

Pragmatics of epistemics in attitudes: A reply to Anand & Hacquard (2013)*

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Abstract. Epistemic modals have a constrained distribution in attitude reports. We argue that this distribution follows from an interaction of the standardly assumed properties of attitude predicates (e.g., Heim 1992, von Stechow 1999) and the assumption that epistemic agents are opinionated about their belief and knowledge (e.g., Stalnaker 2002), that is, an explanans that does not entail a fundamental split between so-called representational (say, epistemic) and non-representational (say, bouletic) attitude predicates (pace Anand & Hacquard 2013). After accounting for the extant data and examining some novel predictions of the proposal, we conclude the paper by looking at the distribution of epistemic modals in some other environments and issues that it raises.

1 A puzzle about epistemic modals in attitude reports

Anand & Hacquard (2013) carefully delineate the distribution of epistemic modals in attitude reports.¹ They observe that while epistemic modals are felicitous in the scope of epistemic and doxastic attitude predicates as well as verbs of saying (as extensively discussed by Stephenson 2007, Yalcin 2008, and many others),

- (1) a. John believes that Mary has to be running late. *(epistemic reading)*
- b. John knows that Mary might be running late. *(epistemic reading)*
- c. John said that Mary might be running late. *(epistemic reading)*

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¹We use the term ‘modals’ to cover modal auxiliaries, modal verbs and modal adverbs, whose distribution we tentatively assume is homogenous in attitude reports, though this needs to be examined further.

they are, at least on certain natural construals, infelicitous in the scope of bouletic and directive predicates (see also Hacquard & Wellwood 2012 for an extensive corpus study).²

- (2) a. #John wants Mary to have to be running late. (epistemic reading)
b. #John demanded that Mary might be running late. (epistemic reading)

Anand & Hacquard (2013) argue that the pattern exemplified in (1)-(2) springs from an interaction of the semantics of embedding predicates and the semantic requirements of embedded epistemic modals. Simplifying, they propose that embedded epistemic modals need to be evaluated relative to an appropriate information state and that such a state is accessible when modals are embedded under epistemic attitude predicates but not when they are embedded under bouletic attitude predicates.³ They submit that this is due to a substantive difference – “a fundamental split” – between the two types of attitude predicates: while epistemic attitude predicates are representational in that they quantify over an information state that embedded epistemic modals can be evaluated against, bouletic attitude predicates are non-representational in that they do not quantify over an information state but rely on comparison of alternatives, which is detrimental to the evaluation of embedded epistemic modals. Anand & Hacquard’s proposal is thus geared towards deriving the generalization in (3), which subsumes the data in (1)-(2).⁴

- (3) **Epistemic Licensing Generalization** (Anand & Hacquard 2013)
Epistemic modals are licensed only in representational attitudes.

An assumption of a fundamental split between attitude predicates in the form envisioned by Anand & Hacquard is not uncontroversial. On the one hand, some authors have argued that an analysis that takes both epistemic and bouletic embedding predicates to operate on information states – that is, on sets of epistemically accessible possible worlds – can and should be maintained even in light of apparently problematic data (e.g., von Stechow 1999).⁵ On the other hand, some authors who Anand & Hacquard take to be

²There is an independent issue in English with embedding certain modalized clauses under predicates that take infinitival complements, e.g., under a variety of bouletic attitude predicates, an issue that is circumvented in French and some other languages, as discussed by Anand & Hacquard (2013). Accordingly, we will sometimes use French examples in the main text.

³We use ‘epistemic attitude predicates’ and ‘bouletic attitude predicates’ as cover terms for the classes of predicates mentioned above (*believe, know, say; want, would like, demand*, etc.). We also conflate the terms ‘epistemic’ and ‘doxastic’. Finally, all the modals in the main text will be considered only on their epistemic construal, which is why we will not continue to mark this in our examples.

⁴The generalization in (3) is an approximation, as Anand & Hacquard (2013) recognize, since epistemic modals can sometimes be embedded under bouletic predicates. We discuss the inadequacy of the generalization and how it relates to our proposal and that of Anand & Hacquard in Section 3.

⁵The “Kratzer-style semantics” that von Stechow (1999) assigns to bouletic attitude predicates like *want* is

proponents of the fundamental split nonetheless assume that both types of predicates have an information state component. For example, in explaining presupposition projection under bouletic predicates, Heim (1992) proposes that bouletic predicates are modal quantifiers over an information state and that their complement combines first with the information state itself (Heim 1992).⁶ Finally, practically all authors assume that bouletic attitude predicates impose certain conditions on an information state, that is, the epistemic state of the attitude holder, which suggests some kind of access to it (see footnotes 5 and 6 and, especially, Section 2 for discussion).

In our treatment of the puzzle exemplified in (1)-(2), we remain agnostic about whether Anand & Hacquard (2013) are correct in adopting a fundamental split between different kinds of embedding predicates. More to the point, we argue that a recourse to a fundamental split between different types of embedding predicates, though perhaps correct, is neither necessary nor sufficient for explaining the distribution of epistemic modals in attitude reports. The paper has the following structure: Section 2 lays out our basic assumptions about embedding predicates and epistemic modality, and resolves the basic distributional puzzle described above. The gist of the resolution is that the commonly accepted presupposition of bouletic predicates (which requires the attitude holder not to be opinionated with respect to the sentential complement of the predicate, as advocated

given in (i): *want* is a modal quantifier that quantifies over a subset of an information state – a subset of the epistemic state of the attitude holder (see footnote 8 for further details), specifically, the set of epistemically accessible worlds that are optimal given the desires of the attitude holder (see Section 2 for discussion of the presuppositions of *want* and footnote 8 for more details on the modal base of *want*).

- (i) $\llbracket \text{want} \rrbracket^c(f, g, p, w, x)$ is defined only if $f(x, w) = \text{DOX}^*(x, w)$, $f(x, w) \cap p \neq \emptyset$ & $f(x, w) \not\subseteq p$. If defined, $\llbracket \text{want} \rrbracket^c(f, p, w, x) = 1$ iff $\forall w' \in \max(f, g, x, w) [p(w') = 1]$. (f is the modal base, g is the ordering source, and \max picks out the best worlds relative to a ranking induced by $g(x, w)$ on $f(x, w)$)

The semantics of *want* in (i) is upward-monotone with respect to its propositional argument. This has been problematized and used to motivate a shift to a ‘non-representational’ (non-monotonic) semantics (e.g., Heim 1992, Lassiter 2011, among others), namely, bouletic attitude predicates appear to exhibit non-monotone behavior with respect to their propositional argument. However, von Fintel shows that the standard arguments to this effect can be defused once one takes into account the ability of quantifier domains to shift in the discourse. We refer the interested reader to von Fintel’s paper for details.

⁶A translation of Heim’s (1992:197) lexical entry for *want* into static semantics is provided in (i): it is a modal quantifier that shares an information state component with von Fintel’s semantics discussed in footnote 5 but differs from it in how ordering with respect to desirability is characterized – Heim’s characterization makes the semantics of *want* non-monotone. See Heim 1992, von Fintel 1999 for further discussion and footnote 8 for more details on the modal base of *want*.

