

Presupposition Projection from Attitude Contexts

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Presupposition Reading Group

1 Presupposition projection through doxastic and bouletic predicates

Presuppositions triggered in the scope of doxastic and bouletic predicates often trigger two inferences, which I call an **i-inference** and **e-inference**.

- (1) It stopped raining (at 15:00).
presupposition: It was raining (at least until 15:00).
- (2) a. David believes that it stopped raining.
b. David hopes that it stopped raining.
- (3) a. **i-inference**: David believes that it was raining.
b. **e-inference**: It was raining.

Similarly for other doxastic and bouletic predicates:

- (4) a. David thinks that it stopped raining.
b. David wants it to stop raining.
c. David is under the impression that it stopped raining.
d. David is convinced that it stopped raining.
e. David is certain that it stopped raining.

These projective contexts are special in that they give rise to two inferences.

As [Geurts 1999](#) points out, both inferences project like presuppositions:

- (5) a. If David believes that it stopped raining, he'll be surprised.
b. David doesn't believe that it stopped raining.
c. Perhaps David believes that it stopped raining.
- (6) a. If David hopes that it stopped raining, he'll be disappointed.
b. David doesn't hope that it stopped raining.
c. Perhaps David hopes that it stopped raining.

2 [Heim's 1992](#) analysis

[Heim 1992](#): §5.2 claims that the i-inference is the semantic presupposition, and the e-inference is pragmatically derived from it, similarly to the case of the proviso inference for conditional, conjunctive and disjunctive sentences (except that the derived inference

is logically independent from the semantic presupposition).¹

- The i-inference can be filtered and in that case, the e-inference (necessarily) doesn't arise (in these examples it is blocked by an anti-presupposition; see below).

- (7) a. David believes that it was raining in the morning,
and he (also) believes that it stopped raining in the afternoon.
b. David believes that it was raining in the morning,
and he hopes that it stopped raining in the afternoon.

- (8) a. If David believes that it was raining in the morning,
he believes that it stopped raining in the afternoon.
b. If David believes that it was raining in the morning,
he hopes that it stopped raining in the afternoon.

- Suppose that the context doesn't entail the i-inference or the e-inference. When one of the sentences in (2) is uttered in this context, one has to at least accommodate its semantic presupposition, the i-inference. In addition, one reasons that the i-inference, by virtue of being accommodated, must be uncontroversial and unsurprising. A natural reason for its backgrounded status is because the e-inference is the case.

So when we hear (66) ["John believes that it stopped raining"] out of the blue, we know two things: first, as a matter of the semantics of this sentence, we know that it requires the presupposition that John believes it was raining. Second, we know that the speaker takes this to be uncontroversial and unsurprising. Now why would it be unsurprising that John has such a belief? The most natural guess is that it would be unsurprising because it was in fact raining and John was in an appropriate position to find out. Of course, these are not the only possible conditions under which someone might form a belief that it was raining, but they are the most *normal* conditions. Therefore, if accommodation is generally accompanied by a suggestion of unsurprisingness, then it is not so puzzling that these are the conditions which we spontaneously imagine to obtain. (Heim 1992: p. 212)

- When the e-inference is common ground, and the i-inference is not, we just accommodate the i-inference and the resulting situation is the same.
- When the i-inference is common ground, but the e-inference is not, we have a situation like the above examples.

3 Geurts' objections to the pragmatic account of the e-inference

Geurts 1999 argues against Heim's 1992 account of the e-inference as coming from pragmatic reasoning.

¹Heim 1992: §5.1 discusses the possibility that the e-inference is due to a generalized *de re* reading of the presupposition. She sounds like she does not consider either approach to be particularly likely. We'll discuss the *de re* approach later.

