

A PARALLEL ACCOUNT OF EPISTEMIC MODALS AND PREDICATES OF PERSONAL TASTE*

Tamina Stephenson,
Massachusetts Institute of Technology

tamina@mit.edu

Abstract

Epistemic modals (*might*, *must*) and predicates of personal taste (*tasty*, *fun*) show parallel behavior related to whose knowledge or taste is relevant for their interpretation. To account for the similarity, I extend Lasersohn's (2005) account of predicates of personal taste to epistemic modals, using his "judge" parameter for the person whose knowledge is relevant. Along the way, I argue for modifications to Lasersohn's view. I also propose a way to place the account in a Stalnakerian theory of conversation.

1 Introduction

An analytical puzzle arises in a similar form for both epistemic modals and predicates of personal taste. In the rest of this section, I will briefly introduce this puzzle and summarize some conclusions drawn in earlier work.

It has been widely assumed since Kratzer (1977) that the modal sentence in (1a) has an epistemic interpretation roughly equivalent to (1b).

- (1) (a) It might be raining.
(b) In some world compatible with what is known in the actual world, it's raining.

This raises the question, though, of whose knowledge is relevant – a question which has been much debated in the literature and seems to have no easy answer.¹ In particular, it has been shown (see, e.g., MacFarlane 2006) that if "what is known" is taken to mean what is known by the speaker, the meaning of (1a) becomes too weak, and if it is taken to mean what is known by anyone at all or by people in general, the meaning becomes too strong. If it is taken to mean what is known by some particular, contextually salient individual or group, then we cannot explain a phenomenon that I will discuss below involving disagreement. (Note that if "what is known" is replaced with "the available evidence," then the question simply becomes that of who the evidence must be available to, and the exact same puzzles arise.)

Lasersohn (2005) discusses predicates of "personal taste" such as *tasty* and *fun*, as in (2).

- (2) This roller coaster is fun.

The sentence in (2) seems to mean that the roller coaster gives rise to a certain kind of pleasant experience. This raises the question of whose experience is relevant. Lasersohn shows that

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¹ See, e.g., Moore (1962), Hacking (1967), DeRose (1991), Egan, Hawthorne & Weatherston (2005), von Fintel & Gillies (2006), and MacFarlane (2006).

if the relevant experiencer is taken to be the speaker, the meaning is too weak, and if it is taken to be everyone or people in general, the meaning becomes too strong. He also shows that if the experiencer is taken to be some particular, contextually salient individual, then once again we cannot explain the phenomenon of disagreement to be discussed below.

We have two very similar questions in different domains: the question of whose knowledge is relevant for an epistemic modal, and that of whose taste or experience is relevant for a predicate of personal taste. Both questions are difficult to answer, and they are difficult for similar reasons, so I suggest that we start by assuming that they are part of a single puzzle.

The rest of the paper is organized as follows: In Section 2, I show two parallels between epistemic modals and predicates of personal taste. In Sections 3–4, I present Lasersohn’s (2005) analysis of predicates of personal taste, argue for modifications to it, and extend it to epistemic modals. In Section 5, I develop an adapted Stalnakerian theory of conversation that goes together with the proposed semantic account. I discuss further predictions of the analysis in Section 6, and then conclude in Section 7.

2 Empirical Parallels between Epistemic Modals and Predicates of Personal Taste

Besides giving rise to a similar difficulty for the analyst, epistemic modals and predicates of personal taste also show parallel behavior that lends support to a unified account. Two such parallels arise in attitude reports and in dialogues involving disagreement.²

2.1 Attitude reports

When an epistemic modal is embedded under *think*, the relevant knowledge is understood to be that of the subject. For example, in (3), *might* expresses Sam’s mental state, so that the sentence says, roughly, that it is compatible with Sam’s beliefs that it’s raining.

(3) Sam thinks it might be raining.

Similarly, a predicate of personal taste embedded under *think* is naturally understood as expressing the experience of the subject. For example, (4) is most easily understood as saying that the roller coaster is fun for Sam.

(4) Sam thinks that the roller coaster is fun.

Unlike with epistemic modals, this link is actually not obligatory with predicates of personal taste. I will return to this issue in Section 4.2.

These facts extend to cases where the subject is a quantifier. For example, (5) says that for each boy x , it follows from x ’s beliefs that x is stupid, and (6) says that for each boy x , x ’s dinner tastes good to x .

(5) [Every boy] _{i} thinks he _{i} must be stupid.³

(6) [Every boy] _{i} thinks his _{i} dinner is tasty.

2.2 Contradictions and disagreements

In making or assessing assertions involving epistemic modals, speakers seem to be allowed to only consider their own knowledge. In (7), for example, it seems acceptable for Sam to utter

² Moltmann (2005) independently makes similar observations about the parallels between predicates of personal taste and epistemic modals, and gives brief suggestions towards a parallel analysis.

³ This example is based on ones from Speas (2004), who argues that the modal base is linked to the bound variable but does not link the effect to attitude predicates. Similar examples are also used in von Stechow & Iatridou (2003) to show that quantifiers can bind pronouns across an epistemic modal.

(7a) if it is compatible with his knowledge that Bill is in his office. It is equally acceptable for Sue to utter (7b) if it is not compatible with her knowledge that Bill is in his office.

- (7) Mary: Where's Bill?
 Sam: I'm not sure. (a) He might be in his office.
 Sue: (b) Nuh-uh, he can't be. (c) He never works on Fridays.
 [OR] No, he can't be. He never works on Fridays.

Similarly, in (8), it seems acceptable for Sam to utter (8a) if the cake tastes good to him, and equally acceptable for Sue to utter (8b) if the cake does not taste good to her.

- (8) Mary: How's the cake?
 Sam: (a) It's tasty.
 Sue: (b) Nuh-uh, it isn't tasty at all!
 [OR] No it isn't, it tastes terrible!

Although each speaker in (7)–(8) seems to be expressing their own knowledge or experience, this cannot be a case of first-person indexicality given that dialogues like (9) are incoherent.

- (9) Sam: I'm a doctor.
 Sue: # No, I'm not! / # Nuh-uh, I'm not a doctor!

