

SPEAKER-ORIENTED VS. SUBJECT-ORIENTED MODALS: A SPLIT IN IMPLICATIVE BEHAVIOR*

Valentine Hacquard,
University of Massachusetts, Amherst

hacquard@linguist.umass.edu

Abstract

Epistemic and root modals are often expressed by the same lexical items cross-linguistically. This cross-linguistic trend supports a Kratzerian analysis, where modals share a semantic core and where the only difference between an epistemic and a root interpretation depends on context. However, another cross linguistically robust pattern seems to argue against such a unifying account. Namely, epistemics tend to scope high (in particular higher than Tense and Aspect) and roots low: a fact which a Kratzerian account cannot explain, and which has led to account which hard-wire a specific syntactic position for epistemics and for roots (cf. Cinque 1999). This paper presents a novel account of modals in the spirit of Kratzer (1981, 1991), but where the modal is relative to an *event* rather than a world of evaluation. This event-relativity can account for the correct interactions of epistemics and roots with Tense and Aspect, without stipulating an interpretation-specific height for modals.

1 Introduction

It is a robust cross-linguistic generalization that the same modal words are used to express various types of modality. The following French examples illustrate. The modal in (1a) receives an *epistemic* interpretation (having to do with what is known, what the available evidence is), while those in (b-d) receive a ‚root‘ or ‚circumstantial‘ interpretation (having to do with particular circumstances of the base world): (1b) is a case of *deontic* modality (having to do with permissions/obligations), (1c) an *ability* and (1d) a *goal-oriented* modality (having to do with possibilities/necessities given a particular goal of the subject):

- (1) a. *Il est 18 heures. Anne n'est pas au bureau. Elle peut/doit être chez elle.*
It's 6:00pm. Anne is not in the office. She may/must be home
- b. *Le père de Anne lui impose un régime très strict. Elle peut/doit manger du brocoli.*
Anne's father imposes on her a strict diet. She can/must eat broccoli
- c. *Anne est très forte. Elle peut soulever cette table.*
Anne is very strong. She can lift this table.
- d. *Anne doit être à Paris à 17 heures. Elle peut/doit prendre le train pour aller à P.*
Anne must be in Paris at 5pm. She can/must take the train to go to P.

Kratzer (1981, 1991) proposes a unifying account of modals: there is just one possibility modal (*pouvoir*) and one necessity modal (*devoir*), which are, respectively, an existential and a universal quantifier over a set of accessible worlds. This set of accessible worlds is provided by a *modal base f*, i.e., a ‚conversational background‘ that the context makes available. The

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flavor of modality (i.e., ‘epistemic’ or ‘root’) is determined by the kind of modal base the context provides: *epistemic* for the former and *circumstantial* for all root modals¹:

- (2) a. $[[\text{can}]](w)(f)(q) = \exists w' \in \text{MB}_f(w): q(w')$
 (3) b. $[[\text{must}]](w)(f)(q) = \forall w' \in \text{MB}_f(w): q(w')$
 where $f_{\text{epist}}(w) = \lambda w'. w'$ is compatible with what is known in w .
 $f_{\text{circumstantial}}(w) = \lambda w'. w'$ is compatible with certain facts in w .

Thus, in such an account, the only difference between (1a) and (1b-d) is simply a matter of which worlds the modal quantifies over: worlds compatible with what is known in (1a) vs. worlds compatible with certain circumstances in (1b-d).

A long standing problem for this proposal is that it cannot explain the systematic trend for modals with an epistemic interpretation to scope higher than any other scope bearing element (in particular, Tense, negation and quantifiers), while modals with a root interpretation scope lower than all of these elements (cf. Brennan 1993, Drubig 2001, among many others). This paper will focus in particular on the interaction of Tense and Aspect with epistemic and root modals, and try to explain why the former scope high and the latter scope low, under the Kratzerian assumption that they share a semantic core.

1.1 Interaction with Tense

It has been shown that epistemic modals in matrix contexts, have to be evaluated at the speech time, rather than at the time given by Tense. When embedded, the modal’s evaluation time has to be the internal now of the embedding attitude (cf. Iatridou 1990, Abusch 1997, Stowell 2001). Thus, while an embedded modal can be evaluated at a time prior to the speech time, it cannot be back-shifted with respect to the attitude time (the embedded past Tense is a sequence of Tense *past*):

- (4) a. *Anne est déjà à Paris.* Elle a pu prendre l’avion.
 ‘Anne is already in Paris. She may have taken the plane.’
 b. *Anne était déjà à Paris.* Paul pensait qu’elle avait pu prendre l’avion.
 ‘Anne is already in Paris. Paul thought that she could have taken the plane.’