3.1 The direction of reasoning

He expresses some general doubt:

[Heim's argument] takes the wrong direction, in that it attempts to draw conclusions about the speaker's beliefs on the basis of the beliefs that he ascribes to a third party, instead of the other way round. [...] Putting the point without any of the necessary nuances: if a person *a*'s doxastic context is the subject of a conversation, the interlocutors will tend to assume that *a* believes what they believe. [...] Heim's argument, however, proceeds in the opposite direction, which is not nearly as plausible: in general, if I describe someone as believing that ϕ , I intend to at least remain uncommitted concerning the truth of ϕ . What is more, if someone describes a person as believing (rather than knowing) that ϕ , his description may often be taken to imply that he doubts that ϕ is true or is even convinced that it is false. In short: if a speaker reports on the beliefs of a person *a* there may be a tendency to ascribe to *a* beliefs that the speaker is taking for granted, but it is *a priori* unlikely that the hearer will ascribe a certain belief to the speaker because the speaker ascribes it to *a*. (Geurts 1999: p. 166)

But as I pointed out in Sudo 2014, this argument misses the point that what we are talking about is accommodation of the presupposition that *a* believes that ϕ , rather than an assertion of *a* believing ϕ .

- It is indeed correct that an assertion of *a* believing ϕ tends to imply that ϕ is false.
- This inference is often analyzed as an anti-presupposition: Percus 2006 proposes that its due to the presuppositionally stronger alternative formed with 'know' in place of 'believe'.

- (9) a. John believes that it is raining.
 b. John knows that it is raining.

- We don't expect such an inference to arise from the presupposition that *a* believes ϕ .

In fact, the speaker is not merely ascribing a certain belief *p* to *a*; they are behaving as if it is taken for granted, and hence unsurprising and uncontroversial, that *a* has the belief *p*. This could well kick start an extra pragmatic reasoning along the lines of what Heim suggests.

3.2 Factive presuppositions about belief ascriptions do not give rise to e-inferences

In addition, Geurts 1999 presents a counter-argument based on an observation parallel to his objection to the pragmatic account of the proviso problem.

- (10) Fred knows that John believes that it was raining. (Geurts 1999: p. 165)

This should presuppose that John believes that it was raining. Geurts observes, correct, that accommodating this presupposition does not seem to trigger the same pragmatic reasoning that leads to the e-inference that it is indeed raining.

In Sudo 2014 I argued against this argument, by pointing out that Geurts is ignoring the anti-presupposition of *believe*.

- Firstly, as mentioned above, *believe* tends to give rise to an inference that the complement clause is in fact not true.

(11) John believes that it was raining.
 $\leadsto$ it was not raining

- This is often analyzed on a par with anti-presuppositions like (12).

(12) a. John likes all of his sisters.
 $\leadsto$ John has more than two sisters
 b. Bill is friends with a founder of my company.
 $\leadsto$ My company has more than one founder

These inferences are considered to arise from the presuppositionally stronger alternatives in (13).

(13) a. John likes both of his sisters.
 b. John likes his sister.
 c. Bill is friends with the founder of my company.

- When embedded under a factive attitude predicate *know*, the anti-presupposition of the embedded clause becomes part of the presupposition of the whole.

(14) a. Fred knows that John likes all of his sisters.
 b. Fred knows that Bill is friends with a founder of my company.

- So, we'd expect (10) to presuppose that it was in fact not raining, but John wrongly believes that it was.
- Given this semantic presupposition, it is not at all surprising that one does not accommodate that it was in fact raining.

4 *De re* presuppositions

There are some exceptions where the i-inference is absent:

- *Stop proof-reading*

(15) John thought that I had stopped proof-reading. (Heim 1992: p. 208)

Heim 1992: p. 208: "I could conceivably mean that John thought of the activity of mine was in fact a proof-reading, but that he may not have recognized as such, that it had stopped. For instance, John may have seen me from a distance and thought I was reading a magazine, then (after he had looked away) heard my step, at which point he concluded that I must have stopped reading the magazine. In fact, I was proof-reading my article and continued doing this even as I was walking around."

- *I am also in bed*²

²Note that Heim 1992 is assuming an anaphoric theory of additive presuppositions due to Kripke 2009. I have reasons to be skeptical of the validity of this analysis (which are spelled out in Donáti & Sudo 2025) but this is orthogonal to the present discussion.