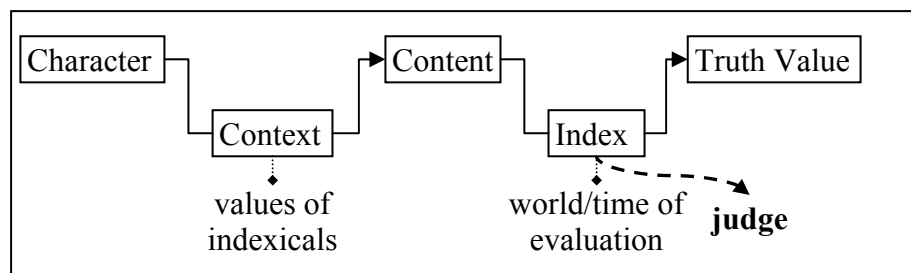
3 Lasersohn's Analysis of Predicates of Personal Taste

In this section I will discuss Lasersohn's (2005) analysis of predicates of personal taste, which I will revise and extend in Section 4 to cover epistemic modals.

3.1 Lasersohn's system

Lasersohn (2005) proposes an account of predicates of personal taste using an extra parameter of evaluation, an individual "judge," which is the person whose taste or experience is relevant for a predicate of personal taste. Crucially, the new parameter is part of Kaplan's (1989) "index," not "context," as illustrated in (10). This means, most importantly, that propositions are now construed as sets of world-time-individual triples, where the individual is the judge.

(10)



I will present a somewhat reformulated version of Lasersohn's account, but the two are equivalent. I assume the two rules of semantic interpretation in (11) in the style of Heim & Kratzer (1998). Note that normal individuals and the value of the judge parameter are both of type *e*. (Worlds are of type *s* and times are of type *i*.) I will write $\llbracket \alpha \rrbracket^{u, w, t, j}$ for the denotation of α in context of utterance *u* at world *w*, time *t*, and judge *j*.

- (11) Given a complex expression γ that is formed by combining α and β :
- (a) If $\llbracket \beta \rrbracket^{u, w, t, j} \in \text{Dom} (\llbracket \alpha \rrbracket^{u, w, t, j})$, then $\llbracket \gamma \rrbracket^{u, w, t, j} = \llbracket \alpha \rrbracket^{u, w, t, j} (\llbracket \beta \rrbracket^{u, w, t, j})$
- (b) If $[\lambda w'_s . [\lambda t'_i . [\lambda j'_e . \llbracket \beta \rrbracket^{u, w', t', j'}]]] \in \text{Dom} (\llbracket \alpha \rrbracket^{u, w, t, j})$, then $\llbracket \gamma \rrbracket^{u, w, t, j} = \llbracket \alpha \rrbracket^{u, w, t, j} ([\lambda w'_s . [\lambda t'_i . [\lambda j'_e . \llbracket \beta \rrbracket^{u, w', t', j'}]]])$

On Lasersohn’s view, predicates of personal taste such as *fun* and *tasty* have the lexical entries in (12). For example, at a world w , time t , and judge j , *fun* denotes the (characteristic function of) the set of individuals that are fun for j in w at t .

- (12) $\llbracket \text{fun} \rrbracket^{u; w, t, j} = [\lambda x_e . x \text{ is fun for } j \text{ in } w \text{ at } t]$
 $\llbracket \text{tasty} \rrbracket^{u; w, t, j} = \llbracket \text{taste good} \rrbracket^{u; w, t, j} = [\lambda x_e . x \text{ tastes good to } j \text{ in } w \text{ at } t]$
 $\llbracket \text{taste terrible} \rrbracket^{u; w, t, j} = [\lambda x_e . x \text{ tastes terrible to } j \text{ in } w \text{ at } t]$

I will treat multi-word expressions such as *taste good* or *taste terrible* as unanalyzed wholes, although of course they should ultimately be given a compositional analysis.

Non-taste predicates such as *doctor* have meanings that do not depend on the judge parameter, but only on the world and time, as shown in (13). Similarly, indexicals depend only on the context and not the index, as shown in (14).

- (13) $\llbracket \text{doctor} \rrbracket^{u; w, t, j} = [\lambda x_e . x \text{ is a doctor in } w \text{ at } t]$

- (14) $\llbracket \text{I} \rrbracket^{u; w, t, j} = \text{the speaker of } u$
 $\llbracket \text{you} \rrbracket^{u; w, t, j} = \text{the addressee of } u$
 $\llbracket \text{now} \rrbracket^{u; w, t, j} = \text{the time of } u$

In constructions like *fun for Sam* or *tastes good to Sue*, on Lasersohn’s view, the preposition *for* or *to* takes a property P and an individual y as arguments and shifts the judge parameter to y , as shown in (15). Note that in this system, the type of a property is $\langle s, \langle i, \langle e, et \rangle \rangle \rangle$, since the judge parameter adds an extra “e.”

- (15) $\llbracket \text{for} \rrbracket^{u; w, t, j} = \llbracket \text{to} \rrbracket^{u; w, t, j} = [\lambda y_e . [\lambda P_{\langle s, \langle i, \langle e, et \rangle \rangle} . P(w)(t)(y)]]^4$

In effect, this changes a judge-dependent property to a non-judge-dependent one. For example, *fun for Sam* simply denotes the set of things that are fun for Sam, as shown in (16). (In Section 4.2, I will derive *fun for Sam* in a different way.)

- (16) $\llbracket \text{fun for Sam} \rrbracket^{u; w, t, j} = \llbracket \text{for} \rrbracket^{u; w, t, j} (\llbracket \text{Sam} \rrbracket^{u; w, t, j}) ([\lambda w'_s . [\lambda t'_i . [\lambda j'_e . \llbracket \text{fun} \rrbracket^{u; w', t', j'}]]])$
 $= [\lambda x_e . x \text{ is fun for Sam in } w \text{ at } t]$

Finally, Lasersohn assumes that speakers typically make and assess assertions using an “auto-centric” perspective – taking themselves to be the judge. However, he assumes that speakers can also take an “exocentric” perspective if someone else’s perspective is particularly salient.