In (4)a), it is a possibility **now**, given what is known **now** (namely that Anne is already in Paris) that she took the train (at some past time). In (4)b), it was a possibility for Paul **at his thinking time** that Anne had taken the time at a prior time. Thus, epistemic modals seem to scope higher than Tense: Despite Tense morphology appearing on the modal itself, Tense seems to be interpreted *below* the modal (as in the English gloss). The same modal, however, with the same Tense marking, but with a root interpretation shows the reverse scope pattern: it has to be interpreted *below* Tense (given Anne’s circumstances **yesterday**, it **was** a possibility for her (**yesterday**) to take the train):

- (5) *Anne est arrivée à l’heure à l’aéroport hier, et donc...* Elle a pu prendre l’avion.
 ‘A. arrived on time at the airport yesterday and thus... She was able to take the plane.’

¹In this paper, I will ignore further distinctions between various circumstantials, as they all pattern together in their interaction with Tense and Aspect. In Kratzer’s system, these distinctions are due to a 2nd conversational background g (*ordering source*) which picks out the best worlds of the modal base, given some ideal:

- (1) Anne must eat broccoli.
 $\forall w' \in \text{Best}(g_{\text{DOCTOR'S ORDERS}}(f_{\text{CIRC}}(w))): \text{Anne eats broccoli}(w')$
 In all best worlds, given doctor’s orders, among those compatible with circumstances, A. eats broccoli.

1.2 Interaction with Aspect

Aspect also seems to interact differently with epistemics and roots. As was shown by Bhatt (1999) for the ability modal, perfective on such a modal yields what Bhatt called an ‘actuality entailment’, that is, an uncancelable implication that the proposition expressed by the complement was actualized. With imperfective, the effect disappears. Hence, in (6)a, but not in (6)b, the continuation that denies the complement comes out as a contradiction.

- (6) a. Anne a pu soulever cette table, #mais elle ne l’a pas soulevée.
Anne could-pfv lift this table, #but she didn’t lift it
b. Anne pouvait soulever cette table, mais elle ne l’a pas soulevée.
Anne could-impf lift this table, but she didn’t lift it
‘Anne was able to lift this table’

This effect extends to all root interpretations (cf. Hacquard 2006). However, epistemics seem immune to it: (7)a) is not a contradiction. Instead, Aspect, which morphologically appears on the modal, seems to be interpreted in the complement VP. Thus the only difference in meaning between (7)a) and (b) is in the Aspectual properties of the loving state: ‘it is possible that Anne once loved Paul’ in (a) vs. ‘it is possible that Anne was in love with him’ in (b):

- (7) a. Anne a pu aimer Paul, comme elle a pu ne pas l’aimer.
Anne could-pfv love Paul, just as she could-pfv not love him.
Anne may have loved Paul, just as she may not have loved him.
b. Anne pouvait aimer Paul, comme elle pouvait ne pas l’aimer.
Anne could-impf love Paul, just as she could-impf not love him.
‘Anne may have been in love with Paul, just as she may not have loved him.’

This data show that epistemic and root modals interact differently with Tense and Aspect. In particular, the ordering of Tense, Aspect and the various modals seems to be fixed cross-linguistically (cf. Cinque 1999). This ordering is unexpected and unexplainable if the only difference between epistemics and roots is in the kind of worlds the modal quantifies over, as determined by the conversational background. Thus, we are led to the following dilemma: on the one hand, given the cross linguistic trend to use the same modals to express both epistemic and root modality, we would want to give them a semantic core; on the other hand, the fact that epistemics are systematically interpreted higher than roots, and that only the latter yield actuality entailments with perfective Aspect suggests that they should be treated as two separate elements. The general trend in previous proposals working on the interactions of modals with Tense and Aspect has been to essentially reject a unified account: Drubig (2001) and Westmoreland (1998) for instance propose that epistemics are evidentials, rather than modals; Bhatt (1999) also rejects a ‘modal’ analysis of the ability modal and treats it as an implicative predicate (like *manage*). Other more conservative accounts follow Cinque’s hierarchy and provide two fixed syntactic positions for modals, either syntactically or by having epistemics take propositions as complements and roots take properties (cf. Butler 2003; Brennan 1993). But again, this doesn’t explain *why* this should be so, nor why epistemics and roots should be expressed by the same lexical items cross-linguistically.

In this paper, I propose that a unified account à la Kratzer can be maintained, and still derive the correct interactions with Tense and Aspect, once we make one crucial modification: I propose that the modal base, which, in Kratzer (1981, 1991), is relative to a world of evaluation, is instead relative to an *event* of evaluation. Specifically, I propose that the modal base takes an event pronoun which needs to be bound locally. The potential event binders at various syntactic positions in turn impose interpretative restrictions on the modal they bind, and explain why only high modals receive an epistemic interpretation. This account

is thus an attempt to motivate semantically Cinque’s ordering of Tense, Aspect and modals, without having to appeal to arbitrary syntactic positions.

