

Truth and Context Change*

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Abstract

Some dynamic semantic theories include an attempt to derive truth-conditional meaning from context change potentials. This implies defining truth in terms of context change. Focusing on presuppositions and epistemic modals, this paper points out some problems with how this project has been carried out. It then suggests a way of overcoming these problems. This involves appealing to a richer notion of context than the one found in standard dynamic systems.

Keywords Truth, dynamic semantics, presuppositions, epistemic modals

1 Introduction

Traditional semantics rests on the notion that the meaning of a declarative sentence is given by its truth conditions and that the meanings of individual expressions consist in contributions to the truth conditions of sentences in which they occur. Beginning in the 1980's this paradigm was challenged by a surge of so-called *dynamic* semantic theories. In place of the traditional picture, these newer theories take the meaning of a sentence to be a *context change potential* (CCP), a measure of how an utterance of the sentence in question affects the conversational context. As it is sometimes said, sentences are instructions, or programs, for changing the context.

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In these systems CCPs play the role of the basic building blocks of the semantics. CCPs are the values assigned by the recursive interpretation mechanism of the language so that the CCPs of compound sentences depend systematically on those of their constituents. For this reason, dynamic semantics involves the project of deriving truth-conditional meaning from context change. To do so, dynamic systems typically propose to define truth in terms of context change.

This paper has two main goals. The first is to demonstrate that this project is far less easy than it has sometimes been thought to be. In particular, it turns out to be difficult to arrive at a definition of truth in terms of context change that simultaneously does justice to different types of expressions and constructions that have been thought to require dynamic treatment.

We will be concerned with two such types: sentences involving *presuppositions* and sentences involving *epistemic modals*. We will see that standard definitions of truth in terms of context change that get things right for presuppositional sentences get things wrong for epistemic modals, and standard definitions that get things right for epistemic modals get things wrong for presuppositions.

The second goal is to suggest a way of overcoming these problems. The solution will be to relativize truth to contexts that have more structure than the contexts that standard dynamic systems appeal to. This device allows one to give a unified treatment of truth in terms of context change which avoids the problems with previous attempts.

There are many kinds of dynamic semantics. There are Discourse Representation Theories (Kamp, 1981, van der Sandt, 1992), Dynamic Predicate Logics (Groenendijk & Stokhof, 1991), Dynamic Montague Grammar (Groenendijk & Stokhof, 1990a), Update Logics (Veltman, 1996), and more. These theories represent a range of kindred formal frameworks motivated by overlapping empirical phenomena.¹ We cannot do justice to all these theories here. Rather, I will confine myself to one kind of framework, namely the one that comes out of the tradition from Heim (1982), (1983).²

Section 2 outlines this kind of dynamic semantics and introduces CCPs. Section 3 argues for a particular conception of the truth conditions of presuppositional sentences. Section 4 turns to the case of epistemic modals and shows how to derive truth conditions for these kinds of sentences. Finally, in Section 5, these different treatments of truth are unified by introducing a rich notion of context.

¹The two main empirical motivations for the dynamic shift came from, on the one hand, certain kinds of anaphora in natural language (chiefly, so-called “donkey anaphora”), and on the other, presupposition projection. Some dynamic theories, notably that of van der Sandt (1992) and Geurts (1999), assimilate these phenomena to each other in important ways. For a useful introduction to some of these themes, see Kadmon (2001).

²Recent, sophisticated developments of this framework include Beaver (2001), Roberts (2003).

2 Dynamics

2.1 Classical CCPs

Dynamic semantics, in the tradition we are concerned with, builds on the seminal work of Stalnaker (1970), (1974), (1978) and Karttunen (1973), (1974). One fundamental insight of this lineage is that conversations take place against a background of shared information that both serves to constrain utterances in certain ways and at the same time is what utterance aim at contributing to.

Correspondingly, a context in this tradition is understood as a body of information shared by the conversational participants that evolves through discourse. We represent this information as a set of possible worlds, namely the set of worlds that are compatible with the information. In turn, the basic kind of CCP is simply a function from contexts to contexts, that is, from one set of worlds to another.

To implement this, we invoke the familiar idea of assigning sets of possible worlds to declarative sentences. Intuitively, they may be thought of as the propositions expressed by the sentences in question, that is, the set of worlds that verify the sentence, or the set of worlds in which the proposition expressed by the sentence is the case.³

We use $\llbracket \phi \rrbracket$ to denote the set of ϕ -worlds, the set of worlds in which (the proposition expressed by) ϕ is the case. Accordingly, we assign sets of worlds to declaratives in the following manner (where W is the set of all possible worlds):

- (1) a. $\llbracket \textit{Elephants have trunks} \rrbracket = \{w \in W : \textit{elephants have trunks in } w\}$.
- b. $\llbracket \textit{Carl loves Liz} \rrbracket = \{w \in W : \textit{Carl loves Liz in } w\}$.
- c. $\llbracket \textit{Most artists are selfish} \rrbracket = \{w \in W : \textit{most artists are selfish in } w\}$.