3.2 Consequences of Lasersohn’s account

Now I will show how Lasersohn’s account explains the phenomena discussed in Section 2 for the case of predicates of personal taste.

First, recall that when a predicate of personal taste is embedded in an attitude report, the most natural interpretation is one where the judge is the attitude holder. For example, (4), repeated in (17), is normally understood to mean roughly that the roller coaster is fun for Sam.

- (17) Sam thinks that the roller coaster is fun. [=(4)]

According to Lasersohn, the linked reading is possible because Sam’s perspective as the attitude holder is automatically salient.

Second, recall that speakers may have disagreements of the form in (8), repeated in (18).

- (18) Mary: How’s the cake?
 Sam: (a) It’s tasty.

⁴ Lasersohn (2005, Sec. 5) introduces *for* syncategorematically with the same effect, essentially stipulating that given a VP α and DP β , where β denotes an individual b , $\llbracket \alpha \text{ for } \beta \rrbracket^{u; w, t, j} = \llbracket \alpha \rrbracket^{u; w, t, b}$.

Sue: (b) Nuh-uh, it isn't tasty at all!
 [OR] No it isn't, it tastes terrible!

Lasersohn's final assumption, which I will share, is that speakers disagree (as indicated by the use of expressions such as *no it isn't*) if and only if the Kaplanian contents of their assertions contradict each other. This assumption is essentially an extension of the empirical observation that a dialogue like (19) is possible but (20) is not. In (19), Sue's assertion has the same content but not the same character as the negation of Sam's assertion, whereas in (20) Sue's assertion has the same character but not the same content as the negation of Sam's assertion.

(19) Sam: I'm a doctor.
 Sue: No, you're not!

(20) Sam: I'm a doctor.
 Sue: # No, I'm not! [= (9)]

Going back to (18), Sam's assertion (18a) and Sue's assertion (18b) do indeed have contradictory contents in Lasersohn's system: the content of (18a) is the proposition $\{ \langle w, t, j \rangle : \text{the cake tastes good to } j \text{ in } w \text{ at } t \}$, and the content of (18b) is the proposition $\{ \langle w, t, j \rangle : \text{the cake does not taste good to } j \text{ in } w \text{ at } t \}$, thus correctly predicting that disagreement is possible.

This also correctly predicts that (21) is not a possible dialogue if Sue is expressing her own taste (though it is possible on an irrelevant reading where Sue is accusing Sam of speaking insincerely). This is because the indexical *me* depends on the context rather than the index, and so the content of Sam's assertion in (21) is the proposition $\{ \langle w, t, j \rangle : \text{the cake tastes good to Sam in } w \text{ at } t \}$. The content of Sue's assertion in (21) (assuming she is expressing her own taste) is $\{ \langle w, t, j \rangle : \text{the cake does not taste good to } j \text{ in } w \text{ at } t \}$, so the two are not contradictory.

(21) Sam: The cake tastes good to me.
 Sue: # No it doesn't, it tastes terrible!

4 Extending the Analysis to Epistemic Modals

In this section, I will extend Lasersohn's system to epistemic modals, which will help explain the parallels between epistemic modals and predicates of personal taste discussed in Section 2. My key claim will be that the "judge" is the person whose knowledge is relevant for the interpretation of epistemic modals. In Section 4.1, I will give a preliminary analysis that follows Lasersohn's system very closely. In Section 4.2, I will bring up a contrast between epistemic modals and predicates of personal taste that poses a problem for the preliminary analysis. In Section 4.3, I will revise the account to capture both the similarities and the differences between the two classes.

4.1 First attempt

The most direct way to extend Lasersohn's system is to give epistemic modals the lexical entries in (22) (putting aside some irrelevant complications of modal semantics), making them fully parallel to predicates of personal taste.⁵

(22) $\llbracket \text{might} \rrbracket^{u, w, t, j} = [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{there is some world } w' \text{ compatible with } j \text{'s knowledge in } w \text{ at } t \text{ such that } p(w')(t)(j) = 1]$

⁵ The proposal in 4.1 is the account I gave in Stephenson (2005). Egan (to appear) independently proposes what is essentially the same account for epistemic modals, as a form of a relativism. My view and Egan's differ from the relativist accounts of MacFarlane (2006) and Egan, Hawthorne & Weatherson (2005) in not relativizing the time of knowledge along with the "knower" (although as time is not Egan's focus, it is not clear whether he intends this to be significant).

$$\llbracket \text{must} \rrbracket^{u; w, t, j} = [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{for every world } w' \text{ compatible with } j' \text{'s knowledge in } w \text{ at } t, p(w')(t)(j) = 1]$$

With these meanings, a sentence of the form “might p,” for example, is true at a world-time-judge triple $\langle w, t, j \rangle$ if and only if it is compatible with j 's knowledge in w at t that p is true.

Together with the assumptions laid out in Section 3, this accounts for the fact that epistemic modals, like predicates of personal taste, can be linked to the subject of attitude predicates and give rise to disagreements with each speaker taking their own perspective.

4.2 A problem

The account sketched above is designed to account for the parallels between epistemic modals and predicates of personal taste, but there is a crucial difference between the two classes that it cannot account for. In attitude reports containing predicates of personal taste, the judge of the predicate can be linked to the attitude holder, but does not have to be, whereas with epistemic modals the link is obligatory. For example, in (23), where the cat's perspective is salient, *tasty* can be understood as “tastes good to the cat.” In (24), however, *might* cannot be understood as “compatible with the dog's knowledge” even though the dog's perspective is salient.

- (23) Mary: How's that new brand of cat food you bought?
 Sam: I think it's tasty, because the cat has eaten a lot of it.
[Kai von Fintel, p.c.]

- (24) Mary: Wow, the dog really likes the dog food you're feeding him.
 Sam: # I think it might be table scraps.

In other words, (24) would not be a coherent dialogue in a context where it is common knowledge that Sam knows what is in the dog's bowl, whereas (23) can be a coherent dialogue in a context where it is common knowledge that Sam does not eat or like cat food.