This paper will be organized as follows: in section 2, I will give my proposal. Section 3 will derive the correlation between modal flavor and height of interpretation. Section 4 will derive the correlation between modal flavor and actuality entailments.

2 Proposal

The premises that I would like to start with are as follows:

1. There is just one possibility modal *pouvoir* and one necessity modal *devoir*. Their flavor depends on contextually-provided conversational backgrounds.
2. We should let the modal merge freely in the tree (no arbitrary syntactic constraints).

Given these two premises, we will then need to explain why a modal merged high (above Tense and Aspect) receives an epistemic interpretation, and is immune to actuality entailments, while a modal merged low (below Tense and Aspect) receives a root interpretation, and yields actuality entailments with perfective Aspect. To do so, I propose to relativize modals to an *event* of evaluation.

2.1 Event relativity

In this section I would like to motivate empirically the event relativity just proposed, putting aside, for now, the difference in flavor (epistemic vs. root). We have seen in the introduction that modals seem to be relative to a time of evaluation (see also Ippolito 2003). For epistemics, this time is the speech time (when the modal is in matrix context), or the internal now of the attitude (when embedded under an attitude). Thus in (4)a) the modal is evaluated at the speech time: *it is compatible with what is known **now** that Anne took the plane*, and in (4)b), the modal’s evaluation time is Paul’s thinking time: *it was compatible with what Paul thought **at his thinking time** that Anne had taken the plane*. With root modals, the time of evaluation is that provided by Tense. Hence, in (5), the opportunity for Anne to take the plane was a possibility at the given past time (yesterday).

As it turns out, modals are also often relative to an individual. For unembedded epistemics, this individual is the speaker (and perhaps a larger community, cf. DeRose 1991, von Stechow and Gillies 2006): *given what **I, the speaker**, know, it is possible that Anne took the plane*. For circumstantial modals, this individual is the subject (cf. Brennan 1993): *given **Anne’s** circumstances, it was possible for her to take the plane*².

Furthermore not all combinations of time and individuals are possible. The following examples illustrate these time/individual restrictions. In (8), with a root (goal-oriented) interpretation, the modal is relativized to Anne’s circumstances at the time given by Tense (a past time), rather than at the speech time:

- (8) a. Anne a dû prendre le train (pour aller à Paris.)
 Anne must-pst-pfv take the train (to go to Paris)
 ‘Anne had to take the train to go to Paris.’
- b. Given **Anne’s** circumstances **then**, she had to take the train then.
 *Given **Anne’s** circumstances **now** she had to take the train.

² When there is no clear agentive subject, as in ‘*it can rain hard here*’, a root modal is still relativized to a participant of the VP event (e.g., the location *here*). As we will see what matters is which event the individual participates in: the speaker for the speech event, and the subject/object/location for the VP event.

In (9), with an epistemic interpretation, the modal is relativized to the speaker at the speech time, and not at a time prior to it. In (10), the modal is relativized to the attitude holder (every contestant) at his attitude time:

- (9) a. Anne a dû prendre le train (vu qu'elle est déjà à Paris.)
 Anne must-pst-pfv take the train (since she's already in Paris)
 'Anne must have taken the train'.
 b. 'Given what **I** know **now**, it must be the case that Anne took the train then.'
 *Given what **I** knew **then** Anne had to take the train.
- (10) Every contestant_i thought he_i might be the winner. [adapted from Speas (2004)]
 'For every contestant *x*, given what *x* knew **at *x*'s thinking time**, it was possible that *x* was the winner.'

The empirical generalization that emerges, then, goes as follows:

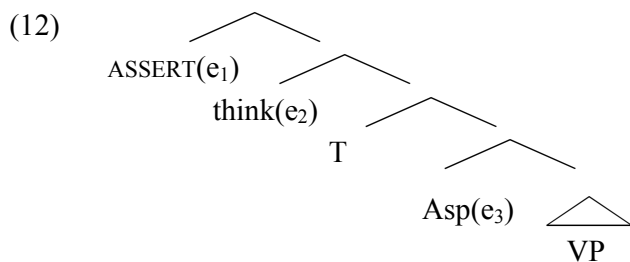
1. When the modal is speaker-oriented, it is keyed to the speech time and receives an epistemic interpretation.
2. When the modal is attitude holder-oriented, it is keyed to the attitude time and receives an epistemic interpretation.
3. When the modal is subject-oriented, it is keyed to the time provided by Tense and receives a root interpretation.