- (16) John: I_1 am already in bed.
 Mary: Mary parents think I_F am also₁ in bed. (Heim 1992: p. 209)

Heim 1992: p. 208: “[This example] is quite clearly felicitous even if Mary’s parents cannot be assumed to have any beliefs about John.”

Heim 1992: §5.1 analyzes these cases as involving *de re* readings of the properties in question:

- (17) a. Of the property P of proof-reading, John thought that my having the property under which John is acquainted with P had stopped.
 b. Of the property P of also being in bed (in addition to John), my parents think that Mary has the property under which they are acquainted with P .

Although *de re* analyses are plausible for cases like these, Heim remains skeptical of it as a general analysis for all cases of e-inferences.

One reason for my scepticism is that I don’t see off-hand how this approach throws light on the appropriateness of *also* in the following minimal variation of [(16)]: imagine John and Mary competed for one job, and everybody, including the parents, knew this.

- (i) John: I_1 got the job.
 Mary: My parents think that I_F also₁ got it.

Why isn’t *also_i get the job* a description that fits the property of getting the job when it happens that x_i gets the job? (Heim 1992: fn. 51)

It is not impossible that there are unknown constraints on which phrases can receive *de re* readings under what circumstances, but as Heim says in the above quote, it’s not clear what such constraints consist in or how plausible they are.

5 Propositional Satisfaction Theory with B: $\mathcal{L}_{SAT}^B$

Let us first formalize Heim’s account of presupposition projection from the complement clause to *believe*.

In addition to the truth-functional connectives of $\mathcal{L}_{SAT}$, we will have a series of belief operators: For each agent x in a given model, we will have $B_x(\varphi)$, which represents ‘ x believes that φ ’.

5.1 Syntax

As in $\mathcal{L}_{SAT}$, we will abstract away from sub-sentential compositionality (for now) and assume that atomic formulas carry presuppositions.

We will not introduce terms here to keep the exposition minimal, so we will use indices $(1, 2, 3, \dots \in \mathbb{N})$ instead of terms to designate attitude holders.

- If $\pi \in \mathcal{L}$ and $p_i \in \mathcal{A}$, $\pi p_i \in \mathcal{L}_{SAT}^B$.
- If $\varphi, \psi \in \mathcal{L}_{SAT}^B$, then $\neg\varphi, (\varphi \wedge \psi), (\varphi \vee \psi), (\varphi \rightarrow \psi) \in \mathcal{L}_{SAT}^B$.

- If $\varphi, \psi \in \mathcal{L}_{\text{SAT}}^{\text{B}}$ and n is an index, then $B_n(\varphi) \in \mathcal{L}_{\text{SAT}}^{\text{B}}$
- Nothing else is a formula of $\mathcal{L}_{\text{SAT}}^{\text{B}}$.

5.2 Semantics

A model for $\mathcal{L}_{\text{SAT}}^{\text{B}}$ is a triple $\mathcal{M} = \langle s, \mathcal{V}, \mathcal{A} \rangle$ where:

- s is a (non-empty) sequence of agents. The i th component of s is denoted by s^i .
- $\mathcal{V}$ is a (non-empty) set of $\mathcal{L}$ -valuations. Each $\mathcal{L}$ -valuation represents a possible world. $\mathcal{L}$ -valuations and possible worlds can be kept ontologically distinct, if you will, but I will henceforth call them possible worlds (but refer to them by v, v', v'' , etc.).
- $\mathcal{A}$ is the function from agents to functions from possible worlds to accessibility relations between possible worlds, representing each agent's beliefs in the given possible world. We will write $v' \mathcal{A}_v^i v''$ to mean ' v'' is indistinguishable from v' according to s^i 's beliefs in v ', and $\mathcal{A}_v^i$ to denote $\{v' \mid v \mathcal{A}_v^i v'\}$, which is s^i 's doxastic alternatives of v at v .

Formulas are interpreted as partial functions over sets $V \subseteq \mathcal{V}$ of possible worlds.