- (i) $\llbracket \text{want} \rrbracket^c(f, >, p, w, x)$ is defined only if $f(x, w) = \text{DOX}^*(x, w)$, $f(x, w) \cap p \neq \emptyset$ & $f(x, w) \not\subseteq p$. If defined, $\llbracket \text{want} \rrbracket^c(f, >, p, w, x) = 1$ iff $\forall w' \in \text{DOX}^*(x, w): \text{sim}_{w'}(\text{DOX}^*(x, w) \cap p) >_{x, w} \text{sim}_{w'}(\text{DOX}^*(x, w) \cap \neg p)$. (f is the modal base, $\text{sim}_{w'}$ picks out worlds most similar to w' , and $p >_{x, w} q$ if every world in p is better for x in w than every world in q)

by Heim and von Fintel) is inconsistent when the complement of a bouletic predicate is an epistemic modal statement relativized to the epistemic state of the attitude holder (namely, every attitude holder is opinionated with respect to epistemic modal statements that are relativized to their epistemic state, e.g., Stalnaker 2002). Section 3 discusses two immediate, seemingly correct predictions of the proposal. These predictions are unexpected on the existing approaches, in particular, on the approach of Anand & Hacquard (2013). Section 4 concludes the paper by looking at the distribution of epistemic modals in some environments other than the scope of bouletic attitude predicates.

2 A resolution of the puzzle

Outline: Bouletic attitude predicates are commonly assumed to trigger a presupposition that the attitude holder is not opinionated with respect to the sentential complement of the predicate (anti-opinionatedness; cf. Heim 1992, von Fintel 1999). This presupposition is inconsistent if the sentential complement is an epistemic modalized sentence that is evaluated relative to the attitude holder – namely, an attitude holder is opinionated with respect to such a complement (opinionatedness; cf. Stalnaker 2002). Since epistemic modals in attitude reports tend to be evaluated relative to the attitude holder (e.g., Hacquard 2006, Stephenson 2007, among others), they tend to yield inconsistency under bouletic predicates.⁷

2.1 Anti-opinionatedness inferences

Although there is considerable agreement in the literature pertaining to the assertive import of epistemic embedding predicates, largely captured in the work of Hintikka (1962), the assertive import of bouletic attitude predicates is more contentious (cf. the differing analyses of Heim 1992 and von Fintel 1999). What may be less contentious is their presuppositional import. In particular, both Heim (1992) and von Fintel (1999) submit that bouletic attitude predicates presuppose that the attitude holder is not opinionated with respect to the sentential complement of the embedding predicate, that is, that it is not the case that she believes the complement of the attitude predicate nor is it the case that she

⁷Dorr & Hawthorne (2014) put forward a proposal similar to ours in attempting to derive the markedness of sentences of the form *#I hope that p and might not p*. However, they do not address the distribution of epistemic modals more generally, and their proposal, which adopts weaker assumptions about entailments of bouletic predicates, does not obviously derive it. Moreover, some of the discussion in Section 3 in the main text contradicts the assumptions they employ in their explanation of the markedness of *#I hope that p and might not p*.

believes its negation.^{8,9}

(4) **Anti-opinionatedness presupposition of bouletic attitude predicates**

It is not the case that a subject of a bouletic attitude predicate believes the sentential complement of the predicate nor is it the case that she believes its negation.

The anti-opinionatedness presupposition of bouletic attitude predicates is illustrated in (5): the sentence conveying that John wants Mary to be running late presupposes that it is not the case that he believes that Mary is running late (= his epistemic state does not entail that Mary is running late) and that it is not the case that he believes that Mary is not running late (= his epistemic state does not entail that Mary is not running late). More concisely, John takes it to both be possible that Mary is running late and that Mary is not running late. (We leave it open what the exact assertive import of sentences like (5) is since it is irrelevant for our explanation of the distribution of embedded epistemic modals, see Heim 1992 and von Fintel 1999 for two representative analyses.)

(5) John wants Mary to be running late.

(6) **Anti-opinionatedness presupposition of (5):**

It is not the case that John believes that Mary is running late nor is it the case that he believes that Mary is not running late.

Shorthand: $\neg\Box_J(\text{Mary is running late}) \ \& \ \neg\Box_J(\neg\text{Mary is running late})$

In accordance, if the sentential complement of a bouletic attitude predicate is a modalized sentence, the presupposition of the sentence will be that the attitude holder is not opinionated relative to the modalized sentence. We will see that the nature of this presupposition plays a crucial role in accounting for the distribution of embedded epistemic modals: it is inconsistent if the modal is evaluated relative to the epistemic state of the attitude holder.

⁸Heim (1992) and von Fintel (1999) point out that the characterization of the presupposition of bouletic attitude predicates in (4) is too strong. The requirement pertains rather to a particular superset of the epistemic state of the attitude holder, specifically, the set of possible worlds compatible with “everything that [the attitude holder] [...] believes to be the case no matter how he or she chooses to act” (Heim 1992:199, cited in von Fintel 1999). As we discuss in footnote 13, adopting their weaker formulation would not affect the force of the main argument of the paper, though it would affect the ease of its presentation. For this reason, we rely on the simplification in (4) in the main text.

⁹It is worth noting that Anand & Hacquard (2013), Section 4, adopt an anti-opinionatedness requirement for explaining the distribution of epistemic modals under what they call emotive doxastic and dubitative predicates, but reject it for bouletic predicates simpliciter. However, they employ it differently from us and, as we will see, deduce different conclusions from it. See Section 4.2 for further discussion.

Modal semantics We assume a conservative semantics of epistemic modals as universal or existential quantifiers over a set of possible worlds (the information state or the modal base) which is relativized to an individual and a world of evaluation (see e.g. von Stechow & Gillies 2011 for discussion of relativity of epistemic modals). At Logical Form, the modal has as its sister an epistemic accessibility function, Ep , that composes with an individual and a world of evaluation to yield an information state corresponding to what the individual believes at the world of evaluation (see e.g. Kratzer 1991). (For readability, no other predicate is represented with its world argument and there is no explicit abstraction over variables in our structures; we use the same symbols in the object- and meta-language.)

- (7)
- a. According to John, Mary has to be running late.
 - b. [have $Ep(\text{John}, w)$] [Mary be running late]
 - c. $\lambda w. Ep(\text{John}, w) \subseteq \{w': \text{Mary is running late in } w'\}$
Shorthand: $\Box_J(\text{Mary is running late})$
- (8)
- a. According to John, Mary might be running late.
 - b. [might $Ep(\text{John}, w)$] [Mary be running late]
 - c. $\lambda w. Ep(\text{John}, w) \cap \{w': \text{Mary is running late in } w'\} \neq \emptyset$
Shorthand: $\Diamond_J(\text{Mary is running late})$

Universal epistemic modals under bouletic predicates If a universal epistemic modal, say, *have to*, is embedded under a bouletic predicate and its modal base is resolved to the epistemic state of the subject of the bouletic predicate, as exemplified in (9), the sentence is infelicitous (but see Section 3.2 for a qualification).

- (9)
- a. #John wants Mary to have to be running late.
 - b. John [want [[have $Ep(\text{John}, w)$] [Mary be running late]]]
└──────────────────────────┘
targeted resolution

The meaning of the sentential complement of *want* in (9) is that, according to John, Mary has to be running late or, more technically, that John's epistemic state entails that Mary is running late, (10). (We discuss configurations in which the epistemic modal embedded under a bouletic predicate is not relativized to the epistemic state of the attitude holder in Section 3.1.)

- (10)
- a. [have $Ep(\text{John}, w)$] [Mary be running late]
 - b. $\Box_J(\text{Mary is running late})$

The anti-opinionatedness presupposition of *want* in (9) is that it is not the case that John believes that Mary has to be running late and that it is not the case that John believes that Mary does not have to be running late.