In order to handle this generalization, I propose that these time and individual constraints arise from some event anchoring: from an event we can recover information about that event's participants and running time: if we anchor a modal to an event, we anchor it to its running time and participants.

Consider the following sentence:

- (11) Paul thought yesterday that Anne had taken the train the day before.

In this sentence, there are (roughly speaking) three relevant times, where 'events' are happening: first, the speech event, which is an asserting event by me, the speaker, at the speech time; the second event is a thinking event by Paul happening yesterday; the 3rd event is an event of taking the train by Anne the day before yesterday. I would like to propose that each of these three events is able to bind the event argument of a modal, and thus anchor that modal to its running time and participants. There would thus be three potential event binders for a modal: first, the speech event, whose participants include the speaker, and whose running time is the speech time. Second, attitude events, whose participants include the attitude holder and whose running time is the internal now of the attitude. Third, the VP event, quantified over by Aspect, whose participants include the subject and whose running time is provided by Tense.



That Aspect can bind events is rather uncontroversial: as we will see shortly, Aspect is, by definition, a quantifier over events. That attitude verbs can bind events could be seen as a reframing in event terms of von Stechow's (2001) proposal, according to which attitude verbs are binders over person, world, and time triplets. The nature of the speech event may be

a bit more controversial. However, many researchers have found it useful to represent the speech event/assertion operator in the grammar (cf. Rizzi 1997, Ginsburg and Sag 2001, Krifka 2001, Tenny and Speas 2004). I won't go into much detail here, but simply assume the following: the speech event is syntactically represented; there is only one speech event per utterance, in topmost position, whose role is to determine the nature of the utterance: if it is an assertion, it will be an asserting event, if it is a question, it will be a questioning event, and if it is an order (as for imperatives), it will be an ordering event. I will further assume that this speech event is able to bind free event pronouns in its scope, paralleling the binding of free world pronouns by a default matrix world binder in Percus (2000)'s system.

We would thus have three event binders for modals. One may wonder whether this binding obeys any locality restrictions: could a low modal be bound by a high event binder, if there is a closer binder in between? The answer appears to be no. In fact, the second empirical generalization that seems to emerge is that a modal will always be relative to the closest event binder. Consider the following example:

- (13) Every contestant_i thought he_i might be the winner. [adapted from Speas (2004)]
For every contestant x, given **my evidence **now**, it was possible that x was the winner.*

Here we have a case of a high epistemic modal (interpreted above the Tense of the embedded clause). This modal seems to be keyed **obligatorily** to the attitude event: it cannot be bound by the speech event. As Speas (2004) and Stephenson (2006) observe, the modal cannot be relativized to the speaker (to the speech event in the current framework).

The upshot of this section is that a modal seems to be relativized to an individual and a time. Not any individual-time pair is however attested. It appears, instead, that the modal is relativized to the participants and running time of the closest event c-commanding it. Thus, if a modal is below Aspect (which we know from the fact that it is interpreted below Tense and Aspect), it seems to be relativized to the event quantified by Aspect. If the modal is above Aspect (which we know from the fact that it is interpreted above Tense and Aspect), it is bound either by an attitude verb, if present, or by the speech event. My proposal is that this relativization arises from various event binders binding an event pronoun in the modal's restriction:

- | | | | | | | | | | |
|------|----|----------------------------|------------------------|----------------------|---|------------------------|----------------------|---|----------------|
| (14) | a. | e _{speech} * | (Att ₂) | | T | Asp₁ | Mod _{f(e1)} | V | e ₁ |
| | b. | e _{speech} * | Att₂ | Mod _{f(e2)} | T | Asp ₁ | | V | e ₁ |
| | c. | e_{speech}* | | Mod _{f(e*)} | T | Asp ₁ | | V | e ₁ |

2.2 Assumptions: Modals, Tense and Aspect

Before putting all the pieces together, I would like to make my assumptions about modals, Tense and Aspect explicit.

Tenses and worlds: I assume that Tenses and worlds are pronouns, explicitly represented in the syntax (i.e., they are not parameters) (cf. Partee 1973, Kratzer 1998, Percus 2000, a.o.). The following entries are from Kratzer (1998), where the overlap/anteriority relation with the speech time t_0 is given as a presupposition (in curly brackets), i.e., the context has to provide a salient time interval t which overlaps/precedes the speech time:

- (15) a. $[[\text{pres}]]^{\text{g,c}} = t \{t \approx t_0\}$
 b. $[[\text{past}]]^{\text{g,c}} = t \{t < t_0\}$

Modals: I assume, following Kratzer (1981, 1991) that there is just one possibility modal and one necessity modal, which take a proposition as their complement. My account will differ from Kratzer's only w.r.t. to the first restriction of the modal, namely the modal base. As we will see in the next section, I will assume that the modal base picks out a set of accessible worlds from an event, rather than a world of evaluation.