With this in the background, we can now define the most simple kind of CCP of the system. We use $[\cdot]$ to notate CCPs, letting $[\phi]$ denote the CCP of ϕ and $c[\phi]$ the result of applying it to a context c , which we are thinking of as a set of worlds. For sentences like those in (1), CCPs are defined as follows:

Classical CCP

If ϕ is classical, then

$$c[\phi] = c \cap \llbracket \phi \rrbracket.$$

This kind of CCP is ‘classical’ because it does not involve any genuinely dynamic effects. The sentences in (1) are non-dynamic, in this sense, because their only function is to add to the context the information they carry. As Groenendijk, Stokhof, and Veltman (1997) put it, this kind of CCP “uses the static notion of a proposition as the basic unit for the analysis of sentence meaning.” (181)⁴

³In this paper, I am not strict about the distinction between declarative sentences and the propositions expressed by them. Most importantly, I ignore the crucial point that propositions should be assigned to declaratives only relative to contexts, the main reason for this being the presence in natural language of indexical expressions such as pronouns and adverbs like *now*, *here*, etc. Strictly speaking, then, the discussion in this paper only pertains to the non-indexical fragment of natural languages. See Stalnaker (1998) for relevant discussion of indexicality in relation to common ground information.

⁴Cf. van Benthem (1986), Groenendijk and Stokhof (1990b), von Stechow and Gillies (2007).

As can be seen from the definition, the effect of a classical sentence is to discard from the context all the worlds that do not verify it. For example, the CCP of (1a) will discard all the worlds in which elephants do not have trunks. As long as we are only considering classical sentences, then, the effect of their CCPs is just to add propositional information to the context.

2.2 Presuppositional CCPs

The first kind of genuine dynamic effect we encounter springs from presuppositions. The dynamic conception of presuppositions sees them as *admittance conditions* on contexts in the sense that an utterance of a presuppositional sentence is felicitous only if its presuppositions are already included in the context.⁵ Presuppositional sentences are therefore associated with CCPs that are partial functions from contexts to contexts.

This project forces a particular view of the kind of contextual information that CCPs operate on. In order to correctly model the felicity conditions of presuppositional sentences by means of partiality, the contexts that CCPs take as their arguments must be representations of a particular kind of contextual information. Using Stalnakerian terminology, this kind of information is typically called *common ground*.

The common ground of a conversation is a collection of information that the participants mutually *accept* for the purpose of the exchange. The crucial feature of acceptance, in this sense, is that it is a non-factual propositional attitude that is weaker than belief. In other words, that p is accepted does not entail that p is true, nor does it entail that p is believed. As such, acceptance is akin to assumption or supposition.

Employing this notion of acceptance, Stalnaker (2002) defines common ground information as follows:

It is common ground that ϕ in a group if all members accept (for the purpose of the conversation) that ϕ , and all believe that all accept that ϕ , and all believe that all believe that all accept that ϕ , etc. (Stalnaker, 2002, 716)

So, the common ground consists of information that is accepted by everyone and which everyone mutually believes that everyone accepts.

The motivation for this conception is that, as Stalnaker has repeatedly emphasized, successful communication involving presuppositions does not require that the presuppositions be in fact true, nor does it require that the presuppositions be believed to be true by the participants:

Successful communication is compatible with presuppositions that are recognized to be false, but the information that they are being presupposed must be actually available, and not just assumed or pretended to be available. (Ibid.)

Consider for example the presuppositional sentences in (2).

⁵This conception of presuppositions was originally introduced by Karttunen (1974). Subsequently it was formalized by Heim (1983) in arguing against her predecessors, chiefly, Gazdar (1979) and Karttunen and Peters (1979).

- (2) a. Katie has started swimming.
 Presupposes: It is not the case that Katie used to swim.
 b. The chairman reads Proust every day.
 Presupposes: There is a chairman.
 c. Marvin’s sister lives in Munich.
 Presupposes: Marvin has a sister.

In each case felicity depends on the presupposition being accepted by the participants. For example, for my utterance of (2a) to be felicitous, it is sufficient that you are willing to accept for the purpose of the current exchange that it is not the case that Katie used to swim, even though you may well at the same time believe or even know that this is in fact false. And similarly for the other examples.

So to model how successful communication, or felicity, is influenced by presuppositions, CCPs must operate on common ground information. Accordingly, we assume that c represents common ground information:

Common Ground

$c = \{w \in W : \forall \phi \text{ s.t. all participants accept that } \phi \text{ and all believe that all accept that } \phi, \text{ and all believe that all believe that all accept that } \phi, \text{ etc.: } w \in \llbracket \phi \rrbracket\}$.

Using the familiar device of notating presuppositions by subscripts, we then define the CCP of a presuppositional sentence as a partial function:

Presuppositional CCP

- P1. $c[\phi_\psi] \neq \#$ iff $c \subseteq \llbracket \psi \rrbracket$.
 P2. If $c[\phi_\psi] \neq \#$, then $c[\phi_\psi] = c \cap \llbracket \phi \rrbracket$.

As seen from P1 the CCP of ϕ_ψ is defined if and only if all the worlds in the common ground are ψ -worlds. Or, following standard practice of thinking of the subset-relation as representing entailment, a presuppositional sentence is felicitous if and only if the common ground entails its presuppositions.⁶ In turn, this is another way of saying that an utterance of a presuppositional sentence is felicitous if and only if its presuppositions are accepted in the common ground.⁷ In turn, P2 specifies that, when defined, the CCP of ϕ_ψ proceeds like a classical CCP and discards all the worlds that do not comply with the assertive component of the sentence. For example, (2b) is defined if and only if it is common ground that there is a chairman; and if so, it discards from the common ground all the worlds in which the chairman does not read Proust every day.

Presuppositions engender genuine dynamics because their CCPs do more than just add information to the common ground. The partiality of the CCP of a presuppositional sentence represents a kind of *test*. The common ground information is tested to see whether it includes the presupposition. If the test is successful, the update proceeds classically. If the test fails, the update fails. In this sense, update failure is a representation of conversational infelicity.

⁶Cf. Karttunen (1974, 182).