- $\llbracket \pi \mathbf{p}_i \rrbracket(V) = \lambda V: \text{for each } v \in V, \llbracket \pi \rrbracket(v) = 1. \{v \in V \mid \llbracket \mathbf{p}_i \rrbracket(v) = 1\}$
- $\llbracket \neg \varphi \rrbracket = \lambda V: V \in \text{dom}(\llbracket \varphi \rrbracket). V - \llbracket \varphi \rrbracket(V)$
- $\llbracket (\varphi \wedge \psi) \rrbracket = \lambda V: V \in \text{dom}(\llbracket \varphi \rrbracket) \text{ and } \llbracket \varphi \rrbracket(V) \in \text{dom}(\llbracket \psi \rrbracket). \llbracket \psi \rrbracket(\llbracket \varphi \rrbracket(V))$
- $\llbracket (\varphi \vee \psi) \rrbracket = \lambda V: V \in \text{dom}(\llbracket \varphi \rrbracket) \text{ and } \llbracket \neg \varphi \rrbracket(V) \in \text{dom}(\llbracket \psi \rrbracket). \llbracket \varphi \rrbracket(V) \cup \llbracket \psi \rrbracket(\llbracket \neg \varphi \rrbracket(V))$
- $\llbracket (\varphi \rightarrow \psi) \rrbracket = \lambda V: V \in \text{dom}(\llbracket \varphi \rrbracket) \text{ and } \llbracket \varphi \rrbracket(V) \in \text{dom}(\llbracket \psi \rrbracket). V - \llbracket \neg \psi \rrbracket(\llbracket \varphi \rrbracket(V))$
- $\llbracket B_n(\varphi) \rrbracket = \lambda V: \text{for each } v \in V, \mathcal{A}_v^n \in \text{dom}(\llbracket \varphi \rrbracket). \{v \in V \mid \llbracket \varphi \rrbracket(\mathcal{A}_v^n) = \mathcal{A}_v^n\}$

The only new thing is the last clause. What's crucial here is that $B_n(\varphi)$ presupposes that s^n believes the presupposition of φ to be true, which is the i-inference.

6 Bouletic predicates

6.1 Hintikka-style semantics

One way to analyze the semantics of bouletic predicates is in terms of universal quantification over bouletically ideal possible worlds. That would be parallel to the analysis of *believe* above.

To illustrate the in a bivalent static setting. (We'll ignore differences between *hope* and *want* for now).

- (18) a. $\llbracket \text{believes that } \varphi \rrbracket = \lambda w_s. \lambda x_e. \text{for each } w' \in \text{Dox}_w^x, \llbracket \varphi \rrbracket(w') = 1$
b. $\llbracket \text{hopes that/want } \varphi \rrbracket = \lambda w_s. \lambda x_e. \text{for each } w' \in \text{Bu}_w^x, \llbracket \varphi \rrbracket(w') = 1$

However, we'd then expect presuppositions triggered in their complement clauses to project universally with respect the domain of quantification, as in the case of *believe*, failing to derive the i-inference (although it should be acknowledged once again that Heim's theory itself does not make direct predictions about how presuppositions should project).

There are some additional arguments against the Hintikka-style analysis:

- Heim 1992 mentions the following argument: It predicts for any pair of sentences, ϕ and ψ , such that ϕ entails ψ , if ‘Andy wants/hopes ϕ ’ is true, ‘Andy wants/hopes ψ ’ is true. This prediction is not borne out:

- (19) a. Nathan wants to teach in the morning.
b. Nathan wants to teach.
- (20) a. I hope my donation helps homeless people.
b. I hope there are homeless people.
- (21) a. I hope the murderer will be caught.
b. I hope there is a murder.
- (22) John is in a furniture store, looking at a couch that has a very scary price-tag. The salesman comes up to him and the following conversation takes place:
Salesman: Would you like to buy this couch?
John: No
Salesman: Would you like to buy it at a 25% discount?
John: Yes (von Fintel 1999: p. 120)

But it should be noticed that in some cases, the predicted inference sounds valid:

- (23) a. Andy wants to buy a green sweater.
b. Andy wants to buy a sweater. (Zimmermann 2006: p. 718)
- When ϕ and ψ contradict each other, ‘ x wants/hopes ϕ ’ and ‘ x wants/hopes ψ ’ should too. Some such cases sound ok.
- (24) a. James wants to take drugs.
b. James wants to be clean.
- (25) a. I want to teach in the afternoon.
b. I want to not teach at all.