Aspect: In the Davidsonian (1967) tradition, I assume that verbs are predicates of events, and thus have to combine with an event argument. Aspects are quantifiers over events: they take a predicate of events (VP) and return a predicate of times, which in turn combine with a Tense pronoun. I will assume the following lexical entry for perfective Aspect³, slightly modified from Kratzer (1998):

$$(16) \quad [[\text{PERFECTIVE}]] = \lambda w. \lambda t. \lambda P_{\langle e,t \rangle}. \exists e [e \text{ is in } w \ \& \ \tau(e) \subset t \ \& \ P(e) = 1]$$

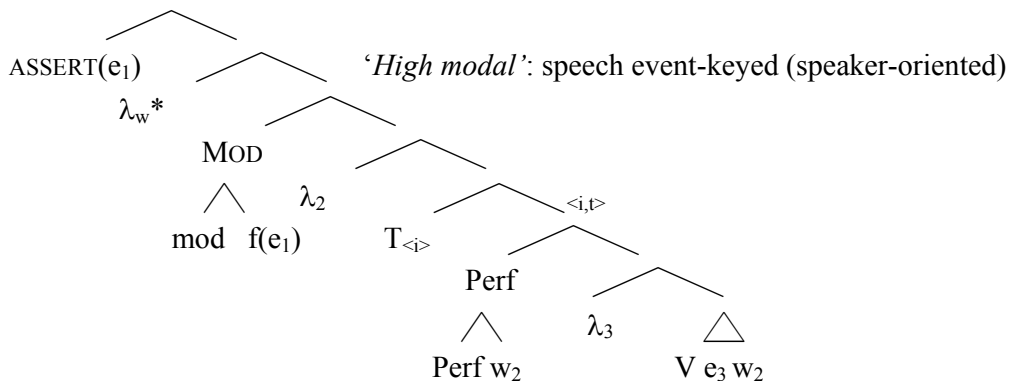
Aspect quantifies over the event described by the VP and locates its running time w.r.t. to the time provided by Tense. Traditionally, Aspect is taken to be base-generated right below Tense. I will assume instead that it is merged as an argument of the verb, and then moves out of the VP for type reasons (cf. von Stechow 2001), analogously to a quantifier over individuals in object position. When Aspect moves out, it leaves a trace of type ε (for events), and moves to a position right below Tense in order to combine with a time argument. This Aspect-movement approach allows us to maintain a parallel with quantification over individuals, and, as will become relevant in the next section, lets modals keep the same type whether they appear above or below Tense. Alternatively, we could maintain a more traditional view and have Aspect base-generated under T. In this case, we would need to allow the modal to either take properties of events or propositions as its complement.

2.3 Putting the pieces together

Recall that one of the goals of this paper was to obtain the correct ordering of epistemic and root modals with respect to Tense and Aspect without arbitrary syntactic stipulations, and without lexicalizing the flavor of modality (i.e., there is just one modal for both epistemics and roots). Given the assumptions in section 2.2., there are two possible outcomes:

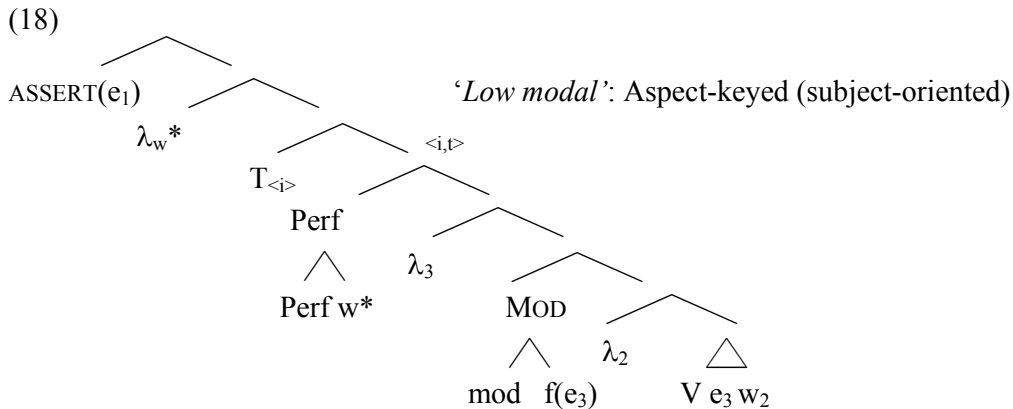
1. A modal merges above Tense (17): the ordering we obtain is MOD>T>ASP>VP (T, ASP, and VP organize themselves in that particular order for independent type/selection reasons).
2. A modal merges below Tense (18): the only available position for the modal is between Aspect and the VP: the modal needs a propositional complement: in this configuration, the only possibility is the VP⁴; Furthermore, Aspect needs to combine with a time pronoun, and hence moves above the modal, right below Tense.