⁷Needless to say, an assertion may be odd or inappropriate for other reasons than the failure of one or more of its presuppositions to be accepted. These other possibilities are ignored here.

3 Truth and Presuppositions

3.1 Heimian Truth

The dynamic shift in Heim's (1982), (1983) work was her proposal to take CCPs as basic and to derive truth-conditional meanings from them. More precisely, she argued that "the truth-conditional aspect of the meaning of any expression is predictable on the basis of its CCP," and that this meant that

a compositional assignment of CCPs to the sentences of a language can fully replace a compositional assignment of truth conditions of the sort normally envisaged by semanticists, without any loss of empirical coverage. (1983, 253)

Heim believed that this maneuver was necessary in order to achieve one of her major goals, namely to give a predictive and systematic account of presupposition projection, the phenomenon by which the presuppositions of complex sentences depend on those of their parts. In order to achieve this goal, Heim proposed to make the recursive interpretation of the language assign CCPs, rather than truth-conditional meanings. Concretely, she proposed to define connectives and other operators in terms of the CCPs of their constituents, rather than in terms of the truth conditions of their constituents, as is traditionally done.⁸

As such, the architecture of Heimian semantics illustrates an important point, namely that dynamic semantic theories are mainly designed for predicting and explaining discourse phenomena, rather than theorizing about truth-conditional meaning in the way of orthodox semantics. (I return to this in Section 4.)

Neither the complexities of presupposition projection, nor how Heim's account worked will concern us here. Nor will we be concerned with the question of whether her argument was in fact right. That is, whether in order to predict and explain presupposition projection, one has to let recursion operate on CCPs and hence derive truth conditions from the latter. What we are concerned with is whether truth *can* be from derived context change, and if so, how.

Let us first look at Heim's own proposal. Her suggestion was the following:

Now given that we think of files [i.e., contexts] as recording what has been said in a discourse, we ought to assume that saying something false produces a false file, and saying something true produces (ceteris paribus) a true file. Indeed, we might try to use this relationship between the truth of an utterance and the truth of a resulting file to define the former in terms of the latter. (1982, 330)

The thought behind this, then, is that, since contexts are bodies of information, contexts can be true or false of particular worlds. Bodies of information are represented as sets of worlds, namely the worlds that are compatible with the information in question. A world is compatible with a piece of information, just in case the information is true there. In other words, a context is true of a world just in case the world is included in it:

⁸Rooth (1987) and Soames (1989) presented an objection to this project, which has subsequently been endorsed by others, e.g., Schlenker (2008a), (2008b). Against this, Stokke (forthcoming) argues that the objection is unsuccessful.

Truth of a Context

c is true w.r.t. w iff $w \in c$.

A context is true of a world if and only if all the information is true there.⁹

Heim's suggestion was that a sentence is true just in case it does not produce a false context. And given what we have just seen, the proposal naturally becomes that a sentence is true at a world w if w survives updating with that sentence.

Heim spelled this out in the following definition of truth:¹⁰

Heimian Truth

If $c[\phi] \neq \#$ and $w \in c$, then

H1. ϕ is true w.r.t. w and c iff $w \in c[\phi]$.

H2. ϕ is false w.r.t. w and c iff $w \notin c[\phi]$.

The idea is simple. To see whether a sentence ϕ is true relative to a world w and a context c , check whether w survives updating c with ϕ . When w survive updating with ϕ ? When w is not discarded by the CCP of ϕ . When is w not discarded? When ϕ is the case there.

3.2 The Gap Constraint

There is a problem with this idea, though. The problem is that, since we have assumed that c represents common ground information, this definition incorrectly predicts that conversational infelicity is sufficient for a truth-value gap.¹¹

Heim's definition entails a condition on truth-value gaps. That is, it makes predictions for when sentences are neither true nor false. We want to make such predictions because we think, as did Strawson (1950) and before him Frege (1892), that presupposition failure gives rise to truth-value gaps. Heimian Truth entails Heimian Gappiness:

Heimian Gappiness

ϕ is neither true nor false w.r.t. w and c iff either

H3. $c[\phi] = \#$, or

H4. $w \notin c$.

Focus on H3, which states that a sentence is neither true nor false if updating with it fails. We are assuming that c represents common ground. Updating with a presuppositional sentence fails just in case its presupposition is not accepted in the

⁹Strictly speaking, of course, we cannot really speak of *truth* here, since truth is a notion that will be derived within the system that we are in the process of characterizing. But, following Heim, it does not harm, as long as we keep this proviso in mind. E.g., we can think of what is being defined here as the 'correctness' of a context with respect to a world.

¹⁰Cf. Heim (1982, 330), (1983, 253).

¹¹Heim (1982, 337–341) discussed a different problem for her definition of truth than the one I focus on here. Namely that, as a result of H4, if the context contains any false information, all subsequent sentences are predicted to be neither true nor false. More precisely, suppose that it is common ground that ψ , i.e., $c \subseteq \llbracket \psi \rrbracket$. And suppose that ψ is false at the actual world, i.e., $@ \notin \llbracket \psi \rrbracket$. Hence, $@ \notin c$, and so H4 predicts that all sentences are neither true nor false w.r.t. $@$ and c . (For the same reason, H4 is also responsible for the desirable prediction represented by the top left-hand cell of Table 1.)

common ground. But given that common ground information is characterized in terms of the weak attitude of acceptance, this means that a presuppositional sentence can be neither true nor false even if its presupposition is in fact true. And this is intuitively the wrong result.