More generally, predicates of personal taste seem to be easily linked to salient referents, giving what Lasersohn calls “exocentric” readings, but this is not the case for epistemic modals. For example, *tasty* can be easily understood as “tastes good to the cat” in (25), but *might* cannot be understood as “compatible with the dog's knowledge” in (26).

- (25) [Context: Sam is watching his cat eat a new brand of cat food. After a few hesitant bites the cat devours it eagerly. Sam says:]

Oh good, the new cat food is tasty. [cf. Lasersohn (2005): (39)]

- (26) [Context: Sam is watching his dog eat dog food. The dog is eating the food with enthusiasm that he usually saves for table scraps. Sam says:]

Oh good, that might be table scraps.

The account sketched above incorrectly predicts (24) and (26) to be possible. Below I will revise the account so as to capture this contrast as well as the parallels between the two classes.

4.3 Revised analysis

My first step in revising the analysis is to take the judge dependency out of the lexical meanings of predicates of personal taste, instead treating them as two-place predicates. New lexical entries are given in (27).

- (27) $\llbracket \text{tasty} \rrbracket^{u; w, t, j} = \llbracket \text{taste good} \rrbracket^{u; w, t, j} = [\lambda x_e . [\lambda y_e . y \text{ tastes good to } x \text{ in } w \text{ at } t]]$
 $\llbracket \text{taste terrible} \rrbracket^{u; w, t, j} = [\lambda x_e . [\lambda y_e . y \text{ tastes terrible to } x \text{ in } w \text{ at } t]]$
 $\llbracket \text{fun} \rrbracket^{u; w, t, j} = [\lambda x_e . [\lambda y_e . y \text{ is fun for } x \text{ in } w \text{ at } t]]$

This means, that semantically and syntactically, a predicate of personal taste takes two arguments, the first of which gives the person whose taste is relevant. Their lexical meanings, then, are no longer judge-dependent. But the judge parameter is still part of the system, and predicates of personal taste can still essentially become judge-dependent, as we will see.

Next, to bring the judge back in, I propose that there is a silent nominal item, which I will call PRO_J , that simply denotes the judge. That is, it has the meaning in (28).

$$(28) \quad \llbracket PRO_J \rrbracket^{u; w, t, j} = j$$

Predicates of personal taste have the option of taking PRO_J as their first argument. When this happens, the resulting meanings are essentially the same as they are on Lasersohn's account. For example, the meaning of $[tasty PRO_J]$, shown in (29), is the same as the lexical entry for *tasty* given earlier in (12).

$$(29) \quad \llbracket [tasty PRO_J] \rrbracket^{u; w, t, j} = \llbracket [tasty] \rrbracket^{u; w, t, j} (\llbracket PRO_J \rrbracket^{u; w, t, j}) = [\lambda y . y \text{ tastes good to } j \text{ in } w \text{ at } t]$$

Predicates of personal taste can also take individual arguments, which can either be silent or overt. When overt, they take the form of PPs as in *fun for Sam* or *tastes good to Sue*, meaning that the prepositions used in these constructions denote the identity function, as shown in (30).

$$(30) \quad \llbracket [to] \rrbracket^{u; w, t, j} = \llbracket [for] \rrbracket^{u; w, t, j} = [\lambda y_e . y]$$

I assume that predicates of personal taste can also take silent pronouns as arguments, which simply pick out contextually salient individuals in the same way as overt pronouns.⁶ I will use the notation “ pro_A ” as a shorthand for a silent pronoun referring to individual A.

The difference between epistemic modals and predicates of personal taste is that epistemic modals do not have the option of taking an individual argument, silent or overt. Rather the person whose knowledge is relevant is always given by the judge parameter. There are a number of ways to achieve this. I will assume that just like predicates of personal taste, epistemic modals have a syntactic and semantic argument slot for the “knower,” but that this is restricted to PRO_J by a syntactic selection requirement. This means that epistemic modals now have the lexical meanings in (31) but, since they always occur with PRO_J , we can treat *must PRO_J* and *might PRO_J* as unanalyzed wholes with the meanings given in (32).

$$(31) \quad \llbracket [might] \rrbracket^{u; w, t, j} = [\lambda x_e . [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{there is some world } w' \text{ compatible with } x \text{'s knowledge in } w \text{ at } t \text{ such that } p(w')(t)(x) = 1]]$$

$$\llbracket [must] \rrbracket^{u; w, t, j} = [\lambda x_e . [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{for all worlds } w' \text{ compatible with } x \text{'s knowledge in } w \text{ at } t, p(w')(t)(x) = 1]]$$

$$(32) \quad \llbracket [might PRO_J] \rrbracket^{u; w, t, j} = [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{there is some world } w' \text{ compatible with } j \text{'s knowledge in } w \text{ at } t \text{ such that } p(w')(t)(j) = 1]$$

$$\llbracket [must PRO_J] \rrbracket^{u; w, t, j} = [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{for all worlds } w' \text{ compatible with } j \text{'s knowledge in } w \text{ at } t, p(w')(t)(j) = 1]$$

This should be thought of as a simplification of a full semantic theory of modals, where all modals take a restrictor argument giving the modal base and/or ordering source. My claim is essentially that the kind of restrictor taken by epistemic modals is inherently judge-dependent.

Another way to encode the difference between epistemic modals and predicates of personal taste would be to keep the meanings for epistemic modals proposed in Section 4.1, making them directly dependent on the judge (though again, this should probably be seen as a simplification of a full modal theory where the judge dependency comes in via the restrictor). In that

⁶ Once null referential pronouns are posited, the question arises as to whether these pronouns can be bound in the same way that overt pronouns can. I leave this to future work.

case, it would then also be an option to eliminate PRO_j, and instead make predicates of personal taste ambiguous between a judge-dependent use and an argument-taking use. Mainly for convenience, I will adopt the analysis given in (27)–(32).

With these changes in place, I propose that there are no exocentric readings in Lasersohn’s sense. In examples like (23) and (25), *tasty* occurs with a silent pronoun referring to the cat, and thus no judge dependency is involved.