(17)



³ We will return briefly to imperfective Aspect in section 4.

⁴ Recall that I assume an extensional system where worlds are pronouns in the syntax.



We thus obtain two possible configurations: in (17), the modal is above Tense and Aspect. In this configuration, the modal’s event argument has no choice but to be bound by the speech event (unless it is further embedded under an attitude verb. In (18), the modal is below Aspect. Given the strict locality condition for event binding, the modal’s event argument has to be bound by Aspect (provided the syntax will rule out a derivation where Aspect and the event argument of the modal are not co-indexed). So far, we have that a modal is either merged high, in which case it is speech event relative (i.e., keyed to the speaker and the speech time) or merged low, in which case it is Aspect bound (i.e., keyed to the VP event’s participants and running time, that is, the subject and the time given by Tense). What we need to explain now is why a high modal (bound by the speech event or an attitude event) gets an epistemic interpretation, and why a low modal (bound by Aspect) gets a circumstantial interpretation. This is the question we address in the next section.

3 Correlating syntactic height with modal flavor

To understand the correlation of modal flavor and syntactic height, we now need to turn to the modal bases. Recall that we need the modal base to take an event rather than a world argument. I will thus recast the modal bases in terms of events, and show that not all event binders can license all modal bases. Specifically, I will argue that only a speech event or an attitude event can license an epistemic modal base.

3.1 Epistemic modal base

Recall Kratzer’s epistemic modal base⁵:

$$(19) \quad f_{\text{epis}}(w) = \lambda w'. w' \text{ is compatible with what is known in } w.$$

The accessible worlds are those compatible with ‘what is known’. Kratzer (1981, 1991) focus on modals in matrix contexts. However, when we embed an epistemic under an attitude verb, we see that the accessible worlds are those compatible with what the attitude holder *believes*, rather than *knows* (i.e., the factivity disappears):

(20) It is not raining; however, Paul believes it might be raining.

It appears, then, that an epistemic modal base picks out a set of accessible worlds compatible with a set of beliefs. In matrix context, those beliefs are those of the speaker. Given that the speaker presumably believes what he believes to be true, in matrix context, we seem to be considering worlds compatible with what the speaker takes to ‘know’ (i.e., what he believes

⁵ In Kratzer’s system, the modal base is a parameter. This creates problems in cases of stacked modals where the modal bases are different. I thus follow von Stechow and Heim (2001) in representing the modal base f in the syntax.

to be true). Given the acceptability of (20), I will take it that the worlds provided by an epistemic modal base are those compatible with what is ‘believed’ at a certain point in time (either by the speaker, in matrix context, or by the attitude holder, when embedded).

Thus, the epistemic modal base picks out a set of worlds compatible with a set of beliefs. How can we recast this in terms of *events*? Empirically, we seem to find a difference between various event descriptions (i.e., verbs). Some—but not all—have a set of beliefs (or propositions) associated with them. Verbs like *run* or *sleep* describe respectively a running event and a sleeping event, neither of which has a set of beliefs or propositions associated with them. However, attitude verbs like *believe* do. My claim in this section is that only those events that have a set of beliefs associated with them will be able to license an epistemic modal base. Those will be the event described by attitude verbs – where the set of beliefs are those of the attitude holder, and the speech event – where the set of beliefs will be those of the speaker.

Attitude verbs: Attitude verbs are special verbs in that they have ‘content’: that is, a set of propositions associated with them. In the Hintikka (1962) tradition, attitude verbs are taken to be quantifiers over worlds. For instance, *believe* quantifies over worlds compatible with the subject’s beliefs:

(21) Paul believes that it is raining.

In all worlds w' compatible with Paul’s beliefs in w , it is raining in w'

The literature on attitudes usually abstracts away from Aspectual properties of attitude verbs and hence ignore their Davidsonian argument. However, attitude verbs are verbs, and as such, they are predicates of events. I propose to directly link the set of propositions associated with an attitude verb to its event argument via a $\text{CONTENT}(e)$ function: this function picks out the set of propositions associated with the event described by an attitude. Note that any account of attitudes provides a set of propositions (the content of the attitude). The $\text{CONTENT}(e)$ function I suggest is just a way to recover this set directly from the attitude’s event argument. I thus propose to revise slightly the semantics of *believe* so that (21) will now be as follows (note that *believe* is a state eventuality rather than an event – hence the ‘s’ variable):

(22) Paul believes that it is raining.