In table form, here is what Heimian Truth predicts for the case of ϕ_ψ :

Table 1	ψ accepted	ψ not accepted
ψ false	gap	gap
ψ true	true/false	gap

As seen from the right-hand column of Table 1, Heimian Truth predicts that infelicity is sufficient for a truth-value gap. In particular, the problem here is with the bottom right-hand cell. That is, the prediction that even if its presuppositions are in fact true, a presuppositional sentence still receives a truth value gap if its presuppositions are not accepted in the common ground.

Suppose, for example, that even though Marvin does have a sister, we are in a context where it is common ground that he does not (perhaps the conversationalists falsely believe this.) Since the presupposition is not common ground, Heimian Truth therefore predicts that (2c) is neither true nor false relative to this context. And this is clearly wrong. Intuitively, given that Marvin in fact has a sister, (2c) should be true or false depending on whether his sister lives in Munich or not.

Intuitively, a presuppositional sentence should receive a truth value gap if and only if its presupposition is in fact false, regardless of whether it is accepted by the participants of the context. Another way of putting this, is in the form of a constraint on when to assign truth-value gaps:

Gap Constraint

ϕ_ψ is neither true nor false if and only if ψ is false.

The Gap Constraint is just another way of spelling out the Frege-Strawson conception of presuppositions. If we want to derive truth conditions from CCPs while honoring the Gap Constraint, we will need to look beyond Heimian Truth.¹²

3.3 Factual Truth

It is obvious that the source of the problem is that common ground information is allowed to distort the evaluation for truth, falsity, and gappiness. Another way of making the point is that when we want to evaluate presuppositional sentences (and indeed classical ones) for truth, we want to look at just the facts at the world

¹²In a similar vein, Stalnaker (1999, 11) points out that what Heimian dynamic semantics “leaves out is the possibility of evaluating the truth or falsity of what is said relative to possible situations that are not compatible with the prior context.” Stalnaker’s main complaint is that these systems “have blurred the distinction between force and content [...]” Stalnaker objects that, as a result, one cannot do justice to a view according to which “Sometimes when a statement rests on false presuppositions, the question of the actual truth of the statement does not arise, but other times a speaker may succeed in making a claim that is actually true or false, even when taking for granted, in making the claim, something that is in fact false.” At least on the face of it, such a view rejects the right to left direction of the Gap Constraint. By contrast, I am concerned with the problem of arriving at a definition of truth in terms of context change that respects (both directions of) the Gap Constraint.

of evaluation (the actual world), and not whatever information is accepted by the conversational participants.

But this does not mean that we cannot still think of truth as derived from how CCPs affect particular kinds of information. The facts at the actual world can be represented as a kind of information. Since a body of information is represented as the set of worlds compatible with it, the facts at the actual world, conceived of as a type of information, are represented by the singleton of the actual world. The actual world is the only world that is compatible with the body of information that uniquely describes it.

A definition that will make truth depend only on the facts, then, is given as follows:¹³

Factual Truth

If $\{w\}[\phi] \neq \#$, then

F1. ϕ is true w.r.t. w iff $w \in \{w\}[\phi]$.

F2. ϕ is false w.r.t. w iff $w \notin \{w\}[\phi]$.

Note that this definition does not relativize truth to a context, i.e., to a body of information. The reason is that the ‘context’ we are looking at here is just the maximal information uniquely characterizing the actual world. For the same reason, this definition of truth also makes more limited predictions concerning gappiness:

Factual Gappiness

ϕ is neither true nor false w.r.t. w iff $\{w\}[\phi] = \#$.

In particular, then, a presuppositional sentence ϕ_ψ is neither true nor false at w , according to this definition, if and only if updating $\{w\}$ with ϕ_ψ fails. And according to P1 – the definedness condition for Presuppositional CCPs – it fails if and only if $\{w\}$ does not entail ψ . That is, it fails if and only if w is not a ψ -world. In other words, Factual Truth satisfies the Gap Constraint.

We have solved our problem. Factual Truth produces the following table of predictions for presuppositional sentences:

Table 2	ψ accepted	ψ not accepted
ψ false	gap	gap
ψ true	true/false	true/false

As desired, gappiness is now completely independent of conversational success. Whether a sentence has a truth value or not is unaffected by whether an update of common ground information fails or succeeds.

In the next section we will see that Factual Truth nevertheless makes wrong predictions for other kinds of sentences.

¹³This definition is mentioned in passing by Schlenker (2008b, 5), although Schlenker’s motivation for it is does not stem from the problems I am concerned with here. The definition was also suggested to me independently by Dilip Ninan (p.c.).

4 Truth and Epistemic Modals

4.1 Modal CCPs

Epistemic modals comprise another class of expressions that give rise to specifically dynamic effects. Like presuppositions, epistemic modals are standardly seen as imposing tests on the context. But unlike presuppositional sentences, modal sentences are not seen as proceeding by way of classical updates when their tests succeed. Rather, epistemic modals are seen as purely procedural in the sense that they *only* involve tests.

The modals *might* and *must* are dual in the sense that *might* ϕ is equivalent to \neg *must* $\neg\phi$. For this reason, everything I will have to say will transpose from one to the other, *mutatis mutandis*, and I will therefore concentrate on *might* in what follows.

Consider the following examples:

- (3) a. Tina might be out of butter.
b. It might be snowing in Minsk right now.
c. Berlusconi might be convicted.

According to dynamic orthodoxy, *might* ϕ serves to check whether the prejacent ϕ is compatible with the common ground. So for example, the general suggestion is that the conversational function of (3a) is to test whether the common ground is compatible with the claim that Tina is out of butter.

