

Judge dependence, epistemic modals, and predicates of personal taste

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Abstract Predicates of personal taste (*fun, tasty*) and epistemic modals (*might, must*) share a similar analytical difficulty in determining whose taste or knowledge is being expressed. Accordingly, they have parallel behavior in attitude reports and in a certain kind of disagreement. On the other hand, they differ in how freely they can be linked to a contextually salient individual, with epistemic modals being much more restricted in this respect. I propose an account of both classes using Lasnik's (Linguistics and Philosophy 28: 643–686, 2005) “judge” parameter, at the same time arguing for crucial changes to Lasnik's view in order to allow the extension to epistemic modals and address empirical problems faced by his account.

Keywords Epistemic modals · Predicates of personal taste · Context dependency · Relativism · Attitude reports

1 Introduction

It is widely assumed that (1a) has a reading (its epistemic reading) which can be expressed as something like (1b) (Kratzer 1977).

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

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A troublesome question lurks in (1b). There is reference to the set of worlds “compatible with what is known,” but the question is, known by *who*? If “what is known” is taken to mean “what is known by the speaker,” the resulting meaning is too weak (see, e.g., MacFarlane 2006). On the other hand, if “what is known” is taken to mean “what is known by anyone at all” or “what is known by people in general” the meaning becomes impossibly strong. The question of exactly whose knowledge is relevant for the interpretation of epistemic modals turns out to be difficult to answer, and a great deal of effort has gone into trying to either answer it or evade it (for example, by using descriptions like “what is known”), in both the linguistics and the philosophy literature.¹

Lasersohn (2005) discusses a similar puzzle that arises with “predicates of personal taste” such as *tasty* and *fun*. He uses examples like (2).

(2) This roller coaster is fun.

Lasersohn shows that if *fun* in sentences like (2) is taken to mean “fun for the speaker” or “fun for someone,” the meaning is too weak; on the other hand, if it’s taken to mean “fun for everyone” or “fun for people in general” it becomes too strong. The question of whose taste or subjective experience is relevant to the interpretation of a predicate of personal taste thus turns out to also be difficult to answer, and the difficulty in this regard is very similar to the difficulty of specifying whose knowledge is expressed by an epistemic modal. I would like to suggest, then, that these two questions are difficult for the same reason; there is just one puzzle that applies to both epistemic modals and predicates of personal taste.²

The structure of the paper is as follows. In Sect. 2, I give examples of the parallel behavior of epistemic modals and predicates of personal taste. In Sect. 3, I present Lasersohn’s analysis of predicates of personal taste, and show how it purports to explain the puzzling behavior of predicates of personal taste discussed in Sect. 2. In Sect. 4, I extend this analysis to epistemic modals, first extending Lasersohn’s system directly and then arguing for a modification to it. The revised version explains the puzzling behavior of both epistemic modals and predicates of personal taste, and also accounts for a difference between them. In Sect. 5, I discuss how to place this kind of analysis in a Stalnakerian theory of conversation and the common ground. In Sects. 6–7, I compare my analysis to recent proposals by Egan et al. (2005) and MacFarlane (2006) for epistemic modals, and Lasersohn (2005) for predicates of personal taste, showing that my proposal fares better in both domains. In Sect. 8, I conclude with brief comments and discussion.

¹ In addition to Kratzer and MacFarlane’s work, see, for example, Moore (1962), Hacking (1967), Stalnaker (1984), DeRose (1991), Egan et al. (2005), and von Fintel and Gillies (2005, 2006).

² Egan et al. (2005) also connect their relativist view of epistemic modals with examples like *Rotting flesh tastes great* (uttered by a vulture), but they do not explore taste predicates in depth.

2 Parallels between epistemic modals and predicates of personal taste

In this section, I will show that epistemic modals and predicates of personal taste have parallel behavior in attitude reports and in certain phenomena of contradiction and disagreement.³

2.1 Epistemic modals in attitude reports

Much discussion about the semantics of epistemic modals has been devoted to the question of whose knowledge state is being expressed, or as it is sometimes put, what the relevant “community of knowers” is. For example, DeRose (1991) proposes that the community of knowers is fairly free, but that it’s required to include the speaker. Egan et al. (2005) give counterexamples to this constraint. The main thing that seems to be generally agreed on is that it is not obvious how to figure out who the relevant “knowers” will be for any particular example. I would like to begin, though, by looking at a class of examples where this uncertainty disappears, namely those such as (3)–(4) where an epistemic modal is embedded under *think*.⁴

(3) Sam thinks it might be raining.

(4) Sam thinks it must be raining.

In (3)–(4), the embedded modal seems to express Sam’s mental state. For example, (3) is true iff Sam’s beliefs do not exclude the possibility that it’s raining, and (4) is true iff Sam’s beliefs exclude the possibility that it isn’t raining. This fact extends to cases where the grammatical subject of *think* is a quantifier, as in (5). (Indices are used just as a shorthand to indicate the intended reading and are not meant to have theoretical status.)

(5) (a) [Every boy]_i thinks he_i must be stupid.

(b) [Every contestant]_i thinks they_i might be the winner.⁵

The sentences in (5) have a reading where the “knowers” range along with the subject. For example, (5a) says that for each boy *x*, *x*’s beliefs entail that *x* is stupid.

In cases where one propositional attitude report is embedded under another, a modal always reports the mental state of the immediate subject, as illustrated

³ 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.

⁴ In this paper I will restrict my attention to modal verbs and auxiliaries. I leave it to future research to determine whether modal expressions of other syntactic categories, such as *probably* and *likely*, have parallel behavior.

⁵ These examples are 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 and Iatridou (2003) to show that quantifiers can bind pronouns across an epistemic modal.

in (6)–(7). In (6a), for example, the content of Mary’s belief is that Sam’s beliefs don’t exclude the possibility that it’s raining. On the other hand, (7a) says that Mary’s beliefs don’t exclude the possibility that Sam thinks it’s raining. (Underlining indicates the “knower” for a particular modal.)

- (6) (a) Mary thinks that Sam thinks it might be raining.
 (b) Mary thinks that Sam thinks it must be raining.
- (7) (a) Mary thinks that Sam might think it’s raining.
 (b) Mary thinks that Sam must think it’s raining.

The adverbial clause *as far as x knows* has the same effect as an attitude predicate, as illustrated in (8)–(9).

- (8) As far as Sam knows, it might be raining.
- (9) Mary thinks that as far as Sam knows, it might be raining.

2.2 Predicates of personal taste in attitude reports

Lasersohn (2005) looks at a different kind of item that turns out to have largely parallel behavior, namely what he calls “predicates of personal taste.” The paradigm cases are *tasty* and *fun*. As Lasersohn observes, it is difficult to draw a sharp distinction between predicates of personal taste and predicates expressing moral or aesthetic values, such as *beautiful* or *moral*. (Some borderline examples are *funny*, *annoying*, and *tasteful*.) Ultimately it would be desirable to give all of these classes a unified treatment, but (like Lasersohn) I will restrict my attention to the paradigm cases of *tasty* and *fun* (plus related expressions such as *taste good*), taking the relevant class of items to be those which pattern in roughly the same way.

Because predicates of personal such as like *tasty* and *fun* relate to an internal state or experience, the question arises as to whose internal state or experience is being reported in any particular case, or in Lasersohn’s terminology, who is the “judge.” And as with the issue of who the “knower” is with epistemic modals, this turns out to be hard to answer. But also like epistemic modals, predicates of personal taste behave differently when embedded under a verb like *think*. For example, consider (10)–(11).

- (10) Sam thinks the dip is tasty.
- (11) Sam thinks that the roller coaster is fun.

These examples have a very salient reading where the predicate of personal taste is linked to the subject of *think*, that is, where the judge is clearly Sam. We will see that this is not the only possible reading, and that predicates of personal

taste differ from epistemic modals in this respect. I'll return to this in Sect. 4.2. Bearing this caveat in mind, we can see that the link remains when the subject of *think* is a quantifier that binds a pronoun in the embedded clause. For example, (12) has a reading where the judge co-varies with the boys. (Underlining indicates a link between a predicate and the judge.)

(12) [Every boy]_i thinks his_i dinner is tasty.

As with epistemic modals, when one *think*-clause is embedded under another as in (13), the predicate is linked to the subject of the *think*-clause that most immediately embeds it, as illustrated in (13).

(13)(a) Mary thinks that Sam thinks the dip is tasty.

(b) Mary thinks that Sam thinks that the roller coaster is fun.

Also as with epistemic modals, the same effect can be achieved in some cases with certain adverbial phrases, as Lasersohn points out. Some of these are illustrated in (14).

(14)(a) The roller coaster is fun for Sam.

(b) As far as Sam is concerned, the roller coaster is no fun.

(c) The cake tastes good to me.⁶

Thus one parallel between epistemic modals and predicates of personal taste is in their behavior when embedded under propositional attitude predicates such as *think*.

2.3 Contradictions and disagreements

Another parallel between epistemic modals and predicates of personal taste is in the fact that both give rise to a peculiar kind of disagreement between speakers. I take the presence of expressions like *no* or *nuh-uh* to mark disagreement in English, as used, for example, in the dialogue in (15), which involves three people, Mary, Sam, and Sue.

(15) Mary: Where's Bill?

Sam: He's in his office.

Sue: Nuh-uh, he's at home! He doesn't work on Fridays.

[OR] No, he isn't, he's at home! He doesn't work on Fridays.

Disagreement is also possible in the dialogue in (16), which contains an epistemic modal.

⁶ I assume that *tastes good* has the same meaning as *is tasty*, ignoring the fact that it's presumably built up from *taste* and *good*. The two expressions don't have exactly the same distribution, as seen for example in the fact that *?tasty to me* is less acceptable than *tastes good to me*. But when convenient, I will substitute one for the other.

- (16) 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.
 [OR] No, he can't be. He never works on Fridays.

The puzzling thing about discourses like (16) is this: Sam seems to be expressing his mental state, and Sue seems to be disagreeing with him. But if this is the case, then Sue ought to be understood as saying that Sam is wrong about his own mental state. However, Sue does not seem to be doing that, but rather expressing her own mental state. In other words, two speakers can disagree about a statement containing an epistemic modal simply because they have different knowledge states. Compare this to (17), where Sam's statement explicitly refers to his own knowledge; here it seems odd for Sue to respond as if she is disagreeing.

- (17) Mary: Is Bill in his office?
 Sam: Well, I'm not sure, but I don't know that he isn't.
 Sue: #Nuh-uh, he's at home! He doesn't work on Fridays.
 [OR] #No, he isn't, he's at home! He doesn't work on Fridays.

Thus there are two facts to be explained: the fact that disagreement is possible in (16), and the contrast between (16) and (17) in this respect.⁷

Once again, the behavior of predicates of personal taste is very similar. For example, in (18)–(19), Sam seems to be expressing his own taste or experience, and Sue seems to be expressing hers, and yet they are disagreeing.

- (18) Mary: How's the cake?
 Sam: It's tasty.
 Sue: Nuh-uh, it isn't tasty at all!
 [OR] No it isn't, it tastes terrible!
- (19) Mary: How was the party?
 Sam: It was fun.
 Sue: Nuh-uh, it wasn't fun at all!
 [OR] No it wasn't, it was no fun at all!