- (11) **Anti-opinionatedness presupposition of (9-b):**
 $\neg \Box_J \Box_J (\text{Mary is running late}) \ \& \ \neg \Box_J \neg \Box_J (\text{Mary is running late})$

Existential epistemic modals under bouletic predicates If an existential epistemic modal, say, *might*, is embedded under a bouletic predicate and its modal base is resolved to the epistemic state of the subject of the bouletic predicate, as exemplified in the French example in (12),¹⁰ the sentence is infelicitous as well (again, see Section 3.2 for a qualification).

- (12) a. #Jean veut que Marie puisse être en retard.
 John wants that Mary might be in late
 b. John [wants [might Ep(John,w)] [Marie be running late]]
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targeted resolution

The meaning of the sentential complement of *want* is that, according to John, Mary might be running late or, more technically, that John's epistemic state is compatible with Mary running late, (13).

- (13) a. [might Ep(John,w)] [Mary be running late]
 b. $\Diamond_J (\text{Mary is running late})$

The anti-opinionatedness presupposition of *want* is that it is not the case that John believes that Mary might be running late and that it is not the case that John believes that it is not the case that Mary might be running late.

- (14) **Anti-opinionatedness presupposition of (12-b):**
 $\neg \Box_J \Diamond_J (\text{Mary is running late}) \ \& \ \neg \Box_J \neg \Diamond_J (\text{Mary is running late})$

As we alluded to above, the anti-opinionatedness presuppositions described in (11) and (14) turn out to be problematic: they are incompatible with the assumption that epistemic agents are opinionated about their beliefs and knowledge.

¹⁰We use a French example in (12) because existential epistemic modals in English cannot occur in infinitival clauses (see footnote 2). Similar examples can be constructed in German, Slovenian and a variety of other languages, where they are also unacceptable on the construal described in the main text.

2.2 Opinionatedness inferences

Epistemic agents can be assumed to have access to their beliefs and knowledge: if someone believes a proposition, they believe that they believe it (positive introspection) and if it is not the case that someone believes a proposition, they believe that it is not the case that they believe it (negative introspection) (Stalnaker 2002).^{11,12} Combined, these assumptions give us the principle of opinionatedness:

(15) **Opinionatedness**

For any proposition, an epistemic agent is opinionated about whether he or she believes it to be true.

It follows from opinionatedness that although simple modal statements are contingent, say, it may or may not be the case that, according to John, Mary has to be running late, it is not contingent that his epistemic state either entails that, according to him, Mary has to be running late or that, according to him, Mary does not have to be running late.

(16) **Consequence of opinionatedness, relevant for (9-b):**
 $\Box_J \Box_J (\text{Mary is running late}) \vee \Box_J \neg \Box_J (\text{Mary is running late})$

Naturally, opinionatedness holds both for universal and existential epistemic modal statements, not least because a proposition is possible if and only if its negation is not necessary. Accordingly, although it is contingent whether, according to John, Mary may be running late, it is not contingent that his epistemic state either entails that, according to him, Mary may be running late or that it is not the case that, according to him, Mary may be running late.

¹¹Together with the assumption that people have consistent beliefs, opinionatedness translates into the following properties of the epistemic accessibility relation E_p : it is transitive (positive introspection), euclidean (negative introspection) and serial (consistency). The modal logic that we obtain is KD45 (see Fagin et al. 1995, Chapter 3, and Stalnaker 2002 for further details).

¹²These assumptions are not uncontroversial in philosophical literature. For example, although the principle of positive introspection has been endorsed by many authors (esp. Hintikka 1962) and presupposed in much work outside philosophy (e.g., Lewis 1969), it has been questioned in recent work on epistemology (esp. Williamson 2000). We refrain from getting mired in the discussion of arguments for and against the validity of positive (and negative) introspection; instead we refer the reader to Greco 2013 for a recent discussion and defense of it. In any case, returning to the linguistic task at hand, even if the introspection principles turn out not to be generally valid, our claims in the main text about opinionatedness of attitude holders relative to the respective modal statements, e.g., the claims in (16)-(17), still arguably hold in natural contexts. In relation to our resolution of the puzzle about the distribution of embedded epistemic modals, this would effectively mean that although certain occurrences of embedded epistemic modals do not give rise to *logically* inconsistent inferences, they do give rise to *contextually* inconsistent ones in natural contexts. Consequently, if this is the case, one might expect that embedded epistemic modals relativized to the subject of the bouletic predicate could be licit in contexts that are appropriately tweaked (that is, licit to the extent that the tweaked contexts are not marked themselves).

- (17) **Consequence of opinionatedness, relevant for (12-b):**
 $\Box_J \Diamond_J (\text{Mary is running late}) \vee \Box_J \neg \Diamond_J (\text{Mary is running late})$

It is clear that the consequences of opinionatedness in (16) and (17) are at odds with the anti-opinionatedness inferences accompanying epistemic modals embedded under bouletic predicates, exemplified in (11) and (14), respectively.

2.3 A clash of anti-opinionatedness and opinionatedness

A sentence that conveys that John wants Mary to necessarily be running late in which the embedded epistemic modal is resolved to the epistemic state of John, (18), gives rise to an anti-opinionatedness presupposition that contradicts John's opinionatedness about his belief and knowledge, (19).

- (18) a. #John wants Mary to have to be running late.
 b. John [want [[have Ep(John,w)] [Mary be running late]]]
- (19) a. **Anti-opinionatedness presupposition, repeated from (11):**
 $\neg \Box_J \Box_J (\text{Mary is running late}) \ \& \ \neg \Box_J \neg \Box_J (\text{Mary is running late})$
 b. **Consequence of opinionatedness, repeated from (16):**
 $\Box_J \Box_J (\text{Mary is running late}) \vee \Box_J \neg \Box_J (\text{Mary is running late})$

Accordingly, any sentence that has a parse along the lines of (18) will be pragmatically marked since it gives rise to mutually inconsistent inferences – (19-a) contradicts (19-b).¹³

¹³In footnote 8, we observed that von Stechow and Heim argue that the anti-opinionatedness presupposition of bouletic attitude predicates pertains to a proper superset of the subject's epistemic state rather than to her epistemic state simpliciter, that is, to $\text{Ep}^*(\text{John},w) \supset \text{Ep}(\text{John},w)$ in the case of (9-b)/(18). This turns out to be inconsequential for our reasoning, no matter whether the embedded modal operates on $\text{Ep}^*(\text{John},w)$ or on $\text{Ep}(\text{John},w)$. Assume that the embedded modal is universal and that it operates on $\text{Ep}(\text{John},w)$ (the other case trivially corresponds to our derivation in the main text). This gives us the anti-opinionatedness presupposition in (i-a), while the relevant consequence of opinionatedness is given in (i-b).

- (i) a. **Anti-opinionatedness presupposition of (9-b):**
 $\neg \Box_{J^*} \Box_J (\text{Mary is running late}) \ \& \ \neg \Box_{J^*} \neg \Box_J (\text{Mary is running late})$
 b. **Consequence of opinionatedness:**
 $\Box_{J^*} \Box_{J^*} (\text{Mary is running late}) \vee \Box_{J^*} \neg \Box_{J^*} (\text{Mary is running late})$
 [where $\Box_{J^*}(p) = \lambda w. \text{Ep}^*(\text{John},w) \subseteq p$, for $\text{Ep}(\text{John},w) \subset \text{Ep}^*(\text{John},w)$]

Now, if a proposition is not entailed by a certain epistemic state, say, $\text{Ep}(\text{John},w)$, then it is trivially also not entailed by its superset, say, $\text{Ep}^*(\text{John},w)$. This allows us to conclude from (i-a) that (ii) holds, whose second conjunct contradicts the second disjunct of the opinionatedness inference in (i-b).