6.2 Comparative semantics

Drawing on Stalnaker 1984, Heim 1992 proposes a comparative semantics for bouletic predicates (which was subsequently adopted by Villalta 2008, Anand & Hacquard 2013, Harner 2016, among others; see Crnič 2011: Appendix for a summary).

Again, illustrating this in a bivalent static setting:

- (26) $\llbracket \text{want } \phi \rrbracket = \lambda w_s. \lambda x_e. \text{ for each } w' \in \text{Dox}_w^x, \text{SIM}_{w'}(\{w'' \in \text{Dox}_w^x \mid \llbracket \phi \rrbracket(w'') = 0\}) <_w^x \text{SIM}_{w'}(\{w'' \in \text{Dox}_w^x \mid \llbracket \phi \rrbracket(w'') = 1\})$
- (27) a. $\text{Dox}_w^x := \{w' \mid w' \text{ is compatible with } x\text{'s beliefs in } w\}$
b. $\text{SIM}_{w'}(S) := \{w'' \in S \mid w'' \text{ is maximally similar to } w' \text{ among the worlds in } S\}$
c. $S <_w^x T$ iff for each $s \in S$ and $t \in T$ x prefers t to s in w

“[W]anting something is preferring it to certain relevant alternatives, the relevant alternatives being those possibilities that the agent believes will be realized if he does not get what he wants.” (Stalnaker 1984: p. 89)

“[A]nother way of stating these truth conditions is the following disjunctive form: For every belief world w' , either φ is true in w' and w' is more desirable than its closest non- φ -alternatives, or else φ is false in w' and w' is less desirable than its closest φ -alternatives.” (Heim 1992: p. 193f)

Transposing this in a dynamic setting, we'll be applying the ϕ -update to Dox_w^x , whereby predicting the i-inference.

6.3 $\mathcal{L}_{\text{SAT}}^{\text{ATT}}$

Let us now add the bouletic predicate H to the fragment.

- If $\pi \in \mathcal{L}$ and $p_i \in \mathcal{A}$, $\pi p_i \in \mathcal{L}_{\text{SAT}}^{\text{ATT}}$.
- If $\varphi, \psi \in \mathcal{L}_{\text{SAT}}^{\text{ATT}}$, then $\neg\varphi, (\varphi \wedge \psi), (\varphi \vee \psi), (\varphi \rightarrow \psi) \in \mathcal{L}_{\text{SAT}}^{\text{ATT}}$.
- If $\varphi, \psi \in \mathcal{L}_{\text{SAT}}^{\text{ATT}}$ and n is an index, then $B_n(\varphi), H_n(\varphi) \in \mathcal{L}_{\text{SAT}}^{\text{ATT}}$.
- Nothing else is a formula of $\mathcal{L}_{\text{SAT}}^{\text{ATT}}$.

The model contains $\leq$, in addition to $\mathcal{A}$.