On the other hand, if Sam makes explicit that he is expressing his own taste, Sue's responses then become odd, as illustrated in (20)–(21).

⁷ Given the observation about attitude predicates in Sects. 2.1–2.2, we might also expect (i) (which is based on (16)) to be odd, yet it is acceptable. Note, though, that the form of Sue's response (*No he can't be!* rather than *No you don't!*) shows that her disagreement targets the embedded proposition. I will come back to this in Sect. 5.4.

(i) Sam: I think Bill might be in his office.
 Sue: No! / Nuh-uh, he can't be. He never works on Fridays.

- (20) Mary: How's the cake?
 Sam: It tastes good to me.
 Sue: #Nuh-uh, it doesn't taste good at all!
 [OR] #No it doesn't, it tastes terrible!
- (21) Mary: How was the party?
 Sam: It was fun for me.
 Sue: #Nuh-uh, it wasn't fun at all!
 [OR] #No it wasn't, it was no fun at all!

Thus, as with epistemic modals, there are two facts about predicates of personal taste to be explained: why disagreement is possible in (18)–(19), and why these contrast with (20)–(21).

I should clarify that when I say that disagreement is possible in a certain dialogue, I mean very narrowly that expressions like *no* (*it isn't*) and *nuh-uh* are allowed. I don't mean that we have an intuition that the speakers disagree about something, which may be a broader phenomenon. I also don't mean that the disagreement is necessarily a rational or sensible one to engage in. The dialogues in (18) and (19) are just the kind of arguments that are often pointed out to be futile, given that people's tastes simply differ. That is not my concern. The only fact that matters for my purposes is that such dialogues can and do occur—often enough, in fact, to give us ample opportunity to perceive their futility.

3 Lasersohn's analysis of predicates of personal taste

In this section I will summarize Lasersohn's (2005) account of predicates of personal taste, which uses an additional individual parameter (the "judge"). In Sect. 4 I will extend the same kind of view to epistemic modals.

3.1 Basic assumptions

Lasersohn's starting point is the dual view of sentence meaning from Kaplan (1989). On this view, there are two senses of the "meaning" of an expression: the "character," which is constant for a single expression across utterances, and the "content," in which the reference of indexicals such as *I* and *now* has been fixed. For example, suppose that one speaker, A, utters the sentence *I am in Boston now* at time t_1 , and another speaker, B, utters the same sentence at time t_2 . The two utterances have the same character, but the content of A's utterance is the proposition that A is in Boston at time t_1 , and the content of B's utterance is the proposition that B is in Boston at time t_2 . In general, then, the content of an expression is a function from world-time pairs $\langle w, t \rangle$ to extensions (i.e., its intension). The character of an expression is thus a function from contexts of utterance to contents. In particular, the content of a sentence (a proposition) is

a function from world-time pairs to truth values, and the character of a sentence is a function from contexts of utterance to propositions. The elements of the context of utterance that determine content from character are called the “context” and the parameters of evaluation that determine truth value from content are called the “index.”

Given that both the context of utterance and the world and time contribute to the extension of an expression, we can write the extension of an expression α as $\llbracket \alpha \rrbracket^{c; w, t}$, where c is the context of utterance (the context), w is the world of evaluation, and t is the time of evaluation (so $\langle w, t \rangle$ is the index). Assuming a system of semantic interpretation along the lines of Heim and Kratzer (1998), we can use the two rules of semantic interpretation in (22).⁸ (Note that worlds are type s and times are type i .)

(22) **Rules of semantic interpretation:**

Functional Application (FA): If α is a complex expression formed by combining two expressions β and γ , and $\llbracket \gamma \rrbracket^{c; w, t}$ is in the domain of $\llbracket \beta \rrbracket^{c; w, t}$, then $\llbracket \alpha \rrbracket^{c; w, t} = \llbracket \beta \rrbracket^{c; w, t} (\llbracket \gamma \rrbracket^{c; w, t})$.

Intensional Functional Application (IFA): If α is a complex expression formed by combining two expressions β and γ , and $[\lambda w'_s . [\lambda t'_i . \llbracket \gamma \rrbracket^{c; w', t'}]]$ is in the domain of $\llbracket \beta \rrbracket^{c; w, t}$, then $\llbracket \alpha \rrbracket^{c; w, t} = \llbracket \beta \rrbracket^{c; w, t} ([\lambda w'_s . [\lambda t'_i . \llbracket \gamma \rrbracket^{c; w', t'}]])$.

3.2 A new parameter

To analyze predicates of personal taste, Lasersohn adds a “judge” to the index. In particular, the content of a sentence under this view is a function from world-time-individual triples $\langle w, t, j \rangle$ to truth values. Thus the extension of an expression α should now be written as $\llbracket \alpha \rrbracket^{c; w, t, j}$, where c is the context of utterance (the context), w is a world, t is a time, and j is the judge (so $\langle w, t, j \rangle$ is the index). It should be noted that since the judge is an individual, formally speaking Lasersohn’s indices are in fact centered worlds, although he does not present the idea in those terms. I will not discuss other uses of centered worlds, but will make the connection implicitly by using the notion of doxastic alternatives.

Lasersohn’s “judge” is the individual whose taste or experience is relevant for a predicate of personal taste. Thus *fun*, *tasty* (or *taste good*), and *taste terrible* have the meanings in (23).

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

⁸ Lasersohn presents his analysis in a somewhat different form, but the two versions are essentially equivalent.

On the other hand, the extension of a normal, non-judge-dependent predicate such as *[be a] doctor* does not depend on the judge, as shown in (24).

$$(24) \quad \llbracket \text{be-a-doctor} \rrbracket^{c; w, t, j} = [\lambda x_e . x \text{ is a doctor in } w \text{ at } t]$$

All the meanings given so far are for expressions that don't depend on the context of utterance (and thus have the same content regardless of the context of utterance). Some expressions that do depend on the context of utterance are given in (25).

$$(25) \quad \llbracket \text{I} \rrbracket^{c; w, t, j} = \text{the speaker of } c \\ \llbracket \text{you} \rrbracket^{c; w, t, j} = \text{the addressee of } c$$

Adding a new parameter of evaluation requires us to revise the rules of interpretation from (22), replacing them with those in (26). Note that the judge parameter is an individual (type e).

(26) **Rules of semantic interpretation [revised]:**

Functional Application (FA): If α is a complex expression formed by combining two expressions β and γ , and $\llbracket \gamma \rrbracket^{c; w, t, j}$ is in the domain of $\llbracket \beta \rrbracket^{c; w, t, j}$, then $\llbracket \alpha \rrbracket^{c; w, t, j} = \llbracket \beta \rrbracket^{c; w, t, j} (\llbracket \gamma \rrbracket^{c; w, t, j})$.

Intensional Functional Application (IFA): If α is a complex expression formed by combining two expressions β and γ , and $[\lambda w'_s . [\lambda t'_i . [\lambda j'_e . \llbracket \gamma \rrbracket^{c; w', t', j'}]]]$ is in the domain of $\llbracket \beta \rrbracket^{c; w, t, j}$, then $\llbracket \alpha \rrbracket^{c; w, t, j} = \llbracket \beta \rrbracket^{c; w, t, j} ([\lambda w'_s . [\lambda t'_i . [\lambda j'_e . \llbracket \gamma \rrbracket^{c; w', t', j'}]]])$.

In the case of modified predicates of personal taste such as *fun for Sam*, Lasersohn treats the preposition as an intensional operator that shifts the judge parameter to the object of the preposition. This amounts to using the syncategorematic rule in (27).

$$(27) \quad \llbracket \text{P for } y \rrbracket^{c; w, t, j} = \llbracket \text{P} \rrbracket^{c; w, t, y} \\ \text{[where P is a predicate and } y \text{ is a DP]}$$

The *to* in *tastes good to Sam* works the same way.⁹ These are presumably different from *for* and *to* in their normal prepositional use such as in *a present for Sam*.

Attitude predicates such as *think* or *believe* take propositions as arguments, but in effect only operate on the world and time. Roughly speaking, *think* would have a lexical entry along the lines of (28).¹⁰

⁹ This does not account for the fact that we say *fun for Sam* and *tastes good to Sam* in English, and not **fun to Sam* or **tastes good for Sam*. I will return to this issue in Sect. 7.

¹⁰ This is simplifying Lasersohn's view of propositional attitudes somewhat (see Lasersohn 2005, Sect. 6.2).

- (28) $\llbracket \text{think} \rrbracket^c: w, t, j = [\lambda p_{\langle s, \langle i, et \rangle \rangle} . [\lambda z_e . \forall \langle w', t' \rangle \text{ compatible with } z\text{'s beliefs in } w \text{ at } t, p(w')(t')(j) = 1]]$

Lasersohn's final assumption is that speakers typically make assertions, and assess the assertions of others, from an "autocentric" perspective—taking themselves to be the judge. This is not always the case, though: in contexts where the perspective of another person is particularly salient, they may make and assess assertions from an "exocentric" perspective. One such context is that of an attitude report, since if a speaker is reporting the thoughts or experience of someone else, then it is natural to take them as the judge. I will present some criticisms of this view of perspective-taking in Sect. 7.

3.3 Consequences

Lasersohn's account can explain the "linked" reading of examples like (10), repeated in (29), where the judge of *tasty* is naturally understood to be Sam. Lasersohn's explanation is that in attitude reports, it is especially natural for the speaker to take an exocentric perspective using the subject as the judge. This view predicts that the link is not obligatory. As I mentioned earlier, this turns out to be correct for predicates of personal taste; I will return to this in Sect. 4.2.

- (29) Sam thinks the dip is tasty.

Lasersohn's account can also give at least the beginnings of an explanation for why predicates of personal taste give rise to disagreements in dialogues like (18), repeated in (30).

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

If we assume that what is crucial for the occurrence of expressions such as *nuh-uh* and *no it isn't* is the content of sentences (i.e., propositions), we can make some sense of (30). The content of the sentence uttered by Sam is a function from world-time-judge triples $\langle w, t, j \rangle$ to truth values that yields the truth value 1 just in case the cake tastes good to j in w at t . The content of the sentence uttered by Sue is the negation of this, the function from triples $\langle w, t, j \rangle$ that yields true just in case the cake does not taste good to j in w at t . Thus Sue utters a sentence that negates the content of Sam's sentence, and they disagree. On the other hand, if the judge is made explicit as in (20), repeated in (31), the sentence uttered by Sam has a different content: the function from triples $\langle w, t, j \rangle$ that yields the truth value 1 just in case the cake tastes good to Sam in w at t . This is because *for me* operates on the judge parameter; the value of *me* is set to Sam by the context of utterance before the calculation of the

content. The content of Sue's response is not the negation of this, so it sounds odd for her to signal that she is disagreeing.

- (31) Mary: How's the cake?
 Sam: It tastes good to me.
 Sue: #Nuh-uh, it doesn't taste good at all!
 [OR] #No it doesn't, it tastes terrible!

This explanation for the contrast between (30) and (31) depends crucially on the assumption that speakers may take an autocentric perspective, thus in effect evaluating assertions using a different judge. In Lasersohn's system, this is technically no different from the situation that arises when two speakers believe they are in different worlds and thus disagree about whether a proposition is true in the actual world. Conceptually, though, there is a difference between the two situations, because there is always an objective fact of the matter as to what is the actual world and time, whereas there is no analogous "actual judge." I will develop a slightly different view of this in Sect. 5.