This is standardly implemented by assigning to *might* ϕ the following CCP:¹⁴

Modal CCP

$$c[\textit{might } \phi] = \{w \in c : c[\phi] \neq \emptyset\}.$$

According to this clause, the CCP of *might* ϕ returns all the worlds from c just in case the result of applying the CCP of the prejacent to c is non-empty. That is, if there is at least one ϕ -world in c . If not, the context is reduced to absurdity, represented as the empty context.

This means that *might* ϕ is seen as engendering an inconsistency when ϕ is incompatible with the common ground. Analogously, consider the Classical CCPs defined in Section 2 above. Suppose ϕ is accepted in the common ground. So all worlds in c are ϕ -worlds. If we try to update with $\neg\phi$ in this situation, the result is the empty context, since the intersection of ϕ -worlds and $\neg\phi$ -worlds is empty.

Although an utterance of *might* ϕ in a context where $\neg\phi$ is common ground is thus seen as inducing an absurd information state, one that is compatible with no world, it is not straightforward to equate this kind of infelicity with the infelicity that occurs when a presupposition is not accepted in the common ground and which, as we saw, is represented by undefinedness. Hence, we will not assume that the kind of infelicity that arises from an utterance of a *might*-claim when its prejacent is incompatible with the common ground is identifiable to that which results from presuppositions not being accepted.

¹⁴Cf. Veltman (1996), van der Does, Groenenveld, and Veltman (1997), Groenendijk et al. (1997), Beaver (2001, ch. 5), Gillies (2001), von Stechow and Gillies (2007). The suggestion is also briefly described in Stalnaker (1970).

4.2 Non-Collapse

What can we say about the truth conditions of modal sentences, given what we have so far? Our preferred definition of truth at the moment is Factual Truth. Yet this definition will fail for the modal case. Plugging *might* ϕ into this definition, we derive the following prediction concerning when *might* ϕ is true:

$$\textit{might } \phi \text{ is true w.r.t. } w \text{ iff } w \in \{w\}[\textit{might } \phi] \text{ iff } w \in \llbracket \phi \rrbracket.$$

As shown here, *might* ϕ is predicted to be true if and only if the actual world survives updating with the modal sentence. But given our conception of Modal CCPs, this will be so if and only if the actual world is a ϕ -world. Hence, we make the clearly incorrect prediction that *might* ϕ is true if and only if ϕ is true. Clearly, this is unsatisfactory. For example, claiming that (3a) is true if and only if Tina is actually out of butter is obviously wrong.

One way of stating this problem is to note that Factual Truth, when applied to Modal CCPs, violates the following truism about epistemic modality:¹⁵

Non-Collapse

What is epistemically possible is sometimes not merely what is actually true.

Non-Collapse states that the truth conditions of *might* ϕ do not collapse into those of its prejacent ϕ . But this kind of collapse is precisely what is engendered by Factual Truth as applied to modals.

4.3 Fixed Point Truth and Reflexivity

Given what we have just seen, it is hardly surprising that dynamic semantic systems designed to handle modals usually do not appeal to Factual Truth. Instead, it is common to define truth in accordance with the idea that, as von Stechow and Gillies (2007) put it, “A sentence is true in a state of information iff the information it carries is already present in that state.” (p. 50)

More precisely, the suggestion is that a sentence ϕ is true relative to a context c if and only if c is a *fixed point* for the CCP of ϕ . In other words, ϕ is true relative to c if and only if c is left unchanged by its CCP:

Fixed Point Truth

$$\phi \text{ is true w.r.t. } c \text{ iff } c[\phi] = c.$$

As we saw, the Modal CCP of *might* ϕ either leaves the common ground unchanged or reduces it to the empty, or absurd, common ground. It leaves it unchanged if and only if its prejacent is compatible with the common ground. So Fixed Point Truth has the desired result that *might* ϕ is true relative to c if and only if ϕ is compatible with c .

Correspondingly, Fixed Point Truth has the consequence that *might* ϕ is not true if its prejacent is incompatible with the common ground, since that is the only case

¹⁵I am here following the terminology of Yalcin (2007, 1002).

in which its CCP does not leave the context unchanged – rather, it reduces it to absurdity. It might be thought that, intuitively, *might* ϕ should be false when its prejacent is incompatible with the information in the context. However, for the purpose of the argument I am interested in making at this stage, we do not have to take a stand on this matter. The observations I want to make pertain specifically to the predictions concerning when *might* ϕ is true.

The main point to note is that, as with presuppositional sentences, there are good reasons to think that common ground information is not the right kind of information to use for deriving truth conditions for epistemic modals. One way to see this is to consider another truism about epistemic modality, often called Reflexivity:¹⁶

Reflexivity

What is actually true is epistemically possible.

Reflexivity requires that if ϕ is actually true, then *might* ϕ is true. But if c in Fixed Point Truth represents common ground information, it is easy to see that Reflexivity is not validated.

Suppose for example that Tina is actually out of butter. So the actual world is a no-butter-world. But imagine further that the conversational participants we are considering firmly believe that Tina has plenty of butter. So all worlds in the common ground are butter-worlds. In other words, the actual world is not included in c . In this scenario, (3a) is predicted to be not true by Fixed Point Truth even though its prejacent is actually true. I take this to be the wrong result. In particular, note that Reflexivity is violated even in the absence of an explicit falsity condition for the modal. So if c represents common ground information, Fixed Point Truth cannot be the right way of deriving truth conditions for sentences involving epistemic modals.¹⁷

4.4 Truth, Consistency, and Support

Before proceeding, it will be useful to address two potential worries at this point. The first comes from the fact that, as noted earlier, the chief aim of dynamic semantic systems is typically not to make predictions about truth and falsity, but rather to theorize about certain conversational effects, or discourse phenomena. Groenendijk et al. (1997) write,

Truth and falsity concern the relation between language and the world. In dynamic semantics it is information about the world rather than the world itself that language is related to. Hence, the notions of truth and falsity cannot be expected to occupy the same central position as they do in standard semantics. More suited to the information oriented approach are the notions of *consistency* and *support*. (192)

¹⁶Cf. Yalcin (2007, 1002).