- (ii) **Entailment of anti-opinionatedness presupposition of (9-b):**
 $\neg \Box_{J^*} \Box_J (\text{Mary is running late}) \ \& \ \neg \Box_{J^*} \neg \Box_{J^*} (\text{Mary is running late})$

In a parallel way, a sentence that conveys that John wants Mary to possibly be running late in which the embedded epistemic modal is resolved to the epistemic state of John also gives rise to an anti-opinionatedness presupposition that contradicts John’s opinionatedness about his belief and knowledge:

- (20) a. #Jean veut que Marie puisse être en retard.
 b. John [wants [might Ep(John,w)] [Mary be running late]]
- (21) a. **Anti-opinionatedness presupposition, repeated from (14):**
 $\neg \Box_J \Diamond_J(\text{Mary is running late}) \ \& \ \neg \Box_J \neg \Diamond_J(\text{Mary is running late})$
 b. **Consequence of opinionatedness, repeated from (17):**
 $\Box_J \Diamond_J(\text{Mary is running late}) \ \vee \ \Box_J \neg \Diamond_J(\text{Mary is running late})$

Accordingly, any sentence that has a parse along the lines of (20) will be pragmatically marked since it gives rise to mutually inconsistent inferences – (21-a) contradicts (21-b).

We have thus shown that epistemic modals embedded in bouletic attitude reports yield inconsistent meanings when they are relativized to the epistemic state of the attitude holder. Accordingly, any sentence containing such an epistemic modal will be infelicitous. As a final piece of our resolution of the puzzle about epistemic modals in attitude reports, we point out that such problematic construals of epistemic modals in attitude reports are in natural contexts, all else being equal, preferred to others (e.g., Hacquard 2006, Stephenson 2007). This explains the tendency of epistemic modals to be infelicitous in bouletic attitude reports. (See Section 3.1 for cases where this preference is counteracted and where, consequently, the embedded epistemic modals are felicitous.)

2.4 Subject relativization preference

When it comes to epistemic modals that are embedded under attitude predicates, the resolution of their modal base is constrained. In particular, without pressures to the opposite, say, without overt modification of the modal by phrases like *in view of what x knows*, the modal base of the embedded modal tends to be conditioned on the mental state of the attitude holder (see e.g. Hacquard 2006, Stephenson 2007; similar preference obtains

And if a proposition is entailed by a certain epistemic state, say, $Ep^*(\text{John},w)$, then it is trivially also entailed by its subsets, say, $Ep(\text{John},w)$. This means that the first disjunct of (i-b), which entails $\Box_J^* \Box_J(\text{Mary is running late})$, contradicts the first disjunct of (ii). Thus, we obtain a clash: an entailment of the anti-opinionatedness presupposition of (9-b), given in (ii), contradicts an entailment of opinionatedness, given in (i-b). Reasoning is similar with existential epistemic modals.

Thus, adopting a more sophisticated characterization of anti-opinionatedness leaves the results of our proposal unchanged. Accordingly, we stick to the simpler, though perhaps empirically inadequate, formulation of anti-opinionatedness in the main text, mainly for ease of presentation.

also with certain embedded deontic modals, discussed by Hacquard 2006, and embedded imperatives, discussed by Crnič & Trinh 2009).¹⁴

(22) **Subject relativization preference**

The modal base of an unmodified epistemic modal embedded under an attitude predicate is preferably resolved to the epistemic state of the subject of the embedding predicate.

As an illustration, the modal base of the epistemic modal that is embedded under the attitude predicate *know* in (23-a) intuitively comprises of possible worlds compatible with what the attitude holder, John, knows, effecting that the sentence conveys the meaning paraphrased in (23-b), where the modal base of the epistemic modal is overtly restricted to John's epistemic state.

- (23) a. John knows that Mary might be late.
 b. In view of what John knows, Mary might be late.

A consequence of the subject relativization preference is that the sentences at the heart of this paper, sentences in which unmodified epistemic modals are embedded below bouletic attitude predicates, are preferably parsed with epistemic modals relativized to the epistemic state of the attitude holder.

- (24) a. #John wants Mary to have to be running late.
 b. John [want [[have Ep(John,w)] [Mary be running late]]]
 └──────────────────────────┘
 preferred resolution

- (25) a. #Jean veut que Marie puisse être en retard.
 b. John [wants [[might Ep(John,w)] [Mary be running late]]]
 └──────────────────────────┘
 preferred resolution

Since these parses give rise to inconsistent anti-opinionatedness presuppositions, that is, anti-opinionatedness presuppositions that clash with opinionatedness, as shown in (18)-(21), the sentences are correctly predicted to be pragmatically marked and infelicitous – at least to the extent that other resolutions of the modal base of the modal are unavailable. The general reasoning underlying our derivation is schematized in (26).

¹⁴Although by adopting (22) we treat the described resolutions of epistemic modals in attitude reports as springing from a *parsing preference*, which is in principle violable, rather than a grammatical principle, it is obvious that treating it as a grammatical principle would not detract from our proposal (though see Section 3.1). We leave it to future research to determine what is the precise nature of the constraint in (22).

- (26) a. #Subj wants Mod_{ep} p.
 b. **Preferred parse:** Subj [wants [Mod Ep(Subj,w)] p]
 c. **Anti-opinionatedness:** $\neg\Box_s\text{Mod}_s(p) \ \& \ \neg\Box_s\neg\text{Mod}_s(p)$
 d. **Opinionatedness:** $\Box_s\text{Mod}_s(p) \ \vee \ \Box_s\neg\text{Mod}_s(p)$
 Anti-opinionatedness contradicts opinionatedness!

This completes our resolution of the puzzle about epistemic modals under bouletic predicates. In contrast to Anand & Hacquard (2013), our proposal does not rely on a fundamental split between representational and non-representational attitude predicates, that is, it is compatible with all extant approaches to bouletic predicates to the extent they assume an anti-opinionatedness presupposition (e.g., Heim 1992, von Stechow 1999; see Section 4 for discussion of Anand & Hacquard’s assumptions in this respect). Moreover, the proposal gives rise to novel predictions, which we discuss next.

3 Predictions

Outline: The approach we developed in the preceding section gives rise to at least two predictions that contradict Anand & Hacquard’s Epistemic Licensing Generalization.

- (3) **Epistemic Licensing Generalization** (Anand & Hacquard 2013)
 Epistemic modals are licensed only in representational attitudes.

The first prediction pertains to the resolution of the modal base of an embedded epistemic modal and is borne out by the data discussed by Anand & Hacquard (see also Papafragou 2006). The second prediction pertains to what may be called intervention effects and has to our knowledge not been discussed previously: if an appropriate operator intervenes between the embedding bouletic predicate and the embedded epistemic modal, a clash between opinionatedness and anti-opinionatedness need not arise even if the embedded modal is resolved to the epistemic state of the attitude holder. This prediction also appears to be borne out. We submit that these predictions are problematic for Anand & Hacquard’s account of the distribution of embedded epistemic modals.