I call this only the beginnings of an explanation because it does not provide us with any insight into why disagreement would still involve the content in this way once the judge parameter is added into the system. Since the phenomenon of disagreement is only relevant in multi-speaker dialogues, we can only answer this question by looking at the pragmatics and rules of conversation, which I will do in Sect. 5.

4 Extending the analysis to epistemic modals

In this section I show how Lasersohn's apparatus can be extended to epistemic modals. In Sect. 4.1, I will give a preliminary proposal that extends Lasersohn's analysis very directly. In Sect. 4.2, I will bring up a contrast between epistemic modals and predicates of personal taste that poses a problem for that approach. In Sects. 4.3–4.4, I will revise the analysis in a way that captures both the parallels and the differences between epistemic modals and predicates of personal taste. In Sect. 4.5, I address one apparent problem for the revised proposal.

4.1 First attempt

The most direct way to extend Lasersohn's account to epistemic modals is to simply identify the person whose knowledge is relevant for an epistemic modal with the judge. On this view, the lexical entries for *might* and *must* would be those given in (32).¹¹ (I will modify these slightly in Sect. 4.3.)

¹¹ This is what I proposed in an earlier version of this work (Stephenson 2005). Egan (2007) independently proposes a very similar view. My view and Egan's differ from the accounts of MacFarlane (2006) and Egan et al. (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).

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

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

This view will straightforwardly explain the parallel behavior of epistemic modals and predicates of personal taste discussed in Sect. 2. For example, the subject of *think* in examples like (3), *Sam thinks it might be raining*, can be linked to Sam because Sam's perspective is salient in a context where his mental state is being reported. Speakers can disagree in dialogues like (16) based on the fact that they have different knowledge because each of them may take an autocentric perspective, with themselves as the judge. As we will see, however, there is a problem with directly importing Lasersohn's analysis to epistemic modals.

4.2 A problem

The first attempt neatly accounts for the similarities between epistemic modals and predicates of personal taste, but there turn out to also be important differences. We have seen that in attitude reports involving either epistemic modals or predicates of personal taste, the judge of the embedded clause may be linked to the subject of the matrix attitude predicate; however, while this link is optional with predicates of personal taste, it is obligatory with epistemic modals. To see that the link is optional with predicates of personal taste, compare example (33) with (34).

(33) Mary: Has anyone tried the cake?
Sam: Sue has. She thinks it's tasty.

(34) 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.)

In (33), the judge of *tasty* is naturally understood to be Sue, whereas in (34) it's naturally understood to be the cat. The difference seems to come purely from the fact that the cat's perspective towards the cat food is especially salient. (Lasersohn uses examples like (34) as evidence that speakers may take an exocentric perspective.)

On the other hand, now compare (35) with (36).

(35) Mary: I heard it isn't very nice out.
Sam: Yeah, Sue thinks it might be raining.

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

In (35), the judge of *might* is naturally understood to be Sue, as expected. However, in (36), the judge of *might* cannot be understood to be the dog, even though the dog’s perspective with regards to the taste of the dog food is salient (from Mary’s statement), and even though the dog’s attitude towards the dog food could be caused by his mental state (e.g., if he always likes food meant for people better than food meant for dogs). In other words, Sam’s statement is only felicitous if Sam does not know what the dog food consists of, regardless of whether the dog knows. In a context where it’s assumed that Sam knows what he is feeding to his dog, his response sounds odd.

A related point can be made if a predicate of personal taste is embedded under an epistemic modal as in (37).

(37) The cat food might be tasty. (Danny Fox, p.c.)

In (37), *tasty* can mean “tastes good to the cat” (for example) or it can mean “tasty” in the judge-dependent way, but *might* can only have the judge-dependent interpretation. For example, imagine that Sam reads the ingredients on a can of cat food and reflects that there is nothing in it that he actually dislikes; then he might utter (37) to convey that we shouldn’t assume that the cat food would taste terrible to us just because it’s intended for cats. Now imagine that Sam is watching his cat eat the cat food, and he can’t tell from her reaction whether she likes it; in this case he might utter (37) to convey that he isn’t sure whether the cat food was a good choice. Finally, imagine that Sam is watching his cat sniff the cat food inquisitively, evidently trying to decide whether it’s going to taste good. In this case, Sam cannot utter (37) to convey something about the cat’s mental state. On the simple extension of Lasersohn’s view, we might expect that the choice between an autocentric or exocentric perspective would extend over the entire utterance. Thus it is surprising not only that the interpretation of *tasty* can vary in a way that the interpretation of *might* cannot, but that *tasty* can vary independently of *might*. This suggests that, if I am on the right track in treating epistemic modals as judge-dependent items in the first place, the ability of predicates of personal taste to vary should be captured in some way other than the general option of using an exocentric perspective.

4.3 Revised analysis

The first change I will make to Lasersohn’s system has to do with the source of judge dependency for predicates of personal taste. Instead of making them directly dependent on the judge, I take them to be simple two-place predicates whose first argument is the person whose taste or experience is relevant. New lexical entries are given in (38).

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

Note that the judge parameter is still there, but these items are no longer inherently judge-dependent. To bring judge dependency back into the system, I propose that there is a silent nominal item PRO_j that refers to the judge. The lexical entry for PRO_j is given in (39).

$$(39) \quad \llbracket \text{PRO}_j \rrbracket^{c; w, t, j} = j$$

Note that PRO_j is not a pronoun in the sense of being able to be bound or controlled, nor is it an indexical since it takes its reference from the index rather than the context of utterance. Its role is more analogous to that of a world-denoting item that picks out the world of evaluation. When a predicate of personal taste with the new kind of meaning as in (38) takes PRO_j as its first argument, the result will be the same as the original judge-dependent meanings given earlier in (23) (as the reader can verify).

I assume that in expressions such as *fun for X*, the preposition makes no semantic contribution. In other words, *for* is the identity function on individuals, as in (40).

$$(40) \quad \llbracket \text{for} \rrbracket^{c; w, t, j} = [\lambda y_e . y]$$

Then a predicate of personal taste can take a PP directly as an argument, instead of taking PRO_j . Crucially, I also assume that a predicate of personal taste can take a null referential pronoun referring to a contextually salient individual.^{12,13}

Epistemic modals, on the other hand, keep their lexical entries from the preliminary analysis in (32) (to be revised slightly below). The difference between epistemic modals and predicates of personal taste, then, is that epistemic modals are inherently judge-dependent, whereas predicates of personal taste become judge-dependent only if they take PRO_j as an argument.¹⁴

I further assume that attitude predicates such as *think* obligatorily shift the judge parameter of the embedded clause to the matrix subject. (This option was proposed in an earlier version of Lasersohn's paper and later rejected.) I will

¹² 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 an exploration of their behavior in this respect to future work.

¹³ The silent referential pronouns I have posited do not behave in all ways like their overt counterparts, as we can see in (i)–(ii). Sentence (i) cannot be understood as saying that both Sam and Mary think the tuna tastes good to Sam (or to Mary), while this is possible for (ii). I leave this as an open puzzle.

(i) Sam thinks that the tuna is tasty, and Mary does, too.
 (ii) Sam thinks that the tuna tastes good to him, and Mary does, too.

¹⁴ On an alternative formulation of this analysis (which I proposed in Stephenson 2006), epistemic modals take an individual “knower” argument, but require that it always be PRO_j due to a syntactic selection requirement or semantic presupposition. Another possible formulation would eliminate PRO_j and instead make predicates of personal taste systematically ambiguous. The crucial point with any of these variants is that predicates of personal taste can take referential arguments while epistemic modals cannot.

implement this using the notion of doxastic alternatives (Lewis 1979; Chierchia 1989), defined in (41).¹⁵

$$(41) \text{ Dox}_{w,t,x} = \{ \langle w',t',y \rangle : \text{it is compatible with what } x \text{ believes in } w \text{ at } t \text{ that he/she/it is } y \text{ in } w' \text{ at } t' \}$$

The doxastic alternatives of an individual x in world w at time t are the set of world-time-individual triples $\langle w',t',y \rangle$ such that it is compatible with x 's beliefs in w at t that x (him/herself) is y in w' at t' . Intuitively, these represent properties that x self-ascribes. For example, if John self-ascribes the property of being an individual named John, then all of John's doxastic alternatives are triples $\langle w',t',y \rangle$ such that y is named John in w' at t' . The lexical entry for *think* using doxastic alternatives is given in (42).

$$(42) \llbracket \text{think} \rrbracket^{c; w,t,j} = [\lambda p_{\langle s, \langle i,et \rangle \rangle} . [\lambda z_e . \forall \langle w',t',x \rangle \in \text{Dox}_{w,t,z} : p(w')(t')(x) = 1]]$$

Unlike the lexical entry used in Sect. 3.2, this meaning for *think* operates on the world, time, and judge parameters. It has the effect that a sentence of the form “ x thinks that S ” is equivalent to “ x thinks that S is true as judged by x .” In many cases this will be equivalent to “ S is true as judged by x ” because of what Lasersohn refers to as epistemic privilege. For example, if S is *the cake is tasty*, then given that people have privileged access to their own experiences of taste, a person will generally think that a cake tastes good to them just in case it does taste good to them. The principle of epistemic privilege holds with respect to epistemic modals only provided that a person has no false or unjustified beliefs that they take to be knowledge.

In the interest of consistency, I will recast the meanings of epistemic modals using a notion of “epistemic alternatives” (in analogy to doxastic alternatives), which I define in (43).

$$(43) \text{ Epist}_{w,t,x} = \{ \langle w',t',y \rangle : \text{it is compatible with what } x \text{ knows in } w \text{ at } t \text{ that he/she/it is } y \text{ in } w' \text{ at } t' \}$$

The key difference between doxastic alternatives and epistemic alternatives is that a person's knowledge cannot rule out the actual individual that they are in the actual world and time at which they are located, and so $\text{Epist}_{w,t,x}$ must always include $\langle w,t,x \rangle$ itself. Presumably knowledge also carries extra requirements for justification, so that if x rules out a triple $\langle w',t',y \rangle$ without sufficient

¹⁵ I use doxastic alternatives in order to capture the fact that the shifted judge is interpreted *de se* (Pranav Anand, p.c.; Danny Fox, p.c.). For example, (i) cannot be used in a context where Sam believes that it's compatible with what is known by a man on television that it's raining, but is unaware that the man is Sam himself. This point will not be crucial here, however.

(i) Sam thinks it might be raining. (Pranav Anand, p.c.)

justification, then $\langle w',t',y \rangle$ will still be among x 's epistemic alternatives. New lexical entries for *might* and *must* using this notion are given in (44).

$$(44) \quad \begin{aligned} \llbracket \text{might} \rrbracket^{c; w,t,j} &= [\lambda p_{\langle s, \langle i, et \rangle \rangle} \cdot \exists \langle w',t',x \rangle \in \text{Epist}_{w,t,j}: p(w')(t')(x) = 1] \\ \llbracket \text{must} \rrbracket^{c; w,t,j} &= [\lambda p_{\langle s, \langle i, et \rangle \rangle} \cdot \forall \langle w',t',x \rangle : \text{Epist}_{w,t,j}: p(w')(t')(x) = 1] \end{aligned}$$

Note that my lexical entries for epistemic modals can be thought of as a simplification of a fuller theory of modality where modals take restrictor arguments, which come in various types (deontic, epistemic and so on) and determine the modal base and/or ordering source. On a more complete view of this kind, my claim would be that the only kind of epistemic restrictor is one that makes reference to the knowledge of the judge.