One final piece is needed. I assume that attitude predicates such as *think* obligatorily shift the judge parameter to the attitude holder. For example, *think* has the meaning in (33).⁷

$$(33) \quad \llbracket \text{think} \rrbracket^{u, w, t, j} = [\lambda p_{\langle s, \langle i, et \rangle \rangle} . [\lambda x_e . \text{for all worlds } w' \text{ compatible with } x \text{'s beliefs in } w \text{ at } t, p(w')(t)(x) = 1]]$$

This takes a proposition p and an individual x , and says that for all worlds w' compatible with x 's beliefs, p is true as judged by x . That is, within the quantificational statement, x is plugged in as the judge parameter instead of the matrix judge j . (A meaning along these lines was proposed by Lasersohn in an earlier version of his 2005 paper, and later rejected.)

4.4 Examples

Now let me show how the revised analysis works in some examples. First consider the case of a matrix epistemic modal as in (34a). The assumed structure is given in (34b) and the meaning is computed in (34c).

$$(34) \quad \begin{aligned} (a) \quad & \text{It might be raining.} \\ (b) \quad & [\text{might PRO}_j] [\text{it be raining}] \\ (c) \quad & \llbracket (b) \rrbracket^{u, w, t, j} = \llbracket \text{might} \rrbracket^{u, w, t, j} (\llbracket \text{PRO}_j \rrbracket^{u, w, t, j} \\ & ([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{it be raining} \rrbracket^{u, w'', t'', j''}]]]) \\ & = [\lambda x_e . [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{there is some world } w' \text{ compatible with } x \text{'s knowledge in } \\ & \text{ } w \text{ at } t \text{ such that } p(w')(t)(x) = 1]] (j) \\ & ([\lambda w'' . [\lambda t'' . [\lambda j'' . \text{it's raining in } w'' \text{ at } t'']]]) \\ & = 1 \text{ iff there is some world } w' \text{ compatible with } j \text{'s knowledge in } w \text{ at } t \text{ such that} \\ & \text{it's raining in } w' \text{ at } t \end{aligned}$$

Thus the sentence *it might be raining* is true at an index $\langle w, t, j \rangle$ if and only if it is compatible with j 's knowledge in w at t that it's raining, which is the same as the meaning derived on the preliminary analysis in Section 4.1.

Now consider the case of an epistemic modal embedded in an attitude report as in (35a), with the structure in (35b). This has the meaning in (35c), which simplifies to (35d) under certain assumptions about belief and knowledge.

$$(35) \quad \begin{aligned} (a) \quad & \text{Sue thinks it might be raining.} \\ (b) \quad & [\text{Sue} [_{VP} \text{thinks} [_s [\text{might PRO}_j] [\text{it be raining}]]]] \\ (c) \quad & \llbracket (b) \rrbracket^{u, w, t, j} = \llbracket \text{thinks} \rrbracket^{u, w, t, j} \\ & ([\lambda w_2 . [\lambda t_2 . [\lambda j_2 . \llbracket \text{it might be raining} \rrbracket^{u, w_2, t_2, j_2}]]]) (\llbracket \text{Sue} \rrbracket^{u, w, t, j}) \end{aligned}$$

⁷ The meaning for *think* in (33) involves simplification with respect to the embedded evaluation time, as this is not my focus. It also does not capture the fact that the shifted judge is always interpreted *de se* (Pranav Anand, p.c., Danny Fox, p.c.). This can be improved upon if we adopt a semantics of *think* using Lewis’s notion of doxastic alternatives, as I do in Stephenson (2007).

= 1 iff for all worlds w' compatible with Sue's beliefs in w at t , there is some world w'' compatible with Sue's knowledge in w' at t such that it's raining in w'' at t .

- (d) [assuming that “ x believes p ” is equivalent to “ x believes that x knows that p ”]
 = 1 iff there is some world w'' compatible with Sue's beliefs in w at t such that it's raining in w'' at t .

According to (35c), the sentence *Sue thinks it might be raining* is true at an index $\langle w, t, j \rangle$ if and only if for all worlds w' compatible with Sue's beliefs in w at t , there is some world w'' compatible with Sue's knowledge in w' at t such that it's raining in w'' at t – in other words, if Sue believes that it is compatible with her knowledge that it's raining. This is essentially a knowledge report embedded in a belief report. However, we can assume that believing something is the same as believing that one knows it, allowing us to reduce (35c) to (35d). Thus the sentence is true at an index $\langle w, t, j \rangle$ if and only if there is some world w'' compatible with Sue's beliefs in w at t such that it's raining in w'' at t , in other words, if it is compatible with Sue's beliefs that that it's raining. This is the same as the meaning of the matrix sentence in (34) except that “ j 's knowledge” is replaced by “Sue's beliefs.”

Next, let's look at examples with predicates of personal taste. First consider an unembedded case such as (36).

(36) This cake is tasty.

There are two possibilities for the structure of (36). One possibility is that *tasty* takes PRO_j as its first argument, in which case the structure is (37a) and the meaning is (37b) (where “ c ” stands for the cake being referred to).

- (37) (a) [This cake] [tasty PRO_j]
 (b) $\llbracket (a) \rrbracket^{u; w, t, j} = \llbracket \text{tasty} \rrbracket^{u; w, t, j} (\llbracket \text{PRO}_j \rrbracket^{u; w, t, j}) (\llbracket \text{this cake} \rrbracket^{u; w, t, j})$
 = $[\lambda x_e . [\lambda y_e . y \text{ tastes good to } x \text{ in } w \text{ at } t]] (j) (c)$
 = 1 iff c tastes good to j in w at t

Thus if the sentence *this cake is tasty* contains PRO_j , then it is true at an index $\langle w, t, j \rangle$ if and only if the cake tastes good to j in w at t . This is the same as the meaning on the preliminary analysis from Section 4.1.

The second possibility is that *tasty* in (36) takes a silent referential pronoun as its first argument, for example one referring to Sam (which I write as pro_{Sam}). In this case, the structure is (38a) and the meaning is (38b).