- A model for $\mathcal{L}_{\text{SAT}}^{\text{ATT}}$ is a quintuple $\mathcal{M} = \langle s, \mathcal{V}, \mathcal{A}, <, < \rangle$ where the first three components are as in $\mathcal{L}_{\text{SAT}}^{\text{B}}$.
- $<$ is a function from possible worlds to a similarity ordering among possible worlds. We'll write $<_w$ instead of $<(w)$. For any set S of possible worlds, we write $\max_w^<(S) := \{w' \in S \mid \text{for no } w'' \in S, w' <_w w''\}$.
- $<$ is the function from agents to a function from possible worlds to a (partial) order among the agent's belief worlds in the given possible world, representing each agent's desires in that world. We will write $<_v^i$ for $<(s^i)(v)$. ' $v' <_v^i v''$ ' represents ' v'' is more desirable than v' with respect to s^i 's desires in v '.
- For two sets of possible worlds V' and V'' , we write $V' <_v^i V''$ iff for each $v' \in V'$, for each $v'' \in V''$, $v' <_v^i v''$.
- $\llbracket H_n(\varphi) \rrbracket = \lambda V: \text{for each } v \in V, \mathcal{A}_v^n \in \text{dom}(\llbracket \varphi \rrbracket). \left\{ v \in V \mid \begin{array}{l} \text{for each } v' \in \mathcal{A}_v^n, \\ \max_{v'}^<(\llbracket \neg\varphi \rrbracket(\mathcal{A}_v^n)) <_v^n \max_{v'}^<(\llbracket \varphi \rrbracket(\mathcal{A}_v^n)) \end{array} \right\}$

6.4 Unrealistic and realistic desires

One issue of the above semantics is unrealistic desires.

- (28) I want this weekend to last forever. (But I know, of course, that will be over in a few hours.) (Heim 1992: p. 199)

Here, we do not have ϕ -worlds among the doxastic alternatives.

Similarly, totally realistic desires will pose an issue.

- (29) a. I live in Bolivia because I want to live in Bolivia.
b. A: You're drunk!
B: Yes, and I want to be because only this way can I forget about... (Iatridou 2000: p. 243)

Here, there are no $\neg\phi$ -worlds among the doxastic alternatives.

To deal with (29), Heim proposes to expand the domain of quantification to (30) (which she calls Dox^+):

- (30) $\{ w' \mid w' \text{ is compatible with what } x \text{ believes to be true no matter how } x \text{ chooses to act} \}$

It is guaranteed that the doxastic alternatives are all in this set.

But this doesn't account for (28). For it, she suggests a different way of expanding the domain, *rev* (see below).

Also von Fintel & Iatridou 2017 raises the following issue (attributed to Milo Phillips-Brown):

“[T]he following is compatible with what John believes to be the case no matter how he chooses to act: John doesn't hire a babysitter and goes to the movies anyway, and so his unsupervised kid gets into terrible trouble. This is a world that is not compatible with what John believes (because he believes that he would never leave his kid unsupervised) but it is compatible with Dox^+ . Now, this world is clearly worse by John's lights than a minimally different world where he doesn't go to the movies (so he'd be home to take care of his kid).”

Therefore, (31) should be true, but that's counter-intuitive.

- (31) John doesn't want to go to the movies.

Note that unrealistic and realistic desires are not felicitous with *hope*.

- (32) a. #I hope that this weekend will last forever.
b. #I'm drunk, because I hope I am.

Anand & Hacquard 2013 argue that hope, unlike want, has doxastic meaning, and proposes something along the lines of Heim-von Fintel for hope.

Scheffler's 2008 observations (examples from Anand & Hacquard 2013: p. 6, p. 26):

- (33) A: Is Peter coming?
B: I hope he is.
B: ?I want him to.

- (34) It's raining.
a. #I hope it is raining.
b. I want it to be raining.

- (35) It isn't raining.
a. #I hope it is raining.
b. I want it to be raining.

6.5 Factive and anti-factive bouletics

6.5.1 *Glad*

Heim 1992 analyzes *glad* as a factive version of *want*, but it poses an additional issue:

- It presupposes that the attitude holder believes the complement clause to be true, in addition to the factive presupposition that the complement clause is true.
- Consequently, there won't be doxastic alternatives where the complement clause is false.