¹⁷It might be thought that Reflexivity is entailed by Fixed Point Truth. For given that $c[\phi] = c$ iff $c \subseteq \llbracket \phi \rrbracket$, it follows that if ϕ is true according to Fixed Point Truth, then *might* ϕ is also true according to Fixed Point Truth. But notice that Reflexivity speaks of *actual* truth. It may be that c contains information false at the actual world and hence $@ \notin c$, as in the example in the text. In that case, even though it does hold that if $c[\phi] = c$, then $c[\textit{might } \phi] = c$, Reflexivity is still not satisfied.

The point here is that, as dynamic semanticists, we should be less interested in providing an adequate characterization of truth and falsity and more interested in characterizing conversational effects. And for this project, we might need to appeal to notions that have some superficial similarities with truth and falsity, but which are not to be equated with these traditional notions.

The notions of consistency and support that Groenendijk et al. define have this quality. Without reviewing the details of their semantics, the notions can be roughly glossed as follows: ϕ is consistent in a context c just in case its CCP, if defined, does not reduce c to the empty context, and ϕ is supported by c just in case its CCP leaves c unchanged. In other words, their notion of support is a version of Fixed Point Truth.¹⁸ And similarly, their notion of consistency is roughly speaking just the one we referred to above when noting that *might* ϕ is seen as inducing an inconsistency when its prejacent is incompatible with the common ground.

So the important point to note is that some dynamic semanticists think that (something like) Fixed Point Truth, while needed to handle particular types of discourse phenomena, should not be taken as defining truth. On this view, then, Fixed Point Truth is not seen as the device by which the Heimian project of defining truth in terms of context change is carried out. Hence, it is unimportant that it does not do justice to all our intuitions about truth.

This attitude I take to be completely coherent. It will no doubt be fruitful to be able to characterize precisely such notions as conversational consistency and support. And one does not have to accept that this project either replaces or conflicts with the Heimian project of installing the dynamic conception of meaning at the central place traditionally occupied by truth-conditional meaning. That is, one may hold that the project of defining truth in terms of context change should be carried out independently of the endeavors to capture discourse-based notions.

However, our question is whether *truth* can be derived from context change. Following Heim, we mean by ‘truth’ here the bread and butter notion of truth; that is, the notion of truth that was at the foundation of classical semantics and that Heim claimed to be definable in terms of CCPs in her new, dynamic system. What I have argued above is that for that project, Fixed Point Truth fails when c represents common ground.

4.5 Non-Representationalism

The second worry stems from a particular view concerning epistemic modals that many dynamic semanticists see themselves as motivated by. For example, having adopted Fixed Point Truth, von Stechow and Gillies (2007) comment on how to understand the proposal as follows:

We also want to point out that although it can make perfect sense to assign truth-conditions to modal expressions – they, like the other sentences in our intermediate language, are true in a state iff that state is a fixed-point of the CCP – those truth-conditions are not about whether a proposition expressed by the sentence is true. So there is room to allow that epistemic modals have and contribute to truth-conditions, without requiring them

¹⁸As Groenendijk et al. (1997, 192) point out, the right hand side of Fixed Point Truth is merely a sufficient condition for their notion of support. But we can ignore this here.

to traffic in and express propositional contents. This is yet another way of exploring the idea that epistemic modals involve a kind of comment about the information carried by their prejacent. (55)

In other words, von Fintel and Gillies endorse a particular philosophical position on the nature of epistemic modality in natural language, namely that epistemic modals do not “traffic in and express propositional contents.” Call this position *Non-Representationalism* about epistemic modals.¹⁹

It is clear from their discussion that von Fintel and Gillies’ claim that Non-Representationalism is consistent with assigning truth conditions is to be interpreted in the very spirit that we just saw expressed by Groenendijk et al. concerning the project of characterizing conversational notions such as consistency and support. That is, I take it to be clear that von Fintel and Gillies are not claiming that Non-Representationalism is consistent with assigning conditions for ‘real’ truth, that is, truth in the sense that was traditionally seen as the foundation of meaning.²⁰

I am not making a case against Non-Representationalism about epistemic modals. It might be that the right philosophical view about claims like those in (3) is that they are not truth-apt in the traditional sense. If so, then *a fortiori* we should not be interested in deriving truth conditions for modals from their CCPs. But equally obviously, this does not mean that we should not be interested in doing so for other kinds of sentences of the language, e.g., classical and presuppositional ones.

Yet, I will continue as if Non-Representationalism is false. That is, I will assume that we want to derive truth conditions (of the substantial kind) for epistemic modals. Doing so allows us to potentially accommodate both sides. If one subscribes to Non-Representationalism for epistemic modals (or any other class of expressions of the language), one may simply delete the relevant truth conditions that I shall be exploring in what follows from the final semantics for the language. If one does not subscribe to Non-Representationalism, one should be the more happy with these explorations.

4.6 Epistemic Truth

We may take it therefore that we must validate both Non-Collapse and Reflexivity. And indeed, there is a very common conception of the truth conditions of epistemic modals that does so. Instead of saying that *might* ϕ is true if and only if ϕ is compatible with what is accepted by the conversational participants, the more common thing to say is that *might* ϕ is true if and only if ϕ is compatible with what is *known* by the participants. Correspondingly, it is typically assumed that if the prejacent is incompatible with what is known, the modal claim is false, and not just not true.