- (38) (a) [This cake] [tasty pro_{Sam}]
 (b) $\llbracket (a) \rrbracket^{u; w, t, j} = \llbracket \text{tasty} \rrbracket^{u; w, t, j} (\llbracket \text{pro}_{\text{Sam}} \rrbracket^{u; w, t, j}) (\llbracket \text{this cake} \rrbracket^{u; w, t, j})$
 = $[\lambda x_e . [\lambda y_e . y \text{ tastes good to } x \text{ in } w \text{ at } t]] (\text{Sam}) (c)$
 = 1 iff c tastes good to Sam in w at t

Thus if the sentence *this cake is tasty* contains a silent referential pronoun referring to Sam, e.g., then it is true at an index $\langle w, t, j \rangle$ if and only if the cake tastes good to Sam in w at t . This is not a judge-dependent proposition (as expected given that none of the constituent parts of the sentence are judge-dependent).

When a predicate of personal taste appears with an overt PP, as in (39), this works exactly the same way as the case with a silent referential pronoun. Thus (39) is true at an index $\langle w, t, j \rangle$ if and only if the roller coaster is fun for Sam in w at t , which again is non-judge-dependent.

(39) The roller coaster is fun for Sam.

When a predicate of personal taste is embedded in an attitude report as in (40), the same two possibilities hold for the embedded sentence.

(40) Sue thinks this cake is tasty.

If (40) contains PRO_J, then it has the structure in (41a) and the meaning in (41b), which reduces to (41c) under certain assumptions about people's knowledge of their own perception.

(41) (a) [Sue [thinks [this cake is tasty PRO_J]]]

(b) $\llbracket (a) \rrbracket^{u; w, t, j} = \llbracket \text{thinks} \rrbracket^{u; w, t, j}$

$([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{this cake is tasty PRO}_J \rrbracket^{u; w'', t'', j''}]]]) (\llbracket \text{Sue} \rrbracket^{u; w, t, j})$

= 1 iff for all worlds w' compatible with Sue's beliefs in w at t, c tastes good to Sue in w' at t

(c) [Assuming Sue has privileged access to her own experiences of taste]

= 1 iff c tastes good to Sue in w at t

According to (41b), the sentence *Sue thinks this cake is tasty* (with PRO_J) is true at an index $\langle w, t, j \rangle$ if and only if for all worlds w' compatible with Sue's beliefs in w at t, the cake tastes good to Sue in w' at t – in other words, if Sue believes that the cake tastes good to her. But if we assume (following Laserson) that people have privileged access to their own experiences of taste, and therefore cannot have false or incomplete beliefs about them, then this reduces to (41c). Thus if the sentence *Sue thinks this cake is tasty* contains PRO_J, then it is true at an index $\langle w, t, j \rangle$ if and only if the cake tastes good to Sue in w at t.

It is also possible for (40) to contain a silent referential pronoun, for example one referring to Sam. In this case, it has the structure in (42a) and the meaning in (42b).

(42) (a) [Sue [thinks [this cake is tasty pro_{Sam}]]]

(b) $\llbracket (a) \rrbracket^{u; w, t, j} = \llbracket \text{thinks} \rrbracket^{u; w, t, j}$

$([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{this cake is tasty pro}_{\text{Sam}} \rrbracket^{u; w'', t'', j''}]]]) (\llbracket \text{Sue} \rrbracket^{u; w, t, j})$

= 1 iff for all worlds w' compatible with Sue's beliefs in w at t, c tastes good to Sam in w' at t

Thus if the sentence *Sue thinks this cake is tasty* contains a silent referential pronoun referring to Sam, e.g., then it is true at an index $\langle w, t, j \rangle$ if and only if in all worlds w' compatible with Sue's beliefs in w at t, the cake tastes good to Sam in w' at t. In other words, it just means that Sue thinks the cake tastes good to Sam – a simple, factual, non-judge-dependent belief report. Note that *think* still shifts the judge parameter of the embedded sentence, but this has no effect because the embedded sentence is non-judge-dependent.

5 Pragmatic Proposal

In this section I will sketch a pragmatic theory to go with the semantics I have adopted. This requires redefining the notions of assertion and the common ground in a way that takes the new judge parameter into account. My main goal is to shed further light on the phenomenon, discussed earlier, where speakers seem to have disagreements involving predicates of personal taste or epistemic modals while at the same time speaking from their own perspectives.

5.1 Extending the Stalnakerian picture

My starting point is the theory of conversation developed largely by Stalnaker (1978, 2002). On his view, one main purpose of conversation is to establish and update a common ground.

The common ground is the set of worlds, or world-time pairs, that are compatible with what is commonly known or accepted by the participants in the conversation. An assertion is seen as a proposal to restrict the common ground in a particular way, specifically by removing any worlds (or world-time pairs) in which the proposition asserted is not true. Hearers may accept or challenge such a proposal.

To extend the notion of the common ground to a system with a judge parameter, the first step is to redefine the common ground as a set of world-time-individual triples instead of worlds or world-time pairs. (The individual, of course, stands for the judge.) In other words, the common ground should be seen as set of indices, which in the new system have been redefined as world-time-individual triples. In particular, though, I propose that for any member of the common ground $\langle w, t, j \rangle$, the individual j represents the plurality of the entire group of participants in the conversation. This means that as long as it is common knowledge who is having the conversation, which I assume it normally is, every member of the common ground $\langle w, t, j \rangle$ will have the same value for j .⁸ (If it is also common ground what the current time is, then only the worlds will vary.) This also means that, in a sense, just as any conversational context has an actual world and time, it also has an “actual judge,” namely, the group of participants. However, this will not mean that *tasty*, e.g., is equivalent to something like *tastes good to us* (with *us* referring to the group of conversational participants), as we will see below.

As in the standard system, an assertion is a proposal to restrict the common ground to indices at which the proposition asserted is true, where now indices are world-time-individual triples. Crucially, though, I assume that a speaker A is justified in asserting a sentence S provided that A believes that S is true as judged by A themselves – the speaker does not need to believe that S is true as judged by the entire group of participants in the conversation.⁹ More formally, for A to assert S in w at t , it must be the case that for all worlds w' compatible with A 's beliefs in w at t , S is true at the index $\langle w', t, A \rangle$ – or, equivalently, A *thinks that* S must be true, where *think* has the meaning given in Section 4.3 that shifts the judge parameter. This can be seen as one way to formulate Lasersohn's notion of autocentricity.