To deal with this issue, Heim 1992 uses rev.

$$(36) \quad \text{rev}_\varphi(c) := \bigcup \{ c' \supseteq c \mid c' \in \text{dom}(\llbracket \varphi \rrbracket) \}$$

The factive version of H, G, will have the following denotation:

$$(37) \quad \llbracket G_n(\varphi) \rrbracket = \lambda V: \begin{array}{l} V \in \text{dom}(\llbracket \varphi \rrbracket) \text{ and} \\ \llbracket \varphi \rrbracket(V) = V \text{ and} \\ \text{for each } v \in V, \\ \mathcal{A}_v^n \in \text{dom}(\llbracket \varphi \rrbracket) \text{ and} \\ \llbracket \varphi \rrbracket(\mathcal{A}_v^n) = \mathcal{A}_v^n. \end{array} \cdot \left\{ v \in V \mid \begin{array}{l} \text{for each } v' \in \mathcal{A}_v^n, \\ \max_{v'}^<(\llbracket \neg \varphi \rrbracket(\text{rev}_{-\varphi}(\mathcal{A}_v^n))) <_v^n \max_{v'}^<(\llbracket \varphi \rrbracket(\mathcal{A}_v^n)) \end{array} \right\}$$

Similarly, von Fintel 1999 suggests two different ways to expand the doxastic base to the modal base B for ‘glad’:

1. Take the set of doxastic alternatives $\text{Dox}(x, w)$ (in our fragment it’s $\mathcal{A}_v^n$), and add to it $\neg\varphi$ -worlds that are most similar to w , $\max_v^<(\llbracket \neg \varphi \rrbracket(\mathcal{W}))$. Also add any worlds not in $\text{Dox}(x, w)$ that are more similar to w than those in $\max_v^<(\llbracket \neg \varphi \rrbracket(\mathcal{W}))$.
2. Go back to a point where p is not yet surely true. From that point on, go forward and collect all worlds that could have developed from there.

To do: compare these options.

6.5.2 Wish

‘Wish’ (with a finite complement) seems to presuppose that the complement is false and that the attitude holder knows that it’s false. So it’s the opposite of ‘glad’:

Heim 1992 suggests an analysis where rev applies to the positive worlds:

$$(38) \quad \llbracket W_n(\varphi) \rrbracket = \lambda V: \begin{array}{l} V \in \text{dom}(\llbracket \neg \varphi \rrbracket) \text{ and} \\ \llbracket \neg \varphi \rrbracket(V) = V \text{ and} \\ \text{for each } v \in V, \\ \mathcal{A}_v^n \in \text{dom}(\llbracket \neg \varphi \rrbracket) \text{ and} \\ \llbracket \neg \varphi \rrbracket(\mathcal{A}_v^n) = \mathcal{A}_v^n. \end{array} \cdot \left\{ v \in V \mid \begin{array}{l} \text{for each } v' \in \mathcal{A}_v^n, \\ \max_{v'}^<(\llbracket \neg \varphi \rrbracket(\mathcal{A}_v^n)) <_v^n \max_{v'}^<(\llbracket \varphi \rrbracket(\text{rev}_\varphi(\mathcal{A}_v^n))) \end{array} \right\}$$

Alternatively, one could use one of von Fintel’s ways.

6.6 Monotonic semantics

von Fintel 1999 defends a (Strawson-)monotonic semantics (for NPI licensing under negative bouletics).

The idea is that a bouletic predicate universally quantifies over the belief worlds that are maximally desirable for the attitude holder.

In a bivalent static setting this looks like:

$$(39) \quad \llbracket \text{want } \varphi \rrbracket = \lambda w_s. \lambda x_e. \begin{array}{l} \text{for each } w' \in \left\{ w' \in \text{Dox}_w^x \mid \begin{array}{l} \text{no other } w'' \in \text{Dox}_w^x \text{ is} \\ \text{more desirable than } w' \text{ for } x \text{ in } w \end{array} \right\}, \\ \llbracket \varphi \rrbracket(w') = 1 \end{array}$$

On top of this, von Fintel 1999 assumes a diversity presupposition: φ is true in some belief worlds and false in some others. This prevents entailment from ‘believe’ to ‘want’.

