kaplan charges one does on the first horn) but it seems that we may still get the converse problem, i.e. the overgeneration of validities. We have followed Montague and insisted that indexically valid but contingent (or transient) sentences are true at all *standard points*

¹⁷Montague (1968) says, “We should instead have to speak of $(K_4(\mathcal{L}), J)$ -validity” and defines the function J that maps a standard interpretation to $\{\langle t, a \rangle : a \in \llbracket E \rrbracket^{\langle t, a \rangle}\}$. Given this he then points out that “ Ec is $(K_4(\mathcal{L}), J)$ -valid but $\neg P(\neg Ec)$ is not”.

but not true at *all* points. Could there, however, be sentences which are true at all points which shouldn't be counted as indexically valid? In other words, are there sentences which are necessarily and/or eternally true but not indexically valid?¹⁸ Consider, the following sentence.

(3) Necessarily, I am Brian Rabern

This sentence is true, if uttered by me. Assume that the semantics of the necessity operator (\Box) is given in the following natural way.¹⁹

- $\llbracket \Box \phi \rrbracket_{\mathcal{A}}^i = 1$ iff for all $i' \in I$, $\llbracket \phi \rrbracket_{\mathcal{A}}^{i'} = 1$

According to this semantics of 'necessarily' if (3) is true then 'I am Brian Rabern' is true at all points of reference. But if 'I am Brian Rabern' is true at *all* points of reference, then it is, thereby, true at all *standard* points of reference—thus, 'I am Brian Rabern' comes out as indexically valid. Yet, there are many utterances of the sentence 'I am Brian Rabern' which are false, so it clearly should not be a truth of the logic of indexicals. Something has gone wrong.²⁰

Bennett (1978) argues that Montague's treatment of 'necessarily' would be different than this argument assumes: he says, "Nowhere does Montague consider the first person singular in combination with the necessity operator. The previous arguments were assuming a certain treatment of this combination to be implicit in his remarks. . . these arguments are mistaken about what Montague's treatment would be".²¹ Montague does, however, consider a temporal operator in combination with the first person singular and such an operator only quantified over the time parameter of the point of reference (not every parameter). So for example, 'I have always been Brian Rabern' is true, if 'I am Brian Rabern' is true at all

¹⁸Such sentences would be analogous to the "strong necessities" discussed in modal epistemology, see Chalmers (1996), pp. 136-138.

¹⁹In fact this is the semantics for 'necessity' that Scott (1970) gives working within this single index framework (see p. 157). It is also the interpretation of \Box that Kaplan (1989a), p. 508 attributes to the *index theorists*: "A sentence ϕ was taken to be logically true if true at every index (in every 'structure'), and $\Box\phi$ was taken to be true at a given index (in a given structure) just in case ϕ was true at every index (in that structure)." We have already seen that the first conjunct of this quote is not true of Montague (1968) and I will insist below (along with Bennett (1978) and Richmond Thomason) that the second conjunct isn't true of Montague (1968) either.

²⁰Interestingly, this argument can be seen as an implicit version of Hans Kamp's argument for double indexing (see § 0.4), since we here have an indexical 'I' embedded under an operator which (allegedly) shifts the agent parameter.

²¹Bennett (1978), p. 3-4. Bennett reports that it was Richmond Thomason who convinced him of this point.

indices in which the time parameter is shifted to a previous time. But this doesn't require that 'I am Brian Rabern' be true at *every* index and thus doesn't entail that it is true at all standard indices. Consider, for example, how Montague would treat an eternity operator (Z).

- $\llbracket Z\phi \rrbracket_{\mathcal{A}}^{w,t,a} = 1$ iff for all $t' \in T$, $\llbracket \phi \rrbracket_{\mathcal{A}}^{w,t',a} = 1$

Bennett and Thomason suggest that "if Montague were treating the first person singular in combination with the necessity operator, he would define it in a way analogous to the tense operators."²² For example a plausible definition would be as follows (cf. the definition of \square in Kaplan 1989a, p. 545).

- $\llbracket \square\phi \rrbracket_{\mathcal{A}}^{w,t,a} = 1$ iff for all $w' \in W$, $\llbracket \phi \rrbracket_{\mathcal{A}}^{w',t,a} = 1$

Given this, I conclude that there is no Kaplanian argument from considerations of indexical validity and the propriety of points of reference to the denial of early index theory.

What Kaplan's considerations *do* motivate is that there be a distinction drawn between standard and non-standard points of reference and that validity be defined in terms of the standard points. As we have seen this is precisely what Montague (1968) did. Kaplan (1989a) did this as well. Kaplan insists that one cannot avoid the dilemma in the singly-indexed framework of early index theory. He states: "If one wishes to stay with this sort of index theory and blur the conceptual difference between context and circumstance, the minimal requirement is a system of double indexing, one index for context and another for circumstance" (Kaplan 1989a, p. 509-510). But this just isn't true. The dilemma in no way forces a move to a system of double indexing. The essential move that avoids the dilemma is defining validity as truth at every standard point i (of every structure), whether truth be relative to a single index $\langle i \rangle$ or two indices $\langle i, i \rangle$. Compare Kaplan's definition of validity with Montague's.

Kaplan Validity. ϕ is *indexically valid* if and only if for every interpretation \mathcal{A} and every standard point of reference (context) i of \mathcal{A} ,

$$\llbracket \phi \rrbracket_{\mathcal{A}}^{\langle i, i \rangle} = 1.$$
²³

²²Bennett (1978), p. 4

²³Cf. Kaplan (1979).

Montague Validity. ϕ is *indexically valid* if and only if for every interpretation \mathcal{A} and every standard point of reference i of \mathcal{A} , $\llbracket \phi \rrbracket_{\mathcal{A}}^i = 1$.

The charge that Montague and the early index theorists blurred the conceptual difference between “context” and “circumstance” appears ill-founded. It is true that they used a single mechanism—a point of reference—in the semantic treatment of indexicality and intensionality. But Montague, at least, kept the notion of “context” or standard point of reference, distinct from that of a general point of reference. Thus, the definition of indexical validity, and the concept of a speech situation, would come into the picture downstream from the definition of truth at a point of reference.

0.3 Lewis: Context and index

David Lewis (in Lewis 1980) very explicitly argues that points of reference must involve of two distinct kinds of entities (a context and an index): he states, “Contexts and indices will not do each other’s work. Therefore we need both” (p. 31). Lewis outlines his reasons for holding this view at the very beginning of the paper.

Two sorts of dependence of truth on features of context are involved: *context-dependence* and *index-dependence*. A *context* is a location—time, place, and possible world—where a sentence is said. It has countless features determined by the character of that location. An *index* is an n -tuple of features of context, but not necessarily features that go together in any possible context. Thus an index might consist of a speaker, a time before his birth, a world where he never lived at all, and so on. Since we are unlikely to think of all the features of context on which truth sometimes depends and, hence unlikely to construct adequately rich indices, we cannot get by without context-dependence as well as index dependence. Since indices but not contexts can be shifted one feature at a time we cannot get by without index-dependence as well as context-dependence. (Lewis 1980, pp. 21-22.)

Both Lewis’ argument that contexts cannot do the work of indices and his argument that indices cannot do the work of contexts are subtle and often misunderstood. They also employ some contentious premises, which I will argue are not

well-motivated. If so, then contexts and indices *can* do each other's work. And, therefore, we don't need both.

0.3.1 Contexts and parameter proliferation

First let's consider Lewis' argument that contexts are indispensable. On this point Lewis takes his cue from Max Cresswell.

The trouble with the 'coordinate' approach to context dependence is that it seems to require that we give in advance a finite list of contextual features to be taken into account when evaluating a sentence. It is my opinion that there is no such list and that the contextual features to be taken into account depend on the meaning of the sentence. (Cresswell 1973, p. 111)

The points of reference in Lewis (1970) were octuples consisting of a world, a time, a place, an agent, an audience, a list of indicated objects, a segment of previous discourse, and an assignment function. Cresswell (1973) argues that there are many more contextual features upon which the truth of an utterance may depend. Consider the following sentences from Cresswell (1973), p. 111.

- (4) They're playing the national anthem.
- (5) The gods are angry.
- (6) Just fetch your Jim another pint.

Cresswell, argues that these will require points of reference to include a country parameter, a religion parameter, and a previous drinks parameter, respectively. If this is correct, it would seem that we could easily proliferate such examples and thus proliferate contextual parameters indefinitely. Lewis endorses this point.

Dependence on indices won't do, unless they are built inclusively enough to include every feature that is ever relevant to truth. We almost certainly overlooked a great many features. So for the present, while the task of constructing an explicit grammar is still unfinished, the indices we know how to construct won't do. Indices are no substitute for contexts because contexts are rich in features and indices are poor. (Lewis 1980, p. 31)

The basic idea is that one cannot concoct detailed enough lists of contextual parameters to capture all the ways that truth might depend on context. If an index, which is just a tuple of parameters, is to capture all the truth-relevant features of a speech situation, Cresswell's point seems to suggest that it would inevitably be an incomplete list. A Lewisian "context", however, is importantly different from a list. A "context" for Lewis is a point in metaphysical/logical space—a centered world—so it is an entity that has a multitude of properties. We can pick out a context by giving its location in metaphysical space and thereby determine a set of contextual features, instead of trying to generate a long list of all of the relevant contextual features.²⁴ Lewis later puts the point as follows.

We could wait for the end of linguistic inquiry, and define our indices then. But the less patient of us may prefer another solution. Let the features of context mostly be given implicitly. Once we have a world, time, and speaker, what can be lacking? (Lewis 1983, p. 230)

For these reasons, Lewis insists that points of reference should include a context (i.e. a centered world).²⁵

The first thing to notice about this argument is that it is not usually cited in the philosophy of language literature as the reason why points of reference must include contexts—in this regard it is most often Kaplan (1989a) that is cited.²⁶ But more importantly, it is unclear what the force of the argument is supposed to be. Cresswell has shown that there are a multitude of relevant contextual features, thus making a list of all the relevant contextual features would be very hard. But is it impossible in principle? Lewis' remarks seem to indicate that including contexts is not mandatory. Instead he seems to insist merely that it makes things easier, or more practical. He uses locutions such as "for the present" or "while the task... is still unfinished", and he mentions "the ambitious plan of dispensing with contexts after learning how to construct sufficiently inclusive indices", so it seems, for Lewis

²⁴Although see Egan (2009) for some potential problems with this idea stemming from among other things time travelers and interpenetrating ghosts.

²⁵Lewis later states that instead of construing contexts as centered worlds he prefers to understand them as world-bound time-slices of individuals (see e.g. the postscript to "General Semantics" Lewis (1983)). A similar idea is elaborated in chapter 8 of Cresswell (1973), where contexts are construed as properties of utterances.

²⁶A rare exception is Glanzberg (2007) who also attempts to aim the Cresswell proliferation objection at relativistic semantics.

at least, the conclusion is that including contexts makes good sense, since it affords an easy way to side-step the difficult issue of making the indices sufficiently rich.²⁷

It may be that Cresswell’s point about feature proliferation could be turned into an argument that semantics cannot, even in principle, get by without Lewisian contexts (or some such device), e.g. if points of reference must be very long (or infinitely long) lists this might be thought to conflict with certain theories of linguistic competence. Something along these lines seems to be involved in the argument put forward in Glanzberg (2007). But I won’t speculate further on how such an argument might go.

Without further premises there doesn’t seem to be an argument to the effect that lists of parameters cannot in principle do the work of Lewisian contexts. Instead Lewis endorses Cresswell’s worry about parameter proliferation and then provides an elegant way of avoiding the difficulty. So the view that the first parameter of a point of reference should be a centered world (or world-bound time-slice of an agent) is only supported to the extent that Cresswell’s proliferation point is a threat to systematic semantic theory. Thus, it seems that indices can (at least in principle) do the work of contexts.

0.3.2 Contexts and shifting

For the moment, let’s now instead follow Lewis (1980) and assume that contexts should be included in the points of reference. Lewis argues that we cannot get by with contexts (i.e. centered worlds) alone, we also need indices (i.e. lists of various parameters). Here his reason stems from what he calls “shiftiness” and his claim that “contexts are not amenable to shifting” (p. 31).

One of the jobs that Lewis provides for semantic values is *compositionality*, i.e. that the semantic value of any complex expression should be determined by its syntax and the semantic values of its syntactic constituents. Lewis notes that sometimes the extension of an expression depends on the extension of one of its syntactic constituents under a *shift* away from the original context. For example

²⁷Although Kaplanian contexts correspond to centered worlds (except when he goes on to add an assignment function as a parameter of a context; see Kaplan (1989b), p. 591) it seems that Kaplan thinks of a context as a list of whatever parameters are needed to determine “what is said”. He says, “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” (p. 591). It seems that such a conception of contexts would likewise be open to Cresswell’s proliferation argument.

the truth-value of ‘It was raining’ depends on the truth-value of ‘It is raining’ at shifts of the original context into the past—the former is true at time t if and only if the latter is true at a time t' before t . Hence in order for the semantic value of ‘It was raining’ to be determined by its syntactic constituents ‘PAST’ and ‘It is raining’, the semantic value of ‘It is raining’ must provide information about how its extension varies across shifts away from the original context. We can state the shiftiness platitude as follows.

Shiftiness: The semantic value of a sentence ϕ must encode information about the variation of ϕ 's truth-value under various shifts away from the context of utterance (e.g. shifts in time, shifts of world, etc.).

Lewis claims that points of reference which include contexts alone cannot uphold this shiftiness platitude.

... ‘If someone is speaking here, then I exist’ is true at any context whatever. No shift from one context to another can make it false. But a time shift, holding other features fixed, can make it false; that is why ‘Forevermore, if someone is speaking here, then I will exist’ is false in the original context. Likewise a world shift can make it false; that is why ‘Necessarily, if someone is speaking here then I exist’ is false in the original context. The shifts that make the sentence false must not be shifts from one context to another. (Lewis 1980, p. 29)

Prima facie, the argument Lewis provides here seems to be the same as the reasoning on one horn of Kaplan’s dilemma from § 0.2.²⁸ Lewis claims that the following sentence is true at all contexts.

(7) If someone is speaking here, then I exist

And then he contends that “No shift from one context to another can make [(7)] false”, so if we limit ourselves to shifts from contexts to contexts, we get the absurd result that the following sentence will come out as true.

(8) Forevermore, if someone is speaking here, then I will exist

²⁸Lewis makes essentially the same argument in Lewis (1983), pp. 230–232, “Postscripts to ‘General Semantics’”.

Since sentence (7) is true at all contexts, then no matter what context “Forevermore” shifts to, sentence (7) will be true at that context. In order to avoid this absurd result Lewis insists that “Forevermore” must shift to non-contexts.

If we assume we are working with a singly-indexed semantics, then the conclusion *does* follow. But in a doubly-indexed system—which both Kaplan and Lewis are assuming—that conclusion does not follow (see § 0.4 for a detailed discussion of double-indexing). If there are two contexts in the point of reference, then there are shifts from contexts to contexts such that (7) is false and this fact ensures that (8) is false. Hence if, as it seems, Lewis is giving a version of the Kaplanian argument, that we cannot get by with “proper contexts” then the argument only establishes that we can’t get by with a *single* context—note that it therefore refutes the happy coincidence version of index theory. But it does not establish that points of reference require indices in addition to contexts. Understood this way Lewis’ argument does not call for a fundamental distinction between two distinct kinds of gadgets in points of reference (context and index). On the assumption that points of reference must include a context, the argument only requires that a point of reference be an ordered pair of contexts. Given such a setup, the truth of (4) would not depend on a monadic property of centered worlds but instead it would depend on a relational property between pairs of centered worlds—true just in case at every pair (c, c') , the speaker of c exists at all later centers c' (see the end of § 0.4 for further development of this approach).²⁹

Nevertheless, Lewis seems to be putting more weight on a different line of thought, which is evident in the passages immediately preceding that quoted from above.

Dependence on contexts won’t do, since we must look at the variation of truth value under shifts of one feature only. Contexts are no substitute for indices because contexts are not amenable to shifting.

... we need to know what happens to the truth values of constituent sentences when one feature of context is shifted and the rest are held fixed. But features of context do not vary independently. *No two contexts differ by only one feature. Shift one feature only, and the result of the shift is not a context at all.* (Lewis 1980, p. 29, emphasis added.)

²⁹I am indebted to both Andy Egan and Wolfgang Schwarz for helpful discussions on this point.

Whereas the previous line of thought concluded that *sometimes* the result of a shift must be a non-context, the claim here is that the result of shifting a feature is *never* a context. This claim sounds far too strong. It seems obvious that contexts can differ by one feature only. Since for Lewis contexts are locations given by (world-time-place)-triples, it seems that if one merely shifts the time feature of the triple $\langle \text{World 1, Monday, St. Andrews} \rangle$ back one day, one would end up with the triple $\langle \text{World 1, Sunday, St. Andrews} \rangle$. This resulting context is indeed another context. Many theorists have been perplexed by this claim made by Lewis and some have thought that he mistakenly overstated his premise or that he was simply confused on this point.³⁰

Following Weber (2012b) we can make sense of Lewis' claim in the following way. Remember that contexts are locations in logical space (or centered worlds) and that these centered worlds have countless features determined by the character of the location—so with each centered world comes an associated set of contextual features. The centered world $c = \langle w, t, p \rangle$ determines a set of contextual features H . In addition to time, place and world, H includes, e.g., me as speaker, you as addressee, a certain object as demonstratum, the previous course of the conversation, etc.

If we now change a single element of this set of contextual features—we change the time to t^* , say—we get another set of contextual features H^* that differs from H only with respect to its time-element. Lewis, however, insists that there is no guarantee that there will be a corresponding *centered world*, which determines *that* specific set of contextual features H^* . Of course there is the centered world $c^* = \langle w, t^*, p \rangle$, which determines a set of contextual features G —but Lewis contends that we should not expect that $G = H^*$.³¹ Here Lewis is relying on a metaphysical claim about the nature of contexts—*features of context do not vary independently*. It seems that Lewis must be thinking that any given feature of a context is metaphysically “tied” to some other feature, e.g. changing the time of the context necessarily changes the previous course of the conversation. If so,

³⁰One often hears this complaint made in conversation at pubs in Canberra, St. Andrews, and New York; but see King (2003), p. 201 for a condensed instance of it in print.

³¹Note that this relies very heavily on the Lewisian “positional” understanding of contexts. Under a more Kaplanian understanding of contexts, where contexts are lists of various contextual parameters (that correspond to various Lewisian contexts), then it becomes fairly obvious—even accepting Lewis' metaphysical thesis about centered worlds—that two “contexts” can differ by one parameter. I think much of the confusion in this vicinity stems from conflating Lewisian contexts with Kaplanian contexts.

then it is indeed true that no two contexts differ by only one feature.³²

This metaphysical thesis about contexts alone does not quite establish that the result of a shift is never a context. The additional premise needed is the thesis that the type of shifts we are interested in (e.g. the shifts induced by intensional operators) are shifts of *one* feature only. These premises together entail that the result of a shift is never a context, since if shifts away from the original context are always shifts of one feature only and no two contexts differ by one feature only, then the result of a shift is never a context.

But why should we believe these premises? Consider a centered world that has all the same features as my current centered world, except that there is one less atom in the universe. It seems plausible that this pair of centered worlds determines the same set of truth-relevant features except for the world coordinate. What is Lewis' reason for denying this? More to the point, what about a symmetrical universe and the centered worlds that differ merely by way of mirrored locations? Or what about eternal recurrence universes and the centered worlds that differ only in that one is centered on a later recurrence of the former?

Still Lewis might insist that *for the most part* contexts do not differ by one feature only. And this might be thought to restrict their amenability to shifting. One might worry as follows: If the only centered worlds that 'PAST' can shift to are earlier times within an eternal recurrence world and our world isn't an eternal recurrence world, then aren't all past tense sentences trivially false? There just is no centered world prior to this one that differs only in the time feature. So simply pointing out that some contexts differ by only one feature is, perhaps, not enough to dissolve Lewis' argument.

Nevertheless, we needn't—and in any case shouldn't—let things hang on such speculative metaphysical issues. Even if contexts only differ by one feature only very rarely, I see no compelling argument for the thesis that the shifts induced by intensional operators are shifts of *one* feature only. What reason do we have to think that the shifts induced by intensional operators need to go from a point which determines a set of contextual features H to a point that determines a set H^* with a one-feature difference? Why should we worry about the transition from H to H^* instead of just the transition from c to c^* ?

Historically speaking, the operators in modal logic shifted the world parameter

³²This interpretation of Lewis owes much to conversations with Clas Weber and Wolfgang Schwarz. See Weber (2012b).

only and temporal operators shifted the time parameter *only*. And when these logics were combined the operators retained their shifting abilities. So the idea was formed that an intensional operator shifts its parameters independently of all the other parameters.

Kratzer (manuscript), however, points out a number of examples from English where this does not seem to be the case. In English, the operator expressed by the auxiliary “have...(in the past)” seems to shift more than just the time parameter. Consider an actual utterance of (9) by Kratzer on June 25, 2008 in Amherst.

(9) I have eaten scallops in the past

Assume that “have...(in the past)” only shifts the time parameter and leaves the location and world parameters fixed. Then Kratzer’s utterance of (9) is true just in case there is a time before June 25, 2008 in the actual world when Kratzer ate scallops *in Amherst*. This is clearly the wrong result. Intuitively, Kratzer’s utterance of (5) is true just in case she actually ate scallops at some time before June 25, 2008 *at some location*. In this case we don’t want to look at “the variation of truth value under shifts of one feature only”, since the scallop-eating need not have occurred in Amherst. Kratzer concludes that the English aspectual “have (in the past)” obligatorily affects the time and spatial location coordinate together (Kratzer manuscript). This directly conflicts with the thesis that intensional operators only shift a single feature of context.³³

For another example say that Andy utters the following sentence in Canberra at 7:00am on July 2, 2009.

(6) Dave must be sleeping.

For this utterance to be true there is no requirement that in all the worlds compatible with Andy’s knowledge that Dave be sleeping *in Canberra* at 7:00am on July 2, 2009. It is only required that in all the relevant epistemic scenarios Dave be sleeping somewhere (e.g. Queanbeyan) at that time. Here we have a “modal” operator which is affecting the location parameter in addition to the world parameter. Such examples suggest that the thesis about shifting single parameters, which

³³Related to this conclusion Bennett (1978) notes that Montague (1968) gave a semantics for the English “Necessarily” such that it obligatorily affected the world and time coordinate together, i.e. he treated it like “necessarily-eternally”. Consider the sentence “It must be Tuesday”.

may just be a hangover from early index theory, does not hold up to empirical scrutiny. In any case, it needs a defense not just an assertion.

In light of this an interesting alternative now suggests itself. Perhaps the relevant shifts impose constraints along various parametric dimensions, but there is no requirement that the constraints are so restrictive that they can only affect a single parameter of context. In this way, all the various forms of shiftiness are captured by different accessibility relations between centered worlds. Perhaps temporal operators obligatorily shift the time parameter and modal operators obligatorily shift the world parameter but, in general, displacing devices induce (contextually sensitive) accessibility relations between points of reference. (This suggestion, obviously, has interesting connections to the semantics of modals given in Kratzer 1977.) In this way, the general function of a displacing device Σ can be captured by the following schema (where R_Σ is the accessibility relation induced by Σ relative to i).

- $\llbracket \Sigma \phi \rrbracket^i = 1$ iff for all/there exists $i' R_\Sigma i$ $\llbracket \phi \rrbracket^{i'} = 1$

On this picture of the semantics of intensional displacement it would not be required that intensional operators induce shifts of one feature only. Such operators would evaluate their operands at alternative points of reference but the determination of the relevant alternative points of reference would be more complicated than a simple variation along one coordinate. Even if there are ways to handle the Krazterian examples in a simple framework, it must be admitted that, at the very least, there is no principled reason why a semantic framework couldn't work in the multiply-shifty manner I've outlined.

In sum, if Lewis' argument that contexts cannot do all the work is simply a version of Kaplan's dilemma, it fails for the same reason that Kaplan's argument fails. It appears, however, that Lewis' considerations are ultimately based on the combination of a thesis about the metaphysics of contexts and a claim about the semantics of intensional operators. I have suggested that the metaphysical claim is speculative and that the semantical claim is challenged by recent empirical research. If either thesis is false Lewis' argument fails. This at least calls for looking at things anew and rethinking whether or not (sequences of) centered worlds can do all the work required by semantical shiftiness.

0.4 Multiple indexing

0.4.1 The argument for multiple indexing

Neither Kaplan’s argument nor Lewis’ argument has forced a move away from Montague’s early index theory. This raises the question: *What was wrong with early index theory?* Nothing much, I think, except for its limited development. But to make this clear we must confront an issue, which has been lurking in the background, namely *multiple indexing*.

Let a *singly-indexed semantics* be one in which the points of reference only include one parameter of each kind, e.g. one time parameter, one world parameter, one agent parameter, etc. And let a *multiply-indexed semantics* be one in which the points of reference include more than one parameter of some kind, e.g. two time parameters. The arguments of Kaplan and Lewis above are often taken to be arguments for multiple indexing (in particular for double indexing). This interpretation is wrong. Kaplan’s dilemma merely motivates a distinction in the model theory between standard and non-standard points of reference. Lewis’ discussion assumes multiple indexing—he is trying to argue for something different, i.e. the claim that points of reference must be comprised of two fundamentally different kinds of gadgets (contexts and indices). We must take care not to confuse the claim that points of reference are comprised of two different kinds of entities—a “context” and “circumstance”—with multiple indexing.

This is, of course, not to say that there is no good arguments for multiple indexing. In fact, the argument for multiple indexing was introduced by Montague’s student Hans Kamp (in Kamp 1971), who called attention to the following fundamental point.³⁴

³⁴The first argument for multiple indexing appears to have been put forward in Kamp (1967), which was a multilith circulated to a graduate seminar at the University of California in Los Angeles. The results were first noted in print in Prior (1968b): “Hans Kamp devised in 1967 a consistent semantic interpretation for ‘now’ which can be presented, with slight modifications, as a new sort of UT-calculus, in which T ties each tense-logical proposition not to one instant but to two, i.e. our basic form is not Tap but $Tabp$. The proposition p is related to the instants a and b in different ways; the essential difference is that the elimination of complexities from what is put after Tab may take us to other instants than a , but never to other instants than b . And wherever we may have been taken from a by operators like G and H , the one place to which we are always immediately taken by J [‘It is now the case that’] is the instant b , i.e. the instant represented by the second argument of T . We might read the form $Tabp$ as ‘From b it is the case at a that p ’, and ‘From b it is that case at a that p -now’ = ‘From b it is the case at b that p ’” (pp. 101–119).

An essential feature of the word ‘now’ is that it always refers back to the moment of utterance of the sentence in which it occurs, even if it stands itself in that sentence within the scope of one or more tenses. (Kamp 1971, p. 238)

A version of the argument for multiple indexing proceeds as follows:³⁵ Assume points of reference are singly-indexed. Consider the following two sentences.

(12) It is raining.

(13) It is raining now.

At any given point of reference these sentences have the same truth-value—their associated *extension-at-a-point* profiles are identical. But now consider the following two sentences, which are composed of the operator ‘It will always be the case that’ and sentences (12) and (13) respectively.

(14) It will always be the case that it is raining.

(15) It will always the case that it is raining now.

These sentences are true at a time if and only if their embedded sentences are true at all future times. But whereas the truth of the embedded clause of (14) depends on future weather, the truth of the embedded clause of (15) only depends on the weather of the situation in which it occurs. The expression ‘now’ clings tightly to

³⁵The argument given here is essentially the same as the argument in Kamp (1971). Kamp’s actual argument can be given succinctly as follows: Consider the following logical truths (or indexical validities) of English:

(10) It rains if and only if it rains now.

(11) It rains now if and only if it always rains now.

Assume (to reach a contradiction) a singly-indexed semantics. Given that (10) is a logical truth, the semantic clause for the indexical sentential operator ‘Now’ must be as follows:

$$\llbracket \text{Now}(\phi) \rrbracket^t = 1 \text{ iff } \llbracket \phi \rrbracket^t = 1$$

But then (11) is not valid (as long as there are times in structures where it rains and times in structures where it fails to rain). But (11) is valid. Contradiction.

the time in which (15) occurs. Hence there are contexts at which these sentences can differ in truth value, namely the rainy ones with non-rainy futures.

But if we assume that functions from singly-indexed points of reference to truth-values are the compositional semantic values we get the result that sentence (14) is true at a point if and only if sentence (15) is true at that point—since sentences (12) and (13) have the same *truth-at-a-point* profile. As we have seen this is the wrong result. Thus, singly-indexed points of reference encode insufficient information to serve as the inputs to semantic values.

We must move to a multiply-indexed semantics. Note that this argument also refutes the the happy-coincidence implementation of early index theory. Since the happy-coincidence view maintains that semantic values are functions from *contexts* to extensions, the view is essentially singly-indexed. It seems that no one actually held this view and the argument for multiple indexing establishes that no one *should* actually hold this view.

The conclusion of the argument above is that points of reference must include two time parameters. The general argument strategy generalizes in two ways. The first generalization generates analogous arguments for the other kinds of parameters, e.g. worlds, locations, agents. The essential phenomenon that calls for multiple indexing is when an indexical of a certain sort fails to shift under some intensional operator of the same sort. For example, ‘actual’ fails to shift in extension when embedded under certain modal operators, ‘here’ fails to shift under ‘somewhere’, and personal pronouns fail to shift under agent shifting modifiers such as ‘for John’.³⁶

The second kind of generalization moves from requiring two parameters of a certain kind to requiring three, or four, or infinitely many parameters of a certain kind. Vlach (1973) first noted the need to generalized to triple-indexing by considering examples such as the following.³⁷

(16) Once everyone then alive would be dead.

A proper treatment of the semantics of sentence (16) requires three time parameters: one for the time of utterance t , one for the time in the past t' referred to

³⁶For semantics on which modifiers like ‘for John’ are agent shifting operators see Lasersohn (2005) and Stephenson (2007).

³⁷It is perhaps even easier to see the need for triple indexing with iterated modals, e.g. consider “If the Titanic had not hit an iceberg on its maiden voyage, it would still have been possible for everyone who would then have survived the maiden voyage to die on the maiden voyage”. See § 2.4.1 for a detailed discussion of the argument for multiple indexing with respect to modals.

by ‘then’, and one for the time that is in the future from t' , t'' . Or to put the point another way: We can represent the metalanguage truth-conditions of sentence (16) as follows:

$$[\exists t' : t' < t][\exists t'' : t'' > t](\forall x(\text{alive}(x, t') \supset \text{dead}(x, t'')))$$

Given the three temporal variables in the syntax this requires *three* times in the point of reference. With increasingly complex sentences involving further temporal embedding there is a need for further temporal parameters. The appendix to Vlach (1973) briefly outlines the need to generalize to the infinite case (see pp. 183-185) and Cresswell (1990) has a detailed and careful treatment of such a generalization for both the temporal and modal case. The moral is that points of reference must be infinitely-indexed along various dimensions (e.g. times, worlds). There are multiple ways to implement the necessary machinery. What is essential is that multiple time parameters, multiple world parameters, multiple individual parameters, etc. be included in the point of reference.

0.4.2 Multiply indexed frameworks

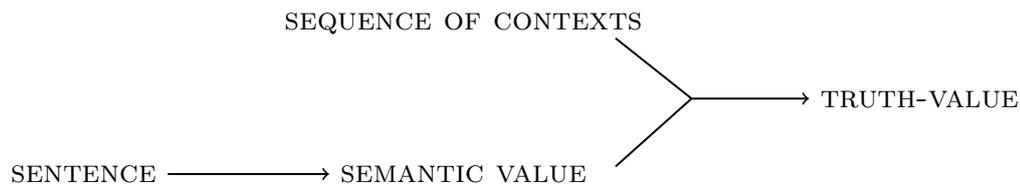
A straightforward way to do this is to have a point of reference be a list containing an infinite sequence of worlds, an infinite sequence of times, an infinite sequence of individuals, etc. Call this the *pure index* approach. A view along these lines is developed in the appendix to Schlenker (2006). Such a semantic framework could be coupled with a variety of syntactic theories depending on whether the language contains object language quantifiers and variables ranging over worlds, times, and individuals.

Perhaps the main worry with the pure index approach is Cresswell’s proliferation objection. In addition to worlds, times and individuals we will need locations, audiences, fragments of previous discourses, religions, previous drinks, etc. The worry is that there will always be some further relevant feature that we failed to list. I have already responded to this worry by insisting that one could, in principle, list all the truth relevant features. A further reply might point to the actual practice of working formal semanticists. It seems that they tend to focus on small fragments of the language at a time. It is arguable, that in these cases the full-blown point of reference is not of concern. At the end of linguistic inquiry

theorists can compile their respective lists of truth relevant features.

Another interesting implementation of the basic machinery is the *pure context* approach. On this approach a point of reference is an infinite sequence of contexts (i.e. an infinite sequence of centered worlds). In a sense, this view is the descendent of the happy-coincidence view, since the single context is replaced by a sequence of contexts. There doesn't seem to be any endorsement of this general view in print.³⁸ But there are clear structural similarities between a view on which points of reference consist of pairs of centered worlds and the frameworks for relativist semantics (e.g. MacFarlane 2005, Stephenson 2007, and Egan 2007) and various semantics for *de se* ascriptions (Ninan 2010a) and various semantics for “shiftable indexicals” (e.g. Schlenker 2003).

Figure 3: Pure context semantics.



If Lewis (1980) is right that “contexts are not amenable to shifting”, then this view is untenable. But we have raised doubts about Lewis’ premises. In particular, I have suggested that all the various forms of intensional shiftiness could be dealt with by different accessibility relations between sequences of contexts.

Of course there are also various impure points of reference that contain the requisite multiple parameters. On the preferred framework of Lewis (1980) (and Lewis 1983) a point of reference was a list containing a centered world and an infinite sequence of other various parameters.

Interestingly, Kaplan (1989a) never mentions the need to move beyond double-indexing, so on the framework he develops points of reference are relatively simplistic: $\langle\langle w, x, t, p \rangle, \langle w', t' \rangle\rangle$. The first element of the tuple is what Kaplan calls a “context of utterance” and second element is “the circumstance of evaluation”. Kaplan does consider adding locations and agents to the circumstance but discussion of multiple indexing beyond double-indexing is absent (unfortunately, discussion of

³⁸Although Wolfgang Schwarz has defended a view along these lines (with different motivation) in a talk presented at the Australasian Association of Philosophy in 2007. And the unpublished Rabern and Egan (manuscript) defends such a view.

multiple indexing is glaringly absent in much of the literature in philosophical semantics.³⁹) Although Kaplan insists on a fundamental conceptual distinction between the two elements of his points of reference, his view actually looks much more like the pure index approach—compare Kaplan’s distinction between context and circumstance to Lewis’ distinction between context and index.⁴⁰ Kaplan’s fundamental distinction does not concern the nature of the elements involved but instead concerns the *role* they play in the semantic theory: he insists that “mere double indexing, without a clear conceptual understanding of what each index stands for, is still not enough to avoid all pitfalls” (Kaplan 1989a, p. 510).

Interestingly, it is actually unclear whether or not Montague held a version of the *pure* index view. Montague seems to have kept a division between the elements of the point of reference that were part of what he called the “context of use” and the element that was the “possible world” (see Montague 1970b, pp. 379-380). This has been emphasized in Israel and Perry (1996).⁴¹

This is as good a place as any to enter a caveat about identifying Montague as a pure index theorist. Montague distinguishes within what we might call a ‘generalized index’ two parts, an index proper (not to be confused with a proper index) and a context of use. The *meanings* of closed sentences are functions from generalized indices to [truth-values]; but the *senses* of sentences are functions only from indices proper to [truth-values]. (Israel and Perry 1996, pp. 7-8)

It is unclear what role, if any, this distinction actually played in Montague’s semantic theory. One might read into it a proto-character/content distinction, since

³⁹But see the reminder in Rabern (2012b).

⁴⁰Although Kaplan does seem to think of the context parameters and the circumstance parameters as mere lists, given the way that they are actually defined all contexts will correspond to Lewisian centered worlds, and all circumstances will correspond to Lewisian centered worlds. Kaplan does not actually use improper points in the formal semantics he provides for *LD*. His set of contexts *C* are all proper (see clause 10, p. 544) and his circumstances of evaluation are world-times pairs, where he stipulates that all times are common to all worlds (see clause 7, p. 543). So every circumstance is a world centered on a time in that world. It seems that Kaplan’s reason for doing it this way was just for reasons of convenience, but this illustrates that double-indexing alone avoids Kaplan’s worries and that the issue of improper indices is only relevant to singly-indexed systems. In light of this it’s not clear what Kaplan is claiming when he says that “the indices that represent circumstance must include improper ones” given that all his circumstances are proper. A complicating issue here is whether the assignment function is supposed to be part of the context or part of the circumstance (see the discussion of reaction 1 in § 6.4.4).

⁴¹See also Thomason’s introduction to Montague and Thomason (1974), pp. 63-64.

Montague seems to identify intensions with Fregean senses.⁴² By dividing up the point of reference, the intensions (senses) would be more in line with Carnapian intensional entities and would be more familiar as potential objects of thought.⁴³ Be that as it may, I suspect that a multiply-indexed version of Montague's points of reference would be more akin to a pure index approach, than a impure or pure context approach. What Montague called "contexts of use" were not centered worlds, they were various parameters "of *remaining* relevant features of possible contexts of use" (Montague 1970b, p. 379).

The main options with respect to multiply-indexed points of reference are clear.⁴⁴ It may be that all of the various options are tenable: multiple indexing can be achieved by means of heterogeneous points of reference or multiple indexing can be achieved by homogenous points of reference.

0.5 Conclusions

Let's take stock.

The early index theorists generalized the points of reference used for the model-theoretic semantics of modal and temporal logic to include additional contextual parameters for the treatment of context-sensitive expressions. This purported to provide a unified framework which could accommodate both intensional and indexical phenomena for the semantics of natural language.

⁴²Cresswell complains about the distinction in his review Cresswell (1976), p. 204: "Montague...first splits up I into two sets, the set I of possible worlds (and moments of this perhaps) and the set J of contexts of use. He then introduces a threefold distinction between the *denotation*, the *sense*, and the *meaning* of an expression. In the case of sentences the denotation of a sentence is a truth value, the sense of a sentence is a function from possible worlds to truth values, and the meaning of a sentence is a function from contexts of use to senses. In an absolute sense a sentence has only a meaning; given a context of use it has a sense, and given also a possible world it has a truth value...Now there is no reason why we should not look at a sentence in this way...But the fact remains that the only feature required for compositional semantics is the meaning...Although Montague gives (on p. 379) an informal explanation of his distinction he gives no argument to shew that it is needed, and I suspect the underlying reason for retaining it was his logicians' conservatism..."

⁴³Note that the distinction really only shows up in Montague (1970b)—there is no distinction between meaning and sense in either Montague (1968) or Montague (1970a). Given this the motivation might have been for reasons of simplicity, since to give the intensional semantics one needn't worry about the extra contextual parameters.

⁴⁴There are further options with respect to the nature of points of reference, e.g. Barwise and Perry (1983) and Kratzer (1989) developed a framework where points of reference are sequences of "situations" (or parts of worlds), which allows for more fine-grained meanings.

Kaplan (1989a) charged that the early index theory blurred the conceptual difference between “context” and “circumstance”. We have seen that Montague and early index theorists had a straightforward response to Kaplan’s dilemma. If there is good reason to accept Kaplan’s distinction between context and circumstance and move away from early index theory, it does not stem from the dilemma.

Lewis (1980) also insisted that points of reference be composed of two fundamentally different gadgets, context and index. We have seen that Lewis’ argument for this conclusion is different from Kaplan’s. Lewis’ argument relies on a claim about the metaphysical nature of contexts, the claim that intensional operators shift one parameter only, and Cresswell’s parameter proliferation argument. I raised doubts about all of these premises. If any of my doubts are well-founded, then points of reference needn’t be complicated in the way Lewis suggests.

Kamp (1971) showed that points of reference must be multiply indexed. One might think that this is the argument that shows that early index theory was misguided. After all, the points of reference of the early index theorists were always singly indexed. But it is only the happy-coincidence version of early index theory that is in direct conflict with the multiple indexing results. The basic commitment of early index theory is that expanded points of reference serve as inputs to the semantic values—there was no requirement that the points of reference correspond to possible speech situations. Furthermore, Montague, of course, knew of Kamp’s results and at the end of Montague (1968) he mentions it as a further development of his framework: “Mr. Kamp has given an analysis, exhibiting several interesting features, of the indexical adverbs ‘yesterday’, ‘today’, and ‘tomorrow’, used in combination with tense operators”.

The idea that semantic theory can treat both context-sensitivity and intensional displacement by means of a pure (multiply-indexed) *point of reference* survives the arguments considered thus far. In my view, the real motivation for contemporary theorists to adopt a context-circumstance style framework comes from a further consideration: *the content of assertion*. In order to assess this motivation we must investigate the relationship between the theory of natural language semantics and the theory of assertion.⁴⁵

⁴⁵For further discussion of the terrain covered in this chapter (from a slightly different perspective) see Rabern and Egan (manuscript). This chapter has benefited from discussions with Andy Egan.