I have one final change to make to Lasersohn's analysis. I assume that what Lasersohn calls an autocentric perspective is obligatory: speakers always make assertions, and accept or reject the assertions of others, using themselves as the judge. When a predicate of personal taste seems to have an exocentric interpretation, it actually has a null referential argument.

4.4 Examples

To see how the revised proposal works, let's first look at a case of a matrix epistemic modal as in (45a). I assume that the structure of (45a) is (45b). The meaning is computed in (45c).

$$(45) \quad \begin{aligned} (a) & \text{ It might be raining.} \\ (b) & \llbracket \text{might} \rrbracket \llbracket \text{it be raining} \rrbracket \\ (c) & \llbracket (b) \rrbracket^{c; w,t,j} = \llbracket \text{might} \rrbracket^{c; w,t,j} ([\lambda w'' \cdot [\lambda t'' \cdot [\lambda j'' \cdot \llbracket \text{it be raining} \rrbracket^{c; w'',t'',j''} \rrbracket]]) \\ & = 1 \text{ iff } \exists \langle w',t',x \rangle \in \text{Epist}_{w,t,j}: \text{it's raining in } w' \text{ at } t' \end{aligned}$$

Thus (45a) is true at a world-time-judge triple $\langle w,t,j \rangle$ iff at least one of j 's epistemic alternatives is such that it's raining.

Now let's see what happens when (45a) is embedded under *think*, with its new meaning from (42), which operates on the judge parameter. An example is given in (46a), with the structure in (46b) and meaning in (46c).

$$(46) \quad \begin{aligned} (a) & \text{ Sue thinks it might be raining.} \\ (b) & \llbracket \text{Sue} \llbracket_{VP} \text{thinks} \llbracket_S \llbracket \text{might} \rrbracket \llbracket \text{it be raining} \rrbracket \rrbracket \rrbracket \\ (c) & \llbracket (b) \rrbracket^{c; w,t,j} = \llbracket \text{thinks} \rrbracket^{c; w,t,j} ([\lambda w'' \cdot [\lambda t'' \cdot [\lambda j'' \cdot \llbracket \text{it might be raining} \rrbracket^{c; w'',t'',j''} \rrbracket]]) (\llbracket \text{Sue} \rrbracket^{c; w,t,j}) \\ & = 1 \text{ iff } \forall \langle w',t',x \rangle \in \text{Dox}_{w,t,Sue} : \exists \langle w'',t'',y \rangle \in \text{Epist}_{w',t',x}: \\ & \text{it's raining in } w'' \text{ at } t'' \end{aligned}$$

This says that (46a) is true at a world-time-judge triple $\langle w,t,j \rangle$ iff every one of Sue's doxastic alternatives in w at t has an epistemic alternative where it's raining. This can be simplified if we make certain assumptions about the relationship between belief and knowledge. Specifically, I assume that to believe something is

to believe that one knows it, which means that the epistemic alternatives of a person’s doxastic alternatives are the same as the person’s doxastic alternatives. Under this assumption, (46c) becomes equivalent to (47).

$$(47) \quad = 1 \text{ iff } \exists \langle w', t', x \rangle \in \text{Dox}_{w,t,\text{Sue}}: \text{it's raining in } w' \text{ at } t'$$

This is the same as the matrix case (45c) except that “j” is replaced by “Sue” and the epistemic alternatives are replaced with doxastic alternatives.

When we turn to predicates of personal taste, there are now two possibilities for the matrix case. Consider (48).

$$(48) \quad \text{This cake is tasty.}$$

One option is for the argument of *tasty* to be PRO_J. In this case, the structure of (48) is (49a), giving the meaning in (49b). (I’m ignoring tense and the contribution of the copula.)

$$(49) \text{ (a) } [\text{This cake}] [\text{is tasty PRO}_J] \\ \text{ (b) } \llbracket (a) \rrbracket^{c; w,t,j} = \llbracket \text{tasty} \rrbracket^{c; w,t,j} (\llbracket \text{PRO}_J \rrbracket^{c; w,t,j}) (\llbracket \text{this cake} \rrbracket^{c; w,t,j}) \\ = 1 \text{ iff the cake tastes good to } j \text{ in } w \text{ at } t$$

This sentence says that the cake tastes good to the judge and is the same as the meaning given for the sentence under the preliminary analysis from Sect. 4.1. However, on the revised analysis, it is also possible for *tasty* to take a null referential argument, for example one referring to Sam. In that case the structure of (48) is the one given in (50a), with the meaning in (50b). (I will use “pro_x” to indicate a null referential pronoun referring to an individual x.)

$$(50) \text{ (a) } [\text{This cake}] [\text{is tasty pro}_{\text{Sam}}] \\ \text{ (b) } \llbracket (a) \rrbracket^{c; w,t,j} = \llbracket \text{tasty} \rrbracket^{c; w,t,j} (\llbracket \text{pro}_{\text{Sam}} \rrbracket^{c; w,t,j}) (\llbracket \text{this cake} \rrbracket^{c; w,t,j}) \\ = 1 \text{ iff the cake tastes good to Sam in } w \text{ at } t$$

On this reading, the sentence says that the cake tastes good to Sam, making it no longer judge-dependent.

For predicates of personal taste that can take overt PP arguments, the situation is exactly the same. For example, the sentence in (51a) is completely parallel to (50), with the structure in (51b) and the meaning in (51c).

$$(51) \text{ (a) } \text{The roller coaster is fun for Sam.} \\ \text{ (b) } [\text{The roller coaster}] [\text{is fun [for Sam]}]. \\ \text{ (c) } \llbracket (b) \rrbracket^{c; w,t,j} = \llbracket \text{fun} \rrbracket^{c; w,t,j} (\llbracket \text{for Sam} \rrbracket^{c; w,t,j}) (\llbracket \text{the roller coaster} \rrbracket^{c; w,t,j}) \\ = 1 \text{ iff the roller coaster is fun for Sam in } w \text{ at } t$$

I will ignore the possibility of overt PPs in the discussion of attitude predicates below, since these have the same effect as null referential arguments.

There are still the same two possibilities when (48) is embedded under *think*, giving (52).

(52) Sue thinks this cake is tasty.

If PRO_J is used as the argument of *tasty* in (52), then the structure of (52) is (53a), with the meaning in (53b).

- (53)(a) [Sue [thinks [[this cake] [is tasty PRO_J]]]]
 (b) $\llbracket (a) \rrbracket^{c; w, t, j} = \llbracket \text{thinks} \rrbracket^{c; w, t, j}$
 $([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{this cake is tasty } PRO_J \rrbracket^{c; w'', t'', j''}]]]) (\llbracket \text{Sue} \rrbracket^{c; w, t, j})$
 $= 1$ iff $\forall \langle w', t', x \rangle \in \text{Dox}_{w, t, \text{Sue}}$: the cake tastes good to x in w' at t'

This says that (53a) is true iff (roughly speaking) the cake tastes good to all of Sue’s doxastic alternatives. Assuming that Sue has privileged access to her own experiences of taste, this becomes equivalent to (54).

(54) $= 1$ iff the cake tastes good to Sue in w at t

On the other hand, if a null referential pronoun—say, one referring to Sam, as in (50)—is used as the argument of *tasty* in (52), then the structure of (52) is (55a), with the meaning in (55b).

- (55)(a) [Sue [thinks [[this cake] [is tasty pro_{Sam}]]]]
 (b) $\llbracket (a) \rrbracket^{c; w, t, j} = \llbracket \text{thinks} \rrbracket^{c; w, t, j}$
 $([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{this cake is tasty } pro_{\text{Sam}} \rrbracket^{c; w'', t'', j''}]]]) (\llbracket \text{Sue} \rrbracket^{c; w, t, j})$
 $= 1$ iff $\forall \langle w', t', x \rangle \in \text{Dox}_{w, t, \text{Sue}}$: the cake tastes good to Sam in w' at t'

This sentence simply describes a factual belief of Sue’s, namely that the cake tastes good to Sam. It’s important to note that *think* still operates on the judge parameter, but since in this case *tasty* has taken a referential argument rather than PRO_J , the embedded clause is non-judge-dependent, so shifting the judge parameter has no effect on the meaning of the sentence.

Similarly, there are two possibilities when a predicate of personal taste is embedded under an epistemic modal as in (37), repeated in (56). (Since predicates of personal taste do not select for propositional arguments, the opposite embedding is not possible.)

(56) The cat food might be tasty.

If PRO_J is the argument of *tasty* in (56), then the structure of (56) is (57a), with the meaning in (57b).

- (57)(a) [might [the cat food be tasty PRO_J]]
 (b) $\llbracket (a) \rrbracket^{c; w, t, j} = \llbracket \text{might} \rrbracket^{c; w, t, j} ([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{the cat food is tasty } PRO_J \rrbracket^{c; w'', t'', j''}]]])$
 $= 1$ iff $\exists \langle w', t', x \rangle \in \text{Epist}_{w, t, j}$: the cat food tastes good to x in w' at t'

In this case, (56) is true at a world-time-judge triple $\langle w, t, j \rangle$ iff j has at least one epistemic alternative where the cat food is tasty—roughly speaking, if it’s compatible with j ’s knowledge that the cat food tastes good to j . This is the meaning needed for the situation where the speaker checks the ingredients of the cat food and realizes that there is nothing in it that he knows he dislikes.

On the other hand, if *tasty* takes a null referential pronoun referring to the cat (for example), then (56) has the structure in (58a) and the meaning in (58b).

- (58)(a) [might [this cat food be tasty $\text{pro}_{\text{the-cat}}$]]
- (b) $\llbracket (a) \rrbracket^{c: w, t, j} = \llbracket \text{might} \rrbracket^{c: w, t, j} ([\lambda w'' . [\lambda t'' . [\lambda j'' . \llbracket \text{the cat food is tasty } \text{pro}_{\text{the-cat}} \rrbracket^{c: w'', t'', j''}]]])$
 $= 1$ iff $\exists \langle w', t', x \rangle \in \text{Epist}_{w, t, j}$: the cat food tastes good to the cat in w' at t'

In this case, (56) is true at a world-time-judge triple $\langle w, t, j \rangle$ iff j has at least one epistemic alternative where the cat food tastes good to the cat. This is the meaning needed for the situation where the speaker isn’t sure whether the cat likes the cat food.

4.5 An apparent problem for the revised analysis

On my proposal, epistemic modals are directly judge-dependent, so that the relevant knowledge can never simply be that of a salient individual. This goes against an observation of Egan et al. (2005), who discuss (59).

- (59) [Context: Ann is planning a surprise party for Bill. Unfortunately, Chris has discovered the surprise and told Bill all about it. Now Bill and Chris are having fun watching Ann try to set up the party without being discovered. Currently Ann is walking past Chris’s apartment carrying a large supply of party hats. She sees a bus on which Bill frequently rides home, so she jumps into some nearby bushes to avoid being spotted. Bill, watching from Chris’s window, is quite amused, but Chris is puzzled and asks Bill why Ann is hiding in the bushes. Bill says:]

I might be on that bus.