Following Heim, von Fintel uses Dox^+ , but he inherits the problem of unrealistic desires. But for conflicting desires, von Fintel argues that there's a contextual shift as to what is desirable. For (40):

- (40) John is in a furniture store, looking at a couch that has a very scary price-tag. The salesman comes up to him and the following conversation takes place:
Salesman: Would you like to buy this couch?
John: No
Salesman: Would you like to buy it at a 25% discount?
John: Yes (von Fintel 1999: p. 120)

von Fintel 1999: p. 120 remarks:

It seems that John's first statement in [(40)] has to be understood against the back-ground of a set of worlds in which the couch has exactly the price stated on the price tag. Among those, the most desirable worlds are not ones where John buys the couch. By the time of John's second statement more worlds are made accessible: apparently the couch can be bought at a 25% discount. Worlds where John does buy the couch at that discount are highly desirable, so John wants to buy the couch at that price. Is the first statement still true in the new situation? I don't think so: it is now false that John doesn't want to buy the couch. In the new context, we would have to say that John doesn't want to buy the couch at its original price. But that is not the same (anymore) as saying that John doesn't want to buy the couch.

He furthermore points out that if these statements are put in a single sentence (so that no context shift is possible), the sentence sounds contradictory.

- (41) a. John doesn't want to buy this couch, but he wants to buy this couch at a 25% discount.
b. John wants to buy this couch at a 25% discount, but he doesn't want to buy this couch.

Crnić 2011 formulates a version of von Fintel's idea where the ordering source varies across contexts: The domain of the universal quantification is the maximally desirable worlds *according to the current ordering source* (which will be presupposed to be a subset of all the maximally desirable worlds).

But this is not without problems either:

- (42) The Who are performing tonight, and Al's parents are deciding whether to take the long drive to the concert. Al knows that he'll see the concert only if he takes the drive, and he knows he'll see the concert if he takes the drive. Al loves The Who, but he gets very carsick, and the drive isn't at all worth it. Al begs his parents to not take the drive.
a. Al wants to see the concert.
b. But Al doesn't want to take the long drive. (Phillips-Brown 2017: p. 951)

The problem is: Both of these sound true in this context. That means that there's an ordering source that makes (42a) true. However, this ordering source should make 'Al wants to take the drive' true as well, but intuitively that sounds false.

7 Filtering with bouletics

The analysis proposed by [Heim 1992](#) correctly predicts the following filtering facts.

- (43) a. David believes that it was raining in the morning and he (also) believes that it stopped raining before noon.
b. David believes that it was raining in the morning and he hopes that it stopped raining before noon.

Similarly:

- (44) a. Beth thinks Andy has a guitar and a violin. She is certain that he will sell his guitar to her.
b. Beth thinks Andy has a guitar and a violin. She wants him to sell his guitar to her.

You can of course filter in conditionals, disjunctions, etc. as well (examples omitted).

But it fails to account for filtering with bouletics:

- (45) a. David hopes that it was raining in the morning and he (also) hopes that it stopped raining before noon.
b. Beth wants Andy to have a guitar and a violin and (also) wants him to sell his guitar to her.

This is because bouletic predicates do not update beliefs.

To resolve this issue, [Heim 1992](#) suggests a solution based on *modal subordination*. I developed an account following her idea in [Sudo 2014](#).

8 Mandelkern's examples

[Mandelkern 2016b](#) raise examples that are problematic for the pragmatic account of e-inferences that are similar to his problems for the pragmatic account of proviso inferences discussed in [Mandelkern 2016a,b](#).

- (46) a. What's become of the vase that used be on the table?
b. ??I don't know. Lucy believes that it was Susie who broke it.
([Mandelkern 2016b](#): p. 8)

Mandelkern argues: The believe-sentence should semantically presuppose the i-inference that Lucy believes that someone broke the vase. Since the e-inference that some broke the vase would contradict the common ground, it shouldn't arise. Then the sentence should be just as fine as (47).

- (47) I don't know. Lucy believes that someone broke the vase, and that it was Susie who broke it.
([Mandelkern 2016b](#): p. 8)

Another similar example:

- (48) I don't know much about Bugandan politics, for instance, whether it's a monarchy or a republic.
??But Bernhard believes that Buganda's monarchy is hereditary.

9 Strong Kleene and other explanatory approaches

10 Other attitudes and modals

say, write
dream
allowed, required
might, must

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