$\exists s[s \text{ in } w^* \ \& \ \tau(s) \supseteq t^* \ \& \ \text{belief}(s) \ \& \ \text{Exp}(s, P.) \ \&$

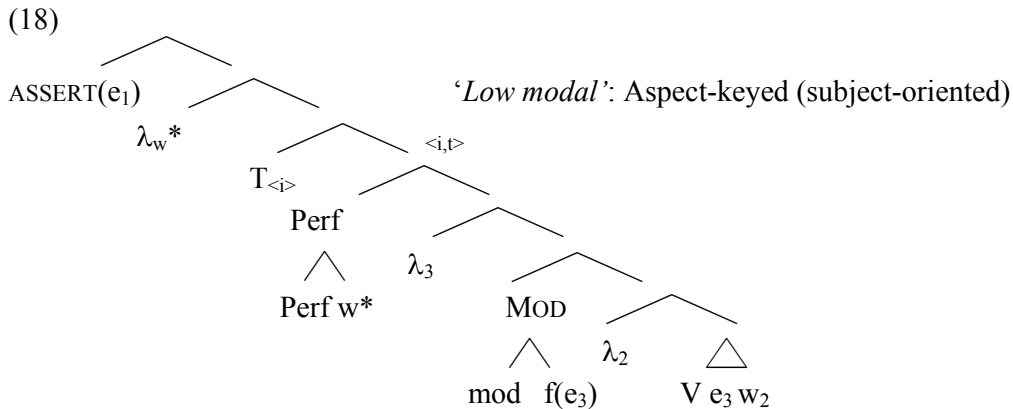
in all worlds w' compatible with $\text{CONTENT}(s)$, it is raining in w'

where $\text{CONTENT}(s) = \{p \mid p \text{ is a belief of the experiencer of } s \text{ at } \tau(s)\}$

Speech event: My claims about the speech event are a bit more tentative. I would like to propose that an asserting speech event also has a set of beliefs associated with it, namely the beliefs of the speaker: when asserting a sentence, a cooperative speaker will in general only utter propositions that are consistent with his beliefs. I will remain agnostic at this point, where exactly this set of beliefs should be represented linguistically. Is it represented in the grammar, or is it perhaps on another dimension of meaning (e.g., presuppositional level)? Whichever way this set of beliefs is represented, it should be recoverable, again, via a $\text{CONTENT}(e)$ function, which picks out the content of the speaker’s beliefs associated with the speech event e .

Recasting the epistemic modal base in event talk: We saw at the beginning of this section that an epistemic modal base requires a set of beliefs, from which it can pick out a set of worlds compatible with that set of beliefs. I propose to formalize this requirement by a $\text{CONTENT}(e)$ function. An epistemic modal base has an eventuality pronoun e , which requires to be bound by an event binder that has ‘CONTENT’. It returns a set of worlds compatible with the content of that *believing event/state*:

(23) $f_{\text{EPISTEMIC}}(e) = \lambda w'. w' \text{ is compatible with } \text{CONTENT}(e)$



We thus obtain two possible configurations: in (17), the modal is above Tense and Aspect. In this configuration, the modal’s event argument has no choice but to be bound by the speech event (unless it is further embedded under an attitude verb. In (18), the modal is below Aspect. Given the strict locality condition for event binding, the modal’s event argument has to be bound by Aspect (provided the syntax will rule out a derivation where Aspect and the event argument of the modal are not co-indexed). So far, we have that a modal is either merged high, in which case it is speech event relative (i.e., keyed to the speaker and the speech time) or merged low, in which case it is Aspect bound (i.e., keyed to the VP event’s participants and running time, that is, the subject and the time given by Tense). What we need to explain now is why a high modal (bound by the speech event or an attitude event) gets an epistemic interpretation, and why a low modal (bound by Aspect) gets a circumstantial interpretation. This is the question we address in the next section.

3 Correlating syntactic height with modal flavor

To understand the correlation of modal flavor and syntactic height, we now need to turn to the modal bases. Recall that we need the modal base to take an event rather than a world argument. I will thus recast the modal bases in terms of events, and show that not all event binders can license all modal bases. Specifically, I will argue that only a speech event or an attitude event can license an epistemic modal base.