I have made two new and crucial assumptions here: first, that the common ground consists of indices $\langle w, t, j \rangle$ where j is the plurality of all the participants in the conversation; and second, that the norm of assertion only involves the speaker's beliefs about what is true as judged by that speaker individually. In essence, what I have done is made a distinction between the conditions under which a speaker is allowed to make a proposal and those under which the proposal is likely to be successful. To make an assertion, a speaker only needs to believe that the proposition asserted is true with themselves as the judge, but if the assertion is successful, in effect what is added to the common ground is that p is true with the whole group of conversational participants as the judge.

5.2 Examples

Now let me show how these pragmatic assumptions work in cases of disagreement. First consider the dialogue from (8), repeated in (43). (Assume that *tasty* and *taste terrible* take PRO_j .)

- (43) Mary: How's the cake?
 Sam: It's tasty.
 Sue: No it isn't, it tastes terrible! [=(8)]

⁸ Egan (to appear) independently develops a different view, where for indices $\langle w, t, x \rangle$ in the common ground, x varies among the atomic individuals participating in the conversation.

⁹ The norm of assertion should probably be formulated in terms of not just belief, but rather something like justified belief. It is not clear how stricter concepts such as knowledge or true belief should be applied to judge-dependent propositions, and I leave that to future research.

Sam's assertion *it's tasty* is a proposal to restrict the common ground to triples $\langle w, t, j \rangle$ such that the cake tastes good to j in w at t . In order to make that assertion, Sam must believe that the cake tastes good to him – which amounts to a requirement that the cake taste good to him, as discussed in Section 4.4. Sue objects to this proposal by giving a counterproposal to restrict the common ground to triples $\langle w, t, j \rangle$ such that the cake does not taste good to j in w at t .¹⁰ In order to make her assertion, it only needs to be the case that the cake does not taste good to her. Similarly, Sue can go on to assert *it tastes terrible* as long as the cake tastes terrible to her. The key point is that in this dialogue, both Sam and Sue are justified in making their assertions, but neither one can be successful.

The situation is similar for the case of epistemic modals. For example, in (7), repeated in (44), Sam's assertion *he might be in his office* is a proposal to restrict the common ground to triples $\langle w, t, j \rangle$ such that it is compatible with j 's knowledge that Bill is in his office. Sue objects with a counterproposal to restrict the common ground to triples $\langle w, t, j \rangle$ such that it is not compatible with j 's knowledge that Bill is in his office.

- (44) Mary: Where's Bill?
 Sam: I'm not sure. He might be in his office.
 Sue: Nuh-uh, he can't be. He never works on Fridays.
[=(7)]

6 Further Predictions

In this section, I will discuss two further predictions of the analysis. The first lends support to my view. The second poses an apparent problem, and I will suggest one possible solution.

6.1 A restriction on dialogues

The key difference between Lasersohn's (2005) view and the one I have developed here is in how they account for "exocentric" interpretations of predicates of personal taste as in (25), repeated in (45).

- (45) [Context: Sam is watching his cat eat a new brand of cat food. After a few hesitant bites the cat devours it eagerly. Sam says:]
 Oh good, the new cat food is tasty. [=(25)]

Lasersohn's explanation is that the cat's perspective is sufficiently salient in the context of (45) that Sam can take the cat's point of view, speaking from an "exocentric" perspective. My explanation, in contrast, is that in this case *tasty* takes a silent argument referring to the cat (which also requires the cat to be sufficiently salient). I adopted this view in order to account for the lack of exocentric readings with epistemic modals, but in fact it has an advantage for predicates of personal taste as well. Consider a dialogue like (46).

- (46) (a) A: The cat food is tasty.
 (b) B: No, it's isn't!

Observe the following facts: If A intends (46a) to mean "the cat food tastes good to the cat," and B understands that A intended it that way, then (46b) is only felicitous if B intends it to mean "the cat food doesn't taste good to the cat." On the other hand, if A intends (46a) to mean that the cat food tastes good – in the judge-dependent, autocentric way – and B understands A's intention, then (46b) is only felicitous if B also intends it in the judge-dependent,

¹⁰ I assume that the plural judge carries a homogeneity requirement – that is, "the cake does not taste good to j " means that for each atomic part of j , the cake does not taste good to j (see, e.g., Schwarzschild 1994). Thanks to Barry Schein (p.c.) for bringing up this issue.

autocentric way. In other words, it must be the case that either both speakers take an autocentric perspective or both take the same exocentric perspective.

My view accounts for this restriction, since a sentence like (46a) containing PRO_J denotes a different proposition than the same sentence with a silent referential pronoun. This means that an assertion of the sentence makes a different proposal for restricting the common ground. For example, if (46a) contains PRO_J, then A is proposing to restrict the common ground to triples <w,t,j> such that the cat food tastes good to j, whereas if it contains a silent referential pronoun referring to the cat, then A is proposing to restrict the common ground to triples <w, t,j> such that the cat food tastes good to the cat. In order to object to the proposal using (46b), B must make the opposite proposal, and therefore must use the same argument for *tasty* as A.

Lasersohn's account, on the other hand, does not predict this restriction on dialogues, at least not without saying more. On his view, speakers may freely choose to take an autocentric or exocentric perspective, without changing the content of the sentence. This means that the content of (46b), e.g., always contradicts the content of (46a), thus incorrectly predicting that dialogues like (46) are possible regardless of the perspectives taken by the two speakers.

6.2 An apparent problem

I have claimed that epistemic modals cannot be simply linked to salient referents, i.e., they do not allow "exocentric" readings. An example from Egan, Hawthorne & Weatherson (2005) seems to suggest otherwise:

- (47) [Context: Ann is setting up a surprise party for Bill, but Bill and his friend Chris know about it and are spying on her. As she walks down the street carrying party supplies, Ann sees a bus that Bill often rides home on, and runs to hide. Chris asks Bill why Ann is hiding. Bill says:]

I might be on that bus.