(Egan et al. 2005, no. 16)

Egan et al. report that (59) is acceptable on a reading where *might* expresses Ann’s mental state, which I predict to be impossible.

I suggest that on the relevant reading, there is more to (59) than meets the eye—specifically, that there is ellipsis as shown in (60).¹⁶

¹⁶ I assume that elided material is present in the syntactic structure and interpreted at LF; however, a different view of ellipsis would be compatible with my view provided it gave (59) the same meaning.

(60) [Context: Same as (59).]

~~Ann is hiding in the bushes because~~ I might be on that bus.

I believe it's plausible that ellipsis is involved given that Bill's statement in (59) is supposed to be the answer to a question. That is, according to Egan et al.'s original context, (59) is really part of a dialogue along the lines of (61).

(61) [Context: Same as (59).]

Chris: Why is Ann hiding in the bushes?

Bill: I might be on that bus.

Intuitively, Bill's response, on the relevant reading, is understood as an answer to Chris's question. I assume that the meaning of a question is the set of propositions that are possible answers to the question. (See, e.g., Hamblin 1973; Groenendijk and Stokhof 1984). In the case of Chris's question in (61), this is, roughly speaking, the set of propositions of the form "Ann is hiding in the bushes because p" where p is any proposition. Thus for Bill's response to be an answer, it must be understood as expressing a proposition of this form, and the only obvious way to do this is to let "I might be on that bus" stand in for p.

If we assume that (59) has the structure in (60), then the occurrence of *might* is no longer in a matrix clause, but embedded inside the *because*-clause. I suggest that in *because*-clauses that express a person's conscious reasoning or rationale, the judge parameter is shifted to the person whose reasoning is involved—in the case of (59), Ann.^{17,18} One way to achieve this is to give *because* the lexical entry in (62).

(62) $\llbracket \text{because} \rrbracket^{c_i, w, t, j} = [\lambda z_e . [\lambda q_{\langle s, \langle i, et \rangle \rangle} . [\lambda p_{\langle s, \langle i, et \rangle \rangle} . \text{the reason that } p(w)(t)(j) = 1 \text{ is that } \forall \langle w', t', x \rangle \in \text{Epist}_{w, t, z}: q(w')(t')(x) = 1]]]$

According to (62), *because* takes two propositional arguments, p and q, and an individual argument z, and "p because q" is true at a world-time-judge triple $\langle w, t, j \rangle$ iff the reason that p is true at $\langle w, t, j \rangle$ is that all of z's epistemic

¹⁷ The person whose reasoning or rationale is involved is not always the grammatical subject of the higher clause (as I suggested in Stephenson, 2006). For example, in (i) (due to an anonymous *L&P* reviewer), it seems that *might* can be linked to John's epistemic state at least as easily as it can be linked to Ann's in (59). Thanks to this reviewer and *L&P* editor Polly Jacobson for very helpful discussion of the meaning of *because*.

(i) Airplanes frighten John because they might crash.

¹⁸ It's 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 a null referential pronoun. (See footnote 12.) 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.

alternatives in w at t are such that q is true. This has the effect of evaluating the matrix clause with respect to the matrix judge, while evaluating the embedded clause with the person whose reasoning is involved as judge. Roughly speaking, “ p because q ” is equivalent to “ p is true because z knows that q is true as judged by z ,” where z is the person whose reasoning is involved. Note that since z ’s knowledge is involved, rather than simply z ’s beliefs, q must actually be true as judged by z (but need not be true as judged by j). I assume that the individual argument is always silent.

I will leave open the question of what happens when a *because*-clause does not involve anyone’s conscious reasoning or rationale. One possibility is that *because* has a different meaning that does not take an individual argument and does not involve epistemic alternatives; another possibility is that it still has the meaning in (62) but takes either PRO_j or a contextually salient argument such as the speaker.

Now, in the pre-ellipsis sentence in (60), for example, *because* takes Ann as its silent individual argument, and the two sentences *I might be on that bus* and *Ann is hiding in the bushes* as its propositional arguments, giving it the meaning in (63b–c). The syntactic structure is shown in (63a), where pro_{Ann} is used to represent the silent argument referring to Ann, and c^* indicates the context of (60), where Bill is the speaker.

- (63)(a) [Ann is hiding in the bushes] [because pro_{Ann} [I might be on that bus]]
- (b) $\llbracket (60) \rrbracket^{c^*; w, t, j} = \llbracket \text{because} \rrbracket^{c^*; w, t, j} (\llbracket pro_{Ann} \rrbracket^{c^*; w, t, j})$
 $([\lambda w_2 . [\lambda t_2 . [\lambda j_2 . \llbracket I \text{ might be on that bus} \rrbracket^{c^*; w_2, t_2, j_2}]]])$
 $([\lambda w_3 . [\lambda t_3 . [\lambda j_3 . \llbracket Ann \text{ is hiding in the bushes} \rrbracket^{c^*; w_3, t_3, j_3}]]])$
 $= 1$ iff the reason that Ann is hiding in the bushes in w at t is that $\forall \langle w', t', x \rangle \in \text{Epist}_{w, t, Ann} : \exists \langle w'', t'', y \rangle \in \text{Epist}_{w', t', x} : \text{Bill is on the bus in } w'' \text{ at } t''$
- (c) $= 1$ iff the reason that Ann is hiding in the bushes in w at t is that $\exists \langle w', t', x \rangle \in \text{Epist}_{w, t, Ann} : \text{Bill is on the bus in } w' \text{ at } t'$

Thus the sentence in (60) says that the reason Ann is hiding in the bushes is because it’s compatible with Ann’s knowledge that Bill is on the bus. (Note that the two layers of knowledge shown in the last line of (63b) can be collapsed into one as in (63c).) Provided I’m justified in positing ellipsis here, this is possible without letting *might* take a referential argument, and the example in (59) no longer poses a problem for my revised analysis.

Notice that in (64a), where the *might*-statement is embedded under *I think*, it is not possible to understand *might* as linked to Ann’s knowledge. This is completely expected under my view, provided that the ellipsis in (64b) is not possible (corresponding to the ellipsis I posited for (59)).

- (64) [Context: Same as (59).]
- (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.

Without going into the theory of ellipsis in any detail, we can see that this kind of ellipsis is not generally allowed from the fact that (65) does not have a reading equivalent to (66).¹⁹ (The relevant reading would result from eliding the underlined portion of (66).)

- (65) Ann just jumped into the bushes, and Bill and Chris can't agree on why she did that.
 #Bill thinks she's hiding because Chris is there, and Chris thinks Bill is there.
- (66) Ann just jumped into the bushes, and Bill and Chris can't agree on why she did that. Bill thinks she's hiding because Chris is there, and Chris thinks she's hiding because Bill is there.

As I noted earlier, not all speakers I have consulted accept (59) in the first place. This variation could be taken to either be variation in whether the ellipsis in (60) is allowed, or perhaps variation in whether *because* can shift the judge parameter. I'll leave this question open.

5 Pragmatics and judge dependency

In this section, I will discuss how a system using a judge parameter can be embedded in a theory of conversation. In particular, I will propose extended notions of assertion and the common ground that can help make sense of the behavior of judge-dependent items.

5.1 Common ground and assertion

In the theory of conversation and common ground developed in large part by Stalnaker (1978, 2002), it is assumed that the purpose of conversation is to establish and update a common ground or context set, which is the set of worlds consistent with what the conversational participants all believe, believe that they all believe, and so on. (Sometimes what is taken to be relevant is not actual beliefs, but rather the propositions taken to be true for the purposes of the conversation, but this is not important for my purposes.) The context set is thus essentially a proposition, expressed as a set. When a speaker makes an assertion, they are proposing to remove from this set any worlds in which the asserted proposition is not true. The hearers can then accept or challenge this proposal with their own speech acts.

¹⁹ The corresponding gapping case is possible, as in (i).

- (i) Ann just jumped into the bushes, and Bill and Chris can't agree on why she did that.
 Bill thinks she's hiding because Chris is there, and Chris, because Bill is there.

To extend this view of conversation to the semantic system presented here, the first step is to treat the context set as a set of world-time-judge triples instead of worlds or world-time pairs. In particular, I propose that for all the triples in the context set for a conversation, the judge element represents the plurality of the group of participants in the conversation.²⁰ As we will see below, this is not going to mean that *might* (for example) is equivalent to something like “compatible with our knowledge.” What it does mean is that I have in effect introduced a notion of an actual judge, which is just the group of participants in a particular conversation. Moreover, in the typical case there will be no interesting disagreement in a conversation about who the actual judge is, unlike with worlds and possibly times.

The other important piece to add is the norm of assertion. I suggest that it is what Lasersohn would call autocentric. Specifically, I propose that in order for a speaker *A* to assert a sentence *S*, it must be the case that for all of *A*'s doxastic alternatives $\langle w', t', x \rangle$, *S* is true at the index $\langle w', t', x \rangle$. As discussed for the meaning of *think*, this means that *A* must believe that *S* is true as judged by *A*, but does not need to believe that *S* is true as judged by the whole group of conversational participants. Thus the norm of assertion is crucially weak in a certain sense. In order for *A* to assert that *S*, *A* only needs to believe that *S* is true as judged by *A*, but if *A*'s assertion is accepted by the other speakers and added to the common ground, it has the same effect as adding the proposition that *S* is true as judged by the group of conversational participants.²¹

5.2 Consequences

With these new assumptions in place, we can now make some sense of the special kind of disagreement that occurs with epistemic modals and predicates of personal taste, as discussed in Sect. 2.3. Consider (67), for example.

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

In this dialogue, Sam's assertion serves as a proposal to add to the common ground the proposition that the cake is tasty, which, if successful, will have the same effect on the common ground as adding the proposition that the cake tastes good to the entire group of conversational participants. To make this assertion, though, he only needs to believe that the cake tastes good to him. Sue objects to the proposal by asserting that the cake is not tasty (*No it isn't!*), which serves as a counterproposal to restrict the context set to triples $\langle w, t, j \rangle$

²⁰ Egan (2007) independently develops a different view of a relativist pragmatics, where for indices $\langle w, t, x \rangle$ in the context set, *x* varies among the atomic individuals participating in the conversation. I leave it to future work to make a thorough comparison of the two pragmatic systems.

²¹ The norm of assertion is also weak in a different way, given that it only involves belief. We could make it stronger in this sense by replacing doxastic alternatives with epistemic alternatives, without affecting my main points.

such that the cake does not taste good to j in w at t .²² She then goes on to assert that the cake tastes terrible; crucially, in order to do that, she only needs to believe that the cake tastes terrible to her. This shows that the relevant judge for the purposes of the norm of assertion is just the speaker, and not the entire group of conversational participants, because in this case Sue clearly knows that the cake does not taste terrible to Sam. This same point can also be seen by examples like (68), as Lasersohn (2005) observes.

- (68) Sue: This cake isn't tasty.
 Sam: Yes it is! (based on Lasersohn 2005, no. 17)

In this case, again, Sam can assert that the cake is tasty even knowing that it does not taste good to Sue.