3.1 Shifting the modal base

A central ingredient of our derivation of the restricted distribution of epistemic modals was the assumption of opinionatedness about one’s belief and knowledge, (15).

(15) **Opinionatedness**

For any proposition, an epistemic agent is opinionated about whether he or she believes it to be true.

No similar assumption is plausible about one's belief about other people's beliefs and knowledge, e.g., John may not have an opinion about whether, say, Mary's competitors believe that Mary might be running late (cf. Stalnaker 2002 on negative introspection not holding for common belief). This asymmetry in opinionatedness gives rise to a prediction about the distribution of epistemic modals: if an epistemic modal in the scope of a bouletic attitude predicate is relativized to the epistemic state of an individual other than the subject of the attitude predicate, the anti-opinionatedness presupposition of the bouletic predicate will be compatible with the subject's opinionatedness about her belief and knowledge and so the respective sentence may well be felicitous.¹⁵

(27) **Prediction 1 (shifting the modal base)**

An epistemic modal may be felicitous in the immediate scope of a bouletic attitude predicate if it is not relativized to the subject of the attitude predicate.

As observed by Anand & Hacquard (2013), this prediction is borne out (see also the discussion of so-called subjective vs. objective epistemic modals in Papafragou 2006). We illustrate this on the basis of the example in (28), an example that would be marked in the absence of the restrictor *according to the detective* (though note that in appropriately rich contexts a specific information state on which an epistemic modal operates may be accommodated even in the absence of an overt restrictor).

- (28) a. John wants Mary to have to be the murderer according to the detective.
b. John [wants [have Ep(detective,w)] [Mary be the murderer]]

The modal base of the embedded epistemic modal in (28) does not correspond to the epistemic state of the subject of the bouletic predicate, John, but rather to the epistemic state of the detective described in the restrictor. Accordingly, the sentence gives rise to the presupposition that John is not opinionated with respect to whether, according to the detective, Mary has to be the murderer

(29) **Anti-opinionatedness presupposition of (28):**

$\neg \Box_J \Box_D(\text{Mary is the murderer}) \ \& \ \neg \Box_J \neg \Box_D(\text{Mary is the murderer})$

¹⁵Given our discussion in footnote 13, a more precise statement of the prediction would be that an epistemic modal may be felicitous in the immediate scope of a bouletic attitude predicate if its modal base is logically independent of the epistemic state of the subject of the attitude predicate, that is, it is neither entailed nor entails the epistemic state of the subject of the attitude predicate.

and this presupposition is compatible with all the relevant opinionatedness inferences that we are licensed to draw, say, that John is opinionated about whether, according to him, Mary has to be the murderer. The sentence's import is thus contingent and the sentence is correctly predicted to be felicitous.

(30) **Consequence of opinionatedness:**

$$\Box_J \Box_J (\text{Mary is the murderer}) \vee \Box_J \neg \Box_J (\text{Mary is the murderer})$$

Moreover, for a sentence containing an embedded epistemic modal to be felicitous, a shift of the modal base of the embedded modal does not, in principle, have to be to an information state of an attitude holder distinct from the subject – as long as it is to an information state distinct from that of the subject at the attitude time of the main predicate (see footnote 15). Specifically, if the embedded modal is relativized to the epistemic state of the subject at some time distinct from the attitude time of the embedding predicate, the embedded modal should be acceptable as well. For example, although one is opinionated about their actual beliefs, one might not be opinionated about their future beliefs and, accordingly, anti-opinionatedness requirement of bouletic predicates may be satisfied in such cases. Again, this is borne out: the sentence in (31), where the embedded modal quantifies over the detective's future epistemic state, is acceptable.

(31) The detective would like Mary to still have to be the murderer in the morning.

Anand & Hacquard (2013) discuss the fact that epistemic modals with overtly (or potentially covertly) restricted modal bases can be embedded under bouletic attitude predicates. They suggest that epistemic modals are in these cases felicitous because their modal base can be resolved to the information state provided by a (potentially covert) restriction. However, this suggestion raises the question why a (potentially covert) restriction of embedded modals to the epistemic state of the subject is not possible under bouletic attitude predicates, while a restriction to other epistemic states is possible, as illustrated in (32).

- (32) a. #John wants Mary to have to be running late (according to him).
 b. John wants Mary to have to be running late according to Steve.

The answer to this question is obvious on our proposal and has been extensively discussed above: a restriction to subject's epistemic state at the attitude time of the matrix predicate results in a clash between her opinionatedness about her belief and knowledge and the anti-opinionatedness presupposition of the bouletic predicate.

3.2 Intervention effects

If there is an intervening operator between the embedding bouletic predicate and the epistemic modal at Logical Form, a clash between opinionatedness and anti-opinionatedness need not obtain. More to the point, we have argued that markedness of examples with epistemic modals in the immediate scope of bouletic embedding predicates follows from the fact that the subject of the attitude predicate is opinionated relative to the modalized embedded clause, which clashes with the anti-opinionatedness presupposition of the embedding predicate. But if an appropriate operator takes scope above the modal in the embedded clause, the anti-opinionatedness presupposition does not involve a modal sentence with respect to which the subject is opinionated and so no clash is expected.

(33) **Prediction 2 (intervention effects)**

An epistemic modal may be embedded in the scope of a bouletic predicate if there is an appropriate operator intervening between the predicate and the modal, that is, if the modal is not in the immediate scope of the predicate.

We discuss two types of data that suggest that the prediction is borne out: (i) epistemic modals in restrictors of embedded nominals and (ii) epistemic modals in the scope of embedded connectives. (Testing the prediction in (33) is compounded by the fact that epistemic modals resist taking scope below certain clausemate operators, as discussed by von Stechow & Iatridou 2003 under the heading of Epistemic Containment Principle; see also Swanson 2010. The examples discussed with respect to (i)-(ii) are constructed so as to avoid the relevant confounds.)

(i) Nominal phrases as interveners In constructing examples in which an epistemic modal in a nominal phrase scopes below a bouletic predicate, we need to make sure that the nominal indeed takes narrow scope relative to the bouletic predicate at Logical Form. We achieve this by using bare plurals as the embedding nominals, which tend to take narrow scope relative to other quantifiers, as well as by relying on the definiteness effect (Heim 1987) to further guarantee low-scope of the embedding nominal. The sentences in (34) contain an existential and a universal epistemic modal, respectively, embedded in restrictors of bare plurals that are in the immediate scope of a bouletic predicate.

- (34) a. The defense attorney_i wants there to be people who might (according to her_i) be sympathetic to her client in the jury.
b. The defense attorney_i wants there to be people who must (according to her_i) be sympathetic to her client in the jury.

- (39) John [want [Sue be shortlisted [or [have Ep(John,w)] [Sue got the job]]]]
- (40) **Anti-opinionatedness presupposition of (37-b):**
 $\neg \Box_J(\text{Sue is shortlisted} \vee \Box_J(\text{Sue got the job})) \&$
 $\neg \Box_J(\neg(\text{Sue is shortlisted} \vee \Box_J(\text{Sue got the job})))$

This presupposition does not clash with any relevant opinionatedness inferences, all else being equal. In particular, it does not clash with John's opinionatedness about his belief pertaining to Sue getting the job, (41). Accordingly, the sentence is correctly predicted to be felicitous. Similar reasoning extends to the example in (38-b).