[=Egan, Hawthorne & Weatherson (2005): (16)]

For at least some speakers, *might* can express Ann's mental state rather than Bill's in the context of (47), suggesting that my claim was too strong. Since my account does not allow *might* to take a referential argument, this is a problem.

I suggest, however, that there is more to (47) than meets the eye. Notice that in the description of the context (which is based closely on Egan, Hawthorne & Weatherson's original), Chris asks Bill why Ann is hiding, and Bill's statement is intended as an answer to this question. I suggest, then, that (47) involves ellipsis along the lines of (48), where the crossed-out material is interpreted but not pronounced.

- (48) [Context: Same as (47).]

- (a) Chris: Why is Ann hiding in the bushes?
(b) Bill: ~~Ann is hiding in the bushes~~ because I might be on that bus.

Now suppose that *because*, like *think*, shifts the judge parameter, or at least that one meaning of *because* does so. A lexical entry for *because* that has this effect is given in (49).¹¹

¹¹ It is difficult to give independent evidence for this analysis of *because* since the kinds of examples that seem to support it may also be explained by binding of null referential pronouns. (See note 6.) For example, (i) has a reading equivalent to "each boy x is smiling because the food tastes good to x," which could be explained if the argument of *tasty* is PRO_J and *because* shifts the judge parameter, but could also be explained if the argument is a null referential pronoun bound by *each boy*.

(i) Each boy is smiling because his food is tasty.

- (49) $\llbracket \text{because} \rrbracket^{u; w, t, j} = [\lambda p_{\langle s, \langle i, et \rangle \rangle} \cdot [\lambda Q_{\langle s, \langle i, \langle e, et \rangle \rangle} \cdot [\lambda x \cdot \text{the reason that } Q(w)(t)(j)(x) = 1 \text{ is that } p(w)(t)(x) = 1]]]$

This meaning takes a proposition p , a property Q (the VP of the higher clause), and an individual x (the subject of the higher clause), and says that the reason why x has the property Q is because p is true as judged by x . Crucially, the proposition is evaluated with the subject of the higher clause as judge. Note that in order to make reference to the subject of the higher clause, *because* must take it as an argument separate from the VP. (Another possibility is for *because* to shift the judge parameter to the person whose reasoning or rationale is relevant.)

Given the meaning in (49), then, (48b) has the structure in (50a) and meaning in (50b).

- (50) (a) (48b) = [Ann [[is hiding in the bushes] [because [I might be on that bus]]]]

- (b) $\llbracket (48b) \rrbracket^{u; w, t, j} = \llbracket \text{because} \rrbracket^{u; w, t, j}$
 $([\lambda w_2 \cdot [\lambda t_2 \cdot [\lambda j_2 \cdot \llbracket \text{I might PRO}_j \text{ be on that bus} \rrbracket^{u; w_2, t_2, j_2}]]])$
 $([\lambda w_3 \cdot [\lambda t_3 \cdot [\lambda j_3 \cdot \llbracket \text{hiding in the bushes} \rrbracket^{u; w_3, t_3, j_3}]]]) (\llbracket \text{Ann} \rrbracket^{u; w, t, j})$

= 1 iff the reason that Ann is hiding in the bushes in w at t is that there is some world w_4 compatible with Ann's knowledge in w at t such that Bill is on the bus in w at t .

This says that (48b) is true if and only if the reason that Ann is hiding in the bushes is that it is compatible with Ann's knowledge that Bill is on the bus. As long as we can assume that (47) involves the ellipsis in (48), this allows *might* to be linked to Ann on my account.

Note that the relevant reading of (47) becomes impossible if Bill's statement is embedded under *I think* as in (51a), that is, the ellipsis in (51b) is not possible.

- (51) [Context: Same as (47). Bill says:]

- (a) I think I might be on that bus.
 (b) I think ~~Ann is hiding in the bushes~~ because I might be on that bus.

This is expected in that the required ellipsis is independently unavailable. For example, (52a) cannot have the same meaning as (53), showing that the ellipsis in (52b) is impossible.

- (52) (a) Bill and Chris can't agree on why Ann just jumped into the bushes.
 # Bill thinks she's hiding because Chris is there, and Chris thinks Bill is there.
 (b) Bill and Chris can't agree on why Ann just jumped into the bushes.
 # Bill thinks she's hiding because Chris is there, and Chris thinks ~~she's hiding~~ because Bill is there.

- (53) ... Bill thinks she's hiding because Chris is there, and Chris, because Bill is there.

A remaining question is why not all speakers accept (47) on the intended interpretation in the first place. This could be due to variation in whether the ellipsis in (48) is allowed, or perhaps variation in whether *because* can shift the judge parameter as in (49), but I'll leave this open.

7 Summary of Proposal

To summarize, I have adopted a semantic system using Lasersohn's judge parameter for both predicates of personal taste and epistemic modals. Instead of always building judge dependency into the lexical meanings, however, I have introduced a special item PRO_j that refers to the judge. Predicates of personal taste take an individual argument, which may be PRO_j or may be a silent referential pronoun. Epistemic modals, on the other hand, always combine with PRO_j (or, generally speaking, always have a meaning that depends on the judge). Finally, atti-

tude predicates such as *think* obligatorily shift the judge parameter of the embedded sentence to the attitude holder.

I have also proposed a pragmatic system to go along with the judge-dependent framework. On my view, the common ground is a set of triples $\langle w, t, j \rangle$ where j is the plurality of the group of participants in the conversation. The norm of assertion is “autocentric” in the sense that the speaker only needs to believe that the content of the assertion is true as judged by them.

The proposed semantic and pragmatic system accounts for contradictions and disagreements involving predicates of personal taste and epistemic modals, as well as the behavior of these items in attitude reports. My view differs crucially from Lasersohn’s – and proves to be better – in the way it handles linked readings in attitude reports and “exocentric” readings of predicates of personal taste.

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