The situation is completely parallel if the disagreement involves an epistemic modal as in (16), repeated below in (69).

- (69) 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.
 [OR] No, he can't be. He never works on Fridays.

Here Sam's assertion serves as a proposal to add to the common ground the proposition that Bill might be in his office. If successful, this will have the same effect as adding the proposition that the combined knowledge of the group of conversational participants is consistent with Bill being in his office. Sue challenges this assertion because she believes that her knowledge is inconsistent with Bill being in his office.

Essentially I have proposed that what a group does in a conversation is analogous to what an individual does in developing and revising a set of beliefs: an individual is trying to place him or herself in the space of possible individuals (as reflected in the notion of doxastic alternatives), and similarly a group of people in conversation are on a joint venture to place themselves, as a group, in the space of possible plural individuals. In other words, they are trying to align their world views, not only with regard to factual beliefs such as whether Bill works on Fridays, but also with regard to subjective matters such as what is tasty and which epistemic possibilities are still open. The rules of conversation are set up to let this happen particularly efficiently, by letting a speaker just propose something like "let's establish that we're in a world where Bill doesn't work on Fridays" or "let's establish that we're a group of people for whom this cake is tasty" or "let's establish that our epistemic state leaves it open whether Bill is in his office" without knowing whether their interlocutors will accept the

²² I assume that in the case of distributive predicates, including predicates of personal taste, 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). (This does not apply to epistemic modals, which I assume involve a collective interpretation of knowledge.) Thanks to Barry Schein (p.c.) for bringing up this issue.

proposal. The others are free to object, and if they do, then some argument may ensue, but if they don't, little time needs to be wasted on the issue.

One might still ask why speakers should be able to make proposals that they know will be unsuccessful, as Sue does in (67), where she knows that Sam will not accept the proposition that the cake tastes terrible. I will follow Stalnaker and assume that in making a conversational move, a speaker does not need to intend or even expect the move to succeed. This is analogous to the fact that, as Stalnaker puts it, "Congress may make a law knowing it will be vetoed, a labor negotiator may make a proposal knowing it will be met by a counterproposal, or a poker player may place a bet knowing it will cause all the other players to fold" (Stalnaker 1978, p. 153). Perhaps a more appropriate analogy would be the following: Suppose that a widely used hiking path runs along the edge of a privately owned ranch. The rancher believes that the path is actually on her property, and thus that the hikers are trespassing, but the hikers believe that the path runs along the route of a colonial wagon road, and is therefore a public right-of-way. The rancher puts "No Trespassing" signs along the path, thereby proposing that the path be treated as part of her property. In turn, the hikers put up improvised road signs along it saying things like "1 mile to Acoakset," thereby proposing that it be treated as a public way. The hikers know that the rancher will not accept this proposal, but by doing this they are making it clear to her that her proposal to treat the path as private property has not been accepted either. Similarly, in the case of a disagreement as in (67), the main purpose of Sue's assertion that the cake tastes terrible is to make it clear that she does not accept the proposal to add to the common ground the proposition that it's tasty. I suggest that the ability of speakers to allowably make doomed proposals (sometimes resulting in futile arguments) is an inevitable byproduct of an otherwise useful and efficient system.

5.3 A special case

Note that in my discussion of the purpose of conversation and the norm of assertion I have been talking about normal, information-sharing conversation. Some types of conversation are different. For example, an anonymous reviewer brings up an example along the lines of (70).

- (70) [Context: Sam is playing a game with his young daughter. He is hiding a prize in one of his hands and she has to guess which hand it is in.
Sam says:]
It might be in my right hand. It might be in my left hand. You have to guess.

Of course Sam knows which hand the prize is in—let's suppose it's in his left hand. Then it's surprising on my view that he can assert that it might be in his right hand, since it's not compatible with his beliefs that it's in his right hand.

I suggest that the norm of assertion in a guessing game is different than it is in normal, information-sharing conversation, and that this follows directly from the purpose of the conversation and the roles of the participants. In normal conversation, a speaker making an assertion is trying to get the others to share their beliefs. The speaker must believe the proposition they are asserting because it would be counterproductive to get the other participants to accept a proposition that they themselves do not believe (unless, of course, the speaker is lying, but in that case they are presenting themselves falsely as being engaged in information-sharing conversation). In a guessing game, on the other hand, the clue-giver is not supposed to eliminate the right answer as a possibility, but is also not supposed to give it away. The proposition that the prize might be in the clue-giver's right hand happens to have the special property that even though the clue-giver doesn't believe it, adding it to the common ground does not go against the purpose of the guessing game.

Note that allowing the epistemic modal in (70) to refer directly to the daughter's knowledge is not the answer here. On such a view, (70) would be expected to express roughly the same thing as (71).

- (71) [Context: Same as (70). Sam says:]
 (#/?) You don't know if the prize is in my right hand or my left hand.
 You have to guess.

(71) sounds like an odd thing for Sam to say in the context of a guessing game, since the daughter is presumably aware of her own ignorance. This suggests that (70) does not mean the same thing as (71).

5.4 First-person belief reports

In some cases epistemic modals and predicates of personal taste that are embedded in attitude reports seem to behave the same way that they do in the matrix clause, and disagreement is possible. This is illustrated in (72) and (73).

- (72) Mary: Where's Bill?
 Sam: I'm not sure. I think he might be in his office.
 Sue: Nuh-uh, he can't be. He never works on Fridays.
 [OR] No, he can't be. He never works on Fridays.
- (73) Mary: How's the cake?
 Sam: I think it's tasty.
 Sue: Nuh-uh, it isn't tasty at all!
 [OR] No it isn't, it tastes terrible!

On the face of it, these cases seem to present a challenge to my view of attitude predicates shifting the judge parameter, which predicts that *might* and *tasty* in (72)–(73) are interpreted with Sam as the judge, and thus that Sue should not be able to respond based on her own knowledge or taste. However (as I mentioned in

footnote 7), we can tell from the form of *No, he can't be!* and *No, it isn't!* (rather than *No, you don't!*) that Sue's disagreement targets the embedded clause rather than the main clause. This is part of a more general phenomenon. Simons (2005) observes (also citing Urmson 1952; Hooper 1975 and others) that assertions of the form "x thinks that p" can be used in such a way that the "main point" of the utterance is p, and not the entire attitude report. (This is especially easy with, but not restricted to, first-person reports.) I suggest (as hinted at by Simons) that when a belief report is used as evidence for the proposition being believed—i.e., if the fact that x thinks that p is used as evidence for p—then the utterance acts as if it is asserting both the main clause and the embedded clause. (This happens especially with first-person belief reports, since people generally treat their own beliefs as reliable.) On this view, Sam's utterance in (72), for example, serves as a proposal to (among other things) add to the common ground the proposition that Bill might be in his office. Since this proposition is judge-dependent, Sue can disagree based on her own epistemic state.

One might be concerned that since *think* manipulates the judge parameter, the embedded clause will have a different meaning than it does in a matrix position, but this is not the case. Sam's attitude report in (72) says something about the relation between Sam's belief state and the proposition that Bill might be in his office, but does not change that proposition in any sense.

6 Predictions of the analysis for epistemic modals

In this section and the next I will compare my proposal to existing analyses of epistemic modals and predicates of personal taste, considering the two cases separately. In this section I will look at epistemic modals, focusing on the context-relativist approaches of Egan et al. (2005) and MacFarlane (2006). After summarizing their approach in Sect. 6.1, I will discuss specific differences in predictions between their approach and mine in Sects. 6.2–6.3.

6.1 The context-relativist view of epistemic modals

Egan et al. (2005) and MacFarlane (2006) propose that the truth of an utterance depends not only on the context of utterance (which gives the values for indexicals such as *I* and *now*) and the index (a world and time), but also on a "context of assessment"²³ where someone assesses the utterance as true or false. The very same utterance can be true as assessed by one person at one time, but false as assessed by a different person and/or at a different time. Epistemic modals are linked to the knowledge of the person assessing the sentence at the time that they assess it. Thus a sentence of the form "might S" is true at a particular context of assessment just in case the proposition expressed by S (at the time of utterance) is compatible with the knowledge of the person assessing the sentence, at the time that they are assessing it.

²³ Egan et al. call it a "context of evaluation."

I will refer to accounts with a context of assessment as the context-relativist approach, in contrast to the judge-dependent approach that I advocate. (Both are forms of relativism.) Notice that both approaches add an extra parameter of interpretation that is used by epistemic modals. On the context-relativist approach, this is an entire situation where an utterance is assessed, whereas on the judge-dependent approach, it is simply an individual.

6.2 Scope ambiguities and time lag

On the context-relativist approach, the context of assessment includes the time when the sentence is assessed. I will use “time of assessment” to mean the time provided by the context of assessment, and “time of evaluation” to mean the matrix time (the time provided by the index). On the judge-dependent approach, the relevant knowledge for an epistemic modal is that of the judge at the time of evaluation, while on the context-relativist view, it is that of the assessor at the time of assessment. This property of the context-relativist view leads to a problem that von Fintel and Gillies (2006) discuss at some length, and which does not apply to the judge-dependent view. The issue is that sentences like (74) are ambiguous.²⁴

(74) The keys might have been in the drawer.

Putting aside the salient but irrelevant counterfactual reading, (74) can be understood with an epistemic *might* taking scope either over or under the past tense. The dialogue in (75) illustrates the reading where *might* scopes under the past tense, and the one in (76) brings out the reading where *might* scopes over the past tense.

(75) [Context: Billy is looking for her keys. Alex is trying to help.]
 Alex: The keys might be in the drawer.
 Billy: [Looks in the drawer, agitated] They’re not. Why did you say that?
 Alex: Look, I didn’t say there were in the drawer. I said they might be there – and they might have been. Sheesh.
 (von Fintel and Gillies 2006, no. 10, emphasis added)

(76) [Context: Billy is looking for her keys. Alex is trying to help her retrace her steps.]
 Alex: Where were they when you went to bed last night?
 Billy: Hmm, I remember that I checked a bunch of places and I did see them, but now I forget where. They might have been in the drawer. On the other hand, they might have been on the coffee table. I just don’t remember.

²⁴ Von Fintel and Gillies actually use (74) to make a more general point, and use a different example to illustrate scope ambiguity, but in their discussion the connection is obvious.

In (75), it is compatible with what Alex knew before Billy looked in the drawer that the keys were there; in (76), it is compatible with what Billy knows now that the keys were in the drawer last night. As von Fintel and Gillies observe, the context-relativist view cannot capture this ambiguity because it links the relevant knowledge to the time of assessment, which is not affected by tense. The judge-dependent view can capture the ambiguity since it links the relevant knowledge to the time of evaluation.

Another, closely related issue that von Fintel and Gillies (2006) bring up is the problem of “time lag.” They observe that as time passes it generally becomes increasingly inappropriate to contradict a *might*-statement, as illustrated by examples like (77). The context-relativist view predicts the opposite trend given that knowledge generally grows over time.