- (41) **Consequence of opinionatedness:**
 $\Box_J \Box_J(\text{Sue got the job}) \vee \Box_J \neg \Box_J(\text{Sue got the job})$

The felicity of the sentences in (34) and (37-b)/(38-b) is unexpected on the proposal by Anand & Hacquard (2013). Namely, in all of these examples, epistemic modals are embedded under a non-representational attitude predicate, *want*, and arguably no other intensional predicate that could provide access to an appropriate information state. The occurrences of the modals are thus incorrectly predicted to be unacceptable since they run afoul of the Epistemic Licensing Generalization.

To summarize, we have shown that our account of the distribution of epistemic modals in bouletic attitude reports gives rise to two predictions that relate to two ways of avoiding a clash between anti-opinionatedness and opinionatedness. The first prediction pertains to examples where the embedded epistemic modal is not relativized to the subject of the embedding predicate, while the second prediction pertains to examples where an appropriate operator outscopes the epistemic modal in the embedded clause. In both cases, an opinionatedness inference that would clash with anti-opinionatedness is not licensed and the respective sentence may be felicitous. We have shown, first, that these predictions appear to be correct and, second, that they are, all else being equal, unexpected on the approach to the distribution of embedded epistemic modals advocated by Anand & Hacquard (2013).

4 Conclusion and open issues

Epistemic modals exhibit an idiosyncratic distribution in the scope of bouletic attitude predicates: (i) if the modal base of an epistemic modal embedded under a bouletic predicate is resolved to the epistemic state of the attitude holder at the attitude time of the

embedding predicate, the modal is felicitous only if an appropriate operator intervenes between the embedding predicate and the modal; (ii) if the modal base of an epistemic modal embedded under a bouletic predicate is not resolved to the epistemic state of the attitude holder at the attitude time of the matrix predicate, no special constraint obtains on the modal and the modal may be felicitous. We have argued that this behavior can be shown to follow from two assumptions: the anti-opinionatedness presupposition of bouletic attitude predicates (e.g., Heim 1992, von Stechow 1999) and the opinionatedness of epistemic agents about their belief and knowledge (e.g., Stalnaker 2002). Although our proposal builds on some insights and assumptions of Anand & Hacquard's (2013) treatment of the subject matter, we submit that it captures a broader array of data in a principled manner, in particular, the two descriptive facts mentioned under (i) and (ii). Finally, our proposal is not wedded to any particular assumptions about the semantics of bouletic attitude predicates other than, uncontroversially, that they trigger an anti-opinionatedness presupposition. We conclude the paper by discussing potential extensions of our proposal to the distribution of epistemic modals in antecedent clauses of conditionals in Section 4.1 and by addressing another puzzle observed by Rett (2012) and Anand & Hacquard (2013) in Section 4.2.

4.1 Conditionals

A puzzle Papafragou (2006) and Hacquard & Wellwood (2012) discuss the fact that both existential and universal epistemic modals appear to be on certain natural construals infelicitous in antecedent clauses of conditionals (see also McDowell 1987, Drubig 2001). In the following, we zoom in on the distribution of epistemic modals in antecedents of epistemic conditionals, that is, conditionals in which the antecedent clause can be analyzed as restricting the modal base of a potentially covert matrix epistemic modal (see e.g. Kratzer 1986; our reliance on this analysis of conditionals is not crucial for our purposes, see Gillies 2010 for a recent discussion of an alternative view). We can characterize the infelicitous occurrences of epistemic modals as those, roughly, on which the modal base of the embedded modals is resolved to the epistemic state of the speaker (cf. subjective epistemic modals in the terminology of Papafragou 2006 and others).

- (42) If Max is the murderer, he was in Dallas yesterday.
- (43) a. #If Max must be the murderer, he was in Dallas yesterday.
b. #If Max might be the murderer, he was in Dallas yesterday.

to be one and he was in Dallas yesterday. The possibility presupposition of the sentence is that it is possible, according to the speaker, that Max has to be the murderer.

- (47) a. **Assertion of (46):** $\Box_{sp}(\Box_{sp}(\text{Max is the murderer}) \rightarrow \text{Max was in Dallas})$
 b. **Presupposition of (46):** $\Diamond_{sp}\Box_{sp}(\text{Max is the murderer})$

Due to opinionatedness, we know that either the speaker believes that Max has to be the murderer or she believes that Max does not have to be the murderer.

- (48) **Consequence of opinionatedness, relevant for (46):**
 $\Box_{sp}\Box_{sp}(\text{Max is the murderer}) \vee \Box_{sp}\neg\Box_{sp}(\text{Max is the murderer})$

Together with presupposition (47-b), this entails that the speaker believes that Max has to be the murderer, which entails that, according to the speaker, Max has to be the murderer.

- (49) **Consequence of presupposition of (46) and opinionatedness:**
 $\Box_{sp}\Box_{sp}(\text{Max is the murderer}) (\Rightarrow \Box_{sp}(\text{Max is the murderer}))$

Although this meaning and the meaning of the conditional sentence are consistent, the presupposition of the sentence together with opinionatedness has the consequence that the antecedent clause of the conditional sentence is true in every world compatible with what the speaker believes. That is, the antecedent clause of the conditional is vacuous in every context in which the conditional can be used, (50).

- (50) For any context $c \subseteq (49)$, that is, for any context c in which (46) is defined,
 $\Box_{sp}(\Box_{sp}(\text{Max is the murderer}) \rightarrow \text{Max was in Dallas}) \Leftrightarrow_c \Box_{sp}(\text{Max was in Dallas})$

We put forward that conditionals with antecedents that are vacuous in this way tend to be pragmatically marked because they, all else being equal, run afoul of the Gricean principle of manner, a relevant corollary of which is stated in (51) (based on *Be Brief* in Schlenker 2008).¹⁶

- (51) **Be Brief (Conditionals)**

Given any context set c , an occurrence of an antecedent p in a conditional is infelicitous if for any proposition-type expression q , $(\text{if } p, q) \Leftrightarrow_c q$ (unless the use of the antecedent is dictated by other pragmatic factors).

¹⁶Given the interactive nature of Gricean principles, an expectation arises that if manner considerations are appropriately overridden by other considerations active in the context, say, by some external pressure requiring the use of a conditional sentence (e.g., when explicitly reasoning about a modus ponens inference), the sentence with an epistemic modal in the antecedent may be acceptable even with the modal being relativized to the epistemic state of the speaker at the time of the utterance.

Relativization and intervention Two immediate predictions follow from this proposal that parallel our predictions in the preceding section: an epistemic modal in an antecedent of a conditional may be felicitous (i) if the embedded epistemic modal is not relativized to the same information state as the matrix modal or (ii) if it does not take the highest scope in the antecedent clause. We discuss these predictions in turn.

Ad (i). If the epistemic modal in an antecedent of a conditional is not evaluated relative to the same information state as the matrix modal, as exemplified in (52),

- (52) a. If Max must be the murderer according to the police, he was in Dallas.
 b. [MUST Ep(sp,w)] [if [must Ep(police,w)] [Max be the murderer]] [he was ...]

the possibility presupposition of the conditional will not make the antecedent of the conditional vacuous – this is because we may not conclude from the speaker taking it to be possible that Max has to be the murderer according to the police that the speaker believes that Max has to be the murderer according to the police. Accordingly, the antecedent clause is not vacuous and the sentence may well be felicitous.