Chapter 1

Kaplan, content, and composition

The idea of Content—the what-is-said on a particular occasion—is central to my account. It is this notion that I saw, and continue to see, as the primary idea behind Frege’s *Sinn*.

David Kaplan (1989a)

The semantic framework in Kaplan (1989a) is standard and familiar, as is the distinction between two kinds of meaning that it proposes, the *character* and the *content* of an expression. Kaplan insists that these two aspects of meaning play very different roles in the semantic theory. The content is the information communicated or asserted upon a particular utterance. Whereas, the character of an expression encodes what any utterance of the expression would have as content. This is modeled as a function from various contextual parameters to the information content the expression has relative to those parameters. For example, different utterances of ‘I am hungry’ assert different information depending, crucially, on who happens to be uttering the sentence. But this is not the only difference in roles played by the two aspects of meaning. Kaplanian *contents* are also nominated as the entities over which the composition rules are defined—whereas character is said to do its work prior to the compositional process.

In this section, I will first elaborate and defend this interpretation of Kaplanian semantics. I will, then, argue that the identification of “what is said” with the compositional level of semantic representation is problematic. I will show that Kaplan’s formal language *LD*—*the logic of demonstratives*—exemplifies a failure of the compositionality of assertoric content. The failure is due to a tension between the compositional semantics of quantification and Kaplan’s direct reference

commitments on the content of variables.

1.1 Semantics and “what is said”

Kaplan’s notion of “what is said” or “content” plays two fundamental roles.

C1. The *content* of an expression in a context c is what is said (asserted or expressed) by an expression in a context.

C2. The *content* of any complex expression (in a context) is determined by the contents (in a context) of its syntactic constituents and the way they are put together.

With respect to (C2), Kaplan straightforwardly states that “the Content of the whole is a function of the Content of the parts” (p. 507).¹ A commitment to (C2) is also revealed in Kaplan’s discussion of what is known as *the operator argument* in connection with the compositional semantics of various intensional operators.²³

Kaplan insists that contents cannot be specific with respect to time, since if they were this would give the wrong result for the 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

¹Kaplan accepts a compositionality principle (which he calls “Frege’s principle of intensional interchange”) for both character and content: “(F1) The Character of the whole is a function of the Character of the parts. That is, if two compound well-formed expressions differ only with respect to components which have the same Character, then the Character of the compounds is the same. (F2) The Content of the whole is a function of the Content of the parts. That is, if two compound well-formed expressions, each set in (possibly different) contexts differ only with respect to components which when taken in their respective contexts have the same content, then the content of the two compounds each taken in its own context is the same.” (Kaplan 1989a, p. 507)

²See chapter 3 of Cappelen and Hawthorne (2009) for detailed discussion of the operator argument.

³Kaplan’s commitment to (C2) is also evident in his prohibition of *monsters*, since the prohibition can be understood as a thesis about the compositional mechanisms of the language. Within the Kaplanian framework the claim that there are no monsters is equivalent to the claim that all operators in the language are “at most” intensional operators—that is there are no hyperintensional semantic operations. See § ?for further discussion.

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 it is not the case that all temporal operators are vacuous. Thus, the contents of sentences (in context) are neutral with respect to time. A key 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.⁴

One could resist the conclusion that contents are temporally neutral by denying the premise that temporal operators operate on the contents of their embedded sentences. For example, one could insist that temporal operators operate on the characters—or on the functions from times to assertoric contents in a context—of their complement clause.⁵ But to do so would be to give up the thesis (C2): the claim that the content of a sentence in a context *c* is a function of the assertoric contents (in *c*) of its syntactic constituents. Kaplan does not consider this maneuver. Since he accepts the argument from premises about compositionality to conclusions about the nature of (assertoric) content, it seems he must be assuming that the semantic composition rules are defined over “what is said”-contents.

For these reasons, others commentators have agreed that Kaplan identifies his notion of content with the compositional level of meaning.⁶ For example, Jason Stanley sums up Kaplan’s commitments on what is said as follows.

According to Kaplan’s picture, what is said is fundamentally the object of natural language operators, which for him include expressions such as ‘It is necessary that’ and ‘It was the case that’. On Kaplan’s view, what is said by a sentence relative to a context is fundamentally identified with the semantic value it contributes to larger linguistic contexts

⁴This 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).

⁵Cf. Richard (1982) and Salmon (1986).

⁶See, e.g., Ninan (2010b), pp. 357-359: “In addition to being what is said by a stand-alone sentence in a context, Kaplan assigns contents a compositional role in his formal semantic theory.”

in which it occurs. As Kaplan writes (p. 504), his approach to what is said yields ‘... a functional notion of the content of a sentence in a context...’ (Stanley 2002, p. 322.)

According to this functional notion, contents are constrained to be the type of semantic entities over which the composition rules are defined.⁷ As Kaplan says, “A content must be the *kind* of entity that is subject to modification in the feature relevant to the operator” (Kaplan 1989a, pp. 503-504, footnote 28). This establishes, I think, that the Kaplanian notion of “content” or “what is said” involves the principle that the content of any complex expression (in a context) is determined by the contents (in a context) of its parts and the syntax.

But, one might worry that given this merely functional understanding of content (in terms of compositionality) that Kaplan’s commitment to (C1) would be undercut. Kaplan calls the relevant kind of meaning “what is said”, but this, of course, doesn’t establish that Kaplanian content is supposed to play a central role in a theory of linguistic communication. Perhaps, Kaplan’s notion of “what is said” should not be taken to have any strong connection to the theoretical notion of assertoric content. (For example, the intensions of Montague (1968) are merely functional in this way and do not appear to be constrained by issues stemming from the theory of communication—though see footnote 16 in § 6.2.)

Stanley (2002) seems to endorse this interpretation when he says “Kaplan nowhere discusses how his notion of what is said by a sentence relative to a context relates to what an utterance of that sentence would communicate in that context” (p. 322). But in my judgment, Stanley exaggerates the extent to which Kaplan’s notion of “what is said” fails to line up line with traditional notions of asserted content.⁸ The intuitive notion of “what is said” is absolutely central to Kaplan’s

⁷Kaplan never actually uses the term “compositionality”, instead he talks about what kinds of “semantic operations” exist in the language but the background idea is clearly compositionality.

⁸Stanley is distinguishing three approaches to analyzing “what is said” by a sentence in a context: one stemming from compositionality (associated with Kaplan 1989a), one stemming from a broader theory of linguistic communication (associated with Grice 1989), and one stemming from the semantics of propositional attitude ascriptions (discussed by, e.g., Cappelen and Lepore 1997). His main objective is to emphasize that it is an open question how the notions investigated by these three different approaches interrelate. Focusing on Kaplan’s compositional understanding of content, while downplaying Kaplan’s commitments on the role of content as the object of assertion serves Stanley’s dialectical purposes. I read Stanley as correctly emphasizing the major difference between the approaches of Kaplan and Grice to analyzing “what is said”: Kaplan was fundamentally concerned with compositionality, while Grice wasn’t. But for all that Kaplan could also have in mind a notion of “what is said” that he thought was roughly

investigation. As he says: “I began my investigations by asking *what is said* when a speaker points at someone and says, ‘He is suspicious’” (Kaplan 1989a, p 489).⁹ These intuitive judgments about what is said by an utterance are far removed from the purely functional notion, which only involves compositionality. Kaplan’s argument that indexicals are directly referential essentially relies on common-sense judgments concerning “aboutness” or what was said. For example, consider the following claim by Kaplan.

...if I say, today, ‘I was insulted yesterday’ and you utter the same words tomorrow, what is said is different. (Kaplan 1989a, p. 500)

The claim that different utterances of ‘I was insulted yesterday’ say different things, does not bear directly on compositional semantics *per se*. To have an impact on the purely compositional notion of “what is said” we would need an argument showing that the *compositional* meaning of ‘I was insulted yesterday’ must vary between utterances. But one can agree, for example, that there are worlds where what the first utterance says is true and what the second utterance says is false, without concluding anything about the compositional meaning of ‘I was insulted yesterday’—this is so even if we take into consideration the compositional semantics of modal operators. If one was *only* concerned with compositional semantics, then why would one even bother with a two-tiered system and the notion of “what is said” at all? After all, character functions (or functions from multiply indexed points of reference to extensions) provide all the resources necessary for compositional semantics, if contents in contexts do (cf. the distinction without a difference in Lewis 1980 between “constant but complicated” semantic values versus “variable but simple” semantic values).

We’ve seen already that there is simply no motivation for the Kaplanian two-tiered semantics stemming from issues involved with the compositional semantics (§ 0.2): Remember that we must take care not to confuse the issue of multiple indexing (or double indexing) with the claim that points of reference must be comprised of two different gadgets—a context and circumstance (see § 0.4). We also mustn’t confuse double indexing nor the claim that points of reference must be comprised

in line with the Gricean notion. I think Kaplan’s notion of “what is said” was roughly the traditional notion of a “proposition”, while at the same time being the functional or compositional notion—thus there is an inherent conflict in Kaplan’s “what is said”.

⁹Kaplan is alluding to the discussion in Kaplan (1978).

of two different kinds of gadgets with the claim that the semantic framework must distinguish between two kinds of “meaning”—a character and a content.

Furthermore, Kaplan repeatedly relates his notion of content to the traditional notions such as Fregean sense (p. 511), propositional component (p. 486), and Strawson’s notion of a “statement” (see Strawson 1950).¹⁰

- “The content of a sentence in a given context is what has traditionally been called a proposition.” (Kaplan 1989a, p. 500)
- “Strawson, in noting that the sentence ‘The present king of France is bald’ could be used on different occasions to make different statements, used *statement* in a way similar to our use of content of a sentence.” (Kaplan 1989a, p. 500)

For these reasons, I conclude that the standard interpretation of Kaplanian “what is said” is correct: the Kaplanian content of an expression in a context should be identified with the assertoric content of an expression in a context.¹¹

The general picture is this: the domain of the character function is a set C . Each $c \in C$ is a tuple of content-generating parameters—these tuples are called “contexts of utterance”. Character functions map contexts of utterance to contents. The content of an expression is itself a function from a set G to extensions. Each $i \in G$ is also a tuple of parameters, often understood to be world-time pairs—these are called “circumstances of evaluation”. Assigning a character to an expression amounts to assigning that expression an extension relative to all contexts c and circumstances i . Abstracting over the circumstance coordinate $\lambda i. [\alpha]^{c,i}$ gives the content of α at a context c and abstracting over both the circumstance and the context coordinates $\lambda c, i. [\alpha]^{c,i}$ gives the character of α . Content plays

¹⁰Kaplan does, however, notice that there is a tension between the functional notion of content in terms of compositionality and the traditional notion in terms of assertoric content, 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 a 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.

¹¹Cf. Salmon (2003), p. 385: Kaplan “. . . defined the content of a sentence as the proposition asserted by someone in uttering the sentence. . .”.

two fundamental roles: (C1) content is the object of assertion associated with an expression in a context—the theoretical entity that would be appealed to in a broader theory of linguistic communication—and (C2) content is the entity over which semantic rules are defined at the level of representation concerned with compositionality.¹²

1.2 Composition failure in LD

I will now argue that the two roles, (C1) and (C2), outlined for Kaplanian content are in conflict. I will show that Kaplan’s formal language LD , *the logic of demonstratives*, fails to be compositional, i.e. it is not the case that the content of any complex expression (in a context) is determined by the contents (in a context) of its syntactic constituents together with the syntax. 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.¹³

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:

- If π is an n -place predicate and $\alpha_1, \dots, \alpha_n$ are variables, then $\pi(\alpha_1, \dots, \alpha_n)$ 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 $j \in T \times W$).

¹²If compositionality is construed as functional application in the manner of Heim and Kratzer (1998) we could put the last point by say that the only composition rule is the following: INTENSIONAL FUNCTIONAL APPLICATION. If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any context c and circumstance i : if $\llbracket \beta \rrbracket^{c,i}$ is a function whose domain contains $\lambda i. \llbracket \gamma \rrbracket^{c,i}$, then $\llbracket \alpha \rrbracket^{c,i} = \llbracket \beta \rrbracket^{c,i}(\lambda i. \llbracket \gamma \rrbracket^{c,i})$.

¹³The 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.

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, $f : \{x_i\}_{i \in \mathbb{N}} \rightarrow U$. 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 $\llbracket \beta \rrbracket^{c,f,t,w}$ 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:

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

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 maintains that *variables are the paradigms of directly referential terms* (and when he is in a Russellian mood he expresses this by saying that a “variable’s first and only meaning is its value”, see Kaplan 1989a, p. 484 and Kaplan 1989b, pp. 571-573). In the formal part of “Demonstratives” he gives an explicit account of the content of variables and open formulae. 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 $t \in T$, $w \in W$, $\llbracket \alpha \rrbracket^{c,f,t,w}$. (Kaplan 1989a, p. 546)

That is, the content of α at a context c and assignment f is the function $\lambda t, w. \llbracket \alpha \rrbracket^{c,f,t,w}$, 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 formulae (or all expressions trivially) is only given relative to an assignment function. Among the list of parameters that character is a function from, we must include an assignment of values to variables.

Now consider the following two formulae.

(17) Gx

(18) Gy

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 (17) at $\langle c, f \rangle$ is identical to the content of (18) at $\langle c, f \rangle$ —in Kaplan's notation we have: $\{Gx\}_{c,f} = \{Gy\}_{c,f}$. Now consider the following more complex formulae.

(19) $\forall xGx$

(20) $\forall xGy$

Clearly it could be that $f('y')$ is G without everything being G . But then the content of (19) at $\langle c, f \rangle$ should not be the same as the content of (20) at $\langle c, f \rangle$ —that is $\{\forall xGx\}_{c,f} \neq \{\forall xGy\}_{c,f}$. But, of course, if the contents of (19) and (20) at $\langle c, f \rangle$ are determined by the contents of the quantifier ' $\forall x$ ' and (17) and (18) at $\langle c, f \rangle$ respectively, then the contents of (19) and (20) 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.

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

C2. 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.

The principle (DR) is explicitly stated in Kaplan (1989a) on p. 546 and I have argued above that Kaplan is committed to (C2) (“the Content of the whole is a function of the Content of the parts”, p. 507). Giving up either of these would resolve the tension. Assuming (DR) it follows that Kaplan’s *LD* fails to satisfy (C2) and, thus fails to be compositional in terms of content. If *LD* has a compositional semantics (and it does), then it cannot be given in terms of Kaplanian content.¹⁴ Assuming (C2), it follows that variables are not directly referential.

I will focus on the claim that 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.¹⁵

1.3 Repair strategies

There are, however, some maneuvers, which one might be tempted to make in defense of Kaplan. I will now turn to some potential repair strategies.

One 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.¹⁶ So my argument, which is an argument about *LD* is undeniable on this score.

¹⁴The official statement of the semantics given in 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, pp. 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 , $\llbracket \alpha \rrbracket^g = \lambda z. \llbracket \alpha \rrbracket^{g[x:=z]}$. (And cf. Stanley 2000, p. 395n7.) See § 2.3 for further discussion of the compositional semantics of lambda binders in connection with pronominal binding; and see reaction 3 in § 6.4.4 for discussion of syncategorematic rules and compositionality.

¹⁵As 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.

¹⁶There is a distinction between two kinds of variables, individual variables (\mathcal{V}_i) and positional variables (\mathcal{V}_p) but this is clearly irrelevant to the issue of freedom versus bondage (see p. 541).

It is true, however, that in the more informal discussions of “Demonstratives” and “Afterthoughts” 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). In “Afterthoughts” he makes the following comment.

... a free occurrence of a variable is the mark of an incompletely interpreted expression. . . Do not confuse this case, the case with the interpretational gap, with the case in which a *bound* occurrence of a variable appears free because we are focusing attention on a subformula. It is the second case, the case of *bound* variables, for which the Tarski apparatus of satisfaction and assignments was originally designed. In that case there is no interpretational gap. . . So the rules for evaluating *bound* occurrences of variables are another story entirely, and an irrelevant one. (Kaplan 1989b, p. 592)

It is not at all transparent how Kaplan is envisioning that this distinction should be implemented. Without providing the details, a simple appeal to the distinction between free and bound occurrences of a variable is just a label for the problem. Kaplan seems to be indicating that the assignment function that is involved in the Tarskian semantics of quantification is not involved in the evaluation of free variables. But Kaplan himself states a few lines later that his “treatment [of free variables] uses the familiar idea of an *assignment*, taken from the Tarski apparatus for the treatment of bound variables” (p. 592). And as outlined above, in the formal semantics of *LD*, there is one assignment function, which is the essential parameter used for both the evaluation of free variables and the semantics of binding.

Of course, the story could be complicated such that there were two assignment functions, one for the evaluation of free variables and one for the evaluation of bound variables that occur in quantified formulae. This would also require a syntactic distinction between two classes of homographic expressions in the language, e.g. ‘*x*’, which only occurs free and ‘**x**’, which only occurs bound (on analogy with Kaplan’s claim that “pronouns are lexically ambiguous, having both an anaphoric and a demonstrative use” (p. 572)). In fact, an appeal to homography or ambiguity would suffice. In this way, one could hold onto the claim that *free* variables

are directly referential, while providing *bound* variables with the non-referential content requisite for the compositional semantics of quantification.

While this modification to Kaplan’s syntax and semantics does result in a compositional semantic theory, while retaining the direct reference commitments on “what is said”, it’s unclear whether the modification has independent motivation. One can always vary the syntax in order to adhere to one’s favored semantic theory come what may. But what is the independent motivation to complicate the syntax and semantics in the way outlined? Why would one treat free and bound variables by means of separate semantic mechanisms, if a single mechanism sufficed?¹⁷ This points to an oddity in Kaplan’s whole approach, namely his division of pronouns into “demonstrative” and “anaphoric” pronouns. He says, “[Pronouns] have uses other than those in which I am interested (or, perhaps, depending on how you individuate words, we should say that they have homonyms in which I am not interested)” (Kaplan 1989a, p. 489). (I will return to this point in greater detail in § 3.2.)

A related strategy would be to modify the compositionality principle such that we do not assign semantic contents to expressions *simpliciter* but only to expressions-in-linguistic-environments. An approach of this kind is outlined in Salmon (2006), who insists “If there ever was a case in which Frege’s Context Principle has a straightforward application, this is it: the bound variable” (p. 114).¹⁸ This approach gives up on *semantic innocence*: this is the principle that the semantic value (or meaning) of an expression remains the same no matter what linguistic environment it is embedded in.¹⁹ Such a framework may be ten-

¹⁷As I argue in §6.4.4, taking this proposal seriously threatens to make Kaplan’s monster prohibition true by the definitions of “free variable/pronoun” and “bound variable/pronoun”. Such a thesis is uninteresting if it is just the claim that free pronouns are not bound! A similar worry arises for Salmon’s construal of “direct reference” (see footnote 19 below).

¹⁸For discussion of altering the composition principle in the required way see § 3.2.2 and Pagin and Westerståhl (2010a).

¹⁹Note that Salmon (2006) advocates the classical expression-based semantics over the occurrence-based semantics that he develops—his development of occurrence-based semantics is mostly used as a means to illustrate certain confusions he detects in other discussions of occurrence-based semantics. It seems that on Salmon’s considered view a term can be directly referential even though there are some *occurrences* of it that do not have the term’s customary designatum as semantic value. It seems that Salmon’s notion of “semantic content” of an expression *simpliciter* is not constrained by the compositionality principle (cf. the discussion of Soames 2011 in the next paragraph). Can it be that the semantic content of α is directly referential but the semantic content of every *occurrence* of α is distinct from the semantic content of α ? If so, then what theoretical work is the semantic content of α (*simpliciter*) doing? I’m not sure but it seems to be intimately tied up with intentionality—intuitions about who or what “gets

able, my point is just that a simple appeal to the distinction between free and bound variables, does not get Kaplan off the hook. And fleshing out the requisite details requires one to confront some controversial issues regarding syntax and the compositionality principle (see § 3.2.2 for more discussion of the “occurrentist” maneuver).

A further option is to simply concede that quantificational constructions (and variable binding in general) are not compositional. For example, Soames (2011) discusses issues in this vicinity and states that “Compositionality... fails for Tarskian quantification” (p. 129). The idea here isn’t to jettison compositionality altogether, it is just to give up on the idea that *LD* is compositional at the level of (assertoric) content. This strategy denies (C2). But Soames insists that there is no need for semantics to be compositional in that sense. Instead he claims: “What is crucial is that the semantic content of a formula at an assignment be determinable from that assignment plus *all linguistically significant properties of its parts*” (Soames 2011, p. 129). After all there is, of course, a perfectly compositional semantics for Tarskian quantification. But here we would have to appeal to another level of “meaning” to do the relevant compositional work. While this is a coherent option in the abstract, in the context of Kaplan’s framework it is not innocent, since it conflicts with another pillar of Kaplanian semantics: it amounts to allowing monstrous operations into the language (see § 6.4.2).²⁰

From the perspective of compositional semantics, I think it is obvious what has gone wrong: we have assigned semantic values of the wrong *type* to variables and open formulae. So, the most straightforward fix would be to give up the claim that the content of a variable is a constant function. Instead the content of a variable should be a function from assignments to individuals. This modification, however, would be to give up the thesis (DR) (i.e. that variables are directly referential). If the Kaplanian notion of content was the purely functional notion of “content” qua compositional value, then (DR) would be abandoned. This would be completely analogous to Kaplan’s abandonment of eternalism about propositions. Consider what Kaplan* would say about quantifiers and the need for assignment-neutral contents.

mentioned” by certain sentences, “aboutness”, and “what is said”.

²⁰I will return to discuss monsters in greater length in chapter 6. See also Rabern (forthcoming) for a defense of the claim that under the assumption that Kaplan’s *LD* is compositional, it follows that the semantics for *LD* is monstrous.

If we built the assignment of values to variables into the contents, it would make no sense to have variable-binding quantifiers. If what is said is by an open formula is thought of as incorporating reference to specific individuals it is otiose to ask whether what is said would have been true relative to other individuals. Quantifiers applied to sentences whose contents incorporate a specific assignment of individuals are redundant.

The point is that the content of a formula must be the kind of entity that is subject to modification of assignments (i.e. the parameter relevant to the quantifier).

So while there there are strategies to modify *LD* that will avoid the tension I've outlined, the tension is genuine and its not obvious how one who wished to adhere to the general Kaplanian commitments should proceed. This was demonstrated by a failure of compositionality in *LD*, given the assumption that variables are directly referential. I outlined a few ways to avoid the problem: the more Kaplan-friendly options are to either make a principled syntactical distinction between free and bound variables (or give an occurrence-based semantics) or significantly alter the compositionality principle, whereas the Kaplan-unfriendly options are to give up the thesis that variables are direct referential or give up the identification of "what is said" with the compositional level of meaning. This tension I have pointed to is a general problem that one must confront in semantic metatheory: what is the relationship between the values posited in a compositional natural language semantics and the objects of assertion that are appealed to in the theory of communication?

Appendix 1.A QML and direct reference

I will make a short digression to put the point another way: 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 or open formulae seem suspect. A good question, then, is this: *What was the original motivation for the thesis that variables are directly referential?*

A main motivation seems to derive from issues in quantified intensional logic. In particular, the idea seems to stem from issues surrounding the conceptual versus

objectual interpretation of quantified modal logic (QML). While the issues here motivate the thesis that variables should be construed as rigid designators (rigid de jure)—in the sense that the assignment of values to variables is independent of the possible world parameter—it’s not clear how the complications of QML might motivate the direct reference understanding of variables. The motivation for direct reference seems to be essentially tangled up with intuitive judgments concerning “aboutness” and “what is said” by open formulae and sub-formulae and these motivations are something over and above issues in compositional semantics proper.

Kaplan describes the motivation for direct reference by considering the following quantified modal formula.

$$(21) \exists x(Fx \wedge \neg \Box Fx)$$

Kaplan states that 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 then determine whether or not it is a necessary proposition. Here again Kaplan seems to be endorsing the idea that semantical composition proceeds via composing propositional components (i.e. assertoric contents). Since we must associate a *proposition* with ‘ Fx ’ in order to evaluate (21) and since propositions are sets of worlds (or world-time pairs) we must first supply a meaning for ‘ x ’. Kaplan insists that the only type of meaning a variable has is its value (with respect to an assignment). That is, variables are directly referential.

Notice that there is no *argument* here that variables are directly referential. The idea that a variable’s only meaning is its value seems to be based on a thought like this: Variables in QML should be understood to be rigid, and since variables don’t plausibly have anything like a descriptive meaning (or associated individual concept), their *meaning* should be understood to simply be their value relative to an assignment.

But we know that we cannot take the semantic value of ‘ Fx ’ in (21) to be a proposition (qua set of worlds), since the existential quantifier requires a value that is sub-propositional. We needn’t assign a proposition to ‘ Fx ’, instead we must determine whether or not for some assignment g the content ‘ Fx ’ would have relative to g is necessary.²¹ This doesn’t motivate direct reference. On the

²¹Looking at it this way gives quantification a certain monstrous flavor: “According to some

contrary it motivates that idea that the semantic value of an open formula in QML is a function from assignments and worlds to truth values.

Direct reference is not supported by issues stemming from the compositional semantics of QML. Instead, I think, it stems from simply taking the metaphors of “aboutness” too literally. Or more charitably, the motivation for direct reference stems from philosophical arguments concerning the nature of the objects of assertion—and has nothing directly to do with compositional semantics. That’s fine as far as it goes. But if so, then one shouldn’t be misled into thinking that the thesis of direct reference is somehow a deep truth about language stemming from complicated technical issues in quantified modal logic (or with respect to the compositional semantics thereof). The thesis simply has no such justification.

If we want to calculate the truth-value of (21) at a point of reference $\langle g, w \rangle$ 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):

$$\llbracket \exists x(Fx \wedge \neg \Box Fx) \rrbracket^{g,w} = 1 \text{ iff}$$

there is a $g'R_1g$ such that $\llbracket Fx \wedge \neg \Box Fx \rrbracket^{g',w} = 1$ iff

there is a $g'R_1g$ such that $\llbracket Fx \rrbracket^{g',w} = 1$ and $\llbracket \neg \Box Fx \rrbracket^{g',w} = 1$ iff

there is a $g'R_1g$ such that $\llbracket Fx \rrbracket^{g',w} = 1$ and $\llbracket \Box Fx \rrbracket^{g',w} = 0$ iff

there is a $g'R_1g$ such that $\llbracket Fx \rrbracket^{g',w} = 1$ and there is a $w'R_2w$ such that $\llbracket Fx \rrbracket^{g',w'} = 0$.

For these reasons, I think there are no good reasons to retain the thesis that the content of a variable is an individual while identifying content with the compositional level of meaning.

assignment it is true that $(Fx \wedge \Box Fx)$ ”. See § 6.4 for detailed discussion of the relationship between variable-binding quantifiers and monsters.

Chapter 2

Assertoric composition failures

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 propositional contents of sentences do not obey the compositional principle. . .

David Lewis (1980)

When someone makes an assertion by uttering a sentence 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. 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)

¹I want to stay neutral on the nature of assertion—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 chapter 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 and governs norms on the *act* of assertion.

²Likewise, 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 (1997a) and Ninan (2010b) mean by “assertoric content”.

- what an assertion adds to the common ground (Stalnaker 1978³)
- 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 and the hypothesis that 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 its parts and the way they are put together. This is more carefully defined as follows.⁴

Principle of Compositionality. 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 $m[R(\alpha_1, \alpha_2, \dots, \alpha_n)] = f_R[m(\alpha_1), m(\alpha_2), \dots, m(\alpha_n)]$.⁵

But what does “meaning” *mean* in this definition? Assume we understand the “meaning” of a sentence to be *what is said* by utterances of it. Is the assertoric

³Roughly, 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.

⁴This formulation is adapted from the formulation of basic compositionality ($\text{Func}(\mu)$) provided in Pagin and Westerståhl (2010a).

⁵To 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’.

content of a sentence determined by the assertoric contents of its parts and the syntax?⁶

I argued in § 1.1 that this was the Kaplanian view. And, *prima facie*, it seems right. The following kind of claims seem almost tautological: (i) an utterance of ‘Atticus believes that mirrors are windows into an alternate universe’ is true just in case Atticus stands in the belief relation to the proposition expressed by ‘Mirrors are windows into an alternate universe’, (ii) what is said by an utterance of ‘Oregon is south of Washington and Oregon is north of California’ is determined by the assertoric contents of ‘Oregon is south of Washington’ and ‘Oregon is north of California’, and (iii) an utterance of ‘It is necessary that Hesperus is Phosphorus’ is true just in case what ‘Hesperus is Phosphorus’ *says* is necessary.

I raised a technical problem, internal to Kaplan’s *LD*, with the thesis that the assertoric content of the whole is determined by the assertoric contents of the parts. Unfortunately, the problems aren’t just confined to that artificial machine. Analogous problems arise within a wide array of examples from natural language. In fact, there is a general tension between various contextualist theories of assertoric content and the 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.

Assertoric composition failure. There is an *assertoric composition failure* just in case (i) ϕ and ψ have the same assertoric content at a context 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

⁶Do subsentential expressions 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?”. Kaplan explicitly states that his notion of “what is said” applies to subsentential expression: “I take content as a notion applying not only to sentences taken in a context but to any meaningful part of speech taken in a context. Thus we can speak of the content of a definite description, an indexical, a predicate, etc.” (Kaplan 1989a, p. 501). If one insists that the notion of assertoric content only makes sense for sentences, note that the issues raised in this section can be—and often are—presented in terms of the assertoric contents of *sentences* (which occur as syntactic constituents of complex sentences). For the purposes of exposition 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.

⁷Or to absolutely precise, let A be the function that takes an expression ϕ and a context c and gives the assertoric content of ϕ in c . There is an *assertoric composition failure* iff it is not the case that for every syntactic rule R there is a semantic operation f_R such that

Failures of this kind represent a general pattern that 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 rehearse some of the most discussed cases.

2.1 Eternalism and the semantics of tense

It is a familiar idea that the things we say and believe are *eternal*, in the sense that these contents are such that if they are true (false), then they are true (false) relative to any time. This idea goes back, at least, to Gottlob Frege, who said the following.

The words ‘This tree is covered with green leaves’ are not sufficient by themselves to constitute the expression of thought, for the time of utterance is involved as well. Without the time-specification thus given we have not a complete thought, i.e., we have no thought at all. Only a sentence with the time-specification filled out, a sentence complete in every respect, expresses a thought. *But this thought, if it is true, is true not only today or tomorrow but timelessly.* (Frege 1918, my emphasis⁸)

For many theorists the thesis that the objects of thought and talk are eternal is a simple platitude about nature of such objects. For example Salmon claims, “The eternalness of a proposition is central and fundamental to the very idea of a proposition, and is part and parcel of a philosophically entrenched conception of proposition content” (Salmon 2003, p. 370).⁹ The philosophically entrenched conception of “proposition” is the idea that propositions play, at least, the following theoretical roles: (i) the meanings of a sentence, (ii) the objects of certain mental attitudes (e.g. belief, desire), (iii) the referents of ‘that’-clauses, (iv) the things

$A[R(\phi_1, \phi_2, \dots, \phi_n), c] = f_R[A(\phi_1, c), A(\phi_2, c), \dots, A(\phi_n, c)]$. See Pagin and Westerståhl (2010a) for various formulations of the compositionality principle, including principles like this which accommodate context-sensitivity.

⁸Quoted from the translation by P.T. Geach and R.H. Stoothoff in Beaney (1997), p. 343.

⁹ The eternalness of propositions is so essential to this conception it deserves to be expressed poetically: “The truths truthsayers say and the sooths soothsayers soothsay—these all are propositions fixed, eternal, and unvarying. Eternal are the things asserters assert, the things believers believe, the things dreamers dream. Eternal also are the principles we defend, the doctrines we abhor, the things we doubt. . . these are one and all eternal propositions.” (Salmon 2003, p. 372)

we assert and communicate, (v) the relata of the logical consequence relation, and (vi) the primary bearers of truth. The claim that eternalness of propositions is platitudinous is that claim that these roles—or some special subset of these roles—requires their realizers to be eternal. This claim is far from obvious.

For some theorists, eternalism may just true by their very idea of a “proposition” but any debate with such theorists threatens to be merely terminological. And even if one takes it as definitional that, e.g., the objects of assertion are eternal it is not obvious that eternal propositions can play all of the other roles that constitute the philosophically entrenched conception. A better motivation would be an *argument* that, e.g., the objects of assertion and belief must be eternal.

In this regard it is common to find appeals to the intuitive notion of “what is said”. For example, if I now utter ‘It is raining’ and you utter the same words tomorrow, isn’t what we *say* different? It seems that I will say something *about* today and you will say something about tomorrow. But in another intuitive sense we will say the same thing, since we uttered the same sentence, with the very same meaning (character). These intuitive judgments about “what is said” don’t get us very far. I think Lewis was right when he complained as follows.

Unless we give it some special technical meaning, the locution ‘what is said’ is far from univocal. It can mean propositional content. . . It can mean the exact words. I suspect it can mean almost anything in between. (Lewis (1980), p. 41)

Another type of appeal for eternalist content is to insist that the idea of temporalist content in connection with ordinary notions of belief is somehow incoherent—such as the following by Jeffery King.

. . . it is hard to make sense of the idea that the things I believe may change truth value across time and location. What would it be, e.g., to believe that the sun is shining, where what I believe is something that varies in truth-value across times and locations in the actual world? (King 2003, p. 196)

This, however, is still not much of an argument, since locutions such as “what is believed” suffer from the same kind of ambiguity as “what is said”. And the challenge seems weak, since we know quite well what it would be to believe a

temporal proposition: it would be to locate one's self within a space of world-time points (cf. Lewis 1979a).

King goes on to buttress his claim by appealing to what he sees as the “powerful arguments” for eternalism from Richard (1981).¹⁰ The argument from Richard is perhaps the *only* genuine argument for eternalism.¹¹ The general form of the argument is this: assume propositions are not eternal, then (given some innocent semantic assumptions) certain intuitively invalid arguments, turn out to be valid. Thus, propositions are eternal.

One assumption needed is an assumption about the truth conditions of belief ascriptions. Ignoring the world parameter, the assumption is that an (indexical-free) ascription of the form ‘ α believes ϕ ’ is true at a time t just in case the referent of α (at t) believes the proposition expressed by ϕ (at t). Let $[\phi]^t$ represent the proposition expressed by ϕ at t and let BEL_t represent the belief relation at t (and allow the use/mention error with α), then we can represent this assumption about the semantics of belief ascriptions as follows.

A1. $\llbracket \alpha \text{ believes } \phi \rrbracket^t = 1$ iff $\langle \alpha, [\phi]^t \rangle \in BEL_t$.

We also need an assumption about the semantics of simple past tense sentences. The traditional Priorian semantics will suffice (Prior 1957, p. 9). Again we ignore context and the world coordinate.

A2. $\llbracket \text{PAST}(\phi) \rrbracket^t = 1$ iff there is a $t' < t$ such that $\llbracket \phi \rrbracket^{t'} = 1$.

The denial of eternalism is *temporalism*: the thesis that some propositions vary in truth-value across times. A corollary of temporalism is that if a sentence ϕ is free of indexicals (e.g. ‘now’, ‘I’), then any utterance of ϕ expresses the same proposition. This is the feature of temporalism that plays a central role in Richard's argument.

¹⁰Salmon (2003), pp. 372–374 also endorses this type of argument.

¹¹Schaffer (2012) discusses what he sees as further arguments for eternalism: (i) the analogies between pronouns and tense (Partee 1973) and (ii) the arguments for multiple indexing (in particular the thesis that the language has the full expressive power of object language quantification over times, Cresswell 1990). However, I don't, see these as arguments for eternalism about the objects of assertion. These might be taken as arguments for an extensionalist treatment of tense (i.e. a syntactic representation involving object language temporal quantifiers and variables) but such a syntactic representation is independent of the nature of the semantic values involved (and the nature of propositions, if those are distinguished from semantic values). See, e.g., Ninan (2010a) pp. 372–378 (and Weber 2012a) for how to have an extensionalist syntax with temporalist semantic values.

Temporalism. For any sentence ϕ (free of indexicals) and any times t, t' the proposition expressed by ϕ at t is identical to the proposition expressed by ϕ at t' , i.e. for all times t and t' , $[\phi]^t = [\phi]^{t'}$.

With these assumptions in place Richard asks us to consider the following argument.

(22) Mary believed that Nixon was president.

(23) Mary still believes everything she once believed.

(24) So, Mary believes that Nixon is president.

Richard's contention is that this argument is not a valid argument of English but given the innocent assumptions about the semantics of belief ascriptions and the simple past tense, temporalism validates the argument. The reasoning of the argument can be glossed as this: Mary stood in the belief relation to the temporal proposition that Nixon is president, she still stands in the belief relation to that proposition, thus, she believes that Nixon is president (now). Richard's analysis is that the trouble stems from the assumption that we stand in the belief relation to temporal propositions. And so we should reject temporalism.

The real action in this argument, however, is with premise (23). The fairly innocent assumptions concerning semantics all have to do with premise (22). Premise (23) has to do with *belief retention*.¹² The further assumption needed is the following account of the truth conditions of ascriptions of belief retention.

A3. $\llbracket \alpha \text{ believes everything she once believed} \rrbracket^t = 1$ iff for all propositions p , if there was a time $t' < t$ such that $\langle \alpha, p \rangle \in BEL_{t'}$, then $\langle \alpha, p \rangle \in BEL_t$.

This account of belief retention fits well with eternalist propositions but it doesn't seem to fit well with temporalist propositions. Consider: Yesterday I believed it

¹²There is another version of the argument that takes a slightly different form. Consider the following argument: (i) Mary believed that Nixon was president, and she still believes *that*, (ii) Thus, Mary believes that Nixon is president. This argument not only involves belief retention, it brings in the vexed issue of propositional anaphora. See Schaffer (2012) for a critical discussion the type of propositional anaphora involved in such arguments.

was Sunday and I haven't changed my mind about *that* but I don't locate myself in a world centered on Sunday.¹³ An account of belief retention with respect to centered propositions will have to be more complicated. It is not completely obvious how to model belief change and belief retention on a centered worlds framework, but such a story seems like it should be available.¹⁴ Richard acknowledges that the temporalist could respond by providing an alternative account of belief retention. But he insists that eternalism is more plausible than any of the offered accounts of temporalist belief retention.

For this reason the argument is by no means a knockdown argument against temporalism. In spite of Richard's suggestions to the contrary it seems that the temporalist could provide a principled and adequate account of belief retention that invalidated the questionable argument form. Moreover, Aronszajn (1996) has pointed out that there seem to be Richard-like arguments that actually tell in favor of the temporalists, e.g. consider: (i) At one point in time, most Americans believed that Elvis Presley was alive, but today, few Americans believe that, (ii) So, few Americans believe that Elvis Presley is alive (p. 87). So, I don't think the Richard-style arguments should sway us too much one way or another. Nevertheless, the Richard-style arguments have had their influence.¹⁵

Whether the eternalist conception of propositions is thought to somehow be a platitude of the notion of *information* or whether it is thought to be demonstrated by arguments like Richard's, eternalism is part of the philosophically entrenched conception of a proposition.

In spite of this, there is standard argument that eternalism cannot be true, which we have confronted already, *the operator argument* (Kaplan 1989a, Lewis 1980). The eternalist claims that the semantic content of a sentence (in a context) is an eternal proposition. Given the assumption of *compositionality*—the semantic content of any complex expression is determined by the semantic contents of its syntactic parts—the operator argument against eternalism is the argument to the

¹³Analogous cases arise where the the propositional anaphor picks up on agent neutral centered propositions: "I believe I am Hume, and Heimson believes everything I believe; so Heimson believes he is Hume"; "Ted thinks that his partner has been unfaithful; Ted's partner thinks that too; so both Ted and his partner have trust issues."

¹⁴There is an extensive literature on the related problem of "belief updating" with center propositions in the Bayesian tradition dealing with, e.g., the Sleeping Beauty problem. It seems that in such frameworks conditionalization must be combined with some kind of "shifting"—belief retention, then, can be understood as the shifting without the conditioning on new evidence. For one such proposal on updating self-locating beliefs see Schwarz (2012).

¹⁵See Fitch (1999), Salmon (2003), and Schaffer (2012) for further discussion.

effect that eternalist propositions violate the compositionality principle.

Consider the following two sentences.

(25) It is raining

(26) It is raining now

The eternalist insists that these two sentences *say the same thing* in the sense that at time t they both express the eternal proposition that it is raining at t . But now consider sentences (25) and (26) embedded under the past tense operator PAST.¹⁶

(27) [[PAST] [it is raining]]

(28) [[PAST] [it is raining now]]

It is clear that (27) and (28) do not have the same assertoric content at t . While the truth of what is said by an utterance of (27) at t depends on the weather situations of times prior to t , the truth of (28) at t only depends on the weather situation at t . The content of (25), which is the content relevant for the evaluation of (27), should be a temporally neutral content. As Kalpaln says “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...”. For this reason the eternalist commitment about assertoric content is in direct conflict with the compositionality principle.¹⁷ Therefore, it seems that we should accept temporalism.

This tension is especially salient for those theorists who are led to eternalism by consideration of intuitive notions like “what is said” and “what is believed”, etc., since such notions are supposedly inherited from the Kaplanian notion of “content”. Salmon (2003), following Richard (1982), sets out to modify Kaplan’s semantic framework in order to accommodate the eternal nature of information

¹⁶PAST 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).