- (77) [Context: A randomly chosen card is being put in an envelope. Person A catches a glimpse of the card and knows that it is a black face card. When the envelope is opened ten years later, they find that it is actually the Jack of Clubs.]
 A: [now] It might be the King of Spades.
 B: ??[ten years later] Wrong! / What you said is false!
 (von Fintel and Gillies 2006, no. 19)

On the context-relativist view, von Fintel and Gillies claim, B’s utterance should be acceptable since once the envelope is opened and the card shown, it is no longer compatible with either A or B’s knowledge that the card is the King of Spades. The judge-dependent view again does not face this problem since it links the relevant knowledge to the time of A’s utterance.

There is a serious confound here, though. I have argued that the purpose of utterances like B’s in (77) is to challenge assertions previously made by other parties to the conversation, to prevent the asserted proposition from being added to the common ground. But this only applies within a single conversation. I assume that conversations are real events that happen in the world. They are not always spatially and temporally continuous (as seen, e.g., by telephone conversations and mail correspondences), but they are finite in length and have to fit into particular social conventions, and there are limits to how they can proceed. In particular, a conversation cannot start with some people putting a card into an envelope, and then adjourn and reconvene ten years later when they open the envelope. Thus B’s utterance in (77) is unacceptable not because of the time of the relevant knowledge, but rather because it does not occur in the same conversation as A’s assertion.

6.3 Retraction

MacFarlane (2006) observes that when a speaker makes a statement containing an epistemic modal, and another speaker disagrees with it, the original speaker

sometimes apparently retracts their previous statement, saying that they were wrong, as in (78).²⁵

- (78) Sally: Joe might be in Chicago.
 George: He can't be in Chicago. I saw him in the hall five minutes ago.
 Sally: Oh, then I guess I was wrong.

This kind of example can be explained straightforwardly on the context-relativist approach, since Sally's knowledge state changes between her first and second utterances, and thus at the time of her second utterance, she may assess her previous utterance as false. But of course, this is the very same property of the context-relativist approach that leads to the time-related problems pointed out by von Stechow and Gillies (2006) and discussed in Sect. 6.2 above.

Notice that the same phenomenon does not seem to occur with predicates of personal taste. For example, it seems odd and pathologically meek for Sam to respond to Sue's challenge as in (79).

- (79) Mary: How's the cake?
 Sam: It's tasty.
 Sue: No it isn't, it tastes terrible!
 Sam: #Oh, then I guess I was wrong.

I suggest that when a speaker says "Oh, I guess I was wrong" in reference to a previous assertion, they are not necessarily saying that the previous assertion was false or unjustified, but rather that they had relevant false beliefs when they made it. My claim, then, is that what Sally is "wrong" about in (78) is some relevant belief that she had when she said that Joe might be in Chicago. For example, she might have believed that Joe had plans to fly to Chicago that day, but upon finding out that he was in the hallway five minutes ago concludes that she was mistaken about his plans. To the extent that her previous assertion was based on that false belief, her admission of being wrong may serve as a retraction of her statement.

One might ask how it would even be possible for a *might*-statement to be based on a false belief, if "might p" simply entails the lack of knowledge that p is false. There are two ways to answer this question. One is to assume that pragmatic factors typically require there to be some reason for bringing up a particular epistemic possibility, for example if there is reason to believe that it's fairly likely. Another is to adopt the doubly-modalized semantics of Kratzer (1981, 1991), where worlds in the modal base are ordered with respect to certain properties such as stereotypicality. (On my view, the ordering would apply to epistemic alternatives, that is world-time-individual triples, rather than worlds.) If we accept one or the other of these options, asserting *Joe might be in Chicago*, e.g., would now make a proposal to restrict the context set to triples $\langle w, t, j \rangle$ such that there is some sufficiently likely triple $\langle w', t', x \rangle$ among j 's

²⁵ Examples (78) and (82) come from an earlier version of MacFarlane (2006).

epistemic alternatives in w at t such that Joe is in Chicago. Let's assume that sufficiently likely possibilities include only those where people with travel plans follow them, and people without travel plans stay in their general area. Then when Sally utters the sentence "Joe might be in Chicago" in (78), she doesn't just mean that she hasn't eliminated all the alternatives where Joe is in Chicago, but that in fact there is at least one alternative where people follow their travel plans and Joe is in Chicago. So this probably means that Sally thinks Joe has travel plans. If it turns out that Joe doesn't have travel plans, then her assertion was based on a false belief. That is, if Sally and George made more of their reasoning explicit, the dialogue might go like this:

- (80) Sally: Joe might be in Chicago.
 George: He can't be. I saw him in the hall five minutes ago.
 Why did you think he might be in Chicago?
 Sally: He was going to go there sometime this week.
 George: Oh, no, he's going next week.
 Sally: Oh, then I guess I was wrong.

In (80) it's fairly clear that what Sally is wrong about is her belief about Joe's travel plans, and my claim is that this is also the case in (78).

There is another possibility, of course, which is that Joe *did* have travel plans, but he cancelled them at the last moment, in which case it's much harder to see what Sally might be wrong about. But in this kind of situation, I think it's a bit odd for Sally to say that she was wrong. Consider the dialogue in (81), for example.

- (81) Sally: Joe might be in Chicago.
 George: He can't be. I saw him in the hall five minutes ago.
 Sally: I thought he was going there to visit his relatives sometime
 this week!
 George: Oh yeah, he was, but he changed his plans at the last minute.
 Sally: #Oh, then I guess I was wrong.

It seems strange in this case for Sally to say that she was wrong. On the context-relativist approach this is surprising, since given the new knowledge that Joe changed his travel plans, it would no longer be compatible with Sally's knowledge that Joe was in Chicago, and so she ought to assess her previous assertion, in her new context of assessment, as false. Under the view I have proposed, Sally's original sentence is always evaluated with respect to the judge's knowledge *at the time of evaluation* (in this case the time of utterance since the sentence is in the present tense), and thus should not "become false" in the face of additional knowledge. When the possibility of mistaken belief is factored out, as in (81), this does indeed seem to be the way epistemic modals behave, and so my analysis makes the right prediction.

Recall that predicates of personal taste do not give rise to the same phenomenon of retraction. This makes sense given that assertions involving

predicates of personal taste are normally based only on the speaker's own experience, which they are unlikely to be mistaken about.

A related phenomenon is the case of eavesdropping examples such as (82), due to MacFarlane.²⁶

(82) [*Jane, a stranger, is hiding in the bushes.*]

Sally: Joe might be in Chicago.

George: Oh, really? I didn't know that.

Jane (*sotto voce*): Sally is wrong. I saw Joe just a few minutes ago.

This can be explained the same way as the apparent retraction cases. In (82), Sally's assertion may reveal the fact that Sally believes that Joe has travel plans. If Jane knows that Joe doesn't have travel plans, then she may conclude that Sally has a false belief and is justified in saying that she is wrong.²⁷

The moral of this, I believe, is that researchers have been too quick to assume that "x is wrong" means "x made a false/unjustified assertion" rather than "x has a false belief." The two often coincide in standard systems, but do not necessarily coincide in my view.

7 Predictions of the analysis for predicates of personal taste

In this section I will look again at Lasersohn's account of predicates of personal taste and show that the changes I have proposed lead to better predictions specifically in that domain, apart from the question of extending the analysis to epistemic modals. Recall that the crucial difference between the two accounts has to do with which items encode a dependency on the judge. On Lasersohn's view, judge dependency is built directly into the meanings of predicates of personal taste, so that *fun*, for example, means "fun for the judge." On my view, on the other hand, judge dependency is encoded in the silent nominal PRO_J , which refers to the judge; a predicate of personal taste is simply a two-place predicate whose object may be silent. When a predicate of personal taste takes PRO_J as its object, this results in the meaning "fun for the judge." In Sects. 7.1–7.2 below, I discuss two specific differences between the accounts.

²⁶ See footnote 25.

²⁷ Speakers are mixed in whether they accept (i), an eavesdropping case involving a predicate of personal taste.

(i) [*Jane, a stranger, is hiding in the bushes.*]

Sally: Wow, this cake is really tasty!

George: Oh, really? Let me try.

Jane (*sotto voce*): % Sally is wrong. I tried the cake, and it tastes terrible.

For those who accept (i), it's possible that "X is wrong" can also be used to mean "Don't accept X's assertion!" This still rules out retraction with predicates of personal taste as in (79), since (for example) Sam would presumably stand by his original assertion.

7.1 PP arguments

We have seen that predicates of personal taste can sometimes appear with PPs that seem to explicitly express the person whose taste or experience is relevant. The main example given so far is *fun for X*, where X is the person whose experience is relevant. Lasersohn accounts for this by giving a meaning to *for* that operates on the judge parameter, so that *fun for X* as judged by any judge *j* is equivalent to *fun* as judged by X. This is equivalent to giving *for* the lexical entry in (83).

$$(83) \quad \llbracket \text{for} \rrbracket^{c; w,t,j} = [\lambda y_e . [\lambda P_{\langle s, \langle i, \langle e, et \rangle \rangle} \rangle . P(w)(t)(y)]]$$

Thus the role of *for* on Lasersohn’s view is similar to the role I give to attitude predicates such as *think* (based on an earlier proposal by Lasersohn), the difference being that *for X* operates on predicates whereas *think* operates on propositions.

On my view, in contrast, predicates of personal taste are simply two-place predicates that may take a silent argument, including PRO_J. In principle, though, there is nothing to stop them from taking overt arguments, and I assume that this is what happens in expressions such as *fun for X*. Thus I give *for* the lexical entry in (40), repeated in (84), which is just the identity function on individuals.

$$(84) \quad \llbracket \text{for} \rrbracket^{c; w,t,j} = [\lambda y_e . y]$$

In other words, I assume that in expressions such as *fun for X*, the preposition has no semantic contribution, but is required for some syntactic reason (perhaps to assign case to the object). This is a common assumption to make for relational nouns; for example, in the DP *father of Mary*, *Mary* may be taken to be the object of the relational noun *father*, where *of* has no semantic contribution.²⁸ Other prepositions besides *of* are possible with certain relational nouns, such as *to* in *contribution to the charity*. If we accept this view for relational nouns, then it becomes natural on my view to look at predicates of personal taste as relational adjectives, treating their PP arguments in a way similar to those of relational nouns.^{29,30}

²⁸ See, e.g., Heim and Kratzer (1998, pp. 61–62).

²⁹ The parallel between relational nouns and predicates of personal taste is not complete, however, since relational nouns cannot have the meaning that would result from combining with PRO_J. For example, if Sue is the daughter of A and the mother of C, the dialogue in (i) is absurd.

(i) A: Sue is a daughter. / Sue is the daughter.
 C: #No, she isn’t, she’s a mother! / # No she isn’t, she’s the mother!

³⁰ Conceivably it could be the other way around; for example, *for* could have the lexical entry in (i).

(i) $\llbracket \text{for} \rrbracket^{c; w,t,j} = [\lambda x_e . [\lambda P_{\langle s, \langle i, \langle e, et \rangle \rangle} \rangle \rangle . [P(w)(t)(j)(x)]]$

But it is clearly more straightforward on my view to treat these PPs as arguments of the predicates of personal taste.