This means that we are looking at yet another kind of contextual information. Not common ground, and not the maximal information that characterizes only one

¹⁹Another version of this view is found in Yalcin (2011).

²⁰Similarly, Yalcin (2011, 328) advocates a “distinction between two notions of truth – the notion of truth belonging to formal semantics and the notion of truth belonging to the theory of content” and argues that “The expressivist can define a recursive definition of truth at a point of evaluation in the usual way for his discourse, thereby preserving compositionality, but he can reject the demand to give truth-conditions in the more robust sense, the one appropriate to ordinary factual informational content.”

world. Rather, we are looking at what I shall call *epistemic context*. We notate this kind of context as ec , and define it as follows:

Epistemic Context

$$ec = \{w \in W : \forall \phi \text{ s.t. all participants know that } \phi: w \in \llbracket \phi \rrbracket\}.$$

The epistemic context delineates the set of worlds compatible with what is known by the participants. Given this, we can reshape the fixed point definition of truth:

Epistemic Truth

E1. ϕ is true w.r.t. ec iff $ec[\phi] = ec$.

E2. ϕ is false w.r.t. ec iff $ec[\phi] \neq ec$.

According to Epistemic Truth, a sentence ϕ is true relative to a body of knowledge ec if and only if ec is a fixed point for its CCP, and false if and only if it is not.

Epistemic Truth gives the right results for epistemic modals. Let me briefly explain why. Note what we derive when we plug *might* ϕ into Epistemic Truth:

might ϕ is true wrt. ec iff $ec[\textit{might } \phi] = ec$ iff $ec \cap \llbracket \phi \rrbracket \neq \emptyset$.

might ϕ is false wrt. ec iff $ec[\textit{might } \phi] \neq ec$ iff $ec \cap \llbracket \phi \rrbracket = \emptyset$.

This is precisely what we wanted: *might* ϕ is true relative to a body of knowledge if and only if its prejacent is compatible with it. And *might* ϕ is false if and only if its prejacent is incompatible with what is known.

In contrast to the previous idea of defining a modal sentence as true when the common ground information is a fixed point for its CCP, taking the relevant information to be the epistemic context makes the right predictions concerning our intuitions about the truth conditions of this class of sentences. In particular, while Factual Truth invalidated Non-Collapse and Fixed Point Truth (when applied to common ground information) invalidated Reflexivity, Epistemic Truth validates both principles.

Non-Collapse is satisfied because it is not ruled out that ec will at least sometimes contain more than one world. Indeed, it is overwhelmingly plausible, that ec *always* contains many worlds, since our knowledge is never so specific as to rule out all but the actual world. Reflexivity is satisfied because it follows from the factivity of knowledge that the actual world is always compatible with what is known. To say that a world w is compatible with what is known is to say that everything that is known is true at w . Given factivity, anything that is known is actually true. Hence, the actual world is always compatible with what is known. That is, the actual world is a member of any epistemic context. Consequently, what is actually true is always epistemically possible.

Epistemic Truth is an attractive way of deriving truth conditions for epistemic modals from their CCPs. However, Epistemic Truth cannot be the right way of deriving truth conditions for non-modal sentences. Neither classical nor presuppositional sentences are treated correctly by claiming that they are true just in case they leave the epistemic context unchanged.

A classical sentence ϕ will leave the epistemic context unchanged if and only if all the worlds are ϕ -worlds. Hence, Epistemic Truth would predict that a classical

sentence is true if and only if it is known. This prediction is incorrect both as a prediction about the truth conditions of classical sentences, and as a prediction about knowledge. Classical sentences do not depend for their truth or falsity on whether they are known or not. And further, even though knowledge is factive, we are not omniscient.

A presuppositional sentence will leave the epistemic context unchanged if and only if both its presuppositions and assertive component are true at all the worlds. So, if taken as giving truth conditions for presuppositional sentences, Epistemic Truth implies that a presuppositional sentence is true if and only if both its presuppositions and its assertive component are known. Again, this is clearly the wrong result.

While Factual Truth gives the right results for classical and presuppositional sentences but not for epistemically modal sentences, Epistemic Truth gives the right results for epistemically modal sentences but not for classical and presuppositional sentences.

5 Unification

We have found a way of deriving truth from context change for classical and presuppositional sentences. And we have found a way of deriving truth from context change for modal sentences. But the two are disjoint. They rely on two different ways of making truth depend on CCPs. One of them involves looking at maximally specific factual information; the other involves looking at what is known.

Can we mend this disunity while preserving the appealing features of each? I think the answer is ‘yes’.

5.1 Disunited Truth

Let us collect the different ideas we have found to be attractive. The truth conditions of classical and presuppositional sentences are given by Factual Truth, whereas the truth conditions of epistemic modals are given by Epistemic Truth. Putting this together, we have the following conception of truth:

Disunited Truth

D1. If ϕ is classical or ϕ is presuppositional, then

If $\{w\}[\phi] \neq \#$, then

D1a. ϕ is true w.r.t. w iff $w \in \{w\}[\phi]$

D1b. ϕ is false w.r.t. w iff $w \notin \{w\}[\phi]$.

D2. If ϕ is epistemically modal, then

D2a. ϕ is true w.r.t. ec iff $ec[\phi] = ec$

D2b. ϕ is false w.r.t. ec iff $ec[\phi] \neq ec$.