¹⁷There are some important subtleties that I am glossing over here, some of which I will cover in § 3.2. Also see Weber (2012a) for a careful and detailed analyses of the conflict between eternalism and the compositional semantics of tense. See also King (2003), Rabern (forthcoming), and Schaffer (2012) for issues concerning extensionalist versus intensionalist syntactic representation of tense.

content, while at the same time providing an adequate semantics for the temporal operators.¹⁸ 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 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. Here is how Salmon sums this up 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

¹⁸See also Salmon (1986) and Salmon (1989); although Salmon (2003) is in many respects the clearest and most general explication of the Salmonian view in this vicinity as it attempts to be neutral with respect to the structured versus unstructured semantic theories.

amalgamation . . .” (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*. A content base is (or determines) 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.¹⁹ The upshot is that one can retain eternalism about assertoric content, if one abandons the compositionality of assertoric content.

2.2 Contextualism and embedded epistemic modals

Eternalists are a certain kind of “contextualist”. They hold that sentences such as ‘it is raining’ expresses different propositions in different contexts. Another type of contextualist is the contextualist, who thinks that epistemic modals exhibit a novel kind of context-sensitivity. Many agree that modals are context-sensitive, in the manner proposed by Kratzer (1977), but I have in mind a particular kind of dependence on context (the kind elaborated by, e.g., DeRose 1991). Consider the following sentence (understood to use an epistemic modal).

(29) Leon might be at the pub.

Utterances of (29) in different contexts seem to express different propositions. For example, if A, who notices that its 6:00pm and notices that the lights are off in Leon’s office, utters (29) it seems that A has said something true; but if B, who

¹⁹The proposal in Richard (1982) makes the same essential move—as it distinguishes compositional semantic values from propositional content. Richard states his basic maneuver as follows: “Essential to Kaplan’s argument is the claim that the semantic values of sentences, in a formalism representing tensed English, must be the formal representatives of propositions. This claim is, in part, justified by the view that tenses in English must be understood as operating on propositions. It is this claim which I wish to challenge. It is at least as plausible to suppose that tenses (as well as operators such as ‘It is logically possible that’) operate on the linguistic meanings of sentences, entities which are distinct from propositions” (p. 342). Richard doesn’t pull out an extra layer of semantic values (e.g. Salmon’s content-bases), instead he construes temporal operators (and modal operators) as monstrous operators that operate directly on characters. Indeed the extra complexity in terms of Salmon’s content-bases is not required.

is Leon's office mate and knows that Leon had a meeting at 6:00pm, utters (29) it seems that B has said something false. In these cases, it seems that there is a contextually determined set of possibilities and in uttering (29) the speaker is saying that *Leon being at the pub* is compatible with that set of possibilities. The contextualist view under consideration contends that in different contexts different sets of possibilities are relevant. An intuitive—though not completely accurate—way to state the contextualist view is to say that A's utterance of (29) expresses the proposition that it is compatible with A's knowledge that Leon is at the pub, whereas B's utterance of (29) expresses the proposition that it is compatible with B's knowledge that Leon is at the pub.

The basic contextualist claim is that in different contexts the propositions expressed by epistemic 'might'-sentences concern different bodies of knowledge. There is dispute over which body of knowledge is at issue. A first idea is that the relevant knowledge is the speaker's knowledge. But if A walks up to B and utters (29), it seems that it would be appropriate for B to respond "That's not true". In that case it seems that A's utterance of (29) expresses the proposition that it is compatible with what both A and B know that Leon is at the pub; and that is false. This raises the question of whether there is any constraint at all on whose knowledge is relevant. An attractive idea is the *speaker inclusion constraint* (Egan et al. 2005), which is the principle that although whose knowledge is relevant is flexible it is always the case that the speaker's knowledge is among the relevant body of knowledge.²⁰

A clear motivation for the speaker inclusion constraint provided by Weatherston (2008) stems from the consideration of Moore-paradoxical sentences involving epistemic modals.²¹

(30) Leon is at the pub, but he might not be

If there is a speaker inclusion constraint, then we can provide a pragmatic explanation of why any utterance of (30) would strike us as inappropriate. The explanation is this: by uttering the first conjunct of (30) the speaker would represent herself as knowing that Leon is at the pub; but in uttering the second

²⁰Although certain controversial cases—so-called exocentric uses of epistemic modals—purport to refute this principle, e.g. the example of Tom and Sally in the maze (Egan et al. 2005). See also Stephenson (2007).

²¹Cf. the discussion of premise (6) (It's not the case that I can know I'm not in Prague if I might be in Prague) in Egan et al. (2005).

conjunct of (30) the speaker would be saying that it is compatible with what she (and her mates) know that Leon isn't at the pub (which implies that she doesn't know that he is).

I take this to provide some prima facie motivation for a certain contextualist view of 'might'-sentences. The view is this: The proposition expressed by an epistemic 'might'-sentence in a context is specific with respect to a contextually salient body of knowledge, in particular the knowledge of the speaker and her conversational participants. Let's encode this in the following contextualist clause for (epistemic uses of) 'might'.

- $\llbracket \text{might}(\phi) \rrbracket^{c,w} = 1$ iff there is a world w' compatible with what the speaker of c (and her mates) know in w such that $\llbracket \phi \rrbracket^{c,w'} = 1$

Egan et al. (2005) and Weatherson (2008) present problems for contextualist treatments of 'might' that ultimately concern embedding.²² To get the problem going assume the following simple semantics for 'says'.

- $\llbracket \beta \text{ says } \phi \rrbracket^{c,w} = 1$ iff all w' compatible with what β says in w are such that $\llbracket \phi \rrbracket^{c,w'} = 1$.

Now consider a 'might'-sentence embedded in a speech report.

(31) John says Leon might be at the pub

Assume Ian utters (31). The contextualist semantics predicts that this utterance is true just in case John said that its compatible with what *Ian* knows that Leon is at the pub, since

²²There are various lines of argument in Egan et al. (2005). But a general theme concerns the embedding of epistemic modals under 'says that', propositional attitude verbs, and temporal modifiers. In my view a contextualist should reject principle (4) of the inconsistent set of principles concerning Myles utterance of 'Granger might be in Prague'. This is the principle that would allow one to infer (iii) I might be in Prague, from (i) Myles says that I might be in Prague and (ii) Myles speaks truly. The contextualist should also quibble with principle (1). Since the view is that 'might' is an indexical, we should expect (1) to be no better than the following disquotation principle: when Myles says, 'I am hungry', Myles says that I am hungry. It just so happens that the binding works right in the 'might' case. It is more akin to the following disquotation principle: when John points to himself and says 'He is hungry' John says that he is hungry.

$\llbracket \text{John says Leon might be at the pub} \rrbracket^{c,w} = 1$ iff

all w' compatible with what John says in w are such that
 $\llbracket \text{Leon might be at the pub} \rrbracket^{c,w'} = 1$ iff

all w' compatible with what John says in w are such that
there is a world w'' compatible what the speaker of c (Ian)
knows in w' such that $\llbracket \text{Leon is at the pub} \rrbracket^{c,w''} = 1$.

But that is clearly wrong. The utterance of (31) instead requires that John said it's compatible with what *John* knows that Leon is at the pub. So, when embedded the body of knowledge that is relevant is *shifted* from the speaker of the context to the subject of the report. It seems that the contextualist lacks the resources to accommodate the requisite shift.²³

This is taken to be an argument in favor of relativism, i.e. the propositions expressed by epistemic 'might'-sentences are only true or false relative to a judge (or a body of knowledge). This view, as opposed to contextualism, doesn't build a body of knowledge into the proposition expressed, so it avoids the embedding problem.²⁴ But this requires the relativist to jettison the speaker inclusion constraint. In so far as the speaker inclusion constraint (and contextualism generally) is well-motivated we are left with an unhappy tension between the contextualist commitment on assertoric content and the compositional semantics of embedded 'might'-sentences.

Dilip Ninan has proposed an elegant solution to this puzzle. As Ninan (2010a) presents the puzzle, it is to accommodate the following two pieces of data:

- (a) The fact that 'John says Leon might be at the pub' is true iff John says it is compatible with what *he* (John) knows that Leon is at the pub.

²³The contextualist could appeal to a monstrous semantics for 'says': $\llbracket \beta \text{ says } \phi \rrbracket^{(w,t,a),w'} = 1$ iff all w'' compatible with what β says in w' are such that $\llbracket \phi \rrbracket^{(w,t,\beta),w''} = 1$. Note that if a contextualist appeals to a monstrous semantics, they thereby jettison the equivocation of compositional value with asserted content. Although, I think this essentially right and that it is not fundamentally different from the solution discussed below (i.e. Ninan's "shiftable contextualism", see Ninan 2010a, pp. 368–372.), this first pass proposal will not work for sentences such as 'John says I might be at the pub'. Here we need the body of knowledge to shift without shifting the interpretation of 'I'.

²⁴A simple relativist clause for 'might' would be as follows, where the agent (that determines the body of knowledge) is moved into the circumstance: $\llbracket \text{might}(\phi) \rrbracket^{c,w,a} = 1$ iff there is a world w' compatible what a (and her mates) know in w such that $\llbracket \phi \rrbracket^{c,w',a} = 1$.

- (b) The infelicity of Moore-paradoxical ‘might’-sentences such as ‘Leon is at the pub, but he might not be’.

Ninan contends that a certain version of contextualism can accommodate both data points. This is the view he calls “shiftable contextualism”. The general proposal has two main parts: (i) a compositional semantics for the interaction of epistemic ‘might’ with attitude verbs, and (ii) a definition of the assertoric content of ‘might’-sentences.

The principle trouble with data point (a) is that when ‘might’ is embedded under an attitude verb (e.g. ‘says’) the body of knowledge that is relevant for ‘might’ is *shifted* from the speaker of the context to the subject of the attitude verb. How can the contextualist encode the requisite shift in the semantics? A first thought would be to have attitude verbs shift the agent of the context to the agent of the attitude. This would be to offer the following monstrous semantics for ‘says’ (call it ‘says*’).

- $\llbracket \beta \text{ says}^* \phi \rrbracket^{(w,t,a),w'} = 1$ iff all w'' compatible with what β says in w' are such that $\llbracket \phi \rrbracket^{(w,t,\beta),w''} = 1$.

This proposal indeed allows for the requisite shift when ‘might’ is embedded under ‘says*’.

$$\llbracket \text{John says}^* \text{ Leon might be at the pub} \rrbracket^{(w,t,a),w'} = 1 \text{ iff}$$

all w'' compatible with what John says in w' are such that

$$\llbracket \text{Leon might be at the pub} \rrbracket^{(w,t,\text{John}),w''} = 1 \text{ iff}$$

all w'' compatible with what John says in w' are such that

there is a world w''' compatible what the agent of (w,t,John) (i.e. John) knows in w'' such that $\llbracket \text{Leon is at the pub} \rrbracket^{(w,t,\text{John}),w'''} = 1$.

Although this account does seem to account for both data points (a) and (b), there is trouble for the first person pronoun embedded under ‘says*’, such as:

- (32) John says I am a hero

Consider an utterance of (32) by B . Such an utterance is true just in case John says that B is a hero. But the monstrous semantics of ‘says*’ predicts that B ’s utterance of (32) is true just in case John says that *he* (John) is a hero.

- $\llbracket (32) \rrbracket^{(w,t,B),w'} = 1$ iff all w'' compatible with what John says in w' are such that $\llbracket \phi \rrbracket^{(w,t,John),w''} = 1$.

This simple monstrous semantics is untenable (but see Schlenker 2003). We need ‘says’ to shift the agent whose body of knowledge is relevant without shifting the agent who is relevant for the interpretation of ‘I’. A single agent parameter will not suffice. The obvious fix is to introduce a second agent parameter.

The idea of adding a second agent parameter to the point of reference has already been raised independently. This is essentially a case of multiple indexing, since an agential indexical (‘I’) fails to shift under a purported agent shifting operator (‘says’). Multiple indexing along the agential dimension seems to be necessary (see § 0.4), since the personal pronoun fails to shift under apparent agent shifting modifiers such as ‘for John’ (cf. Lasersohn 2005).

Lewis (1980), however, maintained that the list of index parameters is quite short; and he specifically denied that an agent parameter was required. For Lewis a type of parameter goes in the index if and only if there is an operator that shifts that parameter. And he specifically asks the question: *Are there agent shifting operators?* His answer is ‘no’, so we don’t need an additional agent in the point of reference. But the evidence he points to is confounded. Lewis says,

To be sure, we could speak a language in which ‘As for you, I am hungry’ is true iff ‘I am hungry’ is true when the role of speaker is shifted from me to you—in other words, iff you are hungry. We could—but we don’t. For English, the speaker is not a shiftable feature of context. (Lewis 1980, pp. 27-28).

This quote has mistakenly been construed as an endorsement of Kaplan’s monster prohibition.²⁵ But here Lewis is only interested in what parameters go in the index.

²⁵But see the related discussion in Lewis (1973), p. 112, where the non-shiftable of ‘I’ (in relation to Prior’s egocentric logic, Prior 1968a) is explicitly discussed: “If we prefix to [a first person sentence] an operator ‘Everything is such that...’, ‘The Anighito meteorite is such that...’ or the like, nothing happens. ‘The Anighito meteorite is such that I am a rock’ is false at me because I am not a rock, even though the Anighito meteorite is a rock. ‘I’ is like the present tense marked by ‘now’, and unlike the unmarked present tense, in that we cannot shift its reference by putting in the scope of a suitable operator. Unless we pretend that ‘I’ is shiftable we have no non-trivial egocentric operators.”

It is the presence of the indexical that both lends to the mistaken association with monsters and also makes the example problematic for Lewis' purpose. Consider an analogous example:

We could speak a language in which 'As for tomorrow, it is raining now' is true iff 'It is raining now' is true when the day is shifted from today to tomorrow—in other words, iff it is raining tomorrow. We could—but we don't. For English, the time is not a shiftable feature of context.

Such a conclusion is false and clearly not warranted by these considerations. The reasoning doesn't show that the time is not a shiftable feature of context, instead it simply shows that if time is shiftable then we require a system of double indexing. The same moral applies to Lewis' discussion of the purported agent shifter 'As for you'. If 'As for you' is an agent shifting operator then its effects will be washed out by the indexical 'I'. A better example would be to consider 'As for you, Licorice is tasty'. Mightn't that be true just in case 'Licorice is tasty' is true when the relevant agent is shifted from the speaker of the utterance to the addressee? This indeed seems plausible (cf. Lasersohn 2005 and Stephenson 2007).^{26,27}

For the compositional semantics of the interaction of epistemic 'might' with attitude verbs let's add an agent to the point of reference. So in this simplified case, where we are, e.g., ignoring further multiple world indexing and ignoring time, a point of reference is as follows: $\langle\langle w, t, a \rangle, \langle w', a' \rangle\rangle$. We want 'might' to

²⁶Kaplan also discusses adding an agent parameter to the circumstance, when he discusses the proposal of representing contexts and circumstances by indexed sets of the same kind, allowing for a simple and elegant two-dimensional logic (p. 512). He says: "In order to supply a [nonvacuous feature corresponding to the agent of the context] to circumstances we must treat contents in such a way that we can ask whether they are true for various agents. This can be done by representing the agent by a *neutral*—a term which plays the syntactical role of 'I' but gets an interpretation only with respect to a circumstance" (Kaplan 1989a, p. 511n35). His proposal is to add an expression 'a' that gets its interpretation from the (expanded) circumstance, $\llbracket \mathbf{a} \rrbracket^{c,w,t,a} = a$. And he discusses the addition of various agent shifting operators $\ulcorner O^R \urcorner$, where R specifies an "accessibility" relation (e.g. $R = \lambda xy.y$ is an uncle of x): $\llbracket O^R(\phi) \rrbracket^{c,w,t,a} = 1$ iff there exists b such that aRb and $\llbracket \phi \rrbracket^{c,w,t,b}$. Kaplan notes that the indexical 'I' can then be represented by a sentential agent shifting operator (analogous to treating 'now' as a sentential temporal shifting operator), where R is *identity*.

²⁷In addition, the familiar idea of covert subjects or phonologically null pronouns, can be construed as getting their interpretation from the additional agent in the point of reference, e.g. subject-controlled *PRO* and logophoric pronouns (see Chierchia 1989 and Anand and Nevins 2004).

be sensitive to the second agent parameter, which is provided by Ninan’s lexical entry for ‘might’.

- $\llbracket \text{might}(\phi) \rrbracket^{(w,t,a),(w',a')} = 1$ iff there is a world w'' compatible with a' (and her mates) know in w' such that $\llbracket \phi \rrbracket^{(w,t,a),(w'',a')} = 1$.

Now to deal with the shift in the body of knowledge when ‘might’ is embedded under ‘says’, Ninan has ‘says’ shift the second agent of the point of reference to the agent of the attitude.

- $\llbracket \beta \text{ says } \phi \rrbracket^{(w,t,a),(w',a')} = 1$ iff all w'' compatible with what β says in w' are such that $\llbracket \phi \rrbracket^{(w,t,a),(w'',\beta)} = 1$.

This semantics for ‘might’ and ‘says’ accommodates data point (a), since

$$\llbracket \text{John says Leon might be at the pub} \rrbracket^{(w,t,a),(w',a')} = 1 \text{ iff}$$

all w'' compatible with what John says in w' are such that

$$\llbracket \text{Leon might be at the pub} \rrbracket^{(w,t,a),(w'',John)} = 1 \text{ iff}$$

all w'' compatible with what John says in w' are such that

there is a world w''' compatible with what *John* (and his mates) knows in w'' such that $\llbracket \text{Leon is at the pub} \rrbracket^{(w,t,a),(w''',John)} = 1$.

To deal with data point (b), Ninan’s shiftable contextualist must provide a contextualist definition of assertoric content. Note that the semantic clauses for ‘might’ and ‘says’ provided above are exactly as the relativist insists. But the relativist cannot accommodate data point (b). So how does shiftable contextualism differ from relativism?

As a genuine contextualist (as opposed to relativist), the shiftable contextualist wants the assertoric content of an epistemically modalized sentence to be something that does not vary in truth value across individuals. (Ninan 2010a, p. 370)

The essential move is to not equate assertoric content in a context with compositional semantic value in a context. Ninan insists that the mere fact that the semantic value of a ‘might’-sentence embedded under ‘says’ must be agent-neutral,

does not entail that *propositions* must be agent-neutral—instead it entails that ‘says’ does not operate on *propositions*. Ninan proposes the following definitions of the semantic value and assertoric content of ‘might’-sentences.

- Semantic value in a context: $\lambda w', a'. \llbracket \text{might}(\phi) \rrbracket^{(w,t,a),(w',a')}$
- Assertoric content in a context: $\lambda w'. \llbracket \text{might}(\phi) \rrbracket^{(w,t,a),(w',a')}$

Since on such a view the assertoric content of a ‘might’-sentence adheres to the contextualist speaker inclusion constraint, the pragmatic explanation of the infelicity of Moore-paradoxical ‘might’-sentences is available.

Embedding ‘might’-sentences under ‘says’ requires ‘might’-sentences to have agent-neutral semantic values. But independent considerations motivate the thesis that the assertoric content expressed by a ‘might’-sentence is agent-specific. By not equivocating compositional value with asserted content, the apparent conflict between these data points is resolved. The analogy with the eternalist response to temporal embedding should be clear. In both cases the key move is to insist that compositional semantics does not proceed via assertoric content—instead it proceeds at a level of meaning above (i.e. more fine-grained than) assertoric content.²⁸

2.3 Indexicals and pronominal binding

Consider the following sentence.

(33) Eros loves her

Most theorists would agree that this sentence expresses different propositions in different contexts. In a context where the speaker is demonstrating Olivia, it seems that what is said is that Eros loves Olivia; in a context where where the speaker is

²⁸Ninan insists that his shiftable contextualism is non-monstrous but I think this misconstrues the essential feature of a monstrous semantics. In my view, if there are semantic operations beyond operations on assertoric contents (i.e. “what is said” contents), the semantics deserves to be called *monstrous*. After all, on Ninan’s view ‘might’ is *indexical* in the sense that its assertoric content varies across contexts and the content of ‘might’ is shiftable. Of course, there are certain terminological matters to resolve here and on some resolutions shiftable contextualism comes out as not “monstrous”. Let’s agree for the time being that shiftable contextualism is “quasi-monstrous” (similar remarks hold for the Salmon/Richard-style eternalism). I will return to this issue in depth in chapter 6.

demonstrating Adisyn, it seems that what is said is that Eros loves Adisyn. Such a view is a paradigm of contextualism. But here too, this standard view about the content of indexicals conflicts with compositional semantics—in this case with the compositional semantics of pronominal binding.

The standard Kaplanian way to treat free pronouns such as ‘her’ is as follows.

$$\llbracket \text{her} \rrbracket^c = \text{the contextually salient female in } c$$

The strategy for handling free pronouns in contemporary linguistics is essentially the same. But here pronouns are handled by the variable assignment instead of the Kaplanian context (see Cooper 1983 and Heim and Kratzer 1998).²⁹ The essential idea is that pronouns are to be treated as variables that have certain restrictions on what they can be assigned. For example, $\llbracket \text{her} \rrbracket^g$ will be $g(\text{her})$, if $g(\text{her})$ is female and will get a null value otherwise. These conditions placed on the values of the pronoun are called the “presuppositions” on a pronoun’s value (they are also known as “phi-features”). I will represent the presuppositions on pronouns by placing a condition in brackets as follows.

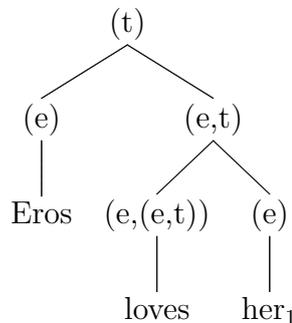
$$\llbracket \text{her} \rrbracket^g = g(\text{her}), [g(\text{her}) \text{ is female}]$$

This should be read as “the extension of **her** relative to g is $g(\text{her})$ on the condition that $g(\text{her})$ is female, otherwise there is a presupposition failure”. We need to add subscripts to the pronouns, due to sentences such as ‘I like her but I don’t like her’, where there are two occurrences of the pronoun ‘her’ that may get different referents. So we have ‘I like her_1 but I don’t like her_2 ’ if the pronouns are not co-indexed and ‘I like her_1 but I don’t like her_1 ’ if they are co-indexed. In this way the assignment function will assign values to the elements of $\{1, 2, 3, \dots\}$, e.g.

$$\llbracket \text{her}_1 \rrbracket^g = g(1), [g(1) \text{ is female}].$$

²⁹In fact, Kaplan (1989b), p. 591 suggested that we include the variable assignment as a parameter of the context: “. . . 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”.

Given this the extension of ‘her₁’ is an individual or an *entity*, so its semantic type is e . The semantic type of the transitive verb ‘loves’ is a function that takes an entity x and returns a function from objects y to 1 just in case y loves x . That is, it takes an entity and returns a function from entities to truth-values, so it is type $(e, (e, t))$. The term ‘her₁’ of type e combines with the transitive verb ‘loves’ of type $(e, (e, t))$ to produce the verb phrase ‘loves her’ of type (e, t) . The name ‘Eros’ is type e and combines with the verb phrase ‘loves her’ of type (e, t) to produce the truth-value of the entire sentence ‘Eros loves her₁’. I will represent this in the syntax tree as follows.



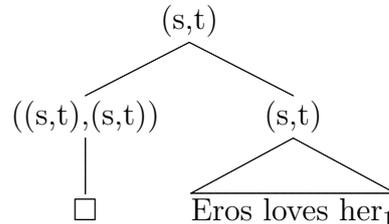
At this point it may seem that we have adequate treatment of the sentence. But we have actually been ignoring something important. Where is the *proposition* expressed by ‘Eros loves her’? Where is the associated function from worlds to truth-values? We can see that something has gone wrong by considering the following sentence.

(34) It is necessary that Eros loves her

The modal modifier ‘It is necessary that’ needs to operate on a function from worlds to truth-values not a simple truth-value. That is to say that the operator needs an argument of type (s, t) instead of type t , where s is the type of *possible worlds*. There is a type mismatch. To remedy this we could go back through and “raise” all the types. An easy way to do this is just to add an s to the left of every type. For example, sentences are type (s, t) instead of t , singular terms are type (s, e) instead of e , predicates are type $(s, (e, t))$ instead of (e, t) , etc.³⁰ Since

³⁰A worry with this strategy is that semantic values can no longer compose by functional application. For example, if ‘Porky’ is type (s, e) and ‘grunts’ is type $(s, (e, t))$, then neither can take the other as argument to generate the value of ‘Porky grunts’, which is type (s, t) . We could

sentences are type (s, t) there is no problem with prefixing a modal operator to a sentence.



It now appears that we have an adequate semantic treatment of ‘Eros loves her₁’, whereby a function from worlds to truth-values is its compositionally determined semantic value.³¹ A problem, however, remains and it stems from a very mundane phenomenon: quantification and pronominal binding.

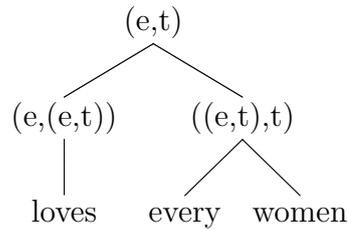
Consider the following sentence, where the quantificational noun phrase occurs in object position.

(35) Eros loves every women

For illustration assume we are back in the extensional framework, where nothing is type (s, \dots) —we know how to move back to the raised types. So the transitive verb ‘loves’ is type $(e, (e, t))$ and following Montague (1973) the quantificational noun phrase ‘every women’ is given type $((e, t), t)$. If we look at the syntax tree for ‘loves every women’ we see that we have a type mismatch.

instead start fresh and redo all the types, so that they jibe in the right way, e.g. let ‘Porky’ be type (s, e) and ‘grunts’ be type $((s, e), (s, t))$. But we need not do this and this isn’t the key issue I want to focus on. It suffices to note that on the strategy of raising types in the simple way, composition proceeds by a slightly different mechanism than functional application. We want ‘Porky’ of type (s, e) and ‘grunts’ of type $(s, (e, t))$ to compose to give ‘Porky grunts’ of type (s, t) . This is how it works: The value of ‘Porky grunts’ of type (s, t) is the function that takes an s feeds it into the values of ‘Porky’ and ‘grunts’ and applies the results to each other and thereby outputs a t . Such a compositional mechanism works in general, so we get the same result as if composition worked via functional application. I will stick with the simple type-raising strategy (with its less transparent compositional mechanism) for presentational purposes. No doubt this could all be made clean and precise by employing *monads* (see Shan (2001)).

³¹Note that I am pretending to accept the view that temporal modification and locative modification, etc. do not raise a problem for having sets of worlds be the compositional values of sentences in context (cf. King 2003 and Cappelen and Hawthorne 2009). Although I think those cases do present a problem, I think the argument here gets to the heart of the problem. My argument from pronominal binding alone establishes that semantic values of sentences in context cannot be classical propositions. The maneuvers of King (2003) to deal with the challenge from tense do not apply to my challenge, since the present challenge assumes an extensionalist syntax.



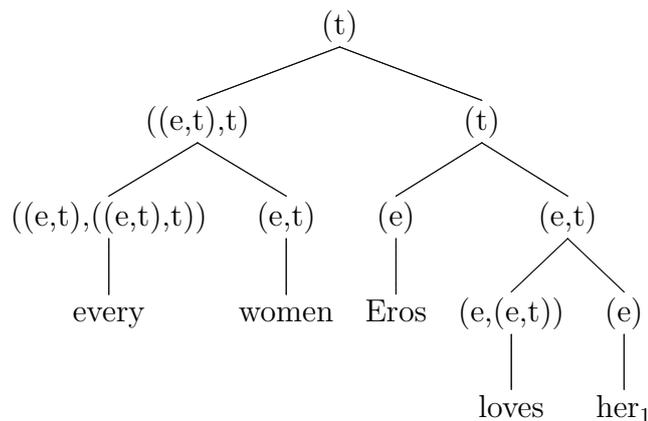
The standard solution to this problem is not to change the type of ‘every women’. It is instead to consider the *logical form* of the sentence—perhaps its logical form differs from its surface structure. It is helpful at this point to consider how one would formalize the sentence in predicate logic.

$$\forall x(women(x) \supset loves(Eros, x))$$

For natural language semantics it is standard to use *restricted quantifiers* (also known as “generalized quantifiers”) instead of the unrestricted quantifiers of predicate logic. But still the logical form of the sentence is such that the quantifier takes wide-scope over the rest of the sentence. That is, the following sentence seems to be equivalent in meaning to sentence (35).

(36) Every women is such that Eros loves her

Thus, the logical form of (35) is best understood to be the logical form of sentence (36).³² Let’s see how things look with this logical form.



³²One could buttress this with the standard transformational syntactic story about quantifier movement (see Heim and Kratzer 1998, pp. 178–200).

The sentence ‘Eros loves her₁’ is type t (ignoring worlds) and ‘every women’ is type $((e, t), t)$, so this still does not compute.

A natural idea at this point is that the phrase ‘is such that’ contributes something to the logical form of the sentence such that it comes out well-typed. We need something to combine with the sentence ‘Eros loves her₁’ and return a predicate meaning. In this case, then, we need something that takes a t and gives back a (e, t) —something of type $(t, (e, t))$. A suggestion might be that ‘is such that’ should be interpreted as the abstraction binder ‘ λ ’.³³ After all, syntactically speaking, lambda binders turn sentences into predicates. So if ‘ Fx ’ is a sentence, then ‘ $\lambda x.Fx$ ’ refers to *the property of being F* .

But how would this work semantically? We need a function that takes a truth-value and returns a property. Consider an example. Assume m is a red square. If m is assigned as the value of ‘ x ’, then the following sentences have the same truth-value.

(37) *Red*(x)

(38) *Square*(x)

But, of course, there is no function that takes the truth-value of ‘*Red*(x)’ to the property of being red, while at the same time taking the truth-value of ‘*Square*(x)’ to the property of being square. The situation is reminiscent of the famous dictum that *there is no backward road from reference to sense* (Russell 1905).

What is required is a change of types. We want to attach a binder ‘ λ ’ to the sentence ‘Eros loves her₁’ so that the semantic type of the result is of a type that jibes with ‘Every women’. Where we went wrong was in our treatment of the assignment function. Semantic types must be functions from assignments to whatever—that is, semantic values must be *assignment-neutral*. We can see this by considering how a lambda binder works. A lambda binder attaches to a sentence and thereby forms a predicate, e.g. by prefixing a lambda binder to the sentence ‘ x is mortal’ we get the predicate ‘ $\lambda x.x$ is mortal’. But the lambda binder doesn’t take a truth-value as argument, it takes a function from assignments to

³³Cf. Lewis (1970), p. 45: “If ‘ x ’ has the n^{th} variable intension, then the corresponding binder ‘ \hat{x} ’ has the n^{th} binder intension: that function ϕ from S-intensions to S/N-intensions such that if ϕ_1 is any S-intension, ϕ_2 is the S/N-intension $\phi(\phi_1)$, ϕ_3 is any N-intension, ϕ_4 is the S-intension $\phi_2(\phi_3)$, i is any index, and i' is that index which has $\phi_3(i)$ as the n^{th} term of its assignment coordinate and otherwise is like i , then $\phi_4(i) = \phi_1(i')$. It can be verified that this intension justifies the reading of ‘ \hat{x} ’ as ‘is something x such that’.”

truth-values as argument. In general, then, the semantics of the lambda binder is given by the following clause.³⁴

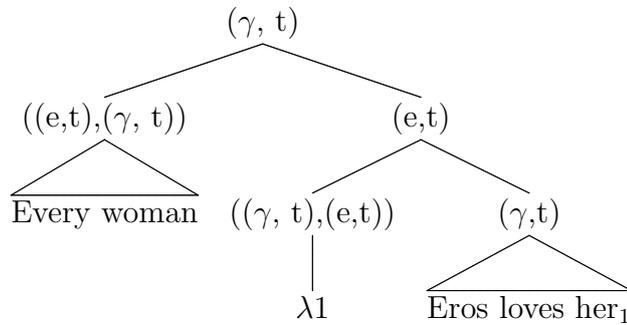
$$\llbracket \lambda \alpha. \phi \rrbracket^g = \lambda i_e. \llbracket \phi \rrbracket^{g[\alpha := i]}$$

So the lexical entry for the lambda binder itself is as follows (where γ is the type of assignment functions).

$$\llbracket \lambda \alpha \rrbracket^g = \lambda p_{(\gamma, t)}. (\lambda i_e. p(g[\alpha := i]))$$

Lambda binders, like Tarskian quantifiers, are assignment-shifting devices. The lambda binder takes something of type (γ, t) and returns something of type (e, t) —so the type of ‘ $\lambda 1$ ’ is $((\gamma, t), (e, t))$.

The situation here is very much the same as the problem we had above with modal environments, where the types needed to be raised. Above we needed to raise the types to be functions from worlds to whatever but here we need to raise the types to be functions from *assignments* to whatever.³⁵ So let’s look at the situation in this new light (just focusing on the issue under consideration).



For the compositional semantics of pronominal binding the types of sentential semantic values have to be functions that take assignments as argument. These are clearly not traditional “propositions” in the sense of being conditions on worlds. And such functions are arguably not apt to be the objects of assertion. Consider again sentence (33) ‘Eros loves her’. It seems that the assertoric content of that sentence varies across contexts. Yet, the semantic value relevant for the compositional semantics remains the constant assignment-neutral content. Again it seems

³⁴See the *Predicate Abstraction Rule* in Heim and Kratzer (1998), pp. 96–98, 186–187.

³⁵Again this can be done in various ways, one of which is to take a fresh start so that everything composes via functional application, cf. Lewis (1970), pp. 45-47.

that compositional semantics does not proceed via assertoric content—instead it proceeds at a level of meaning above (i.e. more fine-grained than) assertoric content.³⁶

2.4 Propositions and multiple indexing³⁷

It is a common view that propositions (i.e. assertoric contents) are the arguments to sentential operators.³⁸ For example, in the sentence

(39) It is necessary that kangaroos have tails.

the necessity operator takes the proposition expressed by ‘Kangaroos have tails’ as argument and checks whether or not it is true in all accessible worlds. Likewise, it is commonly said that propositional attitude reports relate an individual to a proposition. For example, the sentence

(40) Adisyn believes that kangaroos have tails.

says that Adisyn stands in the believing relation to a certain proposition, namely the proposition expressed by the embedded sentence ‘Kangaroos have tails’. The key idea is that sentential operators such as ‘It is necessary that’ or ‘Adisyn believes that’ operate on the proposition expressed by their embedded sentence (in a context).

This common conception acknowledges the need to first resolve indexicality. For example, consider the following sentence:

(41) It is necessary that I am here now.

³⁶Jacobson (1999), pp. 134-135 comments on an analogous separation between semantic value and proposition expressed within her preferred variable-free semantics: “[‘He left’] does not denote a proposition but rather a function from individuals to propositions. Of course to extract propositional information from such a sentence the listener must apply this function to some contextually salient individual. But I don’t see any difficulty assuming that the meaning of [‘He left’] is, indeed, of type $\langle e, t \rangle$.”

³⁷A version of this material has been published as Rabern (2012b)

³⁸For explicit endorsement see King (2003), p. 206: “...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 semantic values relative to those contexts of the sentences in question. And we need not assign sentences any second sort of semantic value.”; and see Cappelen and Hawthorne (2009), p. 1: “The semantic values of declarative sentences relative to contexts of utterance are propositions.”

In a context $\langle w, t, a, l \rangle$ the proposition expressed by ‘I am here now’ is the proposition that a is at location l at time t . In the semantic evaluation of sentence (41) the necessity operator takes this proposition as argument and checks its profile across modal space.

It is also acknowledged that the context must include a world parameter for the resolution of modal indexicals such as ‘actual’. If we ignore the other parameters of context and focus solely on the world parameter, then on the common view sentential truth is relativized to a pair of worlds $\langle w, w' \rangle$. In this way, each sentence is associated with a function from world-pairs to truth-values. The proposition expressed by a sentence in a context is what one gets after supplying a contextual world (cf. Kaplan 1989a). This is to say that the common view accepts *double indexing* but identifies the proposition expressed by a sentence with the set of worlds in which it is true *relative to a context world*.

I have already argued that this view is untenable. In this section I will provide another argument that may be dialectically more effective. I will argue that the compositional semantic value of a sentence (in context) cannot be a set of worlds.

The arguments I have given thus far have been of a familiar type: Essentially, they have been the so-called *Operator Arguments* based on arguments in Kaplan (1989a) and Lewis (1980). Arguments of this kind attempt to establish that sentential values in a context must be relativized to parameters beyond possible worlds, e.g. times, locations, judges, information states, assignments, etc. by focusing on the compositional semantics of various non-world shifty operators (e.g. temporal operators, locative operators, agential operators, variable binding operators, etc.). The argument presented in this section is different in the sense that I will only rely on issues stemming from the compositional semantics of modal operators (or modal quantifiers).

But in a sense the argument is yet another operator argument. The argument is simply this: the motivations for modal double indexing generalize to modal *multiple indexing* (see § 0.4). Thus, sentential semantic values (in context) must be sets of sequences of worlds. Sets of sequences of worlds are not the objects of assertion (i.e. propositions). So, the compositional semantic value of a sentence (in a context) is not a proposition.

2.4.1 Modal multiple indexing

Consider the following sentence:

- (42) It is possible for everyone who actually survived the Titanic’s maiden voyage to have died on the maiden voyage.

The correct representation of (42) requires the use of an ‘actuality’-operator, since neither of the following logical forms quite capture its meaning (where **survive** stands for ‘survived the Titanic’s maiden voyage’ and **die** stands for ‘died on the Titanic’s maiden voyage’):³⁹

4a. $\Diamond[\forall x(\mathbf{survive}(x) \supset \mathbf{die}(x))]$

4b. $\forall x[\mathbf{survive}(x) \supset \Diamond(\mathbf{die}(x))]$

Logical form (4a) simply states that there is a world where no one survives the Titanic’s maiden voyage. So it says nothing about the fate of actual Titanic survivors in other worlds, whereas (42) clearly does. Logical form (4b) does say something about the fate of actual Titanic survivors in other worlds but it doesn’t say anything about their fate as a *collective*. Notice that the truth of (42) requires that there be a world w where all the actual Titanic survivors die in w together—logical form (4b) misses this. Whereas if we add the ‘actuality’-operator ‘ A ’ to the syntax we have the resources to achieve the right result:

4c. $\Diamond[\forall x(A(\mathbf{survive}(x)) \supset \mathbf{die}(x))]$

But, of course, the remedy isn’t just a matter of syntax. If sentential truth were only relativized to a single world, one still couldn’t provide the correct semantic representation of sentence (42). With a single world in the point of reference $\llbracket A(\phi) \rrbracket^w = 1$ iff $\llbracket \phi \rrbracket^w = 1$. Thus there would be no semantic difference between logical forms (4a) and (4c).⁴⁰ For the ‘actuality’-operator to make any difference we must relativize sentential truth to two worlds—that is to say that the correct representation of sentence (42) requires a system of double indexing.

³⁹One might alternatively try to represent this sentence with the use of a plural quantifier, e.g. [the X s: **survivors**(X s)] $\Diamond(\mathbf{die}(X$ s)). I will set this type of response aside as I don’t have the space to argue against it here.

⁴⁰ $\llbracket 4c \rrbracket^w = 1$ iff there is a world $w'Rw$ such that $\llbracket \forall x[A(\mathbf{survive}(x)) \supset \mathbf{die}(x)] \rrbracket^{w'} = 1$ iff there is a world $w'Rw$ such that for all x , either x doesn’t survive in w' or x dies in w' .

$$\llbracket (4c) \rrbracket^{w,w} = 1$$

iff there is a world $w'Rw$ such that $\llbracket \forall x(A(\text{survive}(x)) \supset \text{die}(x)) \rrbracket^{w,w'} = 1$

iff there is a world $w'Rw$ such that for all x , either x doesn't survive in w or x dies in w' .^{41,42}

As I've mentioned, the fact that the semantics of indexicals embedded under intensional operators requires double indexing was first pointed out with regard to tense logic. Consider the following sentence (Kamp (1971)):

(43) Everyone now alive will be dead.

The logical form can be represented as such:

$$[\exists t' : t' > t](\forall x(\text{alive}(x, t) \supset \text{dead}(x, t')))$$

And this requires two times in the point of reference (i.e. an assignment of times to *two* distinct temporal variables). Vlach (1973) upped the ante by focusing on sentences such as the “past tense” version of (43):

⁴¹For dialectical purposes I am intentionally ignoring the semantics of quantification over individuals and the *assignment function* (i.e. the infinite sequence of individuals) required for the semantic evaluation of free variables and variable binding. One might, however, argue that assignment-shifting devices of this sort already provide an argument against the philosophically entrenched view of propositions (and I have in § 2.3 and Rabern forthcoming). Relatedly, one might already be suspect of the view that propositions are the arguments of sentential operators given the phenomena of “quantifying in”. For example, consider sentences such as “Ralph believes some man is a spy” (focus on the reading where the QNP takes wide scope: “Some man is such that Ralph believes that he is a spy”), “Every prime number is such that necessarily it is greater than one”, or “Every man believes that he is misunderstood”. The compositional semantic values of the embedded sentences—containing bound pronouns—cannot be propositions. As I noted in § 1.A, Kaplan (1989a) introduces and motivates direct reference theory by considering the following quantified modal formula: $\exists x(Fx \wedge \neg \Box Fx)$. Kaplan states that 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 then determine whether or not it is a necessary proposition. It is interesting that Kaplan seems to be endorsing the thesis that propositions are the arguments to sentential operators (e.g. \Box) with the type of “quantifying in” example that might be thought to expose its falsity. Thanks to Daniel Nolan and Jonathan Schaffer for helping me to make these connections.