The difference between Lasersohn's view and mine, then, is that in *fun for X* (for example), Lasersohn treats *for X* as a modifier of *fun* while I treat it as an argument of *fun*.³¹ These make different predictions. If the PP is a modifier, then we would expect the same PP to be able to combine with essentially any predicate of personal taste, restricted only by general aspects of meaning (in the same way that a modifier like *for two days* may be restricted to imperfective or atelic predicates but not to specific verbs). If the PP is an argument, on the other hand, we might expect predicates of personal taste to select more idiosyncratically for a PP headed by a particular preposition. This is in fact what we find when we consider a wider variety of predicates of personal taste. Some examples are given in (85). (The judgments given in (85) are my own, and the exact judgments are less important than the variation among predicates.)

(85)	fun for Sue	*fun to Sue
	boring for Sue	??boring to Sue
	tedious for Sue	??tedious to Sue
	pleasurable for Sue	??pleasurable to Sue
	??pleasing for Sue	pleasing to Sue
	??tasty for Sue	??tasty to Sue
	??delicious for Sue	*delicious to Sue
	*tastes good for Sue	tastes good to Sue
	??tasteless for Sue	?/OK tasteless to Sue
	??funny for Sue	funny to Sue
	exciting for Sue	exciting to Sue

Some predicates in (85) can appear with *for*, some can appear with *to*, and some cannot appear with either. (I have not yet found any predicates of personal taste that appear with other prepositions.) There are some semi-regularities, for example, predicates expressing enjoyment or lack of enjoyment tend to appear with *for*. However, the choice of preposition is largely idiosyncratic, with similar predicates sometimes showing different behavior. For example, in my judgment *exciting to Sue* sounds much better than *boring to Sue*, while *fun to Sue* is completely impossible; similarly, *tasty to Sue*, while somewhat odd, is still much better than *delicious to Sue*. *Pleasing* and *pleasurable* seem to be at least somewhat related in meaning, and yet *pleasing* takes *to* and *pleasurable* takes *for*. This suggests that *for*- and *to*-phrases are arguments rather than modifiers of predicates of personal taste, giving my view the advantage over Lasersohn's.

7.2 Autocentric and exocentric perspectives

Recall that Lasersohn assumes that while speakers and hearers typically take an "autocentric" perspective, making and assessing assertions with themselves as judge, they may sometimes take an "exocentric" perspective instead, making and assessing assertions with some other salient individual as the judge.

³¹ Thanks to an anonymous reviewer for discussion of this point.

I assumed, in contrast, that speakers and hearers always take an autocentric perspective in his sense, but that what looks like an exocentric reading can arise if a predicate of personal taste takes a silent referential argument instead of PRO_j .

On the face of it, these two views seem to make similar predictions. On either view, asserting that the cake is tasty will normally require that the cake taste good to the speaker, but if some individual X is particularly salient, it might mean that the cake tastes good to X . Both views also allow for disagreements as in (86), as we have seen.

- (86) Sam: This cake is tasty.
 Sue: Nuh-uh, it isn't tasty at all!
 [OR] No it isn't, it tastes terrible!

However, the two analyses assign different semantic contents to sentences in some cases, which has empirical consequences for when speakers can disagree. On Lasersohn's view, a sentence with a predicate of personal taste has the same content regardless of whether the speaker is taking an autocentric or exocentric perspective. For example, the content of (87) (expressed as a set) is the set of world-time-judge triples $\langle w, t, j \rangle$ such that the cake tastes good to j in w at t .

- (87) This cake is tasty.

On my view, on the other hand, one possible content for (87) is the same as Lasersohn's; this is the content if *tasty* takes PRO_j as its argument, corresponding to Lasersohn's autocentric perspective. But if a particular individual is salient, for example Mary, then *tasty* can take as its argument a null pronoun referring to Mary, in which case its content is the set of world-time-judge triples $\langle w, t, j \rangle$ such that the cake tastes good to Mary in w at t . This corresponds to Lasersohn's exocentric perspective.

Lasersohn and I both assume that two speakers disagree only if the content of the sentence asserted by one is the negation of the one asserted by the other. On Lasersohn's view, a sentence has the same content regardless of the perspective taken by the speaker, predicting that it should be possible for two speakers to disagree when one takes an autocentric perspective and the other takes an exocentric perspective. To test this, consider the dialogue in (88).

- (88) Sam: The tuna is tasty.
 Sue: (#)No, it's isn't! It's not tasty at all!

Suppose that Sam and Sue are feeding tuna to their cat. If Sam intends his statement in (88) to mean that the tuna tastes good to the cat, and Sue understands that he means it this way, then Sue's response is only felicitous if she also means that the tuna does not taste good to the cat. In this case she cannot respond as in (88) based on the fact that the tuna does not taste good to her. On the other hand, now suppose that Sam and Sue are the ones eating

tuna. If Sam's statement is intended in the autocentric way, based on the fact that the tuna tastes good to him, and Sue understands that he means it this way, then her response is only felicitous if it is also autocentric, based on the fact that the tuna does not taste good to her. In other words, for disagreement to be possible in an example like (88), it must be the case (in Lasersohn's terms) either that both speakers are taking an autocentric perspective or that both are taking an exocentric perspective linked to the same third party. My view predicts this, since the difference between an autocentric and exocentric perspective comes from whether PRO_J or a silent referential pronoun is present, which changes the content of Sam's statement. By assumption, disagreement can only occur with contradictory contents, and thus Sue's statement can only indicate disagreement with Sam's if *tasty* has the same argument in both. Lasersohn does not predict this, however, at least not without further stipulation. On his view, nothing prevents this sort of disagreement from occurring, because the content of *the tuna is tasty* is the same in Sam's and Sue's utterances regardless of what perspectives the speakers take. This supports my view over Lasersohn's.

8 Conclusions

In this paper I have developed an account of both epistemic modals and predicates of personal taste using Lasersohn's (2005) framework of judge dependency. At this point, I will summarize the changes to Lasersohn's account that I have proposed, my way of extending it to cover epistemic modals, and my efforts to address certain theoretical and conceptual issues that arise from this general framework.

The essential innovation of Lasersohn (2005), which I have adopted, is to add an individual "judge" parameter to the Kaplanian index, so that the content (or intension) of any expression is a function from world-time-judge triples to its extension. On Lasersohn's account, the meaning of a predicate of personal taste such as *tasty* is directly dependent on the value of the judge: for example, for any world-time-judge triple $\langle w, t, j \rangle$, *tasty* denotes the set of things x such that x tastes good to j in w at t . My account achieves a similar effect in a somewhat different way. I treat predicates of personal taste as two-place predicates, and introduce a silent nominal item PRO_J that refers to the judge. Thus, on my view, for any world-time-judge triple $\langle w, t, j \rangle$, *tasty* denotes the set of pairs $\langle x, y \rangle$ such that x tastes good to y , and *tasty* PRO_J has the meaning that Lasersohn gives to *tasty*. I also assume that predicates of personal taste may take null referential arguments, in which case judge dependency disappears.

Two more differences between Lasersohn's account and mine involve the perspective(s) that may be taken by speakers and hearers in conversation and, relatedly, the semantics of attitude predicates such as *think*. Lasersohn assumes that speakers and hearers normally take themselves to be the judge when making and assessing assertions (an autocentric perspective), but that they can take the perspective of someone else when that individual is particularly salient

(an exocentric perspective). Accordingly, on his view attitude predicates such as *think* don't shift the judge parameter, but it would be expected that attitude reports would generally be contexts where an exocentric perspective is natural. I propose instead that an autocentric perspective is obligatory, and that apparent exocentric cases arise only when a predicate of personal taste has taken a null referential argument rather than PRO_j . This allows me to retain a semantics for attitude predicates on which they shift the judge parameter to the attitude holder, as proposed by Lasersohn in an earlier version of his work.

I extend judge dependency to epistemic modals by making the judge the person whose knowledge is relevant. Unlike with predicates of personal taste, I build the judge dependency directly into the meaning of the modals so that, for example, given a world-time-judge triple $\langle w, t, j \rangle$, *might p* is true iff *p* is compatible with what *j* knows in *w* at *t*. That is, I give epistemic modals roughly the kind of meaning that Lasersohn gives to predicates of personal taste, but with differences in the surrounding assumptions that predict the somewhat different behavior of these items.

As it stands, my view must simply stipulate that predicates of personal taste can take silent individual arguments while epistemic modals cannot, at least in English. We might expect, then, to find a language where predicates of personal taste cannot take referential arguments or epistemic modals can.³² I don't know what the relevant cross-linguistic facts are, and this is an important question for future work. However, it seems likely that predicates of personal taste or items similar to them might have different argument-taking behavior across languages. Japanese experiential predicates could be an example of this (see, e.g., Tenny 2006; McCready 2006). Turning to epistemic modals, as I mentioned in Sect. 4.3, the required judge dependency of epistemic modals actually ought to reside in the restrictor argument rather than the modals themselves, but the question remains of why the modal restrictor could not make reference to the epistemic alternatives of a contextually salient individual. This issue becomes more pointed when we consider the meaning I gave for *because* in Sect. 4.5, which does make reference to the epistemic alternatives of a contextually salient individual, namely the individual whose reasoning or rationale is involved. If *because* can do this, we might ask, why can't *might* and *must*? Once again, I cannot answer this question here, but I suggest that it ought to be investigated as part of a general project looking at cross-linguistic patterns and restrictions on modality. The Kratzerian tradition has emphasized the freedom of modals to take different kinds of modal restrictors determined almost entirely by the context. The facts about epistemic modals discussed here and elsewhere suggest that epistemic modality is more restricted than this view would predict, and it is possible that other kinds of modality have unexpected restrictions as well.

In proposing an additional parameter of interpretation, it is important to explain how it is involved in the pragmatic rules governing conversation. I have proposed that a conversation is always linked to a particular judge, namely the group of participants in the conversation. This is parallel to the link a con-

³² Thanks to *L&P* editor Polly Jacobson for bringing up this point.

versation has with the particular world and time in which it occurs. This means that at the level of entire conversations, there is no conceptual difference between the judge and the other parameters of the index: for any conversation, there is a completely objective fact of the matter about what world-time-judge triple it belongs to. The conceptual difference between the judge and the other parts of the index, I have proposed, only matters within a conversation. Within a conversation, participants are governed by principles which make a distinction between the world and time on the one hand and the judge on the other. While all participants are held responsible, so to speak, to the same world and time (whichever one happens to be the actual one), each one is held responsible to a different judge—namely themselves. This is reflected in the norm of assertion that I have proposed, which says in effect that in order to assert a sentence *S*, a speaker only has to believe (justifiably) that *S* is true with themselves as the judge, although if their assertion is accepted and added to the common ground, it becomes linked to the entire group of conversational participants. At the level of individual conversational moves such as assertions, then, the judge-dependent view makes a conceptual departure from standard assumptions, but this effect goes away as soon as any particular conversation is over and its common ground established.

Developing an appropriate theory of conversation to go along with the judge-dependent approach is just one step towards addressing the conceptual issues that this approach gives rise to. I hope, though, that I have helped to show that the approach is promising enough to make the extra effort worthwhile.

There are also empirical questions still to be answered, most importantly whether there are more kinds of expressions that make crucial use of the judge parameter. If I am right in claiming that epistemic modals share this property with predicates of personal taste, it seems likely that other items do so as well. For example, it's possible that the judge parameter could be involved in setting the boundaries for vague scalar predicates such as *red*. The judge could also be involved in some way in formulating the kind of “logophoric” requirements that seem to apply in certain cases of long-distance binding. I leave these to future work.

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