3.1 Epistemic modal base

Recall Kratzer’s epistemic modal base⁵:

$$(19) \quad f_{\text{epis}}(w) = \lambda w'. w' \text{ is compatible with what is known in } w.$$

The accessible worlds are those compatible with ‘what is known’. Kratzer (1981, 1991) focus on modals in matrix contexts. However, when we embed an epistemic under an attitude verb, we see that the accessible worlds are those compatible with what the attitude holder *believes*, rather than *knows* (i.e., the factivity disappears):

$$(20) \quad \text{It is not raining; however, Paul believes it might be raining.}$$

It appears, then, that an epistemic modal base picks out a set of accessible worlds compatible with a set of beliefs. In matrix context, those beliefs are those of the speaker. Given that the speaker presumably believes what he believes to be true, in matrix context, we seem to be considering worlds compatible with what the speaker takes to ‘know’ (i.e., what he believes

⁵ In Kratzer’s system, the modal base is a parameter. This creates problems in cases of stacked modals where the modal bases are different. I thus follow von Stechow and Heim (2001) in representing the modal base f in the syntax.

3.2 Circumstantial modal base

Recall Kratzer's circumstantial modal base, which picks out worlds compatible with certain circumstances of the world of evaluation:

(28) $f_{\text{circumstantial}}(w) = \lambda w'. w'$ is compatible with certain circumstances in w .

What are these circumstances? I propose that they are the circumstances of the event that binds the event argument of this (circumstantial) modal base. We can thus reformulate the circumstantial modal base as follows:

(29) $f_{\text{CIRC}}(e) = \lambda w'. w'$ is compatible with the circumstances of e at $\tau(e)$

What are the circumstances of an event? I propose that they are the properties of the event's participants (the agent, the theme...) at the event's location, at the event's specific time.

Usually, an Aspect-bound modal will take a circumstantial modal base. As we saw in the previous section, an epistemic modal is unavailable when Aspect quantifies over a contentless event. Thus, the following example will obligatorily receive a circumstantial modal base (with the LF where the modal is below Aspect):

(30) Anne a pu soulever cette table.
 Anne could-pfv lift this table
 $\exists e_1: \exists w' \in f_{\text{CIRC}}(e_1): \text{lift_this_table}(e_1, w') \ \& \ \text{Ag}(e_1, A.)$
There is an event e_1 such that in some world compatible with the circumstances of that event, namely its agent's and theme's physical properties at the time of e , this event is a lifting this table event by Anne.

Here the event is an event of *lifting this table* by Anne. The event participants are Anne and the table, and thus both the properties of Anne at the time of the event (how strong she is, how much training she has had, etc.) and properties of this table (how heavy it is, how voluminous...) will be relevant circumstances for evaluating the modal.

We saw that the epistemic modal base requires a special kind of event, one that has content, and thus cannot be licensed anywhere (in particular when bound by an Aspect quantifying over a content-less event). There are no such restrictions for the circumstantial modal base. Thus, in principle, we should be able to find a circumstantial modal base both with low and high modals. With a high modal, we would obtain examples such as the following:

(31) Anne a pu prendre le train.
 Anne could-pfv take the train.
 $\exists w''$ compatible with the circumstances of the speech event: A. takes the train(w'')

What would (31) mean? What are the circumstances of the speech event? They should consist mainly of properties of the speaker. It is unclear that such a meaning would be coherent. If indeed, it is incoherent, this configuration will be eliminated and an epistemic modal base will thus be favored. Alternatively, we might start considering properties of the speaker as a

this is indeed what is happening, at least with more 'eventive' events, which may accept to be quantified by perfective Aspect:

- (1) a. Paul konnte sehen/merken/^{??}glauben, dass Anne nett war. (I. Heim, pc)
 'Paul could see/notice/believe that Anne was nice'.
 [Paul AspQ₂ [can_{f(e₂)} [see(e₂) [Anne...
 b. Anne a pu remarquer que Paul était gentil.
 'Anne was able to notice that Paul was nice'
 c. He was so tall that one could take him to be adult.
 [one AspQ₂ can_{f(e₂)} [take (e₂)...

speaker: whether the speaker is informative, whether his beliefs are consistent, etc... In which case, the circumstantial modal base will resemble more and more an epistemic one, to the point of indiscernability.

To sum up, we can reframe Kratzer's modal bases in terms of events: the epistemic modal base picks out worlds compatible with the content of event *e*; the circumstantial modal base picks out worlds compatible with the circumstances of *e*, where *e* is an event variable which needs to be bound locally. When the modal appears above Tense and Aspect, the only possible binders are the speech event or an attitude event, if present, which both can license an epistemic modal base. When the modal appears low, the event of its modal base has to be bound by Aspect. In general, the event bound by Aspect doesn't have content: hence, only a circumstantial modal base will be licensed. These results are summed up in the following table:

(32) **Modal flavor/syntactic height constraints**

	epis	circ
Low	*	ok
High	ok	??

We thus obtain that high modals tend to be epistemic and low modals tend to be circumstantial, without having to have two separate entries for each modal.

4 Correlating modal flavor with implicative behavior