⁴²I should also note that I am assuming a constant domain semantics to keep things simple. Moving to a variable-domain semantics makes things more complicated and some subtle issues arise but it does not affect the essential point that double indexing is required.

(44) Once everyone then alive would be dead.

We can represent the logical form of (44) as follows:

$$[\exists t' : t' < t][\exists t'' : t'' > t](\forall x(\text{alive}(x, t') \supset \text{dead}(x, t'')))$$

Given the three temporal variables in the syntax this requires *three* times in the point of reference. And as we've seen with increasingly more complex sentences involving further temporal embedding there is a need for further temporal parameters (again see Vlach 1973, pp. 183-185 and Cresswell 1990). The upshot being that natural language has the full expressive power of object language quantification over times such that points of reference must include an infinite sequence of times.⁴³

Let's now set aside temporal constructions and focus only on world-shifting devices. There is a completely analogous situation in the modal realm. Consider the following “counterfactual version” of sentence (42).

(45) If the Titanic had not hit an iceberg on its maiden voyage, it would still have been possible for everyone who would then have survived the maiden voyage to die on the maiden voyage.⁴⁴

Whereas sentence (42) required that sentential truth be relativized to two worlds, sentence (45) requires that sentential truth be relativized to *three* worlds. Sentence (45) says that in the closest worlds where the Titanic doesn't hit an iceberg on its maiden voyage, the survivors of that voyage are not *essentially* survivors. This cannot be captured by the following logical form (where **no-iceberg** stands for the sentence ‘The Titanic did not hit an iceberg on its maiden voyage’):

$$7a. \text{no-iceberg} \quad \Box \rightarrow \Diamond[\forall x(\text{survive}(x) \supset \text{die}(x))]$$

⁴³Note that due to multiple indexing those who motivate temporalism about propositions via arguments from temporal embedding must instead conclude that propositions are sets of tuples consisting of a world followed by an infinite sequence of times, i.e. sets of pairs of the form $\langle w, \langle t_1, t_2, t_3, \dots \rangle \rangle$. Eternalists may view this as a reductio of such arguments.

⁴⁴I owe examples of this general form to Wolfgang Schwarz. It might sound more natural to consider this dialogue concerning counterfactual histories of the Titanic: “A: Everyone who actually survived the Titanic's maiden voyage could have died on the maiden voyage. B: I agree. And even if the Titanic had not hit an iceberg on its maiden voyage, it would still have been possible for everyone who would then have survived the maiden voyage to die on the maiden voyage.”

This simply says that in the closest worlds where the Titanic doesn't hit an iceberg on its maiden voyage, there is a world accessible from that world where there are survivors of the Titanic's maiden voyage. Thus it says nothing about the other-worldly fate of the survivors in the closest **no-iceberg** worlds. More explicitly (7a) is true at w if and only if in all the closest-to- w **no-iceberg** worlds w' , there is a world w'' accessible from w' such that for all x , either x doesn't survive in w'' or x dies in w'' .

Whereas (45) instead looks to a close world where the Titanic doesn't hit an iceberg, and then says of the Titanic survivors in *that* world, that there is another world where they don't survive. So it says something about the other-worldly fate of the survivors in the closest **no-iceberg** worlds. To put the point a different way, the consequent of the counterfactual must back-reference the world introduced by the counterfactual. (This is analogously to the way that 'then' back-references the time introduced by 'Once' in (44).) So sentence (45) is true at w if and only if in all the closest-to- w **no-iceberg** worlds w' , there is a world w'' accessible from w' such that for all x , either x doesn't survive in w' or x dies in w'' . Notice that there are *three* worlds involved in the semantic evaluation of sentence (45).

With a few harmless assumptions we can get a different and more perspicuous view of the situation. Assume that a counterfactual $\lceil \phi \sqsupset \rightarrow \psi \rceil$ is true at w if and only if for all the closest-to- w ϕ -worlds w' , ψ is true at w' .⁴⁵ Let's abbreviate "the closest-to- w ϕ -worlds" as $C(\phi, w)$ and let's go ahead and use object language modal quantifiers and variables to represent the logical form of counterfactual sentences. We translate a counterfactual sentence $\lceil \phi \sqsupset \rightarrow \psi \rceil$ into syntax using world variables and a restricted modal quantifier as follows:

$$[\forall w' : w' \in C(\phi, w)]\psi(w')$$

Under these assumptions the correct logical form of (45) is as follows:

$$7b. [\forall w' : w' \in C(\text{no-iceberg}, w)][\exists w'' : w'' R w'](\forall x(\text{survive}(x, w') \supset \text{die}(x, w'')))$$

⁴⁵Note that I've made certain simplifying assumptions about the semantics of counterfactual conditionals, e.g. I've made the limit assumption, I've assumed that the quantification involved is "all" instead of "most", and I've assumed that the relevant accessibility relation is tightly constrained by the antecedent. But all that matters for the argument I provided here is that the context world w is represented in the syntax. Any semantics that has the truth of $\phi \sqsupset \rightarrow \psi$ at w depend on the truth of ψ at worlds somehow related to w will share this essential feature.

Logical form (7b) contains three distinct world variables and thus the semantic evaluation of (7b) requires three worlds in the point of reference.

We see that the argument for double world indexing generalizes to triple and quadruple, and ultimately to infinite world indexing (see Cresswell 1990, pp. 34-46).⁴⁶ Which is to say that natural language has the full expressive power of object language quantification over worlds such that points of reference must include an infinite sequence of worlds—a mere doubly-indexed semantics (i.e. a semantics where sentential values are mere sets of worlds relative to a context) is insufficient. This is to say that the compositional semantic value of sentences (in context) must be *sets of infinite sequences of worlds* (or functions from infinite sequences of worlds to truth-values).

2.4.2 Assertoric content under multiple indexing

The preceding section was a reminder of a fact that theorists generally accept, e.g. Kratzer (2011) states:⁴⁷

[Cresswell (1990) has shewn] that natural languages have the full expressive power of object language quantification over worlds and times. Quantification over worlds or times is thus no different from quantification over individuals, and should be accounted for in the same way.⁴⁸

But it hasn't been emphasized that multiple indexing conflicts with the common view that propositions are both the objects of assertion and the compositional semantic values of sentences. If we make the plausible assumption that propositions are not sets of infinite sequences of worlds, then it immediately follows that due to multiple indexing propositions are not the compositional semantic values of sentences.⁴⁹ One could, of course, apply *modus tollens* but do we have any

⁴⁶For a sentence requiring three worlds in the index Cresswell provides “If the economic climate had been favorable it would have been desirable that some who are not actually rich but would have been rich be poor” (p. 40). See Cresswell (1990) p. 40 sentence (36) for a sentence with four worlds in play.

⁴⁷See also Cresswell (1990), pp. 34-46 and Forbes (1989), chapters 1-2.

⁴⁸Kratzer (2011) sec. 5. See also Schlenker (2006) p. 509 and Schaffer (2012), sec. 2.

⁴⁹If propositions are understood to be Russellian or structured (instead of simple sets of points of reference) the conclusion still holds but it is not as straightforward. If Russellian propositions only determine a set of worlds, then they are informationally insufficient. In addition to a world-neutral Russellian content the semantics requires a “content-base” that is neutral with respect to an infinite sequence of worlds (this is analogous to the situation with tense the

independent reason to think that the things we say and believe are (or are best modeled by) sets of infinite sequences of worlds?

As I've noted already, theorists tend to focus merely on the case of *double* indexing. And this lines up well with the Kaplanian distinction between content *generating* versus content *evaluating* parameters (Kaplan 1989a). But the motivations for this Kaplanian distinction are really quite different from the motivations for double indexing from compositional semantics. And once we take the latter motivations to their logical consequence we are left with a system of infinite indexing, which doesn't cohere nicely with Kaplan's two-level picture. There is a fundamental tension in our default philosophical conception of semantic theory.

Yet, one might think that this discussion is misguided for the following reason: If modal language is treated by means of object language quantification and variables, then the semantics of modal constructions are handled by the assignment function (Schaffer 2012). And for this reason it might be thought that there is no threat to the idea that propositions are semantic values. After all, if modal quantifiers present a problem for the common view, then we already have the problem due to individual quantifiers and variables.

Indeed, we do! This was the problem outlined in the previous section (§ 2.3). Whether we call the parameters relative to which expressions have extensions “the index” or “the assignment” makes no essential difference. For example, with an “intensional” treatment of tense extensions are relative to an index $\langle t_1, t_2, t_3 \dots \rangle$, whereas with an “extensional” treatment of tense extensions are relative to an assignment $\langle t_1, t_2, t_3 \dots \rangle$.⁵⁰ It is simply a confusion to think that the semantics of object language quantification is somehow of a different kind than the semantics of “intensional operators”. It's the same semantics in a different syntactic package.

Again the lesson is that we must distinguish between the compositional semantic value of a sentence and the proposition expressed by a sentence in a context—

propositional semantics provided in Salmon 1986, pp. 143-151). We must also bear in mind that providing a recursive pairing of Russellian propositions with sentences does not actually provide a compositional semantics—its more akin to a translation into another language. To complete the semantics one must provide a recursive definition of the truth-values of propositions relative to points of reference.

⁵⁰We could construe the assignment as a function from temporal variables to times instead of as a sequence of times (to which the temporal variables are indexed). In this way there would be a (superficial) difference between the “index” and the “assignment”. But there is no essential difference between these two devices as is demonstrated by the fact that they can both be a sequence of times. The difference is merely verbal and sociological.

compositional semantics does not proceed via assertoric content.⁵¹ This argument is dialectically quite powerful, since only relies on issues stemming from the compositional semantics of modal operators (or modal quantifiers). If one squints just right, however, one can see that it is just the analog of the argument from pronominal binding—it’s the argument from “modal binding”.

Appendix 2.A Mismatch worries

In § 2.1 I outlined how Salmon (1986) (and Richard 1982) avoid the tension between eternalism and the semantics of temporal embedding. I will now address some potential problems with this view having to do with the semantics of speech reports (and attitude reports generally) raised in King (2003). 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. On views where 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.

There is a natural thought in this vicinity that is mistaken. The natural thought is this: speech reports relate an agent to an asserted content by the use of a sentence of the form $\ulcorner \alpha \text{ says } \phi \urcorner$ where the semantic value of ϕ is the proposition that α says. If so, then the semantic value of ϕ must “match” the proposition that α said. But by denying the identification thesis it follows that the semantic value of ϕ cannot be the proposition that α said, since it is not even a proposition! 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 seems that it can’t be that the objects of assertion are distinct from the compositional values of sentences.

Notice that the mere mismatch between the semantic values of expressions

⁵¹We can, of course, recover a set of worlds from a set of sequences of worlds by taking the diagonal. This, of course, does not retain the identification of compositional values with propositions, so it would be wrong to insist that diagonalization saves the common view. Likewise, one could assign sentences sets of worlds and give a non-compositional but recursive account of modal operators. But I am working under the assumption that the semantics for modal constructions is genuinely compositional.

and the things that the expressions involved are about 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 (i.e. intensions). In this case, it seems that the semantics “sees” a relation between two functions, whereas the metaphysics “calls for” a relation between lovers—but no one should object to such a semantics on those grounds.⁵²

The mere mismatch between the semantic values and the “aboutness” content can’t be the worry—such a distinction is what is at issue. If there is to be an objection here it must be that the view is somehow unable to get the truth-conditions right (or only able to via ad hoceries), 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 $\ulcorner \alpha \text{ says } \phi \urcorner$ 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. The complications that are alluded to with this type of mismatch worry must be something more sophisticated.

King (2003; 2007) criticizes Salmon (1986) (and Richard 1982) for insisting that we must assign sentences compositional semantic values addition to assigning them propositions (i.e. assertoric content).⁵³ As King presents the problem it is due to the claim that the things we say and believe are not what temporal (or

⁵²Similar 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 1973). One might object that such a view misconstrues the assertoric content of (or intentional content of) names but there should be no objection to the compositional semantics, *per se*.

⁵³In 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” (p. 206).

modal) operators operate on.

I will focus on the problem raised for Salmon (1986).⁵⁴ 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 a general picture of which Salmon’s is a specific instance, I will demonstrate that this style of objection does not even get off the ground for certain implementations of the general picture. First, I will show that the alleged problem *only* applies to semantic theories that employ structured contents. And secondly, I will demonstrate a natural way for theories which do employ structured contents to completely avoid the problem. This shows that, even if there is a problem for Salmon’s specific version of the general view it is not a general problem for views which distinguish compositional value from assertoric content.

As I already discussed in § 2.1, Salmon (1986) modifies 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.⁵⁵ Salmon insists that Kaplan (1989a) has drawn the wrong lesson from the fact that temporal operators need temporally neutral operands. He says, “Con-

⁵⁴I think that a similar assessment applies to King’s criticism of Richard. King’s criticism is the following: “One problem with Richard’s account is that since tense and modal operators operate on the same thing, since these are not propositions and since propositions are the objects of the attitudes, for Richard *the objects of the attitudes and the things modal operators operate on are not the same*. But that means that on Richard’s view, the following inference should not be valid...But this inference certainly does seem valid: (i) Shannon believes that God exists, (ii) It is possible that God exists, (iii) Therefore, Shannon believes something that is possibly true” (King 2003, p. 208, my emphasis). This type of argument is unpersuasive, since there has been no actual demonstration that the argument is not valid according to Richard’s semantics. In order to access the validity of this argument we need to know what the logical form of (iii) is. We might analyze ‘Shannon believes something’ as ‘There is something that Shannon believes’— $\llbracket \exists q(\text{Believes}(\text{Shannon}, q)) \rrbracket^{c,w,t} = 1$ iff there is a q such that $\text{BEL}(\text{Shannon}, q)$. Importantly, we need not assume that the things that individuals stand in the BEL relation to are propositions—they can be non-propositional semantic values of some sort (e.g. the character-like entities that Richard’s *monstrous* modal and temporal operators operate on). This in no way commits one to the claim that the objects of belief are these non-propositional semantic values. It is completely consistent to say that ‘Shannon believes something’ is true just in case there is a semantic value q that is *so-and so*, while still maintaining that the things we believe are propositions. That is the point. If we tack on the conjunct about possibility we get the logical form of (iii). From here it follows fairly straightforwardly that (i) and (ii) entail (iii) by conjunction introduction and existential quantification.

⁵⁵As I noted already Salmon (2003) is in many respects the most general explication of the Salmonian view in this vicinity but I will often simply refer to Salmon (1986) as that is the work which King (2003) mainly focuses on.

trary to Kaplan, what follows from this is that temporal operators do not operate on propositions”.⁵⁶ Kaplan, as I argued in chapter 1, is tacitly assuming that the assertoric content of a sentence is compositionally determined by the assertoric contents of its parts. It is due to this assumption that Kaplan is blinded to the sensible conclusion drawn by Salmon. Salmon states that “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).

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.

King (2003) insists that pulling apart the compositional value from the proposition expressed leads to certain undesirable consequences. King’s criticism is this: since, on such a view, 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 (e.g. Richard 1982) will also fail in this respect.

What I want to 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 id-

⁵⁶Salmon (2003), p. 386.

iosyncratic *structuralist propositional semantics*. (And, in fact, once we see the semantic clauses in the context of Salmon's broader project, I think they lose any appearance of inelegance.) To support this claim I will lay out the details of Salmon's view and pinpoint where King's objection fits in. Then I will show how the objection does not apply to other theories which deny the identification thesis (including other structuralist semantics). Here in full is the objection that King (2003) raises against the theory of Salmon (1986).

As we have seen, 'Sometimes' operates on the information value base relative to a context of the sentence it embeds. On the other hand, a belief ascription asserts that an individual stands in a relation to the information value relative to a context and time of its embedded sentence. But then what happens when we combine the two as follows:

(46) Sometimes, John believes Frege is happy.

'Sometimes' must operate on the information value base with respect to the context c of 'John believes Frege is happy'. The information value base with respect to c of this sentence includes only the information value base with respect to c of 'Frege is happy'. And this, of course, is an entity that changes truth-value over time at a given world. But then unless something is done, (46) will assert that sometimes John stands in the belief relation to an entity that changes truth-value over time (the information value base with respect to the context of 'Frege is happy'), and Salmon denies that the things believed change truth-value over time. Salmon avoids this consequence by introducing the *eternalization with respect to a time of a value (content) base*. He then has to add two special semantic clauses that use the notion of an eternalization to specifically handle a content consisting of an individual (or the contribution of a definite description), the believing relation and an information value (content) base, (rather than an information value). 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 (46) require special definitions and semantic clauses not required for other belief ascriptions or for other cases in which 'Sometimes' embeds another sentence. That (46) requires such things appears to me *ad hoc*. It seems to me that on a

proper theory, the right truth conditions for (46) should fall out of the semantics for ‘Sometimes’, ‘believes’ and the tenses. (King 2003, p. 210)

The conflict is set up between the claim that ‘sometimes’ operates on the content base of its embedded sentence and the claim that a belief ascription reports that an individual stands in a certain relation to the 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 $BEL_{c,w,t}$ is the relation that holds between an individual and an eternal proposition (relative to point $\langle c, w, t \rangle$):

Clause 1. $\llbracket \text{Sometimes } \phi \rrbracket^{c,t,w} = 1$ iff $\text{SOM}(\lambda t, w. \llbracket \phi \rrbracket^{c,t,w}) = 1$ iff there is a t' such that $\llbracket \phi \rrbracket^{c,t',w} = 1$.

Clause 2. $\llbracket \alpha \text{ believes } \phi \rrbracket^{c,t,w} = 1$ iff $(\llbracket \alpha \rrbracket^{c,t,w}, \lambda w. \llbracket \phi \rrbracket^{c,t,w}) \in BEL_{c,t,w}$.⁵⁷

Clause 1 has it that ‘Sometimes’ operates on the information value base with respect to the context c of its embedded sentence. King insists that the information value base of this embedded sentence must “include” only information value bases. And since the information value base of ‘Frege is happy’ is an entity that changes truth-value over time, King concludes that (46) 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 is 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:

$\llbracket \text{Sometimes, John believes Frege is happy} \rrbracket^{c,t,w} = 1$ iff

there is a t' such that $\llbracket \text{John believes Frege is happy} \rrbracket^{c,t',w} = 1$ iff

⁵⁷This could also be given in terms of a relation R between an individual and a time-neutral semantic value such that $R(\llbracket \alpha \rrbracket^{c,t,w}, \lambda t, w. \llbracket \phi \rrbracket^{c,t,w})$ iff $(\llbracket \alpha \rrbracket^{c,t,w}, \lambda w. \llbracket \phi \rrbracket^{c,t,w}) \in BEL_{c,t,w}$. R can also be analyzed in the style of Hintikka (1969): $R(\llbracket \alpha \rrbracket^{c,t,w}, \lambda t, w. \llbracket \phi \rrbracket^{c,t,w})$ iff for all w' compatible with $\llbracket \alpha \rrbracket^{c,t,w}$'s beliefs in w at t , $\lambda t, w. \llbracket \phi \rrbracket^{c,t,w}(t, w') = 1$.

there is a t' such that $(\llbracket \text{John} \rrbracket^{c,t',w}, \lambda w. \llbracket \text{Frege is happy} \rrbracket^{c,t',w}) \in BEL_{c,t',w}$.

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.

But still the question remains where exactly “eternalization” come in for Salmon’s semantics. In Salmon’s *propositional semantics* provided in appendix C of Salmon (1986) he sets out to recursively assign a Russellian structured content (and structured content base) to every expression of his formal language \mathcal{L} and to recursively define the truth of a structured content (and structured content base) at a circumstance. Here he does introduce a special definition of *the eternalization of a content base*. The problem for Salmon is, roughly the following. First assume the sentence embedded under ‘Sometimes’, i.e. ‘John believes Frege is happy’, expresses an eternal structured proposition. Then at t_c it expresses the proposition,

$\langle \text{John, believes, } \langle \text{Frege, being happy, } t_c \rangle, t_c \rangle$.

But then that means that the whole sentence expresses the proposition,

$\langle \text{sometimes, } \langle \text{John, believes, } \langle \text{Frege, being happy, } t_c \rangle, t_c \rangle \rangle$,

within which the temporal operator ‘sometimes’ is vacuous. So we should instead assume that that sentence embedded under ‘sometimes’ contributes its content base, thus at t_c the whole sentences expresses the following.

$\langle \text{sometimes, } \langle \text{John, believes, } \langle \text{Frege, being happy} \rangle \rangle \rangle$

But now we have John standing in the belief relation to the temporally neutral structured proposition $\langle \text{Frege, being happy} \rangle$. So to fix this problem Salmon builds an eternalization clause into the procedure for evaluating propositions concerning *belief* as follows:

$\langle \text{John, believes, content-base} \rangle$ is true at a time t and world w if and only if $\langle \text{John, believes, } etern_t(\text{content-base}), t \rangle$ is true at t in w

In this way the proposition,

$\langle \text{sometimes}, \langle \text{John}, \text{believes}, \langle \text{Frege}, \text{being happy} \rangle \rangle \rangle$

is true at a time t and world w just in case there is a time t' such that the following is true at t' in w :

$\langle \text{John}, \text{believes}, \langle \text{Frege}, \text{being happy}, t' \rangle, t' \rangle$.

The special definition of the eternalization of a content base is clearly an artifact of the specific structured proposition or Russellian framework that Salmon is developing, since it only has to do with the intermediate level of representation in terms of structured contents. This is why when we calculate through the pure truth-conditional semantics, without taking a detour through structured contents no issues arise. To see this, note that the semantic theory of Salmon (1986) 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 reference.

The formal details for the derivation of the truth-conditions of (46) within Salmon's *propositional semantics* are provided as follows. Let $Valb_{c,g}(\alpha)$ be the *information-value base* (or content base) of an expression α with respect to context c and variable assignment g . And let $Val_{c,g,t}(\alpha)$ be the *information value* (or content) of an expression α with respect to context c , assignment g and time t . Intuitively, the content (content base) of a complex expression is an order tuple of the contents (content bases) of its syntactic parts. We will see that is not quite accurate. Salmon provides the following definitions of value bases for the atomic expressions:

- S2. If α is name, $Valb_{c,g}(\alpha) =$ the designatum of α ,
- S20. $Valb_{c,g}(\text{'Believes'}) =$ the relation of believing, *bel*,
- S21. $Valb_{c,g}(\text{'Sometimes'}) =$ the property of obtaining at sometime, *som*.

The information value, $Val_{c,g,t}$, for these is then defined in terms of value bases as follows: if α is name, $Val_{c,g,t}(\alpha) = Valb_{c,g}(\alpha)$ and $Val_{c,g,t}(\text{'Sometimes'}) = Valb_{c,g}(\text{'Sometimes'})$; but for 'Believes', $Val_{c,g,t}(\text{'Believes'}) = \langle Valb_{c,g}(\text{'Believes'}), t \rangle$. For the complex expressions we are interested in Salmon provides the following definitions.⁵⁸

S23. If Π is a monadic predicate and α a name, then:

$$Valb_{c,g}(\ulcorner \Pi(\alpha) \urcorner) = \langle Valb_{c,g}(\alpha), Valb_{c,g}(\Pi) \rangle$$

$$Val_{c,g,t}(\ulcorner \Pi(\alpha) \urcorner) = \langle Val_{c,g,t}(\alpha), Val_{c,g,t}(\Pi) \rangle$$

S35. If α is a name and ϕ a formula, then:

$$Valb_{c,g}(\ulcorner \text{Believes}(\alpha, \phi) \urcorner) = \langle Valb_{c,g}(\alpha), Valb_{c,g}(\phi), Valb_{c,g}(\text{'Believes'}) \rangle$$

$$Val_{c,g,t}(\ulcorner \text{Believes}(\alpha, \phi) \urcorner) = \langle Val_{c,g,t}(\alpha), Val_{c,g,t}(\phi), Val_{c,g,t}(\text{'Believes'}) \rangle$$

S37. If ϕ is any formula, then:

$$Valb_{c,g}(\ulcorner \text{Sometimes } \phi \urcorner) = \langle Valb_{c,g}(\phi), Valb_{c,g}(\text{'Sometimes'}) \rangle$$

$$Val_{c,g,t}(\ulcorner \text{Sometimes } \phi \urcorner) = \langle Valb_{c,g}(\phi), Val_{c,g,t}(\text{'Sometimes'}) \rangle$$

Salmon notes that the information value of $\ulcorner \text{Sometimes } \phi \urcorner$ is made up, in part, of the information-value base of ϕ rather than its information value. So the information value of 'Sometimes, John believes Frege is happy' will be a tuple consisting of the property *som* and the value base of 'John believes Frege is happy'. The value base of 'John believes Frege is happy' will in turn be a tuple consisting of John, *bel*, and the *value base* of 'Frege is happy'. This is what King means when he says that the information value base of 'John believes Frege is happy' only "includes" the information value base of 'Frege is happy'.

Thus far Salmon has recursively defined the information-value base (and value) of the expressions of the language at a context and assignment (and time) but has not yet defined the *truth* of a content (base) at a circumstance. So, in a sense these content (bases) now need to be given a semantics. Salmon does so as follows for the clauses we are interested in:

⁵⁸In this brief demonstration I am making some dramatic simplifications. But this level of detail will suffice for this discussion. For example, I am assuming that the only singular terms in the language are names, I am ignoring quantification, and, perhaps most dramatically, I am completely ignoring the propositional operator 'that', which assigns every proposition to itself. In addition, in the clauses for the truth of a content (base) at a circumstance I am suppressing the definitions of property and relation exemplification and suppressing mention of the *p*-structure. See Salmon (1986), pp. 143-151 for the dirty details.

S1.19. If i is any individual and p is any information value base, then $\langle i, p, bel \rangle$ is true at t in w iff $\langle i, Etern_t(p) \rangle \in bel$ at t in w .⁵⁹

S1.21. If p is any information value base, then $\langle p, som \rangle$ is true at t in w iff there is a time t' such that p is true at t' in w ; and $\langle p, som \rangle$ is true at w on exactly the same condition.

In S1.19 we see the controversial $Etern_t$, which eternalizes a content base. This is defined as follows:

Definition. For every content base p , content p' and time t , $Etern_t(p) = p'$ iff, for every formula ϕ , context c and assignment g , $Valb_{c,g}(\phi) = p$ iff $Val_{c,g,t}(\phi) = p'$.

Intuitively, to eternalize a content base with respect to a time t is simply to fix its temporal profile, such that if the content base is true (false) at t then it is true (false) eternally. But a content base p is not a simple function from worlds and times to truth-values. Instead it is a structured entity (i.e. a tuple of objects, properties and relations), so we really need to add the time t to all the relevant parts of the tuple.⁶⁰ Roughly speaking, then, $Etern_t$ takes the structured content base of a formula ϕ at (c, g) and gives the structured content of ϕ at (c, g, t) .

With these definitions in place we can see where $Etern_t$ comes into play in King's example sentence. Consider again the problem sentence.

(46) Sometimes, John believes Frege is happy.

Following the recursive definitions we can work out the information value of (i.e. structured proposition expressed by) (46) at c, g, t . By S21 and S37 we get that

$$Val_{c,g,t}(46) = \langle Valb_{c,g}(\text{'John believes Frege is happy'}), som \rangle.$$

By S2, S20 and S35 we get that

⁵⁹The second part of the clause is: If i is any individual and p is any information value and t is any time, then $\langle i, p, \langle bel, t \rangle \rangle$ is true in w iff $\langle i, p \rangle \in bel$ at t in w .

⁶⁰For example, if we assume $Valb_{c,g}(\xi) = Valb_{c,g}(\alpha) \frown Valb_{c,g}(\beta)$, then it may be that $Etern_t(Valb_{c,g}(\xi)) = Valb_{c,g}(\alpha) \frown \langle t \rangle \frown Valb_{c,g}(\beta) \frown \langle t \rangle$.

$$Valb_{c,g}(\text{'John believes Frege is happy'}) = \langle \text{John}, Valb_{c,g}(\text{'Frege is happy'}), bel \rangle.$$

By putting those together we get that

$$Val_{c,g,t}(46) = \langle \langle \text{John}, Valb_{c,g}(\text{'Frege is happy'}), bel \rangle, som \rangle$$

Now that we have the structured content associated with (46) in c, g, t we can look to the definitions of truth at a circumstance in S1.19 and S1.21 to get the truth-conditions of (46).

$Val_{c,g,t}(46)$ is true in a world w iff

there is a time t' such that $\langle \text{John}, Valb_{c,g}(\text{'Frege is happy'}), bel \rangle$ is true at t' in w iff

there is a time t' such that $\langle \text{John}, Etern_{t'}(Valb_{c,g}(\text{'Frege is happy'})) \rangle \in bel$ at t' in w .

Thus, combining Salmon's definition of the associated structured contents and content bases for the problem sentence (46) with Salmon's definition of truth of a content and content base at a circumstance, we get the following overall definition of (46)'s sentential truth at a point of reference.

(*) (46) 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 .

This is essentially the truth-conditions we derived from clauses 1 and 2 above.⁶¹ And (*) is really all that matters, if we are restricting our attention to the compositional semantics, where the primary aim is to define sentential truth at a point of reference (c, g, t, w) .⁶² So the detour through structured contents wherein the

⁶¹ $[[\text{Sometimes, John believes Frege is happy}]]^{c,g,t,w} = 1$ iff there is time t' such that $([[\text{John}]]^{c,g,t,w}, \lambda w'. [[\text{Frege is happy}]]^{c,g,t',w'}) \in bel$ at t' in w .

⁶²King (2007), p. 164 agrees that this is a primary aim of semantic theorizing, he says: "A primary purpose of a semantics for a natural language is to compositionally assign to sentences semantic values that determine whether the sentences are true or false."

eternalization of a content base is employed is in an important sense off the record with regard to the semantics proper.

Semantic theories which are not engaged in Salmon's specific project of first assigning structured contents to expressions before assigning an extension at a point, can just let the semantic value of an expression be a function from points of reference to extensions. As we have seen for such a project there is no need to have a special "eternalization" of a semantic value—we simply supply the function the relevant time argument in the semantic clause.

Of course, the bigger picture is that King himself is engaged in a Russellian project very similar to Salmon's of assigning structured contents to the expressions of the language (see King 2007). Although King (2003) gives the impression that his discussion is neutral with respect to the structuralist versus the function/point style of semantic theories, here we've seen that King's objection to Salmon is an issue internal to Russellianism and so not a worry in general for views which make the theoretical distinction between assertoric content and compositional semantic value.

Even so, it is unclear how King avoids his own objection. King says the problem for Salmon arises "because for Salmon the thing that 'Sometimes' operates on is different from the object of the believing relation". But King's semantics shares the property that the semantic values that are relevant in temporal constructions (i.e. schmentential semantic values) are different from the objects of the believing relation. It is important to note that King also has temporally neutral propositions that enter into his compositional semantics, its just that they are never the semantic value of a sentence in a context. So how does he avoid requiring these special clauses which he thinks should be avoided?⁶³ Perhaps King's objection loses its force once we see the role the special clauses play within a structuralist semantics—if not, it seems that King will run headlong into his own objection when providing the formal details for his preferred structuralist semantics.

In any case, there is a way for a structuralist to deny the identification thesis, while completely avoiding King's worries. In brief, the story would proceed as follows:

- i. In the semantics proper assign each atomic expression a semantic value and specify the recursive composition rules such that the rules together with the

⁶³Note that providing an extensionalist syntactic representation of tense doesn't avoid the issue.

values determine for each sentence of the language its semantic value.

- ii. Then, by an additional recursive procedure, associate with each complex expression a *structured semantic value*, which is a tuple consisting of the (unstructured) compositional semantic values of its parts (in a certain order).⁶⁴
- iii. This structured semantic value, will in turn, determine the *structured assertoric content* that the sentence would have if uttered in any given context. This will involve defining the structured assertoric content (and a structured assertoric content base) of every expression in terms of its structured semantic value.
- iv. Since the truth of a structured assertoric content at a circumstance can be defined in terms of the truth of its associated unstructured semantic value at a circumstance there is no need to have semantic clauses like the eternalization of a structured assertoric content base.

Note that in this framework, the shortest road from sentence to truth does not go via structured assertoric contents as it does in Salmon's framework. But given the connection between the truth of structured and unstructured contents, a longer route via structured assertoric contents is established. The short cut avoids any need to independently define the truth of a structured content at a context and this is why we avoid the need for any special semantic clauses like eternalization. Importantly both sentential truth at a context and structured assertoric content at a context are determined by the compositional semantic values. Thus, even a structuralist that maintains that compositional values and assertoric contents diverge, does not require special definitions and semantic clauses to handle the interaction of tenses and attitude reports.

⁶⁴For example, these could be like the "structured meanings" in Lewis (1970).

Chapter 3

Compositionality regained?

In addition to the composition failure in Kaplan's *Logic of Demonstratives* from chapter 1, I have outlined four examples of assertoric composition failure from natural language in chapter 2. These cases present a general tension between theories of assertoric content and the compositionality principle: expressions that say the same thing embed differently. In every case, it seemed that we must give up the identification of assertoric content with compositional semantic value. Nevertheless, there are strategies that one may pursue to retain that identification and restore the compositionality of assertoric content. In this chapter, I will assess the prospects of such strategies.

Recall again the entrenched philosophical conception of semantics and propositions: A semantics for a natural language aims to compositionally assign to sentences semantic values that encode the truth-conditions of the sentences. These values must be assigned relative to a context, since natural languages contain contextually sensitive expressions. The semantic values that are compositionally assigned to sentences are *propositions*. Propositions play many theoretical roles, one of which is that they are the objects of the attitudes, and thus the objects of assertion.

The entrenched philosophical conception is committed to the identification of assertoric content with compositional value. In so far as the the entrenched conception is appealing and motivated, there is motivation to pursue the various repair strategies. It is surprisingly difficult to find principled arguments or reasons to accept the entrenched conception but there are a few apparent motivations.

An obvious motivation is that having one entity play the role of assertoric content and compositional value is more simple and elegant. But such motivations

are easily defeated. Another apparent motivation stems from the semantics of speech reports. A speech report of the form $\lceil \alpha \text{ says } \phi \rceil$ reports that an agent α stands in the saying relation to a certain assertoric content; and it seems that the semantic value of the complement clause of the report just is the proposition the agent says (although we have cast doubt on this idea in § 2.A). Relatedly, if an agent wants to communicate that p , it seems that they should do so by uttering a sentence ϕ that means p . Let's take these as prima facie motivation for the entrenched philosophical conception of semantics and propositions. And, therefore, there is some prima facie motivation to accept the following principle.

Assertoric-Content Semantic-Value Identification Thesis. The assertoric content (in a context) of an expression is identical to its compositional semantic value.

Or what I'll call the *identification thesis* for short. Before proceeding to the possible strategies for retaining this principle given the challenges from above, there are two related reactions to my challenge that I want to mention and set aside.

One response to the apparent assertoric composition failures, is to insist that in natural languages compositionality outright fails and take the attitude that this is not problematic. A way to motivate this position is to point to other apparent failures of compositionality. For example, it is notoriously difficult to provide a genuine compositional semantics for quotation (see e.g. Cappelen and Lepore 2007 and Pagin and Westerståhl 2010c). And there are many other challenges to compositionality, including treatments of indicative conditionals, donkey anaphora, idioms, and attitude reports, among others.

One might insist that likewise for the constructions I've considered (e.g. pronominal binding, tense, embedded modals, etc.) there is just no genuinely compositional story to tell. But this response has no bearing here, since for all the example constructions I've considered this is not the case. In fact, I have provided a compositional semantics for all the cases considered. It is just that the semantic values involved in the compositional story diverge from the objects that are standardly thought to be the objects of assertion. And that is the point.

If one insists that compositionality is not crucial or that their notion of "semantic value" need not be constrained by such a principle, then this conception of "semantic value" is not my target. On such a conception one may well identify

assertoric content with semantic value, but in the absence of a theoretical role for “semantic value” I’m lost as to the content of such a thesis. By “semantic value” I mean the theoretical entity that plays (at least) these two roles (Lewis 1980): (i) encodes the truth-conditions of sentences, and (ii) contributes to compositionally determining the semantic value of complex expressions. So I take it as definitional that semantic values adhere to the compositionality principle. And the thesis that I’m advocating is the thesis that the values that play the compositional role cannot be identified with the objects of assertion.

A related reaction is to insist that genuine compositionality not really necessary: perhaps it is enough to provide a way to *systematically compute* the meaning of the whole expression from the linguistic properties of its parts. As an example of a systematic computation as opposed to a genuinely compositional story one might point to the semantics of pronominal binding in Heim and Kratzer (1998) (cf. Stanley 2000, p. 395n7). Their official statement of the semantics is not strictly compositional, since 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 ’.¹ Instead such lambda terms are handled by their non-compositional yet systematic rule for predicate abstraction (p. 186):

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 , $\llbracket \alpha \rrbracket^g = \lambda z. \llbracket \alpha \rrbracket^{g[x:=z]}$.

In this way one might concede that a certain linguistic construction is not compositional at the level of assertoric content, and insist that such a compositionality principle is not important. For example, this is what Soames (2011) seems to say about the semantics of Tarskian quantification. But Soames doesn’t think that there is no compositional semantic story to tell—of course there is such a story. And, of course, predicate abstraction *can* be given a compositional semantics (similar to Tarskian semantics for quantifiers)—I provided such a story in § 2.3. Since all the constructions that I appeal to can be given a fairly straightforward composition semantics, it’s unclear to me how an appeal to a non-compositional computation would avoid my point. I’ll admit that I am simply assuming that

¹It is unclear whether it was done this way for merely pedagogical reasons or for some unstated theoretical reason—I suspect it was the former.

genuine compositionality is desirable, without rehearsing and assessing that debate.²

To belabor the point: The issue we are concerned with here is whether or not the theoretical notion of assertoric content can play the role of compositional semantic value. And given the failures outlined in the previous chapters, it appears that it cannot not. There are, however, two main options for retaining the identification of assertoric content with compositional semantic value. I will now turn to assessing these strategies.

3.1 Assertoric Relativism

The first general strategy is to deny the relevant “contextualist” commitment on assertoric content. For example, given the tension between eternalism and the semantics of tense one can simply deny eternalism. After all, the arguments in favor of eternalism did not seem to be ultimately convincing. And there are, in fact, independent motivations for temporalism that one might appeal to (see Lewis 1979b). If one denies eternalism the problem seems to disappear (e.g. Recanati 2007, pp. 61–74 pursues this line of defense).

But to retain the identification thesis such a strategy would have to be adopted across the board. One would, for example, also have to be a relativist about epistemic modals. In this case, there seems to be good reason—stemming from Moore-paradoxical ‘might’-sentences—in favor of contextualism. But there are also independent motivations in favor of relativism, stemming from considerations of “faultless disagreement” (see Egan et al. 2005 and Egan and Weatherson 2011). If one could mount an argument against the relevant contextualism, again, the problem would seem to dissolve.

While I think that one may be able to defend a temporal-egocentric conception of propositions—where propositions are sets of world-time-agent triples—this is still not enough to avoid the general challenge. For the sake of argument let’s assume that we have independent motivation to think that propositions are sets of centered worlds á la Lewis (1979b). Now it seems that the challenge from temporal embedding and the challenge from embedded ‘might’-sentences is avoided—since on this conception semantic values are time neutral and agent neutral.

²See Pagin and Westerståhl (2010b) for extensive discussion of this issue.

But the general problem remains. There is one residual problem that we can reveal in two ways. First note that sets of centered worlds do not resolve the challenge from pronominal binding. The compositional semantics of pronominal binding requires semantic values to be neutral with respect to the assignment function. Recall that an assignment function is a function from variables to individuals. Or, equivalently, it can be conceived of as an infinite sequence of individuals. While centered worlds contain an individual, they only contain a single individual. Centered worlds therefore contain insufficient information for the semantics of pronominal binding. What we require are *sequenced worlds*: $\langle w, t, (a_1, a_2, a_3, \dots) \rangle$.³ That is, we require multiple indexing beyond the mere double indexing that points of reference comprised of a context and a centered world provide.

This leads to the second way of seeing the residual problem. The simplistic picture inherited from Kaplan is that points of reference are comprised of a context and a circumstance. On this view the compositional semantic value is what one gets after supplying the context—sentences express propositions relative to contexts. And propositions are sets of circumstances, which are understood to be sets of centered worlds. But we know that sets of centered worlds will not do as semantic values due to the need for multiple indexing beyond double indexing (see § 0.4 and § 2.4). Theorists tend to focus on double indexing instead of the full blown infinite-indexing, that is actually required. For example, focusing solely on the case of tense: Semantic values must be sets of infinite sequences of times. So even if we accept that propositions are “time neutral”, such propositions will not serve as compositional semantic values.