- (53) a. **Assertion of (52):** $\Box_{sp}(\Box_p(\text{Max is the murderer}) \rightarrow \text{Max was in Dallas})$
 b. **Presupposition of (52):** $\Diamond_{sp}\Box_p(\text{Max is the murderer})$

Ad (ii). If the epistemic modal in the antecedent clause does not take the highest scope in the clause, the possibility presupposition of the conditional, coupled with opinionatedness, again need not make the antecedent vacuous. For example, the sentence in (54) preferably has a structure according to which the epistemic modal in the antecedent clause takes scope below the universal nominal quantifier (see Swanson 2010 for the discussion of the sentence in the antecedent clause).

- (54) a. If every moment I will spend with my child could be the one that really matters, I am really unlucky.
 b. [MUST Ep(sp,w)] [if [every moment]_t [could Ep(sp,w)] [t be the one that really matters]] [I am really unlucky]

On this parse, the antecedent clause of the conditional is not vacuous: there may be worlds epistemically accessible to the speaker in which every moment is such that it is possible that it will be the one that really matters, but, fortunately for the speaker, this does not license one to conclude that one is in such a world, that is, that every moment is such that it is possible that it will be the one that really matters. Accordingly, the sentence may well be felicitous.

- (55) a. **Assertion of (54):**
 $\Box_{\text{sp}}(\text{every moment}_t \Diamond_{\text{sp}}(\text{t really matters})) \rightarrow \text{I am unlucky}$
 b. **Presupposition of (54):**
 $\Diamond_{\text{sp}}(\text{every moment}_t \Diamond_{\text{sp}}(\text{t really matters}))$

We have thus shown that the distribution of epistemic modals in antecedents of conditionals can be explained by recourse to opinionatedness, an independently-motivated assumption about antecedents of conditionals (the possibility presupposition), and plausible assumptions about pragmatics (a violable constraint against vacuous antecedents of conditionals, arguably a consequence of the Gricean maxim of manner). There are many questions that still face this proposal, questions that we leave for another occasion.

4.2 Negated (and negative) belief and emotive attitude ascriptions

A puzzle and a sketch of an account Anand & Hacquard (2013) observe another peculiar aspect of the distribution of epistemic modals: while existential epistemic modals are felicitous under *doubt* and emotive doxastic predicates (e.g., *surprise*, *regret*, *hope*), universal epistemic modals are not (see also discussion in Rett 2012). This is exemplified in (56). We focus on *doubt* in the following.

- (56) a. John doubts that Mary might be the murderer.
 b. #John doubts that Mary has to be the murderer.

Anand & Hacquard (2013, Section 4) propose that this pattern follows from *doubt* triggering an analogue of the anti-opinionatedness presupposition (note that they do not assume that *want* triggers the same presupposition, contra Heim 1992, von Stechow 1999). They call it the *uncertainty condition* – it is effectively a requirement that it is possible according to the subject of *doubt* that the complement of *doubt* holds and that it is possible that it does not hold (this is a simplification, see Anand & Hacquard 2013, Section 4.2, for details). In addition, they assume that *doubt* triggers a doxastic presupposition to a similar effect (namely, that it is possible according to the subject of *doubt* that the complement of *doubt* is true; the presupposition is not vacuous in light of the uncertainty condition due to the way that the uncertainty condition is implemented in their system). Given their assumptions about modal semantics, these two presuppositions are compatible when the embedded modal is existential:

- (57) a. John doubts that Mary might be the murderer.
 b. Uncertainty: $\Diamond_J(\text{Mary is the murderer}) \ \& \ \Diamond_J(\neg \text{Mary is the murderer})$
 c. Doxastic: $\Diamond_J(\text{Mary is the murderer})$

However, the presuppositions are not compatible when the embedded modal is universal. Namely, while the uncertainty condition effectively mandates there to be possible worlds in which Mary is the murderer and possible worlds in which Mary is not the murderer (this follows from their implementation of the condition, whose discussion we omit for the sake of brevity), the doxastic presupposition requires it to be the case that in all possible worlds Mary is the murderer. The two presuppositions are mutually inconsistent and the sentence is consequently marked.

- (58) a. #John doubts that Mary must be the murderer.
 b. Uncertainty: $\diamond_J(\text{Mary is the murderer}) \ \& \ \diamond_J(\neg\text{Mary is the murderer})$
 c. Doxastic: $\square_J(\text{Mary is the murderer})$

The sketched approach faces an immediate issue: while bouletic predicates may well trigger an anti-opinionatedness presupposition, as assumed above, it is not clear that *doubt* triggers the same (or similar) presupposition. Furthermore, Anand & Hacquard’s approach might lack desired generality, especially in light of some seemingly related data pertaining to negated belief ascriptions. We discuss these issues in turn.

An issue with proposed presuppositions We submit that *doubt* does not trigger the presuppositions ascribed to it by Anand & Hacquard, which are akin to those assigned by Heim and von Fintel to *want*. To support this, we look at three types of examples involving presupposition projection.¹⁷ The first example involves presupposition projection under negation: if *doubt* triggers an anti-opinionatedness presupposition, it should project under negation. In particular, this means that the sentence in (59), where *doubt* is embedded under negation and triggers the presupposition that it is possible according to me that climate change is not real, should convey that it is possible according to me that climate change is not real. However, the sentence does not appear to convey this meaning, e.g., the discourse in (59) can be felicitously continued by *I think that the fact that climate change is real is obvious enough*. (See a related discussion on Language Log, Liberman 2014.)

- (59) a. I don’t doubt (at all) that climate change is real but I do think that some climate change activists should take it easy.
 b. Predicted uncertainty: I think it is possible that climate change is not real.

¹⁷We leave it open whether some of the inferences adopted by Anand & Hacquard for *doubt* are cancellable implicatures triggered by *doubt*. In fact, it is conceivable that such implicatures could play some role in explaining the distribution of epistemic modals under *doubt*. But we must leave a detailed exploration of this possibility to another occasion.

The second example involves an occurrence of *doubt* in the nuclear scope of a negative indefinite, (60). The projected presupposition of *doubt* should, all else being equal, entail the universal inference that everyone of the ten policemen takes it to be possible that Mary is not the murderer (see e.g. Fox 2013 on presupposition projection under negative indefinites). Again, this does not seem to be a meaning conveyed by the sentence, e.g., the sentence can be felicitously followed by *They all think she did it on Monday*.¹⁸

- (60) a. None of the ten policemen doubts that Mary is the murderer.
b. Predicted uncertainty: Everyone of the ten policemen thinks it is possible that Mary is not the murderer.

Finally, the sentence in (61), where *doubt* is in the restrictor of a universal quantifier, is felicitous. If *doubt* were to trigger the presupposition that the subject takes it to be possible that Mary is in Madrid, the projected presupposition of the sentence should clash with the assertive meaning of the sentence – namely, the sentence would convey that everyone (or at least someone) thinks that it is possible that Mary is in Madrid (presupposition) and that everyone of these individuals thinks that Mary is in Barcelona (assertion), two mutually inconsistent propositions. Since the sentence is felicitous and conveys a non-trivial meaning, the anti-opinionatedness presupposition could not have been triggered.¹⁹

- (61) Everyone who doubts that Mary is in Madrid thinks she is in Barcelona.

We have thus shown that *doubt* appears not to give rise to either the anti-opinionatedness presupposition or to the doxastic presupposition, that is, the two crucial ingredients of Anand & Hacquard’s account of the distribution of epistemic modals under *doubt*.