The truth conditions in D1 and D2 are disunited in two respects. Their left-hand sides make reference to different parameters; and their right-hand sides state different conditions. Of these two features, the latter is wholly unproblematic. We are

used to the suggestion that truth may depend on radically different things depending on the type of sentence we are looking at. But the fact that the left-hand sides of the clauses in Disunited Truth relativize truth to different parameters may seem more unappealing.

A comparison with traditional semantics for modal logics is instructive here. In this kind of semantics, one typically gives truth conditions like the following:

Modal Truth

M1. ϕ is true w.r.t. w iff $w \in \llbracket \phi \rrbracket$.

M2. $\diamond\phi$ is true w.r.t. w iff $\exists w'$ s.t. $R(w, w')$ and $w' \in \llbracket \phi \rrbracket$.

The right-hand sides of M1 and M2 not only state different conditions, but state radically different types of conditions. Some sentences depend for their truth only on the actual world; some depend on other worlds, related to the actual world in specific ways.

But note that the left-hand sides of M1 and M2 are perfectly unified. That is, both of them relativize truth to the same parameter, namely a possible world. The notion of truth defined by M1 and M2 is the same, it is truth at a world. This unity is what is missing in D1 and D2. The left-hand sides of D1 and D2 do not relativize truth to the same parameters. One defines truth relative to a possible world; the other defines truth relative to an epistemic context. The notions of truth defined by D1 and D2 are not the same. One is truth at a world; the other is truth at a state of knowledge.

Formally speaking, we might be satisfied with our system involving two (or more) different notions of truth, that is, with the formal equivalent of the view that while classical and presuppositional sentences are true or false in one sense, epistemically modal sentences are true or false in another sense. It is not within the scope of this paper to settle the issue of whether this stance is ultimately acceptable. Yet, I will take it to be clear that many will insist that truth should be unified, that there should be one notion of truth applying across the language. We should therefore look for a way of achieving this result.

5.2 United Truth

Is there a way of unifying the left-hand sides of our respective clauses? It is clear that simply imposing one of them on the others will not do. For example, given the right-hand sides of the clauses in D2, modal truth cannot be relativized simply to a world. That would mean relativizing truth to parameters that play no role in the condition for when truth obtains.

So what should truth be relativized to, if not simply to a world or an epistemic context? Put differently, what are the *points of evaluation* relative to which sentences of the language should be assigned truth, falsity, or neither?

The answer is: truth should be relativized to points that have structure. In particular, we can relativize truth to tuples consisting of the different parameters that will be made reference to in the various truth conditions for different types of sentences. Think of a point of evaluation as a situation in which a conversation takes

place. A conversation takes place in a possible world, and it involves both a common ground and an epistemic context. Let us call such a context a *conversational setting* (or just ‘setting’ for short):

Conversational Setting

$$s = \langle w_s, cg_s, ec_s \rangle.$$

The points of our system, then, are conversational settings. A setting is a tuple of the world in which the conversation takes place along with different kinds of information in play.²¹ Some types of information are used to characterize felicity and other conversational effects. Some are used to specify truth conditions.

Truth can then be relativized to conversational settings in the following obvious way:

United Truth

U1. If ϕ is classical or ϕ is presuppositional, then

If $\{w_s\}[\phi] \neq \#$, then

U1a. ϕ is true w.r.t. s iff $w_s \in \{w_s\}[\phi]$

U1b. ϕ is false w.r.t. s iff $w_s \notin \{w_s\}[\phi]$.

U2. If ϕ is epistemically modal, then

U2a. ϕ is true w.r.t. s iff $ec_s[\phi] = ec_s$

U2b. ϕ is false w.r.t. s iff $ec_s[\phi] \neq ec_s$.

Truth is now unified. The same notion of truth is defined by all the clauses in U1-U2. This notion of truth is, as we might say, truth at a setting.

According to United Truth, truth depends on the conversational setting. For some types of sentences, it is the world of the setting that is important; for others it is the epistemic context. But in each case, truth is derived from context change. That is, the truth conditions of a sentence are derived from the way its CCP affects a particular type of information.

According to U1, the truth, falsity, or gappiness of classical and presuppositional sentences depends on what is the case at the actual world. Accordingly, the Gap Constraint is satisfied. In turn, U2 makes the truth or falsity of epistemically modal sentences depend on what is known. For reasons we have seen earlier, this means that both Non-Collapse and Reflexivity are satisfied.

6 Conclusion

Dynamic semantics proposes to derive truth from context change. We saw that the original idea of Heimian Truth made incorrect predictions for presuppositional sentences. Truth, in both the classical and presuppositional cases, depends on the

²¹Ultimately, more parameters of conversational settings may be required. For example, to handle indexicality, we may want to add, in addition to the world, Kaplan’s (1989) parameters of speaker, location, and time of utterance (but see Stalnaker, 1998.) Further, some treatments (e.g., Heim, 2008) of the persons of pronouns require introducing a parameter for the addressee of the utterance.

facts, not on contextual information. Factual Truth captured this, but at the same time could not be the right way of deriving truth conditions for epistemic modals. Rather, the truth conditions of epistemic modals depend on what is known, and not on how things actually are.

To unify these different ways in which truth depends on different things, while preserving the claim that truth itself is one thing, we relativized truth to conversational settings, that is, points of evaluation representing several aspects of the situation in which a conversation takes place.

The unification of truth is an advantageous outcome of adopting this framework. The watershed between truth conditions and conditions for felicity and other discourse-specific notions is another advantage. The assignment of truth values is unaffected by conversational status; and the assignment of conversational status is unaffected by truth value.

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