The problem is that natural languages have the full expressive resources of quantification over worlds, times and individuals, and thus points of reference must be sets of infinite sequences of worlds, times, and individuals. Is there any reason to think that the objects of the attitudes are sets of infinite sequences of worlds, times, and agents? Of course, one could argue for that conclusion as follows: (i) propositions are the compositional semantic values of sentences (in context), (ii) the compositional semantic values of sentences (in context) are sets of infinite sequences of worlds, times, and agents (iii) thus, propositions are sets of infinite sequences of worlds, times, and agents. But many theorists would take this to be a *reductio* of premise (i).

The strategy of denying eternalism and denying contextualism about epistemic

³The name “sequenced worlds” is borrowed from Yalcin (2007) and Ninan (2010a).

modals in order to retain the identification of assertoric content with compositional value, only goes so far. To really carry out the strategy of “going relativist” one would have to be an *extreme assertoric relativist* and (at least) maintain that the objects of assertion are sets of infinite sequences of worlds, times, and agents. While this is a position within the space of possible views on assertoric content, it is one that I assume most would be reluctant to occupy.⁴

3.2 Linguistic Environmentalism

The second general strategy is to retain the relevant “contextualist” commitments but alter the inputs to the compositional process by somehow discriminating between embedded versus unembedded linguistic environments. Due to this discrimination based on linguistic environment I call this strategy *linguistic environmentalism*. The strategy takes two forms: one makes the discrimination in terms of syntax, while the other makes the discrimination in terms of semantics.

3.2.1 Schmentencism

The syntactic form of linguistic environmentalism was described by Lewis as follows:

We can perfectly well build a compositional grammar in which it never happens that sentences are constituents of other sentences, or of anything else. . . In this grammar sentences are the output but never an intermediate step, of the compositional process. If we take this course, we will need replacements for the sentences hitherto regarded as constituents. The stand-ins will have to be more or less sentence-like. But we will no longer call them sentences, reserving that title for the output sentences. Let us call them *schmentences* instead. (Lewis 1980, p. 32)

⁴Ninan (2012a) argues that certain problems with counterfactual attitudes (e.g. imagination) motivate the thesis that that objects of attitudes should be sequenced worlds (sets of world-sequence of individuals pairs) but it doesn't seem that such motivations generalize to the case of worlds and times in addition to individuals. Another motivation to have the objects of assertion be sets of infinite sequences of worlds, times, and agents might stem from Frege-puzzle demands for extremely fine-grained objects of attitudes—but I am not aware of any such argument.

The situation Lewis is imagining is one in which sentences never occur embedded in linguistic environments, instead mere look-a-like expressions embed in linguistic environments—these are schmentences. The essential schmentencite maneuver is a syntactic one: deny that sentences (or the relevant expressions) syntactically embed in the relevant linguistic environments. If sentences do not occur as parts of complex sentences, then their semantic value is never the input to the compositional process. And thus their semantic value is not held hostage to the demands of compositionality.⁵

Consider an example. The eternalist contends that the semantic values of sentences (in a context) are eternal propositions. This appears to conflict with the semantics of temporal embeddings, since, e.g., compositionality demands that the semantic value of the complement clause of the following sentence must be temporally neutral.

(47) It will be the case that it is raining

Here it appears that the sentence ‘It is raining’ occurs as a syntactic constituent of sentence (47). If it does, then given the demands of the composition principle the semantic value of ‘It is raining’ cannot be an eternal proposition. The schmentencite insists that things are not as they appear—the sentence ‘It is raining’ does not embed in temporal environments. Instead sentence (47) is syntactically constituted by the temporal modifier ‘It will be the case that’ and the schmentence ‘it is raining’. Importantly, the schmentence ‘it is raining’ must be distinguished from the genuine sentence ‘It is raining.’ (Lewis suggests that we keep track by “writing the schmentence without a capital letter and a period” (p. 33)). Given this syntax, it is clear that eternalism faces no threat from the semantics of sentences embedded in temporal environments. There just is no such embedding!

King (2003) has provided a recent schmentencite defense of eternalism. But his discussion is confounded, since he runs together two distinct theses. King argues from the premise that tense should be construed syntactically as involving object language quantifiers and variables (instead of Priorean operators) to the conclusion that the semantic values of sentences needn’t be neutral with respect to time (or sequences of times). King states:

⁵Cf. the discussion of “sententiality” in relation to the operator argument in Cappelen and Hawthorne (2009).

I shall argue that temporal expressions (including tenses) and location expressions are not best understood as sentence operators that shift features of the index of evaluation. If this is correct, then indices do not need to contain times or locations for such purported operators to shift. (King 2003, p. 215)

The premise does not support the conclusion. King’s motivation for the premise is roughly pragmatic and sociological. He says that “virtually all current researchers trying to give a treatment of the complex temporal data in natural languages eschew an operator approach to tenses” (p. 221). And suggests that this is so because

... treating tenses as involving quantification over times (and expressing relations between times) rather than index shifting sentence operators (i) allows for a simpler more elegant less ad hoc treatment of tenses and temporal expressions than does an operator treatment; and (ii) allows for a more plausible account of the relation between the surface structures of English sentences and the syntactic representations of those sentences at the level of syntax that is the input to semantics. (King 2003, p. 221)

Whether or not these are good reasons, let’s agree with King that syntactically speaking we should treat tenses as involving object language quantification over times. (The issue is fundamentally a syntactic one, so something in the vicinity of King’s (ii) should carry the weight.) King insists that from this it follows that the semantic values of sentences needn’t be neutral with respect to time (or sequences of times) as they must be given the traditional Priorean syntax.

The type of syntactic representation that King has in mind seems to be one based on a simple predicate logic (opposed to, say, a lambda-calculus based syntax). All of his examples use syntax that looks to simply add temporal quantifiers and variables to predicate logic. For example, it seems that King has in mind something like the following contrast between an “intensionalist” (i.e. Priorean) syntax and an “extensionalist” syntax of ‘It was raining’ (where the free variable t^* gets assigned the time of the context).

Intensionalist syntax: $[[\text{PAST}] [\text{it is raining}]]$

Extensionalist syntax: $[[\exists t : t < t^*] [\text{it is raining at } t]]$

The standard operator argument for temporalism maintains that, given the intensionalist syntax, ‘it is raining’ must have a temporally neutral semantic value or else the modifier PAST would be vacuous. But this exact same argument also applies to the extensionalist syntax. If we assume that the semantic value of ‘it is raining at t ’ is specific with respect to a time, then the quantifier is vacuous—just as the quantifier in ‘ $\forall xFa$ ’ is vacuous. We have confronted this fundamental point already: variable-binders require assignment neutral operands. So, for temporal quantifiers the semantic value of sentences must be neutral with respect to the assignment of times to temporal variables. This is just to say that semantic values must be neutral with respect to time (or really a sequence of times). The semantic situation is exactly the same here as with the intensionalist syntax. The difference is merely syntactical.⁶ So representing tense with object language quantifiers and variables does not avoid the operator/quantifier argument against eternalism.

The essential syntactic issue is not extensionalist versus intensionalist; instead the issue is over schmentencism. King seems to think that one adopts schmentencism if and only if one adopts an extensionalist syntax.⁷ This is where he runs together two distinct theses. On the contrary, one can be both an *intensionalist schmentencite* and an *extensionalist non-schmentecite*.

Remember that the essential schmentencite maneuver is to deny that sentences syntactically embed in the relevant linguistic environments. We have seen already that one can be an extensionalist while maintaining that *sentences* (such as ‘it is raining at t ’) embed under quantifiers (such as ‘ $[\exists t : t < t^*]$ ’).⁸ An intensionalist

⁶The semantics of the operator-theoretic treatment requires a sequence of times in the “index”, whereas the quantificational treatment requires an assignment function in the point of reference. This is a merely verbal difference. An assignment function might as well be construed as a Tarski-style sequence. Is this sequence a part of the Lewisian “index”? Of course it is—semantically speaking quantifiers just are “operators”. In fact, Lewis (1970), p. 24 explicitly understands the assignment of values to individual variables as a coordinate of the index. And thus quantifiers are explicitly construed as “index-shifting operators”.

⁷For example King says “. . . the strategy of reconstruing all apparent index shifting operators except modal ones (i.e. world shifting ones) as e.g. object language quantifiers” has the consequence that “the expression ‘Somewhere’ embeds in a sentence like ‘Somewhere the sun is shining’ is not a sentence!”, King (2003), p. 226.

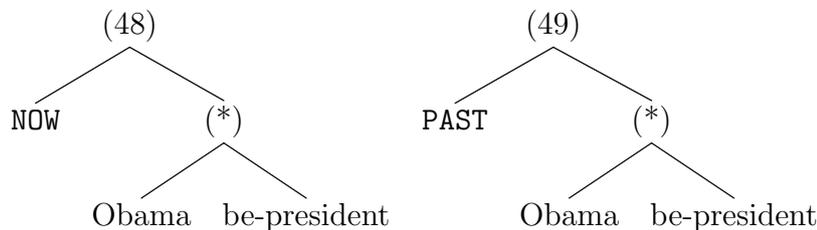
⁸One might complain that expressions such as ‘it is raining at t ’ with free variables are “open” sentences and are therefore not even properly called sentences. But that is really beside the point. The point is that one can both represent the syntax of the sentence ‘It is raining’ as the open formula ‘it is raining at t ’ and maintain that ‘It was raining’ is syntactically composed of the quantifier ‘ $[\exists t : t < t^*]$ ’ and the open formula ‘it is raining at t ’. Such a view employs an extensionalist syntax (i.e. object language variables and variable-binders) and also holds that ‘It was raining’ contains the *sentence* ‘It is raining’ as a syntactic constituent (i.e. denies schmentencism). It should be noted that it is very standard to insist that genuine *sentences* can

schmentencite, instead, maintains that temporal modifiers are Prior-style index-shifting operators but denies that they are *sentential* operators—they are mere schmentential operators. For example, consider the following sentences.

(48) Obama is president

(49) Obama was president

The intensionalist schmentencite maintains that sentence (48) does not embed under the past tense operator PAST. A natural way to implement this would be as follows.



The fact that the schmentence (*), which occurs embedded under PAST, cannot be an eternal proposition, is consistent with the thesis that the semantic value of the genuine sentence (48) is an eternal proposition.⁹

Another case of schmentencism we have encountered already is Kaplan’s stance on pronouns. This is due to his distinction between free and bound pronouns.

The group of words for which I propose a semantical theory... have uses other than those in which I am interested (or, perhaps, depending on how you individuate words, we should say that they have homonyms in which I am not interested). For example, the pronouns ‘he’ and ‘his’

contain free pronouns, e.g. ‘He left’. We shouldn’t conflate the logician’s use of “sentence” in the sense of closed formula with the use in linguistics. See Weber (2012a) for further discussion of the schmentencite defense of eternalism in relation to open versus closed sentences.

⁹I should note that a charitable interpretation of King (2003) might be that he had in mind a *particular* extensionalist syntax whereby sentences do not embed under temporal quantifiers. In fact, he represents the syntax for ‘Maggie is happy’ and ‘Maggie was happy’ as $[\exists t(t = t^* \ \& \ \text{maggie be happy}(t))]$ and $[\exists t(t < t^* \ \& \ \text{maggie be happy}(t))]$, respectively (p. 221). But this is merely one among many syntactic representations employing object language temporal variables and binders (e.g. see Ogihara 1996, Kusumoto 2005, and von Stechow 2009). And it seems very unnatural to represent ‘Maggie is happy’ with an existential quantifier—more natural would be the simple $[\text{maggie be happy}(t)]$; in which case, the operator/quantifier argument again gets traction. See also Ninan (2010b), pp. 372-378 for discussion of what follows (or doesn’t follow) about assertoric content given an extensionalist syntax of tense.

are used not as demonstratives but as bound variables in ‘For what is a man profited, if he shall gain the whole world, and lose his own soul?’ (Kaplan 1989a, pp. 489-490)

And similarly in “Afterthoughts” he states that “pronouns are lexically ambiguous, having both an anaphoric and a demonstrative use” (Kaplan 1989b, p. 572). One way to interpret these remarks is to understand Kaplan as maintaining that the sentence ‘Eros loves her’ does not occur as a constituent of the sentence ‘Every women is such that Eros loves her’. Given a lexical distinction between free variables and bound variables, then, one can avoid the argument from pronominal binding. The semantic value of the sentence ‘ Fx ’ can be a truth-value so long as the orthographically similar constituent of ‘ $\forall xFx$ ’, namely ‘ Fx ’, is really a distinct expression.

In principle, the schmentencite maneuver can be applied any time one’s commitment on assertoric content conflicts with the semantics of embedding. For example, the contextualist about epistemic modals can insist that epistemic ‘might’-sentences do not embed under attitude verbs. In this way, there is no challenge to this type of contextualism from embedding phenomena.

In the last section, it was shown that in order for the assertoric relativist to carry out their strategy, they would have to accept the radical view that the things we say are (or are modeled by) sets of infinite sequences of worlds, times, and individuals. This was because semantic values must be multiply indexed. Multiple indexing is perhaps the most troubling challenge to the thesis that identifies the semantic value of a sentence with its assertoric content.

But here too one can make the schmentencite maneuver. For example, assume one thinks that the assertoric content of a sentence (in a context) is a set of worlds. Sets of worlds cannot be the semantic values of sentences simply due to iterated modals—the semantic values of sentences must be sets of infinite sequences of worlds (recall § 2.4). But now the schmentencite claims that sentences do not embed under modal operators/quantifiers. If not, then the semantic values of sentences needn’t be multiply indexed. Yet non-sentential expressions—schmentences—*do* embed under modal operators/quantifiers. The arguments for multiple indexing will apply to the semantic values of schmentences (but not sentence), so the semantic values of schmentences must be sets of infinite sequences

of worlds, while the semantic values of sentences can be simple sets of worlds.¹⁰

The schmentencite makes non-standard syntactic claims. If the schmentencite strategy is to vindicate the identification of semantic value with assertoric content, the syntactic claims must be well-motivated. Does the view have independent motivation stemming from contemporary syntax theory? Perhaps at the end of syntactic investigation the schmentencite will be vindicated. But even so, the way that the schmentencite retains the identification between assertoric content and compositional value seems to be a cheat. The identification is retained by making the role for the compositional semantic value of a sentence trivial. The semantic value of a sentence never composes with other values, so it can fulfill the compositional role vacuously. The compositional work is instead done by schmentences. So, in an important sense we need to assign both compositional semantic values and assertoric contents to “sentences”, but since the schmentencite divides the labor between schmentences and genuine sentences, they can claim to have vindicated the identification of sentential meaning with asserted content. For this reason I think Lewis (1980) was right when he complained that the schmentencite “victory is both cheap and pointless” (p. 33).

3.2.2 Occurencism

Among the three fundamental principles for philosophical analysis that Frege lists in the introduction to the *Grundlagen* is the Context Principle: “nach der Bedeutung der Wörter muss im Satzzusammenhang, nicht in ihrer Vereinzelung gefragt werden” (Frege 1884). In other words, never ask for the meaning of a word in isolation, but only in the context of a sentence.¹¹ In later work, Frege proposes

¹⁰In this way, the schmentencite can even maintain that the semantic values of sentences are truth-values. This is related to the the view of Schaffer (2012). He presents his thesis as the view that propositions are necessitarian (and eternal and universal), such that they are, if true necessarily true and if false necessarily false. Such propositions are what Kaplan calls “perfect propositions”, since their “truth changes neither through time nor possibility” (Kaplan 1989a, p. 503n28). When such a view is stated within the structuralist (i.e. Russellian) guise it is the view that the semantic values of sentences-in-context are structured propositions that bear truth-values *absolutely* (necessarily, eternally, universally). When the view is translated into an unstructured function/point-style semantic framework it reduces to the view that the semantic values of sentences-in-context are truth-values (or nullary functions to truth-values).

¹¹There are many conflicting interpretations and employments of this principle (including Wittgenstein 1921 §3.314: “Der Ausdruck hat nur im Satz Bedeutung”). Linnebo (manuscript) distinguishes three prominent interpretations: (i) expressions don’t have meaning in isolation

a novel semantics of intensional contexts such that the reference of a sentence *shifts* from its customary reference to its customary sense—this is the doctrine of indirect reference (see Frege 1892 and Dummett 1973, pp. 264–294).¹² The occurencite version of linguistic enviormentalism takes its cue from these Fregean doctrines.

Frege uses the phenomenon of quotation as a model to illustrate the type of semantic shift he proposes. In order to refer to a word, we put the word in quotes, e.g. ‘Gottlob’ contains the letter ‘b’. We are not making the absurd claim that Gottlob contains the letter ‘b’, we are making the true claim that the word ‘Gottlob’ contains the letter ‘b’. So, in this case “‘Gottlob’” does not refer to the same object that ‘Gottlob’ refers to: that is how quotation works. Frege thinks that there is a similar device we can use to talk about the *sense* of an expression. In order to talk about the sense of ‘Gottlob’, Frege suggests that we simply use the phrase “the sense of ‘Gottlob’”. So, ‘Gottlob’ refers to a man, “‘Gottlob’” refers to a name, and “the sense of ‘Gottlob’” refers to a sense. With respect to the latter Frege says that it is clear that “in this way of speaking words do not have their customary referent but designate what is usually their sense” (Frege 1892). When words are used “indirectly” in this manner they designate the sense they would normally express. Thus, the indirect referent of a word is its customary sense.

they only have meaning in a sentence, (ii) the meaning of all sentences in which an expression occurs determines the meaning of the expression, (iii) the meaning of an expression cannot be explained in isolation but must always be explained in the context of complete sentences. The first interpretation is the one that is most relevant one for our purposes. Note, however, that this probably isn’t the best interpretation of the Context Principle. Following Dummett (1973), it seems that something along the lines of (ii) and (iii)—what we might call “compositionality interpretations” of the Context Principle—may be the most faithful to Frege. This interpretation is supported especially by later glosses on the Context Principle in the *Grundlagen*, e.g. Frege (1884), §60: “Es genügt, wenn der Satz als Ganzes einen Sinn hat; dadurch erhalten auch seine Theile ihren Inhalt.” [English translation: *It is enough if the sentence as a whole has meaning; thereby the parts also have meaning.*]

¹²A certain interpretation of the Context Principle (expressions don’t have meaning in isolation they only have meaning in a sentence) and Frege’s doctrine of indirect reference appear to be related, since there is no such thing as the unique meaning of a sentence: there is both the meaning in indirect contexts and the meaning in direct contexts. But it is unclear to me whether there is really this strong of a connection between the two principles. The Context Principle doesn’t appear explicitly after the *Grundlagen*—in fact, there is no mention of a general background principle in Frege’s later work in philosophy of language where he introduces the sense/reference distinction and the doctrine of indirect reference. Whatever the Context Principle is exactly, it is clear that it is primarily put to use in the *Grundlagen* in relation to the “contextual definition” of number, and not as general principle guiding the semantics of intensional contexts.

Frege also endorsed a special form of the compositionality principle that we can call the *principle of extensionality*: that the referent of a complex expression is determined by the referents of its parts. By this principle, it follows that the truth-value of a sentence remains unchanged when its parts are replaced by parts with the same referents. A special case of this can occur when a sentence is embedded in a larger sentence. If we replace an embedded sentence with a sentence with the same referent (i.e. truth-value), then the truth-value of the entire sentence remains unchanged. But Frege notes that,

Exceptions are to be expected when the whole sentence or its part is in direct or indirect quotation; for in such cases, as we have seen, the words do not have their customary referents. (Frege 1892)

Obviously, from the sentence “My favorite sentence is ‘Snow is white’”, we cannot substitute for ‘Snow is white’ a sentence that has the same truth-value, e.g. ‘Grass is green’, while retaining the truth-value of the whole. Since “‘Snow is white’” designates a certain sentence, in order to preserve the truth-value of the whole we must substitute in something that designates the same sentence, instead of something that designates the same truth-value.

Frege uses this insight about indirect linguistic contexts to analyze propositional attitudes reports. Consider the following sentences.

(50) Copernicus believed that the sun is the center of our solar system

(51) Copernicus believed that the center of our galaxy is a black hole

The first sentence is true. The sentence that occurs within it, ‘the sun is the center of the solar system’, is true as well. Under the assumption that when this sentence is embedded in a belief report it still designates *the True*, we should be able to substitute in any sentence that also designates the True while preserving the truth-value of the whole. But this is not the case. The sentence ‘the center of the galaxy is a black hole’ is true but since Copernicus did not believe that there was a black hole at the center of our galaxy, (51) is false.

Frege insists that this is not a counterexample to the principle of extensionality; instead he maintains that in (50) the sentence ‘the sun is the center of the solar system’ designates its indirect referent (i.e. its customary sense). So the apparent

failure to persevere truth-value results from mistakenly assuming that the sentence ‘the sun is the center of the solar system’ designates that same thing unembedded as it does when embedded in an indirect context (compare this to assuming that ‘Gottlob’ still designates a man when embedded in a quotational context). In this way, Frege can maintain that the truth-value of a sentence is determined by the referents of its parts. But the principle cannot be stated in terms of the referents of the parts *simpliciter*, it must be in terms of the referents of the *occurrences* of the parts. When a sentence occurs unembedded it designates its truth-value but when it *occurs* embedded in an indirect context it designates its customary sense.¹³ Davidson (1968) introduced the name “semantic innocence” for the principle that the meaning of an expression remains the same no matter what linguistic environment it is embedded in. The type of semantic shift appealed to in Frege’s doctrine of indirect reference gives up semantic innocence (both in terms of reference and sense).

The occurrence version of linguistic environmentalism likewise denies semantic innocence by discriminating between the semantic values of an expression relative to embedded versus unembedded linguistic environments. The occurrence version insists that a semantic theory should assign semantic values to occurrences of expression types instead of expression types (*simpliciter*). This can be understood as assigning semantic values to ⟨expression, environment⟩-pairs instead of to expressions.¹⁴

Salmon (2006) provides an occurrence treatment of the semantics of bound variables and pronouns (see §1.3). If one carried out this occurrence-based semantics in general, could one maintain that the assertoric content of a sentence is compositionally determined by the assertoric contents of its parts? Not exactly, since meanings must be relativized to linguistic environments. But one can perhaps maintain a similar thesis.

Occurrence principle of compositionality. The content of any complex expression *relative to a linguistic environment* is determined

¹³Note that this thesis combined with Frege’s thesis that sense determines reference, immediately leads to a hierarchy of senses, since embeddings can be iterated.

¹⁴Let a *linguistic environment* E be an ordered pair $\langle \phi, \alpha \rangle$ of any sentence ϕ and any expression α from a language \mathcal{L} . Where E is a linguistic environment $\langle \phi, \alpha \rangle$ one can write “ $E(\beta)$ ” for the sentence that results when β is uniformly substituted for α in ϕ . For example if $E = \langle \text{‘Atticus slept’}, \text{‘Atticus’} \rangle$, then $E(\text{‘Olivia’})$ is the sentence that results when ‘Olivia’ is uniformly substituted for ‘Atticus’ in ‘Atticus slept’—that is the sentence ‘Olivia slept’.

by its syntax and the contents of its syntactic constituents *relative to their linguistic environments*.¹⁵

In this way, one can say, e.g., that the content $\forall xFx$ is determined by the content of $\forall x$ and Fx *relative to their linguistic environments*. Let ξ be the linguistic environment of being embedded under $\forall x$ and let \emptyset be the unembedded environment. Then the content of $\langle 'Fx', \xi \rangle$ can be a set of sequences of individuals as is required for compositionality, while the content of $\langle 'Fx', \emptyset \rangle$ can be a truth-value.

Notice that we can no longer say what *the* assertoric content of a sentence (in context) is—at least without specifying a linguistic environment. We can say that relative to the null environment the assertoric content of a sentence (in context) is such-and-such. But relative to other environments (e.g. embedded under various intensional operators) the assertoric content of the sentence will be something else. So in an important sense all we can say is this: restricting attention only to such-and-such linguistic environments, the assertoric content of sentences are of kind so-and-so.

At this point, the difference between the occurencite and the schmentencite looks to be merely technical. They are technically different ways of doing the same thing. The schmentencite maintains that we assign content to expression types and distinguishes the embedded from the unembedded by insisting that they are different expression types; the occurencite maintains that the embedded and the unembedded are the same expression types, but they make the distinction between embedded versus unembedded by insisting that we only assign content to expression-type/environment pairs.

In both cases the way that the environmentalist retains the identification between assertoric content and compositional value seems to be a cheat. In both cases the identification is retained by insisting that the semantic value of a stand-alone sentence (in context) plays no compositional role. The compositional work is instead done by the values of schmentences or embedded-sentences, since the environmentalist divides the labor between schmentences/embedded-sentences and genuine-sentences/unembedded-sentences. So there is still an important sense in which we need to assign both compositional semantic values and assertoric

¹⁵In more detail such a modified compositionality principle would be defined as follows: Let m be the function that maps an expression-environment pair (α, E) to its *content*. Then for every syntactic rule R there is a semantic operation f_R such that $m[R((\alpha_1, E_1), (\alpha_2, E_2), \dots, (\alpha_n, E_n))] = f_R[m(\alpha_1, E_1), m(\alpha_2, E_2), \dots, m(\alpha_n, E_n)]$. See Pagin and Westerståhl (2010a).

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contents to “sentences”. Although both forms of linguistic environmentalism do technically retain the identification, they seem to give up the original spirit of the view.

Chapter 4

Historical digression: embedding and content

One often makes a remark and only later sees how true it is.

Ludwig Wittgenstein (1961)

In this chapter, I will provide a brief historical survey of the distinction between two kinds of sentential content: compositional meaning and assertoric content. This distinction between what sentences ‘mean’ and what they ‘say’ will guide our discussion of the proper theoretical relationship between natural language semantics and the theory of communication in the next chapter.

4.1 Dummett: Ingredient sense and assertoric content

Michael Dummett’s important distinction between *ingredient sense* and *assertoric content* comes up in his discussion of Gottlob Frege’s philosophy of language in *Frege: Philosophy of Language* (Dummett 1973). In particular, the distinction arises in a discussion of Frege’s redundancy theory of truth in relation to failures of bivalence, although in later discussions the distinction is also employed more generally, including as a two-dimensionalist response to Kripke’s modal argument against the descriptive theory of names (see Dummett 1991; I’ll outline Gareth Evans’ 1979 employment of the distinction for this purpose in § 4.2).

Frege held a view that is sometimes called “the redundancy theory of truth”, which he stated as follows:

The sense of the word ‘true’ is such that it doesn’t make any essential contribution to the thought. If I assert ‘It is true that seawater is salty’, I assert the same thing as if I assert ‘Seawater is salty’. (Frege 1915/1979, p. 323)

The general claim here, which is also called Frege’s *equivalence thesis*, is that an utterance of a sentence ϕ says the same thing as an utterance of a sentence ‘It is true that ϕ ’. Or alternatively, we could say that ϕ and ‘It is true that ϕ ’ have the same truth-conditions, or that they express the same proposition. Dummett (1973) explicates and endorses this Fregean thesis about truth: Dummett insists that any state of affairs that makes ϕ true would also make ‘It is true that ϕ ’ true—and for Dummett the content of an assertion is identified with the conditions for its correctness (Dummett 1991, pp. 47-48).

But Dummett notices a problem. The problem arises when one combines the equivalence thesis with the view that there are failures of bivalence (where the principle of bivalence is the principle that states that every declarative sentence is either true or false).

For example, we might have a failure of bivalence with sentences containing empty names, or with future contingents, or when certain presuppositions are not met, or when vague predicates are involved. Take the case of vagueness, and consider the following sentences:

(52) Frank is bald

(53) It is true that Frank is bald.

According to Frege’s equivalence thesis these have the same content. But consider how these sentences embed under negation (on the assumption that Frank is a borderline case of baldness).

(54) \neg Frank is bald

(55) \neg It is true that Frank is bald

Since Frank is a borderline case of baldness, (54) should get the value ‘indeterminate’, whereas since ‘Frank is bald’ is not a true sentence (55) should come out as

true.¹ So sentences (52) and (53) embed differently under negation, but by Frege's equivalence thesis they have the same content, and thus they should embed the same under negation. So if there are failures of bivalence, then it looks like we have to give up Frege's equivalence thesis.

At this point Dummett makes the key move. He says:

We must distinguish... between knowing the meaning of a statement 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: let us refer to the former simply as knowing the content of the statement, and to the latter as knowing its ingredient sense. (Dummett 1973, p. 447)

The proposal is to make a distinction between two sentence-level contents. The content relevant for the compositional semantics is the ingredient sense. As long as ϕ and \ulcorner It is true that ϕ \urcorner have a different ingredient sense, that will explain their embedding behavior under negation. But the sentences may still have the same assertoric content and since Frege's equivalence thesis concerns assertoric content we can retain the equivalence.

To spell this out a bit more consider a truth table for ϕ and $\text{Tr}(\phi)$ (see figure 4.1). We see that in the worlds where ϕ is true, $\text{Tr}(\phi)$ is also true, and in the worlds where ϕ is false, $\text{Tr}(\phi)$ is also false; but in worlds (e.g. w_3) where ϕ is indeterminate $\text{Tr}(\phi)$ is false. So if we think of these functions as the ingredient senses of ϕ and $\text{Tr}(\phi)$, we see that they have different associated ingredient senses and this explains the difference in their embedding behavior: Negation maps indeterminate to indeterminate, but it maps false to true.

But Dummett insists that we shouldn't infer from this difference in ingredient sense that ϕ and $\text{Tr}(\phi)$ say different things about the world. They still have the same truth-conditions: consider the way that they divide the space of worlds into the one where they are true versus the rest (this is represented by the grey versus

¹Under certain assumptions about the semantics of negation and the truth operator in a multi-valued setting: assume that negation is *weak* in the sense that it maps indeterminacy to indeterminacy, whereas the truth operator (or predicate) is *strong* in the sense that it maps indeterminacy to falsity. Such assumptions are made in Dummett (1991), p. 48, when discussing multi-valued logic. The essential point is simply that ϕ and $\text{Tr}(\phi)$ say the same thing (in the sense that they have the same conditions for correctness). But in a certain multi-valued logics $\neg\phi$ and $\neg\text{Tr}(\phi)$ can differ in truth-value, since if ϕ is indeterminate so is $\neg\phi$, whereas $\neg\text{Tr}(\phi)$ is true.

white areas in figure 4.1). If we think of the assertoric content as the set of worlds where they are true, then they have the same assertoric content.

Figure 4.1: Assertoric content versus ingredient sense.

	ϕ	$\text{Tr}(\phi)$
w_1	T	T
w_2	F	F
w_3	N	F
w_4	T	T
\dots	\dots	\dots

The point is that it shouldn't be assumed that the assertoric content of a sentence exhausts its meaning. The additional level of meaning—the ingredient sense—accounts for the diverse contributions sentences with the same assertoric contents can make to more complex sentences of which they are subsentences.² Here is how Dummett explains the distinction in a later work:

It is true enough that the sentences “Seawater is salt” and “The statement ‘Sea water is salt’ is true”, or “It is true that seawater is salt” have the same assertoric content. The assertoric content of a sentence is what is conveyed by an utterance of it on its own to make an assertion—what is added to the picture of the world of a hearer who accepts the assertion correct. But it is a fallacy, committed by Frege and by many others, to infer from two sentences’ having the same assertoric content that they are equivalent. . . For the assertoric content of a sentence does not exhaust its meaning. It also has an *ingredient sense*, which determines the contribution it makes to the sense of a more complex sentence of which it is a subsentence. The identity of

²Interestingly, Dummett also puts the distinction to use with respect to the conflict between eternalist content and temporal modifiers (as discussed in § 2.1) in the following nice example: “The sentences ‘It is raining here’ and ‘It is raining where I am’ have the same assertoric content: they provide just the same information to a hearer. But, subjected to the temporal quantifier ‘always’, they yield sentences with different contents: ‘It is always raining here’ and ‘It is always raining where I am’ do not say the same at all. This is because the adverb ‘here’ is temporally rigid, while ‘where I am’ is temporally flexible” (Dummett 2001, p. 259).

the assertoric contents of two sentences by no means implies that they have the same ingredient sense. (Dummett 2007, p. 179)

To foreshadow the discussion in the next chapter, we can say that natural language semantics is concerned primarily with ingredient sense, whereas the theory of communication is concerned with assertoric content. Dummett is admirably clear on this point when he states, “Ingredient sense is what semantic theories are concerned to explain” (Dummett 1991, p. 48); where by “semantic theory” Dummett clearly has in mind the project of a formal, truth conditional, and compositional semantics to be outlined in § 5.2. Dummett glosses semantics as follows: “What a semantic theory is required to do... is to exhibit the way in which the semantic value of a sentence is determined by the semantic values of its components, and to give the general condition for a sentence to be true, in terms of its semantic value” (Dummett 1991, p. 61).

4.2 Evans: Content and modal embedding

In his 1979 “Reference and contingency” Gareth Evans explicitly applies Dummett’s distinction to the modal realm and to a discussion of Kripke’s cases of the contingent a priori (Kripke 1980). In this way, Dummett’s brand of two-dimensionalism can be employed as a defense of the descriptive theory of names against Kripke’s attack.³

It’s illuminating to see the distinction put to use in this familiar setting. The relevant descriptivist view is the view that a definite description “gives the meaning” of a proper name—as opposed to the weaker view that a definite description merely “fixes the reference” of a proper name (see Kripke 1980, pp. 55–60). On

³The similar arguments from Kripke (1972) are discussed in an appendix to chapter 5 of Dummett (1973) and Dummett here provides a few important lines of defense (most notably the wide-scope defense; see Smith 1980). Although the distinction between ingredient sense and assertoric content is present in Dummett (1973) the distinction is not employed here in the reply to Kripke (such a discussion is also not added to the revised second edition Dummett 1981). The distinction is, however, used as a reply to Kripke (1980) in Dummett (1991). This book was based off of the 1976 William James Lectures, so it’s not clear to me at what point this line of defense occurred to Dummett, whether it was independent of Evans, or whether the idea was originally due to Evans (a reasonable guess might be that it occurred to Dummett sometime after Kripke’s criticism of Dummett in the preface to Kripke 1980, perhaps in conversation with Evans concerning the arguments in Evans 1979). In any case, this Dummettian rejoinder seems to provide the most promising defense of descriptivism (see Stanley 1997a, and Ninan 2012b for more recent developments).

this view the semantic content of a proper name is the same as the semantic content of a definite description. So for example, an utterance of “Shakespeare was born in Stratford-upon-Avon” says the same thing as an utterance of “The author of Hamlet was born in Stratford-upon-Avon”.

Kripke’s modal argument is essentially the argument that substitution of names and definite descriptions fails in modal contexts. Since proper names are rigid designators, whereas definite descriptions, in general, are not, they can not be substituted for each other in modal contexts *salva veritate*. Consider the following sentences.

(56) Shakespeare might not have been Shakespeare.

(57) Shakespeare might not have been the author of Hamlet.

Assume the descriptivist view that the semantic content of ‘Shakespeare’ and ‘the author of Hamlet’ are the same. Then the semantic content of (56) is the same as the semantic content of (57). But while sentence (56) does not have a true reading, sentence (57) clearly does (e.g. Shakespeare might have died from tuberculosis at the age of eleven). Thus, the descriptivist view is mistaken and the contents of ‘Shakespeare’ and ‘the author of Hamlet’ must differ.

To explicate Evans’ response to this style of argument it helps to introduce Evans’ notion of a “descriptive name”: A descriptive name is a name whose reference is fixed by description. To use the Wittgensteinian metaphor, the unique thing about a descriptive name is that its reference-fixing description *says* what the referent is and thereby *shows* its sense. For example, consider the reference fixing stipulation (D).

(D) Let us use ‘Julius’ to refer to whoever invented the zipper.

In uttering (D) we introduce the name ‘Julius’ and stipulated that it refer to the inventor of the zipper. Given this stipulation it seems that we could use either of the following sentences to communicate who invented the zipper.

(58) Julius is Whitcomb Judson

(59) The inventor of the zipper is Whitcomb Judson

In other words, given the stipulation about ‘Julius’ it seems that utterances of the sentences (58) and (59) would say the same thing (or express the same proposition).

But now if we look at how these sentences embed in a modal environment, we see a difference.

(60) Necessarily, Julius is Whitcomb Judson

(61) Necessarily, the inventor of the zipper is Whitcomb Judson

Sentence (60) says that it is necessary that *Julius*—the inventor of the zipper (i.e. Whitcomb Judson)—be identical to Whitcomb Judson. And that’s true. There are many properties that Whitcomb could have lacked but being identical to himself is not one of them. Sentence (61), instead, says that it is necessary that the inventor of the zipper be Whitcomb Judson. And that is clearly false, since being the inventor of the zipper it is a merely contingent property of Julius. (In the Kripkean jargon: since ‘Julius’ is rigid while ‘the inventor of the zipper’ is not, the embedded sentences have different modal profiles. So the complex sentences (60) and (61) have different truth-conditions.) So it seems that contrary to our initial impression the embedded sentences (58) and (59) must express different propositions.

We seem to have a familiar puzzle: On the one hand sentences (58) and (59) seem to have the same meaning given stipulation (D), but given that they embed differently under modal operators they can’t have the same meaning. And at this point Evans insists on Dummett’s distinction, he says: “I hold that the two sentences [i.e. (58) and (59)] do have the same content, despite their modal differences” (Evans 1979, p. 187, footnote 10). And this is because Evans’ holds that “. . . sentences with the same content might embed differently inside the scope of modal operators” (Evans 1979, p. 177). Evans insists that there is no problem with the idea that the name ‘Julius’ is equivalent in meaning (in some important sense) with description ‘the inventor of the zipper’—even though one is rigid and the other isn’t (see Stanley 1997a for a detailed defense of this idea). In Evans’ terminology we could say that ‘Julius is the inventor of the zipper’ is deeply necessary (given the stipulation) but superficially contingent (given the way it embeds under ‘Necessarily’).

Dummett (1991) pushes essentially the same criticism of Kripke’s arguments: From the fact that (56) and (57) differ in truth value, Kripke infers that the embedded unmodalised sentences ‘Shakespeare is Shakespeare’ and ‘Shakespeare is the author of Hamlet’ express different propositions (or have different contents)—and thus ‘Shakespeare’ and ‘the author of Hamlet’ differ in content. But here Dummett retorts:

The word ‘proposition’ is treacherous. What the two unmodalised sentences share is a common assertoric content; if Kripke is right about the modalised sentences with ‘might have’, the unmodalised sentences differ in ingredient sentence, being (logically) subsentences of the modalised ones. The difference between them lies *solely* in their different contributions to the sentences formed from them by modalisation and negation; in a language without modal operators or auxiliaries, no difference could be perceived. (Dummett 1991, p. 48)

Since Kripke’s considerations concern failures of substitution, Dummett insists that they merely reveal certain constraints on ingredient sense (i.e. compositional semantic value) and from this one cannot directly infer a conclusion about assertoric content (i.e. propositional contribution). Just as one shouldn’t conclude that ϕ and $\text{Tr}(\phi)$ express different propositions given the diverse ways they can embed under negation operators, the descriptivist theory of propositional content cannot be refuted by appealing to the diverse embedding behavior of names and descriptions under modal operators.⁴

⁴It is interesting to note that there is a direct line of influence from Dummett through Evans (1979) to Davies and Humberstone (1980) and to the contemporary “two-dimensionalists” (Chalmers 2006). The different strands of two-dimensionalist thought have been implemented in various ways but perhaps at the core is the idea that there is one kind of sentential content that is the object of assertion/belief/knowledge/understanding, while there is another kind of sentential content that is responsible for embedding behavior (e.g. under modals, tense, and negation). The type of *two-dimensionalism* that I am defending here is essentially the “old school” variety of Dummett (and Stanley 1997a), which gets motivation from purely linguistic concerns—instead of, say, epistemological concerns.

4.3 Stalnaker: Propositional concept and proposition

Robert Stalnaker's 1978 apparatus of *reinterpretation by diagonalization* relies on a sharp distinction between the semantic value of a sentence in a context (i.e. what proposition is contributed to modal environments in a context) and the assertoric content of a sentence in a context.

To see this I will setup a familiar puzzle and demonstrate the Stalnakerian resolution of the puzzle. Make three assumptions: (A1) the contents of assertion are sets of worlds, and (A2) the standard Kripke semantics for modal operators and names (i.e. that proper names are rigid designators) (Kripke 1980). By the latter assumption, we can conclude that (since Hesperus is Phosphorus) the following sentence is true.

(62) It is necessary that Hesperus is Phosphorus

And finally, assume (A3) that although an utterance of (63) is never informative an utterance of (64) can be.

(63) Hesperus is Hesperus

(64) Hesperus is Phosphorus

The puzzle is this: Give the Kripkean modal semantics, sentence (62) is true if and only if in every (accessible) world w , $\llbracket \text{Hesperus} \rrbracket^w = \llbracket \text{Phosphorus} \rrbracket^w$. So if (62) is true, then the set of worlds associated with (64) is the set of all worlds. But, of course, this set is identical to the set of worlds associated with (63). According to (A1) the contents of assertions are sets of worlds, and so since (63) and (64) are true in exactly the same worlds, it would seem that any assertion of (63) will express the same proposition as (64). But according to (A3) utterances of (63) and (64) can differ in informativeness.

Stalnaker (1978) provides a way to retain all three assumptions and resolve the puzzle. A short riddle provides the way forward.