An issue of generality? A preliminary investigation suggests that a distribution of epistemic modals that parallels the one we outlined in (56) appears to obtain also with explicitly negated belief predicates, (62), predicates that uncontroversially lack the presupposition ascribed to *doubt* above. Since these examples closely resemble the examples with

¹⁸Note that this continuation would also be infelicitous if the presupposition would project existentially under negative indefinites (see Beaver 2001, Chemla 2009, and footnote 19 for further discussion).

¹⁹The example in (61) is problematic on both the assumption that presuppositions project universally from restrictors of universal quantifiers (Heim 1983) and on the assumption that they project existentially (Beaver 2001; see Chemla 2009 for discussion). Namely, if the presupposition projects existentially, the main predicate still gets predicated of an individual that takes Mary to possibly be in Madrid (otherwise universal quantification would be vacuous). Finally, evoking local presupposition accommodation in the restrictor of the quantifier to avoid contradiction would not be helpful: the proposition that everyone who takes it to be *possible that Mary is in Madrid* (= local accommodation) but doubts that Mary is in Madrid thinks that she is Barcelona is inconsistent and should lead to the sentence being marked.

doubt in their semantic import, a pursuit of a unified explanation of the data seems to be mandated, a pursuit that does not take recourse to specific presuppositions of *doubt*.

- (62) a. John doesn't think that Mary might be running late.
b. #John doesn't think that Mary must be running late.

A different approach? In accordance to the discussion above, we put forward that the markedness of the examples in (56) and (62) does not spring from a clash between anti-opinionatedness and opinionatedness – and thus does not fall under the scope envisioned for this paper. Specifically, there is no clash between anti-opinionatedness and opinionatedness in these examples either because the relevant embedding predicates do not trigger an anti-opinionatedness presupposition (*doubt*, negated belief predicates) or because an anti-opinionatedness presupposition and opinionatedness involve sufficiently distinct information states not to yield a contradiction (*surprise*, *regret*, etc.).²⁰ Accordingly, the distribution of epistemic modals under *doubt*, *surprise*, etc., needs to be explained in a different way – a way that we have to leave unmapped in this paper.

References

- Anand, Pranav & Valentine Hacquard. 2013. Epistemics and attitudes. *Semantics and Pragmatics* 6(8). 1–59. doi:10.3765/sp.6.8.
- Beaver, David I. 2001. Presupposition and assertion in dynamic semantics. CSLI publications.
- Chemla, Emmanuel. 2009. Universal implicatures and free choice effects: experimental data. *Semantics and Pragmatics* 2(1–33).
- Crnič, Luka & Tue Trinh. 2009. Embedding imperatives. In Suzi Lima, Kevin Mullin & Brian Smith (eds.), Proceedings of NELS 39, 227–239.
- Dorr, Cian & John Hawthorne. 2014. Embedding epistemic modals. *Mind* 122(488). 867–913.

²⁰Although von Stechow (1999) argues that an emotive doxastic predicate triggers an anti-opinionatedness presupposition, the modal base to which this presupposition is relativized includes counterfactual worlds which are not part of the epistemic state of the subject and in which the complement of the predicate is false (see esp. von Stechow 1999:123 on how these worlds may be selected). Accordingly, an opinionatedness inference that would clash with the anti-opinionatedness presupposition does not necessarily obtain.

- Drubig, Hans Bernhard. 2001. On the syntactic form of epistemic modality. Manuscript, University of Tübingen.
- Fagin, Ronald, Joseph Halpern, Yoram Moses & Moshe Vardi. 1995. Reasoning about knowledge. Cambridge, MA: MIT Press.
- von Fintel, Kai. 1999. NPI licensing, Strawson entailment, and context dependency. Journal of Semantics 16(2). 97–148.
- von Fintel, Kai & Anthony Gillies. 2011. ‘might’ made right. In Andy Egan & Brian Weatherson (eds.), Epistemic modality, Oxford: Oxford University Press.
- von Fintel, Kai & Sabine Iatridou. 2003. Epistemic containment. Linguistic Inquiry 34(2). 173–198.
- Fox, Danny. 2013. Cancelling the maxim of quantity: Another challenge for a gricean theory of scalar implicatures. Manuscript, MIT & HUJI. (to appear in *Semantics and Pragmatics*).
- Gillies, Anthony S. 2010. Iffiness. Semantics and Pragmatics 3(4). 1–42. doi:10.3765/sp.3.4.
- Greco, Daniel. 2013. Iteration and fragmentation. Manuscript.
- Hacquard, Valentine. 2006. Aspects of modality: MIT dissertation.
- Hacquard, Valentine & Alexis Wellwood. 2012. Embedding epistemic modals in english: A corpus-based study. Semantics and Pragmatics 5(4). 1–29.
- Heim, Irene. 1983. On the projection problem for presuppositions. In Michael Barlow, Dan Flickinger & Micheal Wescoat (eds.), Proceedings of WCCFL 2, 114–125. Cascadilla Press Somerville, MA.
- Heim, Irene. 1987. Where does the definiteness restriction apply? evidence from the definiteness of variables. In Eric Reuland & Alice ter Meulen (eds.), The representation of (in) definiteness, vol. 14, Cambridge, MA: MIT Press.
- Heim, Irene. 1992. Presupposition projection and the semantics of attitude verbs. Journal of Semantics 9(3). 183.
- Hintikka, Jaakko. 1962. Knowledge and belief: an introduction to the logic of the two notions. Cornell University Press.

- Kratzer, Angelika. 1986. Conditionals. In Arnim von Stechow & Dieter Wunderlich (eds.), Semantics: An international handbook of contemporary research, 651–656. Mouton de Gruyter.
- Kratzer, Angelika. 1991. Modality. In A. von Stechow (ed.), Semantics: An international handbook of contemporary research, 639–650. Berlin: de Gruyter.
- Lassiter, Daniel. 2011. Measurement and modality: NYU dissertation.
- Lewis, David. 1969. Convention: A philosophical study. Cambridge, MA: Harvard University Press.
- Liberman, Mark. 2014. Not doubting that not. Language Log blog post. URL: <http://languagelog.ldc.upenn.edu/nll/?p=10311> [posted on February 8, 2014].
- McDowell, Joyce. 1987. Assertion and modality: University of Southern California dissertation.
- Papafragou, Anna. 2006. Epistemic modality and truth conditions. Lingua 116. 1688–1702.
- Rett, Jessica. 2012. On modal subjectivity. UCLA Working Papers in Linguistics 16. 131–150.
- Schlenker, Philippe. 2004. Conditionals as definite descriptions (a referential analysis). Research on Language and Computation 2. 417–462.
- Schlenker, Philippe. 2008. Be articulate: A pragmatic theory of presupposition projection. Theoretical Linguistics 34(3). 157–212.
- Stalnaker, Robert. 1968. A theory of conditionals. In Nicholas Rescher (ed.), Studies in logical theory (supplementary monograph to the *American Philosophical Quarterly*), 315–332. Blackwell.
- Stalnaker, Robert. 2002. Common ground. Linguistics and Philosophy 25. 701–721.
- Stephenson, Tamina. 2007. Judge dependence, epistemic modals, and predicates of personal taste. Linguistics and Philosophy 30(4). 487–525.
- Swanson, Eric. 2010. On scope relations between quantifiers and epistemic modals. Journal of Semantics 27. 529–540.
- Williamson, Timothy. 2000. Knowledge and its limits. Oxford: Oxford University Press.

Yalcin, Seth. 2008. Modality and inquiry: Massachusetts Institute of Technology dissertation.