If you call a horse's tail a leg how many legs does a horse have? The answer, of course is four, since calling a tail a leg doesn't make it one. But one can see a different way to take the question. (Stalnaker 1978, p. 317)

The sentence ‘Hesperus is Phosphorus’ is true in all worlds. We can represent this by the following matrix (where i is the actual world and j, k, \dots are other possible worlds).

	i	j	k	\dots
i	T	T	T	\dots

This matrix represents that fact that ‘Hesperus is Phosphorus’ is true relative to every possible world. But this kind of evaluation holds fixed the semantic facts. We could also consider worlds where the words ‘Hesperus’ and ‘Phosphorus’ refer differently than they actually do. This is what Stalnaker means by “there is a different way to take the question”. For example, if the noun ‘leg’ actually does apply to both kinds of horse appendages (i.e. the lower limbs and the appendage of ligaments and long hairs beginning at the coccygeal vertebrae), then a horse indeed has five *legs*. To capture this dependence on semantic facts, Stalnaker proposes a two-dimensional matrix, where variations in the linguistic facts are represented on the vertical axis.

	i	j	k	\dots
i	T	T	T	\dots
j	F	F	F	\dots
k	F	F	F	\dots
\dots	\dots	\dots	\dots	\dots

Where for a cell in the matrix (x, y) , x is on the horizontal axis and y is on the vertical axis, the cell (i, i) represents that the sentence ‘Hesperus is Phosphorus’ is true in i (actually true) relative to the linguistic facts in i (the actual linguistic facts). The cell (i, j) represents that the sentence ‘Hesperus is Phosphorus’ is true in j (counterfactually true) relative to the actual linguistic facts. The cell (j, j) represents that the sentence ‘Hesperus is Phosphorus’ is false in j relative to the linguistic facts in j . For example, j might be a world where ‘Hesperus’ refers to a comet and ‘Phosphorus’ refers to Venus. If we assume we are speaking from such a world, then any utterance of ‘Hesperus is Phosphorus’ is false. In general, the cells on the diagonal of the matrix represent that the sentence ‘Hesperus is Phosphorus’ is true at a world relative to the linguistic facts at that world. Thus, the diagonal of the matrix represents the metalinguistic proposition that the sentence ‘Hesperus is Phosphorus’ is true.

Stalnaker insists that one constraint on rational communication is that the proposition asserted is always true relative to some but not all worlds compatible with the presuppositions of the conversational participants. Since the proposition semantically associated with ‘Hesperus is Phosphorus’ is the trivial proposition (i.e. true in all worlds) such a proposition cannot be the proposition asserted. Instead when a speaker utters ‘Hesperus is Phosphorus’ it must be the diagonal proposition that is asserted, otherwise their assertion would conflict with a basic norm of rational communication.⁵

In this way the puzzle above is resolved. The standard modal semantics entails that (62) is true and that therefore the set of worlds semantically associated with (64) (and (63)) is the set of all worlds. And it is true that the contents of assertions are sets of worlds. But we cannot infer from this that utterances of (63) and (64) always *assert* the same thing, since if utterances of (63) and (64) are understood to assert their associated diagonal propositions, then they assert different propositions. An utterance of (64) asserts the the sentence ‘Hesperus is Phosphorus’ is true (or that ‘Hesperus’ and ‘Phosphorus’ co-refer) and this is highly informative to someone who doesn’t realize that the sentence ‘Hesperus is Phosphorus’ is true (even though they presuppose the proposition semantically associated with Hesperus is Phosphorus). Whereas even the diagonal of ‘Hesperus is Hesperus’ is non-informative—everyone presupposes that ‘Hesperus’ co-refers

⁵Stalnaker provides a formal two-dimensional operator, “ \dagger ”, which takes the propositional concept of a sentence and outputs the propositional concept of its “diagonalization”. The dagger operator projects the diagonal proposition onto the horizontals of the matrix. Contemplate the propositional concepts of ϕ and $\dagger\phi$:

ϕ	i	j	k	...
i	T	F	T	...
j	T	F	T	...
k	F	T	F	...
...

$\dagger\phi$	i	j	k	...
i	T	F	F	...
j	T	F	F	...
k	T	F	F	...
...

Stalnaker states that we can think of “ \dagger Hesperus is Phosphorus” as expressing the proposition that the sentence ‘Hesperus is Phosphorus’ is true. But, of course, \dagger isn’t being proposed as a linguistic operator of natural language—it is a theoretical device that provides a formal model of a pragmatic phenomenon in a theory of communication. For this reason Stalnaker’s *propositional concepts* should not be confused with Kaplan’s *character functions*. And, even though \dagger operates on the character-like propositional concepts, since it is not put forward as an operator of natural language semantics, it should not be seen as in tension with Kaplan’s monster prohibition. The frameworks are compatible and share a structural similarity (i.e. they are based on a two-dimensional modal logic) but the frameworks are put forward to describe fundamentally different phenomena.

with itself.

This resolution of the puzzle relies on a pulling apart of the semantic value of a sentence in a context (i.e. what proposition is contributed to modal environments in a context) and the assertoric content of a sentence in a context.⁶ Even though for Stalnaker the proposition asserted is always a set of worlds it needn't be the set of worlds that is relevant for the modal semantics. So what is said can differ from what the modal operators operate on. Stalnaker confirms this interpretation in his retrospective article on "Assertion":

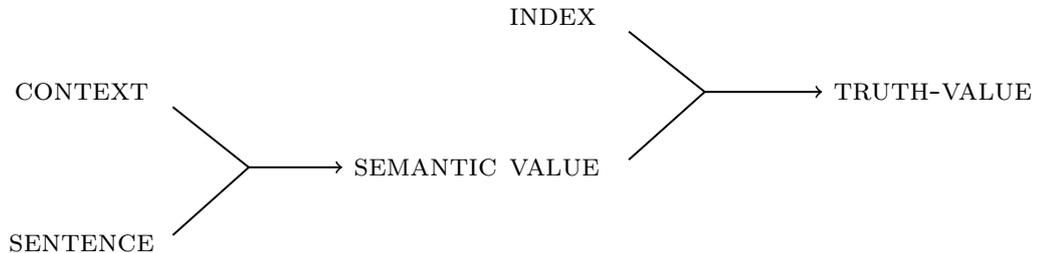
The proposal made in "Assertion" was that in special cases, where there is a prima facie violation of certain conversational rules, utterances should be reinterpreted to express the diagonal proposition, rather than the proposition expressed according to the standard semantic rules. (Stalnaker 2004, p. 297)

4.4 Lewis: Semantic value and propositional content

Lewis (1980) discusses what he sees as a "distinction without difference" between 'variable but simple semantic values' and 'constant but complicated semantic values'. On the conception of semantic values as variable but simple the semantic value of a sentence is a function from indices to truth-values (i.e. simple). But sentences can have different semantic values in different contexts (i.e. variable). Such a view gives us the familiar two-step procedure that takes a sentence to a truth-value:

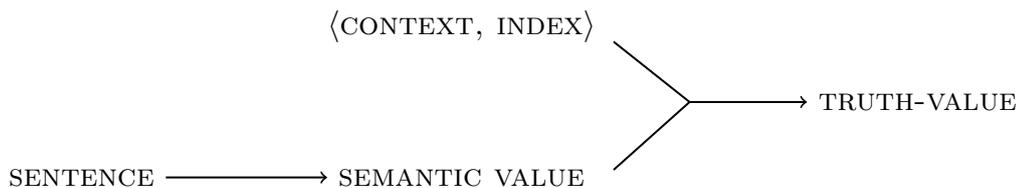
⁶One might insist that the real resolution of the puzzle is instead that (63) and (64) "pragmatically imply" different contents. And this is so even though their "assertoric content" is the same. But on the Stalnakerian picture the notion of assertoric content is that which is contributed to the common ground. There are subtleties here about how, say Kaplan's notion of "what is said" lines up with Stalnaker's notion of the content of an assertion. My purpose here is only to point out that Stalnaker's move, like Dummett's, is to distinguish the semantic values that are relevant for compositional modal semantics from the objects of assertion.

Figure 4.2: Variable but simple.



On the alternative conception, the semantic value of a sentence does not vary across contexts (i.e. constant); instead semantic values are functions from context-index pairs to truth-values (i.e. complicated). On this picture one proceeds from sentence to truth-value in one step.

Figure 4.3: Constant but complicated.



Lewis emphasizes that mathematically there is not a genuine difference between these two options. A theory of the first sort can be easily converted into one of the second and visa versa (simply by currying or uncurrying the functions, Schönfinkel 1924). So, although the frameworks come with different packaging, the information contained therein is identical. Lewis (1980) asks, “Given the ease of conversion, how could anything of importance possibly turn on the choice between our two options?” (p. 35).

Lewis finds an alleged reasons for preferring the ‘variable but simple’ option in Kaplan (1989a).⁷ For Kaplan the variable but simple semantic values correspond

⁷Lewis also discusses the appeal to “propositional middlemen” in Stalnaker (1970). Lewis’ main complaint is that by omitting a discussion of compositional semantic values Stalnaker gives a misleading impression of simplicity. That is, one might be misled into thinking that the propositions Stalnaker is talking about can be identified with the semantic values of sentences. Lewis is concerned to highlight the fact that this identification cannot be maintained (except by the schmentecite; see § 3.2). Only a theorist who mistakenly made the identification would see the Stalnakerian framework as providing motivation for the ‘variable but simple’ option. As is clear from § 4.3 Stalnaker’s multi-dimensional apparatus is used for a different purpose than the

to a pre-theoretic (or perhaps theoretic) notion of “what is said” by an utterance (i.e. the objects of assertion).⁸

Lewis is skeptical of Kaplan’s pre-theoretic appeals to “what is said” but he agrees that there is an important communication theoretic notion of the propositional content of an utterance. Inherent in Lewis’ discussion is a dilemma for any view that tries to identify the propositional content of a sentence in a context with the semantic value of a sentence a context.

First horn: Let the propositional content of a sentence (in context) be whatever they are according to our best account of linguistic communication. These would be the type of entities appealed to in a general account of assertion, e.g., Stalnaker’s theory of assertion and context update. Whatever these entities turn out to be it is unlikely that they can also be the compositional semantic values of sentences. For example, assuming propositions are sets of worlds, then they don’t obey the compositionality principle due to temporal embeddings; or assuming propositions are sets of centered worlds, then they don’t obey the compositionality principle due to pronominal binding; or assuming propositions are sets of world-time-variable assignments, then then they don’t obey the compositionality principle due to multiple indexing.

Second horn: Let the propositional content of a sentence (in context) be whatever they must be according to our best compositional semantic theory. The claim that these entities have independent interest as the objects of assertion (or as the pre-theoretic “what is said”) is implausible.

Of course, someone can wiggle out of the dilemma by either insisting on a formal syntax/semantics according to which the compositional values are plausibly of independent interest as the objects of assertion or insisting on a theory of communication such that the entities appealed to there just happen to be the entities apt for compositionality. But Lewis’ point is that we have no theoretical reason to expect such correspondence from the outset. Lewis sums up the situation as follows.

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 propositional contents of sentences do not obey the

multiply indexed values at issue in Lewis’ discussion.

⁸See the discussion in § 1.1.

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 communication.⁹ Nevertheless, Lewis admits that the things we say and the meanings of our words stand in an 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, Lewis insists, does not call for the *identification* of the two notions—all it calls for is that the propositional content of a sentence in a context should be systematically *determined* by its semantic value. 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 picture is this: Start from the semantic 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 propositional content. Whether or not Lewis is right about the exact nature of propositional content doesn’t matter here—it’s the more general point that I want to endorse. Just as the *extension-in-a-context* of an expression is determined by its semantic value, the *assertoric-content-in-a-context* of an expression is determined by its compositional semantic value. With respect to assertoric content, then, Lewis suggests the following principle.

⁹Soames (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”.

Determination principle. The semantic value of an expression α in context c determines the assertoric content of α in c .¹⁰

So here again we have a historical precedent for making a sharp distinction between what sentences ‘mean’ and what they ‘say’. And furthermore we have a proposal for how the two notions systematically relate.¹¹

¹⁰Once we make the distinction between semantic value and assertoric content there is little reason to have semantic values be given relative to contexts. And if the language contains context-shifting operators (monsters), then there is good reason to *not* have semantic values relative to contexts. For this reason, it seems we should ultimately prefer to take the ‘constant but complicated’ option.

¹¹Such a Lewisian picture of the relationship between compositional semantics and the contents of assertion has recently been developed and advocated in Yalcin (2007), Ninan (2010b), and Rabern (2012a). Earlier Jason Stanley also endorsed such a distinction but he puts it primarily in terms of Dummett’s ‘ingredient sense’ and ‘assertoric content’ (in Stanley 1997b and Stanley 2002 he also cites Lewis as making such a distinction).

Chapter 5

Natural language semantics and the theory of communication

... it is an open question how a notion of what is said that is motivated by straightforward compositionality concerns relates to a notion of what is said that is motivated by accounting for its relation to other notions in the theory of communication.

Jason Stanley (2002)

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.

Communication, at the most general level, is the transmission of information from a sender to a receiver. The form of communication I am interested in here is communication that proceeds by the encoding and decoding of information in a symbol system—more specifically, I will be concerned with the interchange of thoughts or information via the employment of a natural language. It seems that, above all else, the purpose of natural language is for the sharing and coordination of information. The various branches of linguistic investigation—syntax, semantics, pragmatics, phonology, psycholinguistics, etc.—have the shared goal of systematizing our practice of linguistic communication. The question addressed in this chapter is how the project of natural language semantics relates to the

broader theory of linguistic communication.

5.1 The role of assertoric content

To explicate the notion of “what is said” we must first introduce some of the basic theoretical notions that are employed in theorizing about linguistic communication.

- sender and receiver (or speaker and audience)
- the act of sending (or assertion)
- information sent (or what is said)
- information received (or what is communicated)
- byproduct information (or what is conveyed, implicated, etc.)

The notion of information sent or what is said is perhaps the most prevalent in philosophical discussion of linguistic communication. What is said by a sentence in a context is often called “the proposition expressed” by a sentence in a context.

On a first pass one might think that the proposition expressed by an utterance is exactly what is communicated. The intuitive picture is this: a speaker has a belief that p and she wants to transmit it to the hearer; so the speaker utters a sentence that expresses p ; the hearer understands the sentence; and thus the hearer comes to accept that p . But there are cases where the intuitive notion of “what is communicated” diverges from what is said. The notions pull apart because what is communicated depends on what is presupposed in a way that what is said does not.

To see this consider the following example from Stanley (2002). Assume it is presupposed by all participants in a conversation that Max is the tallest man in the room (where presupposition is understood in the manner of e.g. Stalnaker 1974). In such a situation it seems that the following sentences would communicate the same thing.

(65) The tallest man in the room is nice

(66) Max is nice

In spite of the sameness of communicated content, Stanley insists that “there is a philosophically compelling notion of ‘what is said’ according to which these sentences say different things” (p. 328). It is fairly uncontroversial that sentences (65) and (66) express different propositions—after all they have very different truth-conditions. But since in the relevant context it is common ground that Max is the tallest man in the room the communicative upshot of both utterances is the same. In this way a theory of communication should make a distinction between the information sent and the information received.¹

There is a further distinction between information sent and received on the one hand and various informational byproducts of an assertion on the other. A distinction of this type is familiar from Paul Grice’s investigation of among other phenomena, the phenomena of *conversational implicature* (Grice 1989). For example, in response to the question ‘Where is Leon?’, if a speaker utters “He’s either at the pub or in his office”, the speaker’s utterance would suggest that she doesn’t know whether Leon is in his office. Even though the speaker did not literally *say* that she doesn’t know if Leon is in his office. In addition, there is other byproduct information that is conveyed by the utterance including (i) that the speaker uttered the sentence ‘He’s either at the pub or in his office’ and (ii) that, given the speaker’s accent, she is from New Zealand, etc. There is a wide range of information conveyed just by an act of assertion, much of which has little to do with the linguistic properties of sentence uttered. At the core is the information related to the linguistic properties of the sentence uttered and the communicative upshot of that information. In the periphery, are all the various byproducts one can glean from certain properties of the assertion.

With these preliminary distinctions in place we can focus in on the notion of “what is said” or, in the more technical jargon, “assertoric content”. Although the use of the locution ‘what is said’ is not univocal in philosophical discussion of communication, it seems that there is a pre-theoretic notion here that can be explicated. What notion of ‘what is said’ is important depends on what we want the notion of ‘what is said’ to do in a theory of communication. One promising thought here is that ‘what is said’ is the core information associated with an

¹Another place where “what is said” comes apart from “what is communicated” is in a Stalnakerian framework employing centered worlds. If the proposition a speaker expresses is a centered proposition, then the hearer cannot, in general, accept that very same centered proposition expressed—the communicative upshot for the hearer must be different than what the speaker said. See e.g. Ninan (2010a) and Torre (2010).

utterance and is thus inherently tied to the notion of what is communicated. This suggests that a way to nail down the theoretical notion of ‘what is said’ (or the content of assertion) is to work backwards starting from the intuitive notion of what is communicated. Stanley (1997a) (and Stanley 2002) advocates such an approach to ‘what is said’. Since my views here are largely influenced by Stanley’s discussion, I will now provide a brief summary of Stanley’s approach.

Stanley starts by distinguishing two prominent approaches to ‘what is said’ in the literature. The first approach is Kaplan’s. Here Stanley argues that for Kaplan ‘what is said’ is first and foremost identified with the semantic input to various sentential operators, e.g. ‘It is necessary that’. Stanley insists that Kaplan does not address how his notion of ‘what is said’ by an utterance relates to the broader question of what an utterance *communicates*.² Kaplan’s approach is contrasted sharply with the approach of Grice. Grice’s approach to ‘what is said’ is characterized by its primary concern with the more pragmatic aspects of language, e.g. what is communicated and what is conveyed. And Grice’s notion of ‘what is said’ does not appear to be constrained by issues stemming from the compositional semantics of various sentential operators.

As I mentioned in § 1.1, I think Stanley’s essential point that Kaplan doesn’t integrate his ‘what is said’ into a broader theory of communication is correct. But we shouldn’t conclude from this that Kaplan and Grice are investigating different pre-theoretic notions. I think Kaplan took his notion of ‘what is said’ to be more or less the pre-theoretic notion of “what is said by an utterance”—one that affords straightforward integration with the notion of what is communicated. This is supported by the observation that the intuitive notion of ‘what is said’ is absolutely central to Kaplan’s investigation. As he himself says: “I began my investigations by asking *what is said* when a speaker points at someone and says, ‘He is suspicious’” (Kaplan 1989a, p. 489). These intuitive judgments about what is said by an utterance go well beyond the purely functional notion, which only concerns the compositional semantics of sentential operators. In fact, as I’ve already argued, Kaplan’s argument that indexicals are directly referential essentially depends on common-sense judgments concerning “aboutness” and “what was said”. For this

²Note, however, that Kaplan does at one point talk about “the accuracy of communicating what was said” (p. 584) and so seems to identify what is said with what is communicated (at least in cases of successful communication). Kaplan also touches on the issue of “successful communication” in relation to Frege’s discussion of Dr. Lauben and the thought expressed by ‘I have been wounded’.

reason, I read Stanley as correctly emphasizes the major difference between the approaches of Kaplan and Grice to analyzing ‘what is said’—Kaplan’s notion was constrained by compositionality concerns, while Grice’s wasn’t—but I don’t think we should conclude from this that Kaplan and Grice are getting at different pre-theoretic notions. It seems that Kaplan took his notion of ‘what is said’ to both capture a privileged compositional level of semantic representation, while also being more or less compatible with the Gricean notion. It is precisely this Kaplanian two-mindedness about ‘what is said’ that leads to the inherent conflict in Kaplan’s system (see § 1.2).

After distinguishing these approaches to ‘what is said’ Stanley sets out to explicate the notion of ‘what is said’ from “the perspective of a theorist concerned with a notion of what is said conceptually intertwined with the other notions of a theory of communication” (Stanley 2002, p. 324). Stanley’s approach to ‘what is said’, then, is essentially a Gricean approach.

Stanley suggests that the theoretical notion of ‘what is said’ by a sentence in a context is posited to capture certain regularities in what a sentence is used to communicate. For example, utterances of the sentence ‘Penguins waddle’ tend to communicate the same thing. This can be explained by the fact that what is said by uttering the sentence ‘Penguins waddle’ is more or less consistent across contexts. Sentences that tend to communicate the same thing, tend to say the same thing, whereas sentences that tend to say different things tend to communicate different things. The exceptions arise when certain presuppositions are in play. But for a restricted set of contexts, utterances say the same thing if and only if they always communicate the same thing.

Stanley encodes this relationship between ‘what is said’ and ‘what is communicated’ in the Expression-Communication Principle (Stanley 2002, p. 329).³ First let’s define “normal context”.

Definition. Let a *normal* context c be such that:

- (a) it is common ground that all the conversational participants understand the expressions uttered and the participants know the values of the context-

³An earlier version of the principle (in only the left-to-right direction) is stated in Stanley (1997a): If an utterance u of a sentence ϕ and a different utterance u' of another sentence ψ have different assertoric content, then, generally, for any *normal* context c , had ϕ and ψ been uttered in c , they would have communicated different things.

sensitive expressions uttered relative to c .

- (b) it is common ground that every expression uttered is intended to be used with its literal meaning.
- (c) it is common ground that the speaker is being perspicuous (i.e. not flouting the maxim of manner).

The principle can then be stated thusly:

The Expression-Communication Principle. For all normal contexts c , c' and c'' that agree on the features relevant for determining what is said by sentences ϕ and ψ , ϕ relative to c' and ψ relative to c'' *say the same thing* (i.e. express the same proposition) if and only if ϕ relative to c and ψ relative to c communicate the same thing.

As Stanley emphasizes this principle does not provide a definition of ‘what is said’ but is meant to capture important conceptual relations between ‘what is said’ and ‘what is communicated’. In this way the principle places a weak but very plausible constraint on any proper analysis of ‘what is said’.

To see the principle in action consider again sentence (65) and (66). There is a strong intuition that in a context where it is presupposed that Max is the tallest man in the room, utterances of (65) and (66) communicate the same thing. But according to the Expression-Communication Principle, they do not express the same proposition, since there are many other contexts where utterances of (65) and (66) communicate different things.

Another example that is of primary interest for my purposes is the following. Consider:

(67) It is snowing

(68) It is snowing now

Intuitively, in any normal context an utterance of (67) would communicate the same thing as an utterance of (68). If so, it follows from the right-to-left direction of the Expression-Communication Principle that in any (normal) context (67) and (68) express the same proposition. But we know that such a proposition cannot

be the semantic value of (67) and (68). It is by now a familiar point that such a proposition cannot be the argument to sentential temporal operators (e.g. PAST), since (67) and (68) embed differently under such operators.

Before spelling out how the notion of ‘what is said’ that stems from the broader theory of communication relates to the compositional notion of meaning, we must explicate the notion of ‘meaning’ that stems from natural language semantics.

5.2 The role of meaning

One of the most salient—and most mysterious—facts about language is that it has meaning. Words are about things in the world, and utterances of sentences are true or false depending on how those things are. The project of natural language semantics is the systematic study of linguistic meaning. The past forty years have seen an explosion of research into the semantics of natural languages and there are now sophisticated theories of phenomena that were not even known to exist mere decades ago (cf. Partee 2011). Much of the early work in natural language semantics was accompanied by extensive reflection on the aims of semantic theory, and the form a theory must take to meet those aims. But it seems that this meta-theoretical reflection has not kept pace with recent theoretical innovations; and the old philosophical question “What is a theory of meaning?” has been forgotten. The questions that philosophers struggled with at the time of the early development of natural language semantics in the 1960’s and 1970’s also included questions such as:

- What is the aim of semantic theory?
- What is a semantic theory a theory of?
- What features of the world does semantic theory aim to characterize?
- What form must a semantic theory take if it is to meet these aims?

These questions concerning the foundations of natural language semantics must be readdressed in light of the current state-of-the-art in semantic theorizing.⁴ I do

⁴This way of framing things has benefitted from discussion of these issues with Derek Ball. We have organized a workshop on semantic metatheory to take place in St. Andrews, May 2013 and have co-authored various notes and a draft for a proposed collection on the topic.

not propose to answer these questions adequately here. But I think I can provide a generic answer that affords us the ability to see a natural way in which the theory of meaning might be integrated with the theory of communication.

5.2.1 Pre-theoretic meaning phenomena

Whatever form a theory of meaning should take it is platitudinous that its aim should be to provide theoretical descriptions and explanations of “meaning phenomena”. So as a first theoretical step we should list the kinds of things that are pre-theoretically considered to be meaning phenomena. There are three broad categories of meaning phenomena: (i) language-world, (ii) language-mind, and (iii) language-language.⁵

The first category of meaning phenomena is the *language-world* category. One of the most obvious properties of words is that they *refer* to things in our environment, e.g. ‘Theaetetus’ refers to the Greek mathematician Theaetetus, ‘the inventor of bifocal’ refers to Benjamin Franklin, and ‘tetrahydrocannabinol’ refers to the chemical compound $C_{21}H_{30}O_2$. In this way, language relates to the world in that it is *about* certain aspects of the world. Sentences are about various states of affairs, in the sense that they describe the environment to be certain ways. It is this representational or informational feature of language that is perhaps the most central and basic of the meaning phenomena. And this brings us to the notion of *truth*. If the way things are, are the way a sentence represents them to be, then we say that the sentence is true.

The second category of meaning phenomena is the *language-mind* category. The central purpose to which language is put is to give expression to our mental lives—the purpose of language, it seems, is for the sharing and coordination of information. Meaningful language allows us to articulate our beliefs and desires and for our interlocutors to understand and come to know our beliefs and desires. In fact, the meaning of our words seems to be nothing more than the public manifestation of our internal thoughts and ideas. A theory of meaning it seems should describe how we express our mental lives by uttering words, i.e. what is the relationship between meaningful language and our ability to assert and communicate our internal thoughts?

⁵See Chierchia and McConnell-Ginet (2000) and Larson and Segal (1995) for a related (but more detailed) canvassing of the pre-theoretic “meaning” phenomena.

The third category of meaning phenomena is the *language-language* category. There are certain meaning phenomena that seem internal to the language system itself. One such feature is the property of implication or entailment. If I say *Bill walks* that implies that *someone walks*. This entailment seems to be guaranteed by what ‘Bill walks’ and ‘Someone walks’ mean. The truth of certain sentences just follow from the truth of other sentences. Likewise, it seems that ‘Bill is a bachelor’ entails ‘Bill is an unmarried man’. In this case the entailment holds because ‘bachelor’ and ‘unmarried man’ *mean* the same thing. That certain expressions are synonymous seems to be among our pre-theoretic meaning data. Another language internal meaning phenomena is *anaphora*. In the sentence ‘Bill loves his mother’, the meaning of the pronoun ‘his’ is *tied to* the meaning of ‘Bill’. Such features of the language call for theoretical explanation. And there are many other language internal features that a theory of meaning might provide explanations for, including indexicality, vagueness, ambiguity, and anomaly.

A theory of meaning should provide systematic descriptions and explanations of the core data from these broad categories. That is not to say that semantic theory must provide theoretical treatments of all of the phenomena listed above. As with any science when the science develops into a mature science, certain data that pre-theoretically seem to fall within its purview will be re-described and re-categorized. So we should expect that some of this pre-theoretic “meaning” phenomena might not fall within the discipline of a mature natural language semantics. Some of it will fall into formal pragmatics or speech act theory, some of it will fall into psychology, cognitive science or the philosophy of mind, etc. Nevertheless, such meaning data are the starting point for the science of meaning.⁶

5.2.2 The form of a theory of meaning

Natural language semantics is now a mature and thriving subfield of linguistics. Given the development of formal semantics as a science of meaning, we must now address the metatheoretical issues, at least in part, from the perspective of the philosophy of linguistics. Of course just as mathematicians are not necessarily the best theorists to ask what numbers are, semanticists may not be the best theorists

⁶An additional dimension that I haven’t discussed is what *applications* might we expect from a theory of meaning: potential applications include natural language processing, human-computer interactions, information extraction, machine translation, question-answering machines, the “semantic web”, and artificial intelligence (e.g. systems such as Cyc or Watson).

to ask what meanings are. Nevertheless, if the question is what form a theory of meaning should take, then investigating what form the theory of meaning took, will, with all due respect to Hume, at least be relevant.

A quick survey of the principle textbooks and encyclopedia articles in natural language semantics, and the philosophy thereof (see e.g. Larson and Segal 1995, Heim and Kratzer 1998, Chierchia and McConnell-Ginet 2000, and Portner and Partee 2002) all point very clearly to one answer: the primary concern of natural language semantics is with the *truth conditions* of (or propositions expressed by) sentences. In addition, it is insisted that these truth conditions must be systematically output from the semantic properties of the parts of the sentences and their order of combination. That is to say that the predominate view seems to be that the goal of natural language semantics is to *compositionally assign truth conditions (or propositions) to the sentences of the language*.

In this section I will spell out in more detail how these commitments shape the theory of meaning. Along the way I will address the following questions; “How is the context-dependency of language accommodated within this picture?”, “What exactly are ‘truth conditions’?”, and “Where do ‘propositions’ fit into this story?”.

The following claim sounds reasonable: A theory of meaning should assign *meanings* to all the words, phrases and sentences of the language. But “meanings” are entirely mysterious at this point. What type of entity do we assign as the meaning of ‘Caesar conquered Gaul’? What type of entity should we assign as the meaning of ‘Julius Caesar’? Although, no answer seems intuitive for the first question, the latter question does seem to have an intuitive answer, namely Julius Caesar. After all, that is what the name is *about*. So as a starting point we can think of the meanings of expressions as the things in the world they refer to. Alfred Tarski gives expression to the primacy of reference in semantic theorizing.

Semantics is a discipline which, speaking loosely, deals with certain relations between expressions of a language and the objects (or ‘states of affairs’) referred to by those expressions. (Tarski 1936, p. 87)

But a general theory based on this intuitive idea has immediate problems. We might think that ‘Caesar conquered Gaul’ refers to something like the state of affairs of *Caesar conquering Gaul* but what does ‘conquered’ refer to? And even worse what do the words like ‘and’, ‘what’, and ‘the’ refer to? Even if we focus,

for the moment, on expressions that intuitively have a referent such as ‘the inventor of bifocals’, the idea that the meaning of an expression is what it refers to is problematic. Consider the following sentence.

(69) Ben Franklin was the inventor of bifocals

This sentence is true, but its truth doesn’t seem to be a trivial consequence of what the words involved *mean*. In fact, if (69) was true in virtue of its meaning, then it seems that (70) would be false.

(70) Someone distinct from Ben Franklin could have been the inventor of bifocals

The original assumption needs to be reconsidered. It is clear that ‘the inventor of bifocals’ refers to Ben Franklin, but we shouldn’t thereby identify its meaning with Ben Franklin. Moreover, it seems that ‘the inventor of bifocals’ refers to Franklin because of what ‘the inventor of bifocals’ means and because of the way things are. Understood this way we can think of the meaning of ‘the inventor of bifocals’ as providing an algorithm for finding its referent in a given situation. The idea is that the meaning of an expression is a function from a situation to the object referred to by the expression in the situation. Although this conception seems to give us a good grasp on the meanings of expressions that intuitively have a referent, it still doesn’t shed light on what “meanings” are for expressions that don’t intuitively have a referent.

To make some progress we should follow the advice of Lewis (1970): “In order to say what a meaning is, we may first ask what a meaning does, and then find something that does that” (p. 22). One important thing that meanings of expressions are supposed to do is to compose in a way that generates the meanings of more complex expressions. The sentence ‘Caesar conquered Gaul’ means what it does in virtue of what ‘Caesar’ means and what ‘conquered Gaul’ means. So we shouldn’t assume that reference captures the essence of meaning—instead we should think of meanings as entities that combine to produce the meanings of more complex expressions. The meaning of ‘conquered Gaul’ is something that combines with the meaning of ‘Caesar’ to produce the meaning of ‘Caesar conquered Gaul’. Frege proposed a helpful way to think about how the meanings of simple expressions combine to generate the meanings of more complex expressions.

Statements in general, just like equations or inequalities or expressions in Analysis, can be imagined to be split up into two parts; one complete in itself, and the other in need of supplementation, or “unsaturated”. Thus, e.g., we split up the sentence ‘Caeser conquered Gaul’ into ‘Caesar’ and ‘conquered Gaul’. The second part is “unsaturated”—it contains an empty place. . . I give the name *function* to what this “unsaturated” part stands for. In this case the argument is Caesar. (Frege 1891/1997, p. 139.)

On this understanding, the meaning of ‘conquered Gaul’ is a function that takes the meaning of ‘Caesar’ as argument and generates the meaning of ‘Caesar conquered Gaul’. This gives us insight as to what the meanings of expressions such as ‘and’, ‘what’, and ‘the’ could be—they are functions of some sort that map meanings to meanings. For example, the meaning of ‘and’ in a sentence like ‘ p and q ’ should be a function that takes the meaning of ‘ p ’ and the meaning ‘ q ’ to the meaning of ‘ p and q ’.

But what are the meanings of complete sentences? One of the most important features of sentences (or utterances thereof) is that they are either true or false. A first thought might be that the meanings of sentences are truth-values and that the meanings of the parts of a sentence combine to generate a truth-value. But then since the sentences ‘Seventeen is prime’ and ‘Franklin was the inventor of bifocals’ have the same truth-value, they would have the same meaning. And we can see that they clearly differ in meaning by considering the following sentences.

(71) It is necessary that seventeen is prime

(72) It is necessary that Franklin was the inventor of bifocals

This highlights an important feature of sentences that we must not ignore, namely that sentences occur as syntactic parts of more complex sentences. The meanings of sentences, then, must also be entities that combine to produce more complex meanings. Since natural languages make use of non-truth-functional operators the meanings of these sentences can’t just be truth-values—but a sentence has a certain truth-value because of what it means (and because of the way things are). So we can think of the meaning of a sentence as providing an algorithm for finding its truth-value in a given situation. That is to say that the meanings of sentences should be understood as being (or at least encoding) “truth conditions”.

The idea that the “meanings” of sentences are essentially tied to truth conditions is an idea going back at least to Frege and Wittgenstein and was developed by logicians such as Rudolph Carnap, Alonzo Church, Alfred Tarski and Richard Montague. An early and influential theorist who pushed the idea that natural language semantics should get a grip on “meanings” by taking its cue from this logical tradition is Donald Davidson.

There is no need to suppress, of course, the obvious connection between a definition of truth of the kind Tarski has shown how to construct, and the concept of meaning. It is this: the definition works by giving necessary and sufficient conditions for the truth of every sentence, and to give truth conditions is a way of giving the meaning of a sentence. To know the semantic concept of truth for a language is to know what it is for a sentence—any sentence—to be true, and this amounts, in one good sense we can give to the phrase, to understanding the language. (Davidson 1967, p. 310)

That natural language semantics, like the model-theoretic semantics of formal languages, should be primarily concerned with *truth*, was advanced and first developed in great detail in the 1960s by Richard Montague.⁷ In fact, Montague advocated that there is not even a theoretical division between natural languages and formal languages.

There is in my opinion no important theoretical difference between natural language and the artificial languages of logicians; indeed, I consider it possible to comprehend the syntax and semantics of both kinds of languages within a single natural and mathematically precise theory. (Montague 1970b, p. 373)

For a large part it was this conception of natural language semantics that gave rise to the scientific discipline of linguistic semantics. Theorists trained in linguistics, such as Barbara Partee, were greatly influenced by Montague’s work and set out to

⁷This was work carried out in the 1950’s and first published in a series of papers beginning in the late 1960’s. See Montague (1968), Montague (1970b), Montague (1973), Montague and Thomason (1974). Lewis (1970), who said “Semantics with no treatment of truth conditions is not semantics”, should also be mentioned as an early development of the general approach.

extended upon his research.⁸ The following quotes from prominent contemporary linguists confirm the logico-semantic influence.⁹

- “A theory of meaning. . . pairs sentences with their truth-conditions.” (Heim and Kratzer 1998)
- “At the most basic level, a formal semantic analysis postulates a compositional, functional pairing between syntactically analyzed sentences of a language and their truth-conditional meaning.” (Portner and Partee 2002)
- “Minimally, a semantic theory should specify rules by which the truth conditions of complex sentences are computed on the basis of memorized properties of words or morphemes, together with a specification of the syntax (derivation tree) of the sentence at hand.” (Schlenker 2009)

As far as these theorists are concerned the project is clear. The primary aim in the semantics of natural language 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—where the semantic value of a sentence determines the truth value that the sentence would have relative to any given situation. In short, semantic theories compositionally determine truth-conditions.

From Frege and Wittgenstein, semanticists inherited the idea that there is a deep connection between meaning and truth conditions. In the 1960s, Donald Davidson and Richard Montague (Davidson 1967 and Montague 1968) developed two different strategies for transplanting this idea (along with the formal methods developed by logicians) from logic to natural language. Montague’s strategy is model theoretic: it aims to characterize meaning by associating linguistic elements with elements of mathematical structures. Davidson’s strategy, on the other hand, is more closely allied to proof theoretic or axiomatic semantics, which characterizes

⁸See Portner and Partee (2002), Partee (2004), Dowty et al. (1981), and Montague and Thomason (1974) for detailed discussion of how Montague’s works came to have such a great influence on linguistics.

⁹See also Büring (2005): “The task of the semanticist is to devise basic meanings for the words of the language and systematic ways of combining them so as to arrive at intuitively correct truth conditions for entire sentences.” And similar sentiments are expressed in Chierchia and McConnell-Ginet (2000) and in Larson and Segal (1995)—the latter has the added Chomskyan twist that the aim is to specify the workings of the semantics module of the language faculty (where the semantics module encodes our tacit knowledge of an internal compositional T-theory).

the meaning of a logical expression by describing the inferences that sentences involving that connective enter into.¹⁰ But at a level of abstraction they shared a common vision, where the study of meaning was fundamentally concerned with truth conditions.

For followers of Davidson and Montague, then, semantics is primarily focused on the relation between language and the world; the aim is to characterize such properties as reference and truth. It should be mentioned, however, that this conception is not accepted by all theorists of “meaning”. There is another strand in contemporary semantic theory, rooted in Chomsky’s revolutionary work in syntax (e.g., Chomsky 1957), that sees things quite differently. According to Chomsky, linguistics is a branch of psychology; semantics, then, must turn its eye away from the (alleged) relations between language and the world, and toward the relations between language and the human mind. This suggests quite a different orientation than Davidson’s and Montague’s; rather than studying the (mind-independent) conditions under which a given utterance is true, we should be studying the mental representations that underlie our ability to produce and understand meaningful utterances. At about the same time as Davidson and Montague were first putting forward their truth-conditional approaches, Chomsky-inspired semanticists including Jerrold Katz, Jerry Fodor, and Paul Postal, were developing such a view. On their approach, giving a semantics for natural language is more akin to giving translation of natural language into the language-of-thought (Katz and Fodor 1963). In contrast to the logical approach, this Chomskyan approach makes no appeal to truth or truth conditions. Some contemporary semanticist favor this Chomskyan (i.e. internalist/psychologistic) conception of semantics (see for example Pietrowski 2003).¹¹

Despite these challenges, the mainstream of formal semantics is in the tradition of Davidson and especially Montague. But even here there remain serious and unresolved issues in the foundations of this enterprise. One rift, which is perhaps

¹⁰These differences in strategy are associated with other theoretical differences. Montague freely appeals to abstracta, including intensional entities such as propositions. This put him in a position to apply the powerful tools of intensional logics such as modal logic and tense logic to natural language. Davidson, on the other hand, follows Quine in viewing such creatures of metaphysics with suspicion.

¹¹I should note that there may be ways to combine the Chomskyan “semantics is psychology” idea with a broadly truth-conditional approach, e.g. Larson and Segal (1995) clearly take inspiration from both the psychologistic conception of semantics and the Davidsonian conception of semantics. One could likewise envision an attempted integration of model-theoretic semantics with a theory of human semantic competence.

inherent in Kaplan (1989a), is exhibited by the differences in approach between two main branches stemming from the work of Montague: one goes primarily via David Lewis (e.g. “General Semantics”), Barbara Partee and other linguists to the mainstream approach to semantic theorizing in linguistic departments around the world (see e.g., Heim and Kratzer 1998), which is characterized by its focus on type-theoretic syntax-driven semantic composition and its heavy use of intensional model-theory; the other branch takes inspiration from some themes of philosophers such as David Kaplan (e.g. “Demonstratives”), Saul Kripke (*Naming and Necessity*) and others to the mainstream philosophical approach to semantic theorizing where “reference”, “propositions”, and “what is said” take center stage.¹²

Of course, the division between these branches is not as clear as this suggests, since there has been cross-fertilization and collaboration between them from the start. For example, Russellians like Scott Soames and Nathan Salmon surely think that truth conditions are important for semantics but they maintain that the primary aim of semantic theory is to recursively assign “meanings” in the form of structured Russellian propositions to all sentences of a language. Even though these approaches are “mainstream” they both have many foundational questions that remain unanswered: what are propositions, and precisely what role do they play in a theory of meaning?¹³ What are truth conditions? Must the semanticist

¹²Yet another is the trend toward dynamic frameworks: Since the 1980s there has been a trend in formal semantics—from within the broadly Montagovian camp—toward dynamic frameworks (e.g. Heim 1983, Kamp 1981, Groenendijk and Stokhof 1991, etc.). Those who insist that semantics must deliver truth-conditions face a challenge from dynamic frameworks, which characterize meaning not in terms of truth, but in terms of the potential of an utterance to change the context in which it is made. And it is not clear that a dynamic semantics can or even should deliver truth-conditions. (But see Cresswell 2002 for an interesting argument that “dynamic” semantics may not actually be the fundamental departure from truth-conditional semantics it advertises itself to be.) Such theories have had significant success in treating various linguistic phenomena—especially phenomena with respect to which the static truth-conditional frameworks have made little progress. In some cases, the dynamic approach also provides formal treatments of linguistic phenomena that falls on the “pragmatic” side of the traditional semantics/pragmatics distinction. This has led to a blurring and/or integration of formal semantics with formal pragmatics, and raises new questions about the traditional theoretical division between semantics and pragmatics. Unfortunately, I do not have the time or space to work out how the ideas in this dissertation relate to dynamic frameworks, e.g. “Can the theory of linguistic communication do without the theoretical notion of *what is said*?”. Such questions must be left to future research.

¹³The propositional approach to semantics is threatened by the proliferation of theories of propositions: Fregean senses, Russellian structured entities, or sets of various entities: possible (or possible and impossible) worlds, relativist centered worlds, situations, parts of worlds, or truth-makers (Barwise and Perry (1983), Kratzer 1989, Fine forthcoming), epistemic scenarios (Chalmers 2011), and contexts (Schlenker 2003), just to name a few. Given this there is

appeal to the notion of truth or truth-conditions, and if so, how? Exactly what relation do the mathematical tools of the model theorist have to the intuitive notion of meaning discussed by philosophers?

5.2.2.1 What are truth conditions?

Since according to the Davidson/Montague tradition a primary aim of semantics is the encoding of truth conditions, it's worthwhile to take a moment to say what truth conditions are. The intuitive idea is that the truth conditions for a sentence are the conditions that obtain when the sentence is true. For Davidson (1967) truth conditions were given by Tarski's T-schema such that the truth conditions are provided by the right hand side of the T-sentence.

The sentence 'Caesar conquered Gaul' is true iff Caesar conquered Gaul.

We can state this in the preferred notation using denotation brackets as follows:

$\llbracket \text{Caesar conquered Gaul} \rrbracket = 1$ iff Caesar conquered Gaul

That is to say that the extension of the sentence 'Caesar conquered Gaul' = 1 (or truth) just in case Caesar conquered Gaul. The right hand side provides the truth conditions of the sentence, in the sense that the condition must be met in order for the sentence to be true. But what is it that must meet the condition? Above, I spoke loosely of "ways things are" or "situations", so it seems that the things that must meet the condition are possibilities of some sort. A first idea might be to focus on *metaphysically possible worlds*. In this way, the truth conditions of a sentence divide the space of possible worlds into those that meet the condition and those that do not. But the T-sentence above is not relativized to *worlds*—it simply says that the sentence 'Caesar conquered Gaul' is true just in case Caesar conquered Gaul. T-sentences only put a condition on actuality. But then the "meaning" of a sentence is equivalent to its truth-value, since the actual world either meets the condition or it doesn't.¹⁴

clearly not a univocal view that insists that semantic theory is in the business of systematically associating "propositions" with sentences.

¹⁴This is essentially the standard objection raised against the Davidsonian project (see Foster 1976), namely what Larson and Segal (1995) call the "extension problem".

We know that the meaning of a sentence cannot be its actual truth-value because of non-extensional linguistic environments. Remember that sentences can occur as syntactic constituents of more complex sentences. Since our language is intensional we can embed two sentences with identical truth-values into certain environments and get the result that the complex sentences fail to have the same truth-value. If the meanings of sentences were simply truth-values this would violate the principle that the meaning of the whole is determined by the meanings of the parts (i.e. the compositionality constraint).

What is required is not just information about whether or not a sentence is true in the actual situation but also information about whether or not it would be true in some other situation. Assuming that the relevant possibility is metaphysical possibility, this is to say that truth conditions must be relativized to the possible worlds.

$\llbracket \text{Caesar conquered Gaul} \rrbracket^w = 1$ iff Caesar conquered Gaul in w

Such a condition can be construed as a function from possible worlds to truth-values, i.e. an intension. Truth conditions, then, carve out that space of possible worlds in which a sentence is true—such a set is what has often been called a “proposition”. When truth conditions are construed as conditions placed on possible worlds and propositions are understood as sets of possible worlds we have an equivalence between truth conditions and propositions. This conforms to the wide-spread contention that semantics is in the business of systematically pairing sentences with *propositions*.

But things are not this simple. We have been ignoring a very important feature of language, namely *context dependence*. For example consider the following.

$\llbracket \text{I am hungry} \rrbracket^w = 1$ iff I am hungry in w

This definition would only work for *my* utterances of ‘I am hungry’—the truth of your utterance of ‘I am hungry’ does not depend on my hunger. The definition of truth must be relativized to agents.¹⁵

¹⁵As early as Davidson (1967) it was suggested that for natural language semantics truth should be relativized to times and persons in order to accommodate tense and demonstratives (see Davidson (1967), pp. 319-320)—relativization to worlds, however, is not explicitly considered. At the same time relativization of truth to agents (and times) was already being developed in

$\llbracket \text{I am hungry} \rrbracket^{w,a} = 1$ iff a is hungry in w

But that doesn't go far enough. There are many contextual features that affect the truth of a sentence. Consider what is required for expressions such as 'you', 'here', 'now', 'yesterday', 'this', etc. The situations in which sentences are uttered have many various features that are relevant for the truth of the sentence, including the world, the time, the place, the speaker, the audience, and the indicated object. It was a mistake to start with the idea that truth conditions place conditions on possible worlds. Of course, we utter sentences in a possible world but the more basic fact is that we utter sentences in a *context*. As, Lewis (1980) counsels, "Any adequate grammar must tell us that truth-in-English depends not only on what words are said and on the facts, but also on features of the situation in which the words are said" (p. 24). So it seems that we should start with the idea that truth conditions put conditions on contexts of utterance.

$\llbracket \text{Caesar conquered Gaul} \rrbracket^c = 1$ iff Caesar conquered Gaul in c

Conditions of this type would divide contexts of utterance into the ones that meet the condition and those that do not. This would encode what a situation of utterance would have to be like in order for the utterance of a sentence to be true. This is what Lewis (1980) describes as the first job of semantics, i.e. to tell us "[whether truth] would be achieved if a given sentence were uttered in a given context" (p. 28). So it seems that we have the truth-conditional part. But we know that functions from contexts to truth-values cannot meet the compositionality constraint. Recall that the downfall of the happy-coincidence view was the fact that points of reference must be of multiply indexed (see § 0.1.1, § 0.4, and § 2.4).

If we are to identify the truth conditions of a sentence with the semantic value that it is assigned in a compositional truth-conditional semantics, then truth conditions must put conditions of multiply indexed points of reference. While such a conception of "truth conditions" is available, it would be very non-standard and doesn't seem to be what theorist intend when they invoke "truth conditions".

detail in Montague (1968). These ideas were influenced greatly by A.N. Prior's early work in tense logic and Saul Kripke's work in modal logic. See also Prior (1968a) and Scott (1970).

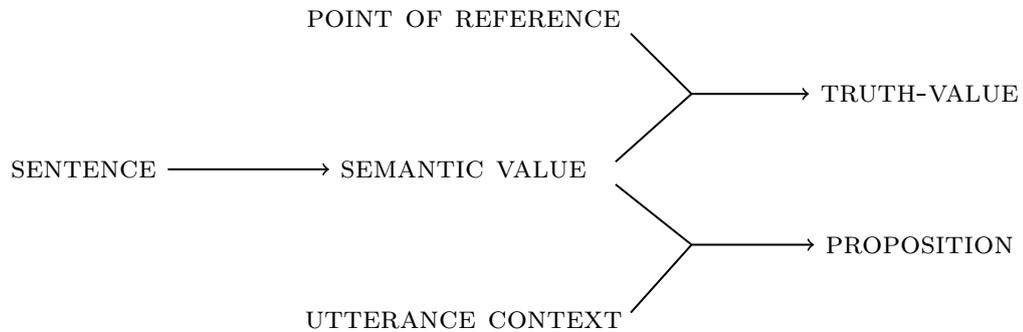
The “truth conditions” of truth-conditional semantics are of central importance. This is because in an important sense truth conditions are the primary data for semantic theory. As a competent speaker of the language a semanticist knows the truth conditions of the sentences in her language. With this as the starting point the semanticist can then reverse engineer the semantic values of subsentential expressions, such that they compose to *encode* the correct truth conditions of the sentence. But this doesn’t demand that the truth conditions of a sentence should be identified with the semantic value of the sentence. After all, the intuitive judgments about “truth conditions” don’t seem to be judgments about whether or not a sentence is true at arbitrary infinitely indexed point of reference. Such judgments instead seem to reveal in what contexts a sentence could be truly uttered (or alternatively, such judgments might reveal what a world would have to be like for an assertion to be true).

There are two ways to proceed at this point (i) think of truth conditions as conditions on contexts of utterance or (ii) think of truth conditions as what is said by the utterance of a sentence in a context. As I see it the choice is not crucial, since a compositional semantic theory will encode both kinds of “truth conditions”. That is the semantic theory will encode both whether truth would be achieved if a given sentence were uttered in a given context and whether what is said by a given utterance is true in a given circumstance. Both are legitimate notions of “truth conditions”. Understanding truth conditions as what is said by an utterance of a sentence in a context, however, provides a theoretical bridge between the truth-conditional compositional theory of meaning and the broader theory of communication.

5.3 Semantics proper and postsemantics

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*.

Figure 5.1: Semantics and postsemantics.



The work of the natural language semanticist resides in the top portion of figure 5.1. This is the part of the story that is concerned with the formal and compositional production of the semantic values of all the complex expressions from the semantic values of the atomic expressions, given the syntax. The notion of assertoric content (or proposition expressed) is downstream from this project. Theorists working on the nature of assertoric content (or mental content and information) should welcome this picture, as it allows them to theorize about the nature of content, somewhat liberated from the confines of 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" or "aboutness". On the the picture I've outlined here there is not total freedom, since the compositional semantic value places constraints on the objects of assertion. But we have seen that certain puzzles in philosophy of language completely dissolve from this methodological perspective.

From this metatheoretical perspective we can draw out two important lessons for semantic theorizing:

Lesson 1. Embedding data is not a reliable guide to the nature of assertoric content.

Lesson 2. Be careful when moving from theses concerning assertoric content to theses concerning compositional values.

For a further example of these lessons in action, consider the doctrine known as *expressivism* about moral discourse. This is usually understood to be a thesis about the meaning of moral language or ethical discourse generally, to the effect that ethical utterances are not truth-apt. Instead ethical utterances serve another

purpose: they serve to express practical or evaluative attitudes. So expressivism is committed to the idea that ethical utterances do not express propositions or do not have truth conditions. But this latter commitment is notoriously problematic for expressivism, since without such semantic values, it is unclear how expressivism can accommodate the compositional semantics of ethical language when it is embedded in certain linguistic environments (e.g. under negation, in conditionals, in attitude reports, etc.)—this is the Frege-Geach problem (Geach 1965).

We can see, however, that given the metatheoretical perspective I've been advocating we should be suspect of this kind of objection. The Frege-Geach objection uses premises concerning embedding and compositional semantics to try to cause trouble for a thesis about the nature of the propositions expressed by ethical language (or the truth-conditions thereof). But it is consistent for an expressivist to assign “ingredient senses” to ethical sentences, which compose in a straightforward way, while at the same time insisting that ethical sentences do not express propositions (or that they are not truth-apt).¹⁶

¹⁶See Rabern (manuscript) “How to Dummett a Frege-Geach”.

Chapter 6

Semantic monsters

Operators like ‘In some contexts it is true that’, which attempt to meddle with character, I call *monsters*.

David Kaplan (1989a)

6.1 What is a monster?

If I were to say to you, “I love you”, it would be true just in case the author loves the reader. But imagine we devised a clever way of speaking such that when we follow up a statement with the expression “swap!”, the contextual interpretation of speaker and hearer are switched. Under this supposition, if I were to say to you “I love you, swap!”, it would be true just in case *the reader* loves *the author*, i.e. just in case you love me.¹

If natural language had means of expression such as “swap!”, it would be populated by linguistic devices that David Kaplan thought to be gross exceptions to the semantic norms. Kaplan (1989a) bracketed off such devices as semantic freaks or semantic *monsters*.

Certain linguistic devices afford us the ability to communicate things about other times, other places, and other ways the world might be. This feature of language is known as *displacement* (Hockett 1960).² What’s interesting about

¹This is somewhat like the case where I say, “I love you” and you reply “Me too!”—here you would in effect be saying “The swapped version is also true”. It is perhaps most plausible to give it a metalinguistic analysis, where one is in effect saying “That sentence in my mouth is also true”—a verbal ditto mark.

²Hockett suggests: “Man is apparently almost unique in being able to talk about things that are remote in space or time (or both) from where the talking goes on. This feature—

monsters is their ability to achieve a radical kind of displacement—they have the ability to uproot an utterance from the context in which it occurred. In this way monsters dissociate the “context of interpretation” from the context of the utterance, where the *context of interpretation* is the sequence of parameters that determines “what is said” (i.e. the content-generating parameters) by an utterance. More familiar intensional devices (e.g. the temporal operator PAST) are displacing devices but their kind of displacement retains the equivalence between the context of interpretation and the context of the utterance. Non-monstrous intensional operators only shift the “circumstance of evaluation” (i.e. the content-evaluating parameters) and thereby do not affect the assertoric content of their complement clause.

We could say that a monster is an expression which when affixed to a sentence requires that the sentence be re-interpreted *as if it were uttered in a different context*—this is the radical displacement that dissociates the context of interpretation from the actual context of the utterance. In this way, “swap!” requires that the sentence ‘I love you’ be interpreted at an alternative context where you utter the sentence to me.

Discussion of monsters makes the most sense within the semantic framework of Kaplan (1989a) (although I will provide a generic definition below). Recall the distinction between two kinds of meaning that Kaplan proposes, the *character* and the *content* of an expression. As we have seen (§ 1.1) these two aspects of meaning play very different roles in Kaplan’s semantic theory: the content is the information asserted by means of a particular utterance, whereas, the character of an expression encodes what any utterance of the expression would have as content. Moreover, Kaplanian content is nominated as a privileged level of semantic representation: contents are the entities over which the composition rules should be defined—whereas character is understood to do its work prior to the compositional process.

Remember that Kaplan’s general picture is this (see figure 6.1): the domain of the character function is a set C . Each $c \in C$ is a tuple of content-generating parameters—these tuples are called “contexts of utterance”. Character functions map contexts of utterance to contents. The content of an expression is itself a function from a set G to extensions. Each $i \in G$ is also a tuple of parameters, often assumed to be world-time pairs—these are called “circumstances of evalua-

displacement—seems to be definitely lacking in the vocal signaling of man’s closest relatives, though it does occur in bee-dancing” (Hockett 1960, p. 6).

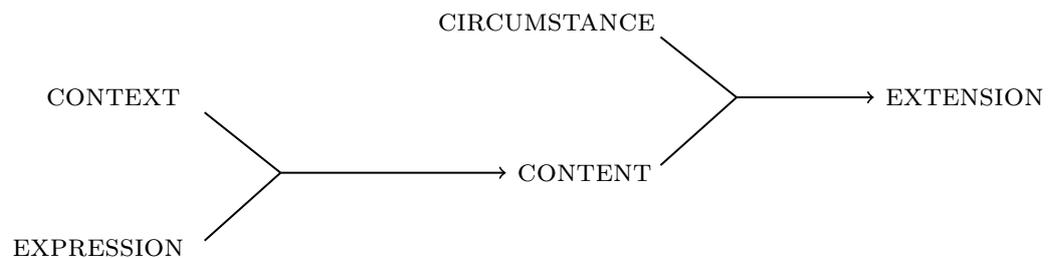
tion”.

Character. Contexts of utterance \rightarrow Contents

Content. Circumstances of evaluation \rightarrow Extensions

Assigning a character to an expression amounts to assigning that expression an extension relative to all contexts c and circumstances i . Abstracting over the circumstance coordinate $\lambda i. \llbracket \alpha \rrbracket^{c,i}$ gives the content of α at a context c and abstracting over both the circumstance and the context coordinates $\lambda c \lambda i. \llbracket \alpha \rrbracket^{c,i}$ gives the character of α .

Figure 6.1: Kaplan’s semantic framework



With this background Kaplan (1989a) describes what a “monster” is in various ways. Monsters are described as *character-operators*, i.e. operators that operate on the character instead of the content of their embedded sentence. They are relatedly described as hyperintensional operators, in the sense they operate at a level of meaning beyond the “intensional”, i.e. beyond the content-level.

- “... operators which attempt to operate on character” (p. 510)
- “Operators... which attempt to meddle with character” (p. 511)
- “... all operators that can be given an English reading are ‘at most’ intensional.” (p. 502 footnote 27)

A further gloss on monsters casts them as *context-shifting operators* or devices that alter the content of their embedded sentence.

- “... [an operator] which when prefixed to a sentence yields a truth if and only if in some context the contained *sentence* (not the content expressed by it) expresses a content that is true in the circumstances of that context”

And, finally, monsters are understood as *indexical-shifting devices* in the sense of operators that shift the interpretation of “indexicals” and therefore violate the principle of direct reference.

- “. . . no operator can control the character of the indexicals within its scope” (p. 510)
- “. . . indexicals always take primary scope” (p. 510)

It seems that these different glosses all coincide within Kaplan’s semantic system. This is due to the fact that the notions of “character”, “context”, “content”, and “indexical” are all inter-defined: Character is a function from context to contents, a context is a sequence of content-generating parameters, and indexicals are expressions whose content varies across contexts.

To see the relations consider a sentence ϕ that varies in content across contexts. Given that ϕ has a non-constant character, it is an indexical (or alternatively, it contains a subsentential expression that is an indexical and ϕ itself merely parasitically indexical). If a character operator Σ is prefixed to ϕ , then the operator will interpret the character of ϕ at other contexts. Since contexts are content-generating sequences this operation alters the content of ϕ (perhaps in virtue of altering the content of one of its subsentential constituents). Thus, the character-meddling-context-shifting operator Σ shifts the interpretation of the indexical sentence ϕ .

For example, consider the attempt at a monstrous operator that Kaplan discusses: ‘In some contexts it is true that’. The semantic clause for this operator is as follows:

- $\llbracket \text{In some context } \phi \rrbracket^{c,i} = 1$ iff there is a context c' such that $\llbracket \phi \rrbracket^{c',i} = 1$.

This operator is at the same time a character operator, a context operator, and an indexical shifter. For the operator to work it must take the character $\lambda c \lambda i. \llbracket \phi \rrbracket^{c,i}$ of its complement clause as argument, since once at the level of content the relevant information about ϕ ’s profile across alternative contexts is lost. And this is clearly a context shifting operator, since it requires us to interpret the embedded sentence at various alternative contexts. For example, if ‘I am not tired now’ is embedded under it, an utterance of the resulting sentence by me from my current context $\langle w_{@}, \text{Brian}, \text{March } 10 \rangle$, would be true just in case some other speaker in another

context, say $\langle w_{@}, \text{Ole}, \text{April 20} \rangle$, is not tired at the time of their context. When the embedded sentence has a non-constant character, then this sort of reinterpretation of the sentence at diverse contexts results in indexical shifting (e.g. ‘I’ has Brian as content and referent in the original context but has Ole as content and referent in a shifted context).

In sum the idea is this: normally, the sequence of parameters relevant for the interpretation of indexical expressions is determined by the context of utterance. But if monsters are involved the context of interpretation (the sequence of content-generating parameters) is shifted away from the original context of utterance. This I think is the essential nature of a monster: they require reinterpretation of their operands, in the sense that semantic computation must look to the content of their operands relative to diverse contexts of interpretation. In other words, the “actual” assertoric content of a monster’s operand is not the relevant semantic value.

This informal gloss on monsters will suffice for most purposes. But when assessing challenges to Kaplan’s ban on monsters, within frameworks that differ in certain respects from Kaplan’s own framework, it proves useful to have a general and formal definition. Let’s delve a bit deeper into monster anatomy.³

6.1.1 Monsters defined

To provide a general definition of monsters and the monster prohibition it will be useful to first define the notions of *parametric sensitivity* and *parametric shifting*. Call the sequence of parameters relative to which a sentence takes a truth-value a *point of reference*.

Definition 1. *An expression α is sensitive to the k^{th} parameter of a point of reference i iff there is a point of reference i' which differs from i only on the k^{th} parameter and which is such that $\llbracket \alpha \rrbracket^i \neq \llbracket \alpha \rrbracket^{i'}$.*

Assume that points of reference are simply worlds and consider this example. The expression ‘the inventor of bifocals’ is sensitive to the world parameter, since there is a world w' distinct from the actual world w such that

³Note that the monstrous functions (Kaplanian monsters) that we are interested in here have no immediate relation to the “monster curves” of geometry, i.e. functions that are everywhere continuous but nowhere differentiable (fractals).

$\llbracket \text{the inventor of bifocals} \rrbracket^w \neq \llbracket \text{the inventor of bifocals} \rrbracket^{w'}$.⁴

The definition of sensitivity also captures the sense in which the indexical ‘I’ is context sensitive—the personal pronoun is sensitive to the context parameter (assuming points of reference contain such a parameter), since there are contexts c and c' such that $\llbracket \text{I} \rrbracket^c \neq \llbracket \text{I} \rrbracket^{c'}$.

Definition 2. An operator Σ shifts the k^{th} parameter of a point of reference i iff: $\llbracket \Sigma\phi \rrbracket^i = 1$ iff for all/some $i' \in A_i^\Sigma$, $\llbracket \phi \rrbracket^{i'} = 1$, where all $i' \in A_i^\Sigma$ differ from i at least in the k^{th} parameter.⁵

For example, we are all familiar with world-shifting operators from modal logic.

- $\llbracket \Box\phi \rrbracket^w = 1$ iff for all $w' \in A_w$, $\llbracket \phi \rrbracket^{w'} = 1$

And notice that the ‘in some context’ operator from above is a context-shifting operator.

To provide a generic definition of a monster we must make a distinction within a point of reference between the content-generating parameters and the content-evaluating parameters (i.e. a generalization of Kaplan’s context/circumstance distinction).

- point of reference = $\langle \text{content-generators, content-evaluators} \rangle$

From the function $\llbracket . \rrbracket$ that, provided an expression, takes a point of reference to an extension, we can recover the character/content structure by currying the function (Schönfinkel 1924). Given a function f of type $f : (X \times Y) \rightarrow Z$ currying it provides the function $\text{curry}(f) : X \rightarrow (Y \rightarrow Z)$.

Let c = the sequence of content-generating parameters. And let i = the sequence of content-evaluating parameters. A point of reference, then, is a sequence

⁴Note that world-insensitivity just is *rigidity* (Kripke (1980)), at least with respect to proper names.

⁵Note that the set A_i^Σ is some set of points of reference determined by the operator Σ and the point of reference i . The definition is not ideal in certain respects but the idea is clear. It could perhaps be made more tight as follows: An operator Σ shifts the k^{th} parameter of a point of reference i iff the lexical entry of Σ is $\llbracket \Sigma \rrbracket^i = \lambda p.f \langle p(g_j(i)) \rangle_{j \in J}$, where f , J and each g_j are determined by Σ and i and at least g_k is not the identity function.

$\langle c, i \rangle$. If we assume that the relevant constructions are compositional the following provides a definition of a monstrous sentential operator.⁶

Definition 3. *A sentential operator Σ is a monster in language \mathcal{L} if and only if there is a sentence ϕ in \mathcal{L} such that $\llbracket \Sigma\phi \rrbracket^{c,i}$ is defined and $\llbracket \Sigma\phi \rrbracket^{c,i} \neq \llbracket \Sigma \rrbracket^{c,i}(\lambda i. \llbracket \phi \rrbracket^{c,i})$.*

This captures the sense in which a monster is a hyperintensional operator (a “character operator”).⁷ Since the parameter c is the sequence of content-generating parameters we can also provide a more intuitive (but equivalent assuming compositionality holds) definition in terms of shifting the content-generating parameter c (i.e. “context shifting”).

Definition 4. *A sentential operator Σ is a monster in language \mathcal{L} if and only if for a point of reference $\langle c, i \rangle$, Σ shifts the parameter c .*

That is to say that Σ is a monster, if in the semantic interpretation of a sentence $\Sigma\phi$, ϕ is evaluated with respect to a sequence of content-generating parameters c' that is different from the sequence of content-generating parameters c with respect to which $\Sigma\phi$ is interpreted.

In step with these two definitions of monsters we can provide the following two definitions of the monster prohibition.

Monster prohibition (Compositionality Formulation). *There is no sentential operator Σ of a natural language \mathcal{L} such that $\llbracket \Sigma\phi \rrbracket^{c,i}$ is defined and $\llbracket \Sigma\phi \rrbracket^{c,i}$ fails to be a function of $\lambda i. \llbracket \phi \rrbracket^{c,i}$.*

⁶This definition assumes that the semantic value of Σ is its extension at a point of reference. This keeps things easier but we can generalize: For a sentential operator Σ let $|\Sigma|^{c,i}$ refer to the semantic function associated with Σ as provided by its lexical entry. Then in the definition replace the occurrence of $\llbracket \Sigma \rrbracket^{c,i}$ with $|\Sigma|^{c,i}$. A similar point holds for the other definitions below.

⁷By a “hyperintensional operator” I mean operators which map intensionally equivalent expressions to different values. Within Kaplan’s framework intensions are functions from circumstances (i.e. content-generating parameters) to extensions. For Kaplan the only hyperintensional operators on his radar are character-operators. This is why he glosses his monster prohibition as the thesis that “all operators that can be given an English reading are *at most* intensional” (Kaplan (1989a), p. 502 footnote 27). But, of course, one could modify Kaplan’s framework such that there were 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”, in the sense of a character operation.

Monster prohibition (Shifter Formulation). *There is no sentential operator Σ of a natural language \mathcal{L} which shifts a content-generating parameter.*

Notice that these definitions have been simplified by limiting the focus to monstrous *sentential* operators. But in full generality a monster could be of any syntactic category. In general form the compositionality formulation of the monster prohibition can be understood as the prohibition of the following composition rule (in the style of Heim and Kratzer 1998):

MONSTROUS FUNCTIONAL APPLICATION. If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any point of reference $\langle c, i \rangle$: if $\llbracket \beta \rrbracket^{c,i}$ is a function whose domain contains $\lambda c \lambda i. \llbracket \gamma \rrbracket^{c,i}$, then $\llbracket \alpha \rrbracket^{c,i} = \llbracket \beta \rrbracket^{c,i}(\lambda c \lambda i. \llbracket \gamma \rrbracket^{c,i})$.

The preceding provides general and formal definitions of monsters and the monster prohibition. For the discussion that follows it will also prove useful to define “context sensitive”, “indexical”, and “indexical shifting”.

Given the definition of “sensitivity” above it is most natural to define “context sensitivity” as follows:

Definition 5. *An expression α of language \mathcal{L} is context sensitive iff there are content-generating parameters c and c' such that $\llbracket \alpha \rrbracket^{c,i} \neq \llbracket \alpha \rrbracket^{c',i}$.*

The definition of sensitivity captures sensitivity of *extension* to a parameter, so this definition captures the sensitivity of an expression’s extension to the parameter c . Indexicality, however, is often understood to be more than mere variation of extension across contexts. For example, ‘Obama is president’ is true at a context in the actual world but false at contexts in non-actual worlds. This isn’t usually understood in terms of the sentence being indexical (although see Lewis 1980, p. 25). Indexicality is instead usually understood to be a matter of the assertoric *content* being sensitive to changes of the context. Notice, however, that the definition does also capture variation of content with context. If there is a difference in extension between points $\langle c, i \rangle$ and $\langle c', i \rangle$ it can only be due to a corresponding difference in content at c and c' .

It is worth pausing to spell this point out, since it can cause confusion. In the literature on contextualism sometimes a distinction is made between mere “context sensitivity” and genuine “indexicality” (cf. the definitions of “indexical”

and “context-sensitive” provided in MacFarlane 2009 in relation to *non-indexical contextualism*). Such a distinction makes sense if we are working with the postsemantic notion of *extension at a context*, instead of (or in addition to) the notion of extension at a point of reference. The definition of extension at a context is defined in terms of extension at a point of reference as follows (where i_c is the sequence of content evaluating parameters that are determined by c).

Extension-at-a-context. The extension of an expression α in $c = \llbracket \alpha \rrbracket^{c, i_c}$.

A special case of extension-at-a-context is sentential truth at a context.

Truth-at-a-context. A sentence ϕ is true in c iff $\llbracket \phi \rrbracket^{c, i_c} = 1$.

MacFarlane (2009) defines “context-sensitivity” with respect to extension-at-a-context as follows: an expression is context-sensitive iff its extension at a context depends on features of the context (i.e. α is context sensitive in this sense iff there are c and c' such that $\llbracket \alpha \rrbracket^{c, i_c} \neq \llbracket \alpha \rrbracket^{c', i_{c'}}$.) Notice that an expression’s extension-at-a-context can be context-sensitive even if its content doesn’t vary across contexts. For example, ‘Obama is president’ is true at a context in the actual world but false at a context in a non-actual world, even though (let’s assume) its content remains constant. This sheds light on Lewis’ comment that “Contingency is a kind of indexicality” (Lewis 1980, p. 25). If we understand Lewis’ use of “indexicality” in the broad sense of context-sensitivity of extension-at-a-context, it makes perfect sense: contingency is indeed a kind of context sensitivity (in this sense).⁸

The distinction between context sensitivity simpliciter (i.e. sensitivity of extension at a point of reference) versus context sensitivity of extension-at-a-context can cause confusion. I am only concerned with the former but I will in any case use the term “indexical” to make it clear that I am concerned with variation of content across contexts. The following definition is effectively no different from the definition of context sensitivity (see definition 5) but it is perhaps more perspicuous.

Definition 6. An expression α of language \mathcal{L} is indexical iff there are content-generating parameters c and c' such that $\lambda i. \llbracket \alpha \rrbracket^{c, i} \neq \lambda i. \llbracket \alpha \rrbracket^{c', i}$.

⁸ Lewis (1980) was not focused on variations of assertoric content across contexts, so there was no need for him to distinguish indexicality from context-sensitivity of extension-at-a-context.

We can get more precision on the source of indexicality by focusing on the specific content-generating-parameter that is responsible for the variation in content.

Definition 7. *An expression α of language \mathcal{L} is k -indexical iff there are content-generating parameters c and c' such that c differs from c' at most in the k^{th} parameter and $\lambda i. \llbracket \alpha \rrbracket^{c,i} \neq \lambda i. \llbracket \alpha \rrbracket^{c',i}$.*

With these in place we can provide definitions that ground common locutions such as “shiftable”, “shiftable indexical”, and “indexical-shifting operator”.

Definition 8. *An expression α of language \mathcal{L} is shiftable-in-extension iff (i) the extension of α is sensitive to the k^{th} parameter of a point of reference and (ii) there is an operator Σ in \mathcal{L} that shifts the k^{th} parameter of a point of reference.*

Definition 9. *An expression α of language \mathcal{L} is shiftable-in-content iff (i) α is k -indexical (ii) and there is an operator Σ in \mathcal{L} that shifts the k^{th} content-generating parameter of a point of reference.*

In accord with the notion of *shiftable-in-content* we can provide a yet another definition of monsters. This can be understood as a ban on “shiftable indexicals”.

Monster prohibition (Shiftee Formulation). *There is no expression α of a natural language \mathcal{L} which is shiftable-in-content by some operator Σ in \mathcal{L} .⁹*

These definitions will suffice for a detailed analysis of monsters across a variety of semantic frameworks.

6.2 Where monsters may dwell

The topic of monsters has reared its head in a wide variety of philosophical and linguistic debates. The issue comes up the most with respect to the semantics of discourse about thought and speech, especially with respect to reports of indexical attitudes (e.g. Israel and Perry 1996 and Schlenker 2003). For example, reports involving *de se* attitudes, self-locating belief or logophoricity (e.g. Castañeda 1966,

⁹This is essentially what Schlenker (2003), p. 29 calls the *Fixity Thesis*: The semantic value of an indexical is fixed solely by the context of the actual speech act, and cannot be affected by any logical operators.

Lewis 1979a, Perry 1979, Chierchia 1989).¹⁰ Relatedly, in theorizing about mental and epistemic discourse monsters have been employed in treatments of Frege’s puzzle and various puzzles of substitution in opaque contexts (e.g. Recanati 2000 and Cumming 2008). For similar reasons, linguistic devices that make implicit reference to attitudes, the common ground or information states, e.g. the semantics of knowledge claims, epistemic modals and indicative conditionals, have been given a monstrous semantics (e.g. Israel and Perry 1996, Weatherson 2001, and Santorio 2010).¹¹ And the threat of monsters has also been noted with respect to the semantics of embedded knowledge claims and embedded epistemic modals in the literature on relativistic semantics (e.g. Egan et al. 2005, Weatherson 2008, Kölbel 2009, and Ninan 2010b).

Most generally monsters are begotten by two-dimensional frameworks. An early and important area of the philosophical literature where the topic of monsters (or quasi-monstrous two-dimensional operators) arose was in theorizing about attributions of apriority with respect to analyses of the Kripkean contingent a priori and necessary a posteriori (see Stalnaker 1978, Evans 1979, and Davies and Humberstone 1980).¹² These two-dimensional analyses often employ monstrous or quasi-monstrous two-dimensional modal operators. For example, the two-dimensionalist model theory for Davies and Humberstone’s fixedly operator \mathcal{F} has it that:

- $\llbracket \mathcal{F}\phi \rrbracket^{w,w} = 1$ iff for all w' $\llbracket \phi \rrbracket^{w',w} = 1$ (Davies and Humberstone 1980, p. 26 footnote 4).

In so far as the “world of utterance” is an aspect of the context of utterance (this is debatable), the \mathcal{F} operator appears to be monstrous.¹³ But the \mathcal{F} operator and the semantics thereof were not put forward as an analysis of natural language *per*

¹⁰It is also arguable that the issue is just below the surface in discussions of indexical belief revision and the semantics of credential attributions in relation to Bayesian probability theory see e.g. Elga (2000), Titelbaum (2008), and Chalmers (2011).

¹¹See also Chalmers (1998) and Nolan (2003).

¹²For a survey of various two-dimensional approaches to the Kripkean contingent a priori and necessary a posteriori see Chalmers (2006).

¹³This work stems in many ways from the work of Crossley and Humberstone (1977) on ‘actual’ in conjunction with Evan’s extension of Dummett’s ingredient sense/assertoric content distinction to the semantic of modals (Evans 1979). Note however, that the main text of Davies and Humberstone (1980) doesn’t actually use a two-dimensional framework to capture these insights; they instead use a model with a “distinguished world”, e.g. for a model $\mathcal{M} = \langle W, w^*, I \rangle$, where $w^* \in W$ represents the “actual world” of the model and I is the interpretation function, $\llbracket A\phi \rrbracket_{\langle W, w^*, I \rangle}^w = 1$ iff $\llbracket \phi \rrbracket_{\langle W, w^*, I \rangle}^{w^*}$.

se. As Humberstone notes in a retrospective article “ \mathcal{F} figures not to simulate a natural language construction, but to throw Evans-derived light on Kripke’s examples of the contingent a priori and the necessary a posteriori” (Humberstone 2004, p. 30).

Likewise Stalnaker’s two-dimensional “copy up” operator \dagger re-interprets its embedded clause at a shifted “context” (Stalnaker 1978). At a level of abstraction \dagger seems to be monstrous. But \dagger is clearly not being proposed as a linguistic operator of natural language. It is instead a theoretical device used to formally model a pragmatic phenomenon in the theory of communication, namely reinterpretation by diagonalization. In spite of their formal similarities Stalnaker’s propositional concepts should not be confused with Kaplan’s characters. And one shouldn’t think that the Stalnakerian devices that operate on character-like values are monstrous—that is, Stalnaker’s theory of reinterpretation of assertoric content is not in tension with Kaplan’s monster prohibition.

What both Davies and Humberstone’s and Stalnaker’s pictures have in common is that they attempt to get a grasp on a notion of apriority that comes apart from necessity by employing a two-dimensional semantics. In a two-dimensional semantics the extensions of expressions are relativized to pairs of possibilities, and a common idea is that an expression’s profile across variations of the first element somehow captures a more epistemic aspect of meaning, while an expression’s profile across variations of the second element is tied to necessity, rigidity, and other non-epistemic modal notions.

If a theorist offers a two-dimensionalist treatment of natural language epistemic locutions such as ‘It is a priori that’, epistemic uses of ‘might’, indicative conditions, or belief reports, such views might reasonably be called monstrous. For example, Chalmers (2002; 2011) develops a two-dimensionalist view according to which attitude verbs and locutions such as ‘It is a priori that’ are sensitive to the primary intensions of their embedded clause. In so far as this treatment is put forward as a semantics for natural language constructions, it looks monstrous. (But whether or not on Chalmers’ view as a whole these operators come out as monstrous is complicated by Chalmers’ 2011 unique commitments on the nature of assertoric content.)

This nevertheless suggests that whether or not a sort of two-dimensional analysis is correct for the epistemic constructions of natural language, depends on issues that are ultimately tangled up with the existence of monsters. And in general

monsters have a natural home in epistemic, doxastic and other hyperintensional logics.¹⁴

In an important sense the issue concerning monsters is at the very foundations of semantic theory and has been implicit in many early discussions of semantic metatheory. In the early tense logical work on the interactions of temporal operators and indexicals stemming from the work of A.N. Prior, which led to the development of multiply-indexed semantics, the issue of monsters is just below the surface (see Prior 1968b, Kamp 1971, and Vlach 1973). In fact, Vlach (1973) introduced the “index operator” K , whose function is to fix the context to which the “then-operator” refers—and this is technically a monstrous operator as it shifts the temporal parameter that represents the time of utterance.

Likewise, when Evans (1985) asks whether tense logic rests on a mistake, the final theory he considers, T_3 , is a monstrous semantic theory, and he notices that it employs what he calls “a hitherto unknown form of embedding”. Evans states:

...it is important to be clear about the novelty of this proposal, for it involves the recognition of a hitherto unknown form of embedding. In all previously-studied forms of embedding ... the semantic value which a complex sentence $\Sigma(e)$ has in a given context is a function of the semantic value which the expression e has in that context. ... But T_3 asserts that the semantic value which the sentence ‘ $P(X)$ ’ has in a context is a function of the semantic value which X would have in another context. For, on the present interpretation, the recursive clause. . . says roughly that the utterance of ‘ $P(X)$ ’ is true iff the utterance of X at some earlier time would have been true. If T_3 is right, the interpretation of a tensed utterance forces us to consider the interpretation which other, perhaps only potential, utterances would have, and this

¹⁴Monsters are also featured in the semantics of metalinguistic discourse, including the semantics of quotation, speech reports, talk about fiction, and ascriptions of indexical validity. For monsters in the semantics of quotation see e.g. Cappelen and Lepore (2003), Geurts and Maier (2005) and Cappelen and Lepore (2007), in speech reports see e.g. Schlenker (2003) and Anand and Nevins (2004), in talk about fiction see Predelli (2008), and on indexical validity see Deutsch (1989). A further fundamental topic where monsters arise is with the nature of context and utterance. These include various phenomena whereby the context of interpretation is dissociated from the context of utterance: the historical present, answering machine cases, talk about fiction, shotgun assertions, free indirect discourse, perpectivals, imaginary contexts, and pretense. See e.g. Predelli (1996), Predelli (1998) and Egan (2009) for discussion of the nature of context, shotgun assertions and delayed assertions. See Predelli (2008) for a monstrous treatment of discourse about fiction and pretense.

is a quite unprecedented feature. (Evans 1985, p. 375)

Evans compares the situation to the following: “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” (Evans 1985 pp. 357-358). The discussion in Evans appears to be independent of Kaplan’s work but the unknown form of embedding Evans is considering is clearly monstrous embedding.¹⁵ Also within temporal semantics, we’ve already seen (see § 2.1) that some eternalist semantics of tense have either toyed with or outright given a monstrous semantics for temporal operators, e.g. Salmon (1986) and Richard (1982).

At a more basic level we see that some early work on the semantics of context-sensitive intensional languages have proposed monstrous frameworks. In so far as a *point of reference* was to do the work of a context of utterance it is arguable that the frameworks developed in Montague (1968), Scott (1970) and Lewis (1970) were monstrous (see § 0.1).¹⁶ Kaplan’s monster prohibition was in part a reaction to these early formulations of semantic theory and what Kaplan viewed as a misguided attempt to “assimilate the role of *context* to that of *circumstance*” (Kaplan 1989a, p. 509)

An underlying theme in these foundational debates is a preoccupation with the

¹⁵See also Evans (2004), which is a letter dated 14 July, 1979, written to Martin Davies in response to a draft of “Two notions of necessity”.

¹⁶ But see Montague and Thomason (1974), pp. 63-64 and Israel and Perry (1996) for the suggestion that Montague had a distinction which disallowed monsters. Montague seems to have kept a division between the elements of the point of reference that were part of what he called the “context of use” and the element that was the “possible world”, and thus made a distinction between what he called the *meaning* and the *sense* of an expression (see Montague 1970b, pp. 379-380, and § 0.4.2). It is unclear to me that this distinction actually played such an important role in Montague’s semantic theory. One might read into it a proto-character/content distinction, and a proto-monster-ban. But the distinction only shows up in Montague (1970b)—there is no distinction between meaning and sense in either Montague (1968) or Montague (1970a). Given this it seems unlikely that Montague had strong theoretical reasons to ban monsters. In fact, in Montague’s intuitive explanation of the sense/meaning distinction he seems to acknowledge that compositional semantics must proceed via “meanings” and not “senses”, so (contra Israel and Perry who focus on the idea that “senses are those intensional entities that are sometimes denoted by expressions”) it looks to me like this is an outright endorsement of a monstrous semantics: “The intuitive distinction is this: meanings are those entities that serve as interpretations of expressions (and hence, if the interpretation of a compound is always to be a function of the interpretations of its components, cannot be identified with functions of possible worlds alone), while senses are those intensional entities that are sometimes denoted by expressions.” (Montague 1970b, pp. 379-380)

principle of the compositionality. This includes answering the following questions: What are the inputs to the compositional process? Does compositionality proceed via functional application at the intensional level or functional application at a hyperintensional level? Hence an investigation into the nature of compositionality in natural language must confront monsters. In this respect, the important and influential discussion of compositionality in Lewis (1980)—where the distinction between (i) variable but simple semantic values and (ii) complex but constant semantic values is made—bears directly on the monster issue.

6.3 Kaplan and the monster prohibition

Kaplan’s discussion of monsters arises within the context of his criticism of early index theory (Kaplan 1989a, pp. 507–512; cf. § 0.1 and § 0.2). The lesson Kaplan draws from early index theory is that there must be a fundamental distinction within a point of reference between the element that represents the context of use and the element that represents the circumstance of evaluation. Indexicality should be treated by the former, whereas intensionality should be treated by the latter. For this reason, Kaplan insists that semantic frameworks, which attempt to treat indexicality and intensionality with a homogeneous point of reference, are “conceptually misguided”. And this Kaplanian lesson has been echoed throughout the philosophical discussions of indexicality and intensionality ever since.

However, as we have already seen (in § 0.2) Kaplan’s initial complaint against early index theory assumes that points of reference are only *singly* indexed. If, instead, a point of reference is doubly indexed, then Kaplan’s argument loses its force.¹⁷

Kaplan does in fact go on to acknowledge that mere double indexing (i.e. double indexing without a fundamental distinction between the two gadgets) would avoid the problem. But he insists that “mere double indexing, without a clear conceptual understanding of what each index stands for, is still not enough to avoid all pitfalls” (Kaplan 1989a, p. 510). The pitfalls he alludes to are monstrous operators, he says:

We could. . . represent contexts by the same indexed sets we use to represent circumstances, and instead of having a logic of contexts and

¹⁷See Rabern and Egan (manuscript) for detailed discussion of this point.

circumstances we have simply a two-dimensional logic of indexed sets. This is algebraically very neat... But it also permits a simple and elegant introduction of many operators which are monsters. (Kaplan 1989a, p. 512)

The idea here is that if the inputs to the compositional semantics are functions from context-circumstance pairs to extensions, then the framework, at least in principle, allows for semantic operations that shift contexts (i.e. monsters). But if, instead, compositional semantic values are the values that are output after applying a character to a context, then operators on character are prohibited by the framework.

Kaplan's driving idea is that all semantic operations need only appeal to the *content* (in a context)—that is functions from circumstances to extensions—of the expressions involved. He asks:

Are there such operators as 'In some contexts it is true that', which when prefixed to a sentence yields a truth if and only if in some context the contained sentence (not the content expressed by it) expresses a content that is true in the circumstances of that context? (Kaplan 1989a, p. 510)

And he answers:

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. 520–521)

If so, then construing semantic values as centered world pairs, is perhaps algebraically neat but it is also very misleading. This is because semantic operations will never make use of the extra information about an expression's variation in content across contexts, even though the framework itself would be perfectly happy to accommodate such operations. But since such operations do not and could not exist in English (or natural language generally) Kaplan thinks that such a framework would misconstrue important conceptual distinctions. It seems that for Kaplan it is not just a contingent, potentially parochial fact about English that such monstrous operations do not exist, but rather it is a deep, central, non-contingent

fact about natural language in general. That is it is a theoretical thesis stemming from Kaplan's views on the nature of linguistic content, context-sensitivity and compositionality. This is why Kaplan keeps harping on the the idea that we must sharply distinguish the roles of context and circumstance.

- The role of context is to *generate* content.
- The role of circumstance is to *evaluate* content.

The idea in the background is the traditional philosophical idea that meanings of sentences are propositions. A sentence like 'I am a sick man' only expresses a proposition provided a context. Thus in order to semantically evaluate a sentence such as

(73) Necessarily, I am a sick man

we must first provide a context to generate the proposition expressed by 'I am a sick man' and then check the modal profile of that proposition. Kaplan thinks that this is the situation in general: we first resolve indexicality (context-sensitivity) and then the compositional semantics provides rules on how to compose the contents of the simple expression to produce the contents of all the complex expressions. That is, the driving force behind Kaplan's ban on monsters is the idea that the composition rules should be defined at the level of assertoric content (or in terms of propositional constituents).

For Kaplan functions from circumstances to extensions are a privileged kind of semantic representation. That is, Kaplanian *contents* are understood to be the entities over which the composition rules should be defined—whereas character is understood to do its work prior to the compositional process. This is the fundamental commitment that is encoded in Kaplan's prohibition of monsters.¹⁸

¹⁸Note that this is not to say that the ban on monsters is incompatible with the semantics *being* compositional at the level of character. After all, if the semantics is compositional at the level of content, then it is thereby compositional at the level of character. One could in principle provide composition rules that are defined over characters and then supply a context to get the contents (and extensions) of the complex expressions. (See Westerståhl (2012) for a detailed analysis of how compositionality at different semantic levels relate to each other.) The question rather is this: assuming that the language in question is compositional at the level of character, is it also compositional at the level of content? In this way the monster prohibition and the compositionality of character and content are connected via the following biconditional: A semantics is monstrous iff (i) it is compositional at the level of character and (ii) it fails to be compositional at the level of content.

Westerståhl (2012) nicely puts the point as follows: “Monsters destroy the compositionality of content”.

In this way, Kaplan’s monster prohibition is best understood as being motivated by a traditional thesis concerning compositionality, namely the thesis that the semantic composition rules are defined over assertoric contents. This thesis about compositionality combined with the thesis that the 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 in these terms, I think this is a plausible rational reconstruction of an argument that is implicit in Kaplan, 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 (i.e. the Kaplanian content of) 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 Assertoric-Content Semantic-Value Identification Thesis from chapter 3. And since we have seen that this thesis is false (chapter 2), it seems that the motivation for Kaplan’s implicit master argument against monsters is undercut. More to the point the existence of monsters and assertoric composition failures are just two sides of the same coin.

6.4 Variable binding and monsters¹⁹

The standard compositional semantics of variable binding employs monstrous operations. As a dramatic first example, Kaplan’s formal language, the *Logic of*

¹⁹A version of this material has been published as Rabern (forthcoming)

Demonstratives (*LD*), is shown to contain monsters. For similar reasons, the orthodox lambda-calculus-based semantics for variable binding is argued to be monstrous. This technical point promises to provide some far-reaching implications for our understanding of semantic theory and content.

Recall the definitions of a monstrous sentential operator form above (see definitions 3 and 4):

- A sentential operator Σ is a *monster* in language \mathcal{L} if and only if there is a sentence ϕ in \mathcal{L} such that $\llbracket \Sigma\phi \rrbracket^{c,i}$ is defined and $\llbracket \Sigma\phi \rrbracket^{c,i} \neq \llbracket \Sigma \rrbracket^{c,i}(\lambda i. \llbracket \phi \rrbracket^{c,i})$.
- A sentential operator Σ is a *monster* in language \mathcal{L} if and only if for a point of reference $\langle c, i \rangle$, Σ shifts the content-generating parameter c .

In essence then, an operator Σ is a monster, if in the semantic interpretation of a sentence $\Sigma\phi$, ϕ is evaluated with respect to a sequence of content-generating parameters c' that is different from the sequence of content-generating parameters c with respect to which $\Sigma\phi$ is interpreted.

6.4.1 Tarskian semantics for quantifiers

All the sentential operators of the propositional calculus are truth-functional. This is not so with the predicate calculus—the quantifiers are *not* truth-functional. Tarski (1936) showed how to recursively assign sentences values of a different kind for the quantifiers to operate on. The relevant values are functions from *variable assignments* to truth-values.²⁰ For completeness let's rehearse the Tarskian syntax and semantics of predicate logic in terms of assignments.

For 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 quantifier \forall . For these we have the following formation rules:

- If π is an n -place predicate and $\alpha_1, \dots, \alpha_n$ are variables, then $\pi(\alpha_1, \dots, \alpha_n)$ is a formula.
- If ϕ and ψ are formulae, then $\phi \wedge \psi$ and $\neg\phi$ are formulae.

²⁰Actually, Tarski (1936) formulated it in terms of functions from *sequences* to individuals. Assignments are functions from variables to individuals, whereas Tarski's sequences were just sequences of individuals—and variables were indexed to positions in sequences. There is clearly no essential difference here. I use the formulation in terms of assignments for continuity with Kaplan (1989a) and contemporary semantic frameworks, e.g. Heim and Kratzer (1998).

- If ϕ is a formula and α is a variable, then $\forall\alpha\phi$ is a formula.
- Nothing else is a formula.

Now for the semantics we have a structure $\{U, I\}$, where U is the set of individuals, and I is an interpretation function (which assigns sets of ordered tuples of individuals to the predicates). For our purposes, the important machinery is that of an “assignment function”, which assigns values to the variables. An assignment function g is a function from variables to individuals, $g : \{x_i\}_{i \in \mathbb{N}} \rightarrow U$. We write $g[\alpha := i]$ to denote the assignment function that is just like g except that it assigns to the variable α individual i . Given this setup we can give the Tarskian semantics for predicate logic by recursively defining 1 (or “truth”) relative to an assignment function as follows:²¹

- For a variable α , $\llbracket \alpha \rrbracket^g = g(\alpha)$.
- For n -place predicate π and variables $\alpha_1, \dots, \alpha_n$, $\llbracket \pi(\alpha_1, \dots, \alpha_n) \rrbracket^g = 1$ iff $(\llbracket \alpha_1 \rrbracket^g, \dots, \llbracket \alpha_n \rrbracket^g) \in I(\pi)$.
- For a formula ϕ , $\llbracket \neg\phi \rrbracket^g = 1$ iff $\llbracket \phi \rrbracket^g = 0$.
- For formulae ϕ and ψ , $\llbracket \phi \wedge \psi \rrbracket^g = 1$ iff $\llbracket \phi \rrbracket^g = 1$ and $\llbracket \psi \rrbracket^g = 1$.
- For formula ϕ and variable α , $\llbracket \forall\alpha\phi \rrbracket^g = 1$ iff for all $i \in U$, $\llbracket \phi \rrbracket^{g[\alpha := i]} = 1$.

The important thing to note here is what the semantic value of the quantifier is. The last clause says that ‘ $\forall\alpha\phi$ ’ is 1 at an assignment g just in case for all assignments g' , ‘ ϕ ’ is 1 at g' , where for all $i \in U$ each g' is just like g except that it assigns i to the variable α . The quantifier, then, looks to the profile across assignments of its embedded formula and gives 1 if the embedded formula is 1 across all assignments and gives 0 otherwise. Assuming that the compositional semantics of such quantified constructions proceeds via functional application, the lexical entry for ‘ $\forall\alpha$ ’ is as follows:²²

- $\llbracket \forall\alpha \rrbracket^g = \lambda p_{\langle \gamma, t \rangle}. \prod_{i \in U} p(g[\alpha := i])$

²¹This actually gives Tarski’s definition of “satisfaction by a sequence”, Tarski reserves the term “truth” for formulae that are satisfied by all sequences.

²²Where \prod is the integer product of the sequence of truth-values (i.e. the sequence of 0s and 1s) and p is a function from assignments to truth-values, i.e. of type $\langle \gamma, t \rangle$.

Thus, on the standard Tarskian semantics for predicate logic, quantifiers are assignment-shifting sentential operators.²³

6.4.2 The monstrous quantifiers of *LD*

You know where this is headed: Kaplan’s formal language the *Logic of Demonstratives* (*LD*) contains monsters. This is due to the fact that *LD* employs assignment-shifting quantifiers and the fact that assignment-shifters meddle with character functions. To demonstrate this I will focus only on a fragment of Kaplan’s *LD* that has to do with variables and quantification.²⁴

The fragment of *LD* we are concerned with has the same syntax as predicate logic. The semantics is slightly more complicated but for reasons that do not concern quantification. 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 $j \in T \times W$). The extensions of expressions are given relative to a point $\langle c, g, t, w \rangle$ where $c \in C$, $t \in T$, $w \in W$ and g is an assignment function. Given this setup the semantics is also essentially the same as predicate logic, except the points at which we recursively define 1 (or “truth”) are expanded, i.e. $\langle c, g, t, w \rangle$. To see this consider the Kaplanian clause for the universal quantifier.

- For formula ϕ and $\alpha \in V$, $\llbracket \forall \alpha \phi \rrbracket^{c,g,t,w} = 1$ iff for all $i \in U$, $\llbracket \phi \rrbracket^{c,g[\alpha:=i],t,w} = 1$.

The extra parameters in the point of reference are, of course, to handle indexicals and modal and temporal operators, which we are currently ignoring.²⁵

Kaplan maintains that *variables are the paradigms of directly referential terms* (and when he is in a Russellian mood he expresses this by saying that a “variable’s first and only meaning is its value”) (see Kaplan 1989a, p. 484 and Kaplan 1989b, pp. 571-573). In the formal part of “Demonstratives” he gives an explicit account of the content of variables and open formulae. Here he introduces the notation

²³This is also evident in the algebraization of the semantics of predicate logic in terms of cylindrical algebra.

²⁴The 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.

²⁵If we added the first person pronoun ‘I’, we would add the clause: $\llbracket I \rrbracket^{c,g,t,w} =$ the agent of c . If we added the modal operator ‘ \Box ’ we would add the clause: $\llbracket \Box \phi \rrbracket^{c,g,t,w} = 1$ iff for all $w' \in W$, $\llbracket \phi \rrbracket^{c,g,t,w'} = 1$, etc.

$\{\alpha\}_{c,g}$ to mean “the content of α in the context c under the assignment g ” and tells us that the content of a variable is as follows (Kaplan 1989a, p. 546).

- If α is a variable, then $\{\alpha\}_{c,g} =$ that function which assigns to each $t \in T$, $w \in W$, $[[\alpha]]^{c,g,t,w}$.

That is, the content of a variable α , $\{\alpha\}_{c,g}$, is a constant function from circumstances to $g(\alpha)$. The content, then, of a variable or an open formulae (or all expressions trivially) is only given relative to an assignment function. So among the list of parameters that character is a function from, we must include an assignment of values to variables. That is to say that the assignment function is among the content generating parameters. We can understand this, if we like, as the thesis that the assignment function should be included as a parameter of the “context”. In fact, Kaplan (1989b) encourages us to do this.

... 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. (Kaplan 1989b, p. 591)

But whether we officially package up the assignment function as a parameter of “context” or not, the general point remains that character functions—the functions that output contents—require inputs, which include, in addition to an agent, a time, a location and a world, an assignment of values to variables. Either way assignment-shifters operate on character and thus assignment-shifters are monsters. That Kaplan’s *LD* is replete with monsters follows directly from the observation that the quantifiers of *LD* are assignment-shifting operators and the observation that character functions require assignments as inputs.²⁶

6.4.3 Generalized quantifiers and lambda binders

Kaplan’s *LD* was put forward as a partial formal model of natural language—“a machine against which we can test our intuitions”. If our best formalization of

²⁶To my knowledge the fact that Kaplan himself employs monsters in *LD* has only been pointed out in Rabern (forthcoming), although a related issue in terms of bound pronouns is discussed in Zimmerman (1991) (see especially §4.1).

natural language included monsters that would surely show that Kaplan’s monster prohibition was mistaken. But *LD* was never put forward as our best formalization of natural language. One place that it is clearly lacking is in its treatment of quantificational devices. Kaplan was more concerned with formalizing the interaction of indexicals and intensional operators, than with the semantics of quantifiers. In a more complete model of natural language he would, we should assume, replace the old Tarskian quantifiers with more empirically adequate quantificational devices. We do not treat the semantics of natural language quantification in the style of predicate logic—natural language quantification is instead treated with generalized quantifiers, where the assignment function does not even enter into the semantic clauses. Why, then, does pointing out this relatively small quirk of Kaplan’s *LD* matter?

Here is why. Quantificational noun phrases, like ‘Every woman’ are indeed not standardly treated as assignment-shifting operators. Instead they are treated as predicates of predicates, i.e. of type $\langle\langle e, t \rangle, t\rangle$. But that is not the end of the story. When employing generalized quantifiers we still need a way to get from the value of a sentence to an associated predicate value. That is to say that we need an account of *variable binding*. For example, consider the following sentence, where the quantificational noun phrase occurs in object position.

- (1) Eros loves every woman.

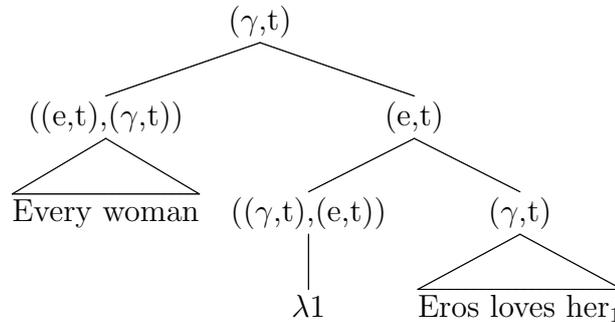
A standard way to treat this sentence is to suggest that its logical form differs from its surface structure. It is instructive to consider how sentence (1) would be formalized in predicate logic: $\forall x(women(x) \rightarrow loves(Eros, x))$. That is to say that it has the same truth-conditions as the more stilted “Every woman is such that Eros loves her”.

Since ‘every woman’ requires an argument of type $\langle e, t \rangle$, but ‘Eros loves her’ is type t , we need a way to get from the value of the sentence ‘Eros loves her’ to the value of the predicate ‘being loved by Eros’. The common strategy is to introduce “lambda binders” into the object language syntax such that when a lambda binder is prefixed to a formula ϕ the complex expression takes on the value of a predicate.²⁷

²⁷See, e.g., Heim and Kratzer (1998), p. 186.

- $\llbracket (\lambda \alpha. \phi) \rrbracket^g = \lambda i. \llbracket \phi \rrbracket^{g[\alpha := i]}$

In this way, the pronoun gets bound by the lambda and everything can proceed up the tree via functional application.



As is clear from the syntax tree the lexical entry for a lambda binder is given as follows:²⁸

- $\llbracket \lambda \alpha \rrbracket^g = \lambda p_{\langle \gamma, t \rangle}. (\lambda i_e. p(g[\alpha := i]))$

Lambda binders, then, are assignment-shifting devices. And that brings us to the general thesis: variable binders, such as the quantifiers of *LD* or the lambda binders of compositional natural language semantics, are monstrous.²⁹ We needn't look far and wide for the existence of exotic monstrous languages, we need only look closer at the details of variable binding at home. The monster prohibition, and the assumptions about compositionality and asserted content that support it, must be reconsidered.

²⁸I have never seen a lexical entry for the lambda binders but it seems fairly obvious and uncontroversial that this is the way to do it. And I hope that some will find this explicit rendering of the semantics of lambda enlightening.

²⁹Importantly, one could make the same point with other examples of natural language variable binding (see Partee 1989 for various cases). The argument here does not essentially rely on the use of lambda binders nor on a syntactic story about quantifier raising. For example, consider the type of binding concerned in so-called *binding arguments* in Stanley (2000): an utterance of “Every bottle is green” in context might express the proposition that every bottle in *this room* is green. But when “Every bottle is green” is embedded, e.g., in “In every room, every bottle is green” the quantifier domain variable is bound such that the utterance expresses the proposition that in every room x , every bottle in x is green. So the variable binding operator is monstrous.

6.4.4 Reactions

I have argued that variable-binding operators must be understood to be monsters; and this includes the devices used in a lambda-calculus-based semantics for variable-binding. If right, not only does this refute the Kaplanian thesis that “directly referential” terms are not shiftable/bindable, it suggests a natural model of semantical shiftiness which can be applied to indexicals.³⁰ Moreover, since monsters operate on entities that are distinct from the assertoric content of their embedded clause, the semantics of variable binding can be used as a straightforward and powerful argument for Dummett’s ingredient sense/assertoric content distinction (as it was in § 2.3). But there are a few reactions to this discussion that suggest ways of avoiding the conclusion or at least downplaying its significance. I will briefly discuss what I take to be the most salient and interesting reactions.

Reaction 1. The assignment function is not strictly speaking part of the “context”, so shifting the assignment is not strictly speaking “context-shifting”. Thus, an assignment-shifter is not strictly speaking a “monster”.

Response. This reply can take two forms. Either the assignment is construed as (i) part of the circumstance (index) or as (ii) neither part of the context nor the circumstance (index) (cf. Zimmerman 1991, §4.1). Kaplan cannot accept (i), since this would conflict with the thesis that free variables are “directly referential”. This understanding would also be committed to the questionable thesis that “what is said” (content) is assignment neutral (i.e. propositions would be construed as functions from world-time-assignment triples to truth-values). In other words, the assignment function would not be understood as a “content generating parameter”, it would instead be understood as a part of the circumstance of evaluation. For these reasons, it seems that Kaplan cannot accept this strategy. Nevertheless, other theorists who do not share Kaplan’s commitments on “direct reference” and “what is said” may find this option the most attractive. But if such a theorist does not agree with Kaplan that the composition rules are defined over *contents* qua the objects of assertion, it seems that they have already given up the spirit of the monster prohibition, which was the idea that there are no semantic operations at a level of “meaning” more fine-grained than the level of

³⁰One can view Cumming (2008) as applying this strategy to proper names; and Santorio (2010) applies such a strategy directly to indexicals.

“what is said”. On the current approach, technically speaking, there wouldn’t be operators on “character”, but characters also would not be functions that output “what is said”. So as I understand it, giving up the thesis that sets of circumstances are assertoric contents, and thereby making sets of circumstances entities apt for compositionality, is merely a way to accept the conclusion under a different guise.³¹

On option (ii)—where the assignment is construed as neither part of the context nor the circumstance—we have to make a decision about the domain and co-domain of the character functions. On the first approach, which seems to be the considered Kaplanian position, “character” is a function that takes a sequence of parameters and outputs a content (sets of world-time pairs). On this understanding, character functions require inputs, which include, in addition to an agent, a time, a location and a world, an assignment of values to variables. Here assignment-shifting devices would be operators on character. One might insist that monsters shouldn’t be understood as just any character operator but instead only the special kind of character operators that shift the “strict context” (i.e. $\langle w, t, p, x \rangle$ without the assignment g). First of all, this understanding has the awkward consequence that even if variables—the paradigms of direct reference—are shiftable, such shifting devices wouldn’t be “monsters”. Moreover, remember that Kaplan glosses his claim that there are no monsters as the claim that all semantic operations are operations on content, so variable-binding, which cannot be construed as operations on content, would seem to be deserving of the pejorative “monster”. Especially, since it is still the case that in the semantic evaluation of a sentence $\Sigma\phi$, the complement clause ϕ is evaluated with respect to a sequence of content generating parameters c' that is different from the sequence of content generating parameters c with respect to which $\Sigma\phi$ is evaluated. Whether or not these operators have semantic effects on “indexicals” depends on what we mean by that term. There are operators that shift the parameters on which semantic interpretation depends in a way that alters the assertoric content of its embedded clause. If an *indexical* is an expression that varies in assertoric content across given variations in content-generating parameters, then such operators are indexical shifters.

³¹One might insist that compositional semantics should not concern itself with a notion of “what is said” or assertoric content. If so, then I say so much the worse for Kaplan’s monster prohibition, since it is fundamentally entangled with such a notion.

The second option with respect to the domain and co-domain of the character functions is to diverge from Kaplan and modify the definition of “character” to be a function from “strict contexts” to a function from assignments to contents.³² But here again there would be semantic operations (variable-binding), which are not operations on content (i.e. “what is said”) and this I think suffices to call such operations “monstrous”.

Reaction 2. As the abundance of scare-quotes already makes clear, what exactly counts as a “monster” seems to depend on a terminological choice. There are several characterizations of monsters floating around: (i) monsters are operators that take characters as arguments, (ii) monsters are context-shifting operators, (iii) monsters are operators that have semantic effects on “indexicals”. So isn’t all this merely a terminological dispute?

Response. To some extent that is my point: The statement of the monster prohibition requires some finessing. But it is not merely terminological. I think the driving force behind Kaplan’s ban on monsters is the idea that the composition rules should be defined at the level of assertoric content (or propositional constituents).³³ If there are semantic operations that don’t operate at the level of content, there is a good case to be made that such operations count as *monsters*. Especially, since such an operator shifts the parameters on which semantic interpretation depends in a way that alters the content of its embedded clause—since in the semantic evaluation of a sentence containing such an operator its embedded clause must be evaluated with respect to distinct sequences of content generating parameters. Although there is no doubt an element of terminological arbitrariness here, in the context of Kaplan’s article, I think the terminology is on my side. So I would displace the charge that this discussion merely makes a terminological point towards those who wish to avoid the conclusion. The strategies above for avoiding the conclusion that variable binders are monstrous are merely terminological: the substantive point that due to variable binding semantic composition must proceed at the level of character (or, at a non-content character-like level) is not avoided.

³²There is an analogous maneuver in Salmon (1986), where he re-defines “character” as the function that maps a context to a function from times to contents.

³³See Ninan (2010b) and Rabern (2012a) for some recent critical discussion of the dogma that compositional semantic values are to be identified with the objects of assertion (of course as we have seen in chapter 4 there has been an undercurrent of theorists who have gone against the dogma, perhaps most notably Dummett 1973, Evans 1979 and Stanley 2002).

Reaction 3. Strictly speaking, in the semantics that Kaplan provides (Kaplan 1989a, p. 545) the quantifiers do not “operate” on anything at all. The semantics, as given, provides the interpretation of the quantifiers by means of a *syncategorematic rule*—a rule that says “When you have $\forall\alpha$ followed by a formula ϕ , the interpretation of $\forall\alpha\phi$ is such-and-such”. In this case, there is no lexical entry or semantic value provided for the quantifier itself. We should not assume that the syncategorematic rule is a mere abbreviation of a treatment that involves a lexical entry—the syncategorematic rule can be understood to provide a full treatment. Likewise, we needn’t provide a lexical entry for the lambda operators and we needn’t provide a semantics of lambda terms that adheres to the rule of functional application. In fact, to do so is nonstandard. Heim and Kratzer (1998) do not provide a lexical entry for the lambda binders, instead they provide the syncategorematic Predicate Abstraction Rule.³⁴ If the semantics of variable binding, is understood to proceed via a syncategorematic rule like predicate abstraction instead of a composition rule like functional application, the thesis that variable binding is monstrous cannot even get off the ground.

Response. First note that a syncategorematic rule such as the following seems to be a paradigmatic example of a monstrous semantics.

- **[[In some context ϕ]]^{c,i} = 1** iff there is a context c' such that **[[ϕ]]^{c',i} = 1.**

But the definitions I provided actually don’t even apply, since the definitions I provided were given under the assumption that the constructions at issue were *compositional*. I have been assuming that the semantics of variable binding is determined by a compositional process—and, in fact, I have provided lexical entries according to which variable binding constructions come out as compositional (in both the Tarski-style and the lambda-calculus-style frameworks).

So I concede that my thesis has a conditional element: The semantics of variable binding is monstrous if (and only if) the semantics of variable binding is compositional. Of course it is open for a theorist to insist that variable binding should be given a non-compositional treatment. If variable binding is assumed to be evaluated by a non-compositional rule, then there is no sense to the question

³⁴PREDICATE 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 , $[[\alpha]]^g = \lambda z. [[\gamma]]^{g[x:=z]}$ (Heim and Kratzer 1998, p. 186).

of whether or not its semantic evaluation involves monstrous mechanisms. The claim that a given linguistic construction is monstrous will only be true (and really only make sense) under the assumption that its semantic evaluation proceeds via a genuinely compositional rule.³⁵ While I concede that my thesis is conditional in this way, I'd like to present the following challenge to any theorist who is tempted to accept my conclusion by denying my antecedent: Why should variable binding be handled by a non-compositional syncategorematic rule, when a straightforward compositional treatment is available?³⁶

Reaction 4. Kaplan treats free variables and bound variables very differently (just as he does free and bound pronouns). For him, free variables are sensitive to the assignment function but bound variables are not. In “Afterthoughts” Kaplan says, “The case we are dealing with here is the free occurrence of a variable in a premise or conclusion of an argument. Do not confuse this case, the case with the interpretational gap, with the case in which a bound occurrence of a variable appears free because we are focusing attention on a subformula. . . . So the rules for evaluating bound occurrences of variables are another story entirely, and an irrelevant one” (Kaplan 1989b, p. 592). So it seems that for Kaplan although quantifiers may shift an assignment function, they would not shift the assignment function that free variables are sensitive to—and so we have no reason to think they are monstrous.

Response. This indeed seems to be Kaplan’s position. It would also require a syntactic distinction between two classes of homographic expressions in the language, e.g. ‘x’, which only occurs free and ‘x’, which only occurs bound (on analogy with Kaplan’s claim that “pronouns are lexically ambiguous, having both an anaphoric and a demonstrative use” (Kaplan 1989b, p. 572)). In fact, an appeal to homography or ambiguity would suffice. But why would one treat free and bound variables by means of separate semantic mechanisms, if a single mechanism sufficed? Taking this idea seriously threatens to make Kaplan’s monster prohibition true by the definitions of “free variable/pronoun” and “bound vari-

³⁵See Pagin and Westerståhl (2010a) for a detailed analysis of when a rule is genuinely compositional.

³⁶It’s unclear whether the motivation for Heim and Kratzer’s syncategorematic treatment of variable binding was done for merely pedagogical reasons or for some unstated theoretical reason. But I suspect it was the former, since they are theoretically guided by Frege’s Conjecture (i.e. that semantic evaluation proceeds via functional application). This seems especially likely since although $\llbracket \cdot \rrbracket^g$ is not compositional $\llbracket \cdot \rrbracket$ itself clearly is compositional.

able/pronoun”. The claim is uninteresting if it is just the claim that free pronouns are not bound! So I concede that there is a way to avoid the conclusion by, e.g., having two separate assignment functions, one for the treatment of free variables and one for the treatment of bound variables. But I see no independent motivation for this complexity. This points to an oddity in Kaplan’s whole approach, namely his division of pronouns into “demonstrative” and “anaphoric” pronouns.³⁷ Since it makes no sense to treat free and bound variables by means of a different mechanism, in so far as the analogy between variables and pronouns holds, it makes no sense to treat free and bound pronouns by means of different mechanisms. Once we see this it becomes difficult to uphold a substantive prohibition of monsters.

6.4.5 Nothing to fear

There are monsters in natural language, given that natural languages are compositional but not compositional in terms of assertoric content. These monsters shift the parameters upon which semantic interpretation depends in a way that alters the assertoric content of their embedded clauses. They require *reinterpretation* of their operands, in the the sense that they dissociate the context of interpretation from the context of utterance—this is the feature that Kaplan found so objectionable. But once we respect the distinction between the objects of assertion and compositional values and consider the roles they play with our linguistic theories, this feature of language appears absolutely mundane and expected. It is only when one is in the grip of the Kaplanian picture, where “what is said” has a privileged role, that operators on character would appear to be exceptions to the semantic norms. With the alternative picture of semantic metatheory that I’ve sketched in chapter 5 operations on character are in fact seen to be the norm and not the exception. In my view it could only be due to an impoverished diet of examples (e.g. constructions involving alethic modal operators and attitude reports) that one would conclude that operations on assertoric content are the norm.

With the ban on monsters lifted we might find some further interesting employment for them. There have already been some recent proposals that employ monsters for the treatment of epistemic operators in the form of assignments shifting operators (e.g. Cumming 2008, Santorio 2010, and Ninan 2012a). But

³⁷Kaplan (1989a), p. 489 says: “[Pronouns] have uses other than those in which I am interested (or, perhaps, depending on how you individuate words, we should say that they have homonyms in which I am not interested)”.

these proposals only provide treatments of the problematic cases where singular terms are embedded under epistemic operators. The natural generalization would be to have epistemic environments shift the interpretation of general terms as well to handle cases involving term pairs such as ‘eye doctor’/‘optometrist’, ‘arugula’/‘rocket’ or ‘ground-squirrel’/‘digger-squirrel’.^{38,39}

³⁸I suspect that there is an interesting convergence of the resulting picture and the theory developed in Chalmers (2004).

³⁹In connection with this idea one might develop syntax and semantics for formal languages, which allow for various forms of *meaning shift*, in the sense of shifts to the interpretation. As a simple example, consider an interpretation shifting treatment of negation in propositional logic. In propositional logic a formula ϕ of language \mathcal{L} is only true (1) or false (0) relative to an interpretation \mathcal{M} , where \mathcal{M} is the assignment of proper extensions to the atomic symbols of the language. The semantics of the negation symbol ‘ \neg ’ is normally given as follows:

$$\llbracket \neg \phi \rrbracket^{\mathcal{M}} = 1 \text{ iff } \llbracket \phi \rrbracket^{\mathcal{M}} = 0.$$

But we could also give an alternative semantics in terms of interpretation shifting. Here negation is viewed as analogous to a modal operator. In this case it doesn’t shift the world parameter—it instead shifts the interpretation.

$$\llbracket \neg \phi \rrbracket^{\mathcal{M}} = 1 \text{ iff } \llbracket \phi \rrbracket^{\mathcal{M}^*} = 1, \text{ where } \mathcal{M}^* \text{ is just like } \mathcal{M} \text{ except it assigns } 1 - \mathcal{M}(\phi) \text{ to } \phi.$$

Of course we have no independent reason to make things more complicated in this way. This semantics for negation is given merely for reasons of illustration and motivation. Likewise, an interpretation-shifting semantics is given for the quantifiers as follows.

$$\llbracket \forall \alpha \phi \rrbracket^{\mathcal{M}} = 1 \text{ iff for all } \mathcal{M}^* \text{ that differ in at most what they assign to } \alpha, \llbracket \phi \rrbracket^{\mathcal{M}^*} = 1.$$

Again this is merely for reasons of illustration and motivation. In fact, the point is that this is essentially the standard clause for quantification except that “interpretations” are understood to be *interpretations* of the constants plus the variables. I am only aware of one logic textbook that mentions the possibility of giving the semantics of quantification in terms of shifting the interpretation: Bostock (1997), see pp. 85–86. This demonstrates that the idea of interpretation shifting semantics is not in itself objectionable. And this opens up the possibility that there may be other and more interesting shifts to the interpretation to handle cases such as the following:

(74) Let’s call tails legs: Then, how many legs does a horse have?

(There are also interesting connections here to adding interpretation shifting validity operators to propositional logic (a la Carnap)).

Chapter 7

Summary

Consider the following puzzle: These sentences seem to communicate the same thing.

- (A) The president is Barack Obama.
- (B) The current president is Barack Obama.

Yet substituting one for the other in a more complex sentence results in different things being said.

- (C) It will always be the case that the president is Barack Obama.
- (D) It will always be the case that the current president is Barack Obama.

Sentence (D) is true just in case at all future times the person who is president *in 2012* is Barack Obama. So, in a sense, the future looking aspect of the sentence—contributed by the operator ‘always’—is washed out by the indexical aspect contributed by ‘current’. With sentence (C) the story is different: It is true just in case at all future times the person who is president *at that time* is Barack Obama. Sentence (C) says something false and sentence (D) says something true, so they say different things.

A common assumption is that what sentences (C) and (D) say is determined by combining the operator ‘It will always be the case that’ and the propositions expressed by their embedded sentences (A) and (B), respectively. But given that sentences (A) and (B) communicate the same thing—express the same proposition—it would follow that sentences (C) and (D) say the same thing. And as we’ve

seen they don't. So we have a puzzle concerning compositional semantics and propositional content.

One common reaction to the puzzle is to deny that sentences (A) and (B) express the same proposition. One might insist that sentence (B) with its temporal indexical 'current' expresses an eternal proposition tied down to the time of utterance, whereas sentence (A) expresses a transient proposition that can vary in truth-values across times. This is fine as far as it goes, but it must immediately be pointed out that this is just one puzzle among a diverse array of analogous puzzles. There are analogous puzzles that instead of temporal indexicals use locational indexicals (e.g. 'here') or agential indexicals (e.g. 'I') and, in fact, there is a more general class of examples that rely on a multitude of diverse hidden variables. So if this reaction is applied across the board, "propositions" end up being the kinds of things that vary in truth-value not just across worlds but also across times, locations, and agents, etc. Here propositions end up looking more like *properties*, in the sense that they aren't true or false of a world, they are true or false of a world *relative* to a perspective within that world. This is the road to *relativism* (see 3.1).

A second reaction to the puzzle is to insist that the puzzle relies on a common but false assumption concerning propositions. Here the idea is that there is a certain powerful and entrenched myth in contemporary philosophy, what we could call "the myth of the proposition", which holds that propositions are both (i) the semantic values appealed to in compositional semantics and (ii) the objects of assertion. Once disabused of this myth, it is thought, we can make a distinction between what is communicated by a sentence and what semantic value it contributes to the compositional process. According to this reaction, then, sentences (A) and (B) express the same proposition, but they have different associated semantic values, which explain the difference in their embedding behavior in (C) and (D). This is the road to *two-dimensionalism* (see 4 and 5.3)

There is a further set of reactions to the puzzle, which in one way or another attempt to side-step the two options outlined above. These forms of response bring up various technicalities concerning natural language syntax and/or the compositionality principle. By making such appeals to syntax or compositionality this form of response makes a discrimination between embedded versus unembedded linguistic environments. Due to this discrimination based on linguistic environment I call this strategy *linguistic environmentalism* (see 3.2)

The strategy takes two forms: one makes the discrimination in terms of syntax, while the other makes the discrimination in terms of semantics. A syntactic environmentalist might appeal to various ideas from contemporary linguistic treatments of tense, in order to deny the assumption that sentences (A) and (B) occur as syntactic constituents of sentences (C) and (D), respectively. While a semantic environmentalist might appeal to Frege's *context principle* or the Fregean *doctrine of indirect reference*, in order to motivate the idea that what sentences (C) and (D) say is not determined by the propositions customarily expressed by sentences (A) and (B), respectively.

In this dissertation I have investigated the dialectic between these three main reactions to this puzzle and the structurally analogous puzzles that are found throughout the philosophy of language. In slogan form the puzzles arise when *sentences that say the same thing embed differently*. I have argued that neither the relativist strategy nor the environmentalist strategy provide for satisfactory resolutions of the puzzles and I've provided a comprehensive defense of the two-dimensionalist resolution.

Given that a main component in the puzzle concerns the semantic treatment of context-sensitive expressions, I begin by looking into Richard Montague's development of indexical semantics for natural language and certain objections to "early index theory" (see 0). I, then, continued in this historical vein and explored how the dialectic above played out in David Kaplan's "Demonstratives" (1). I showed that the puzzle is not resolved within Kaplan's preferred picture of semantic theory, and so, given the influence of the Kaplanian picture on contemporary philosophy of language, we see that puzzles in this vicinity are at the heart of many contemporary debates and developments in the philosophy of language.

I, then, focused in on a few of these contemporary debates (see 2), e.g. how the dialectic plays out in the temporalist/eternalist debates (see 2.1) and how the dialectic plays out in the recent contextualism/relativism debates concerning epistemic modals (see 2.2). I also outlined the ways in which the lessons impact broader debates inside and outside of the philosophy of language (e.g. with respect to expressivism and the Frege-Geach objection).

An underlying question throughout was what impact the various resolutions to the puzzle have for a certain controversial issue in semantic theory: Kaplan's monster prohibition (see 6). A *monster* is an expression, which when affixed to a sentence, requires that the sentence be reinterpreted as if it were uttered in a

different context (see 6.1.1). In this connection, I argued that the standard compositional semantics of *variable binding* is monstrous, and that, in fact, monsters are ubiquitous in natural languages (see 6.4). This is because natural languages are compositional but not compositional in terms of assertoric content, thus the composition rules require reinterpretation of embedded clauses at contexts of interpretation distinct from the context of utterance.

In sum, I've argued for two main points concerning the philosophy of natural language semantics. Firstly, that the objects of assertion are distinct from the entities appealed to in the compositional rules of natural language semantics (i.e. I've defended *Dummettian two-dimensionalism*). Secondly, that natural languages contain context-shifting operators known as "monsters". And I've argued that these theses are, in fact, simply two sides of the same coin.

Once we accept the two-dimensionalist view and separate the notions of semantic value and assertoric content, we need to confront anew the metatheoretical question of what exactly we ought to take the explanatory roles of the notions of compositional semantic value and of content, respectively, to be. I've sketched such an answer in broad strokes but to these questions much more remains to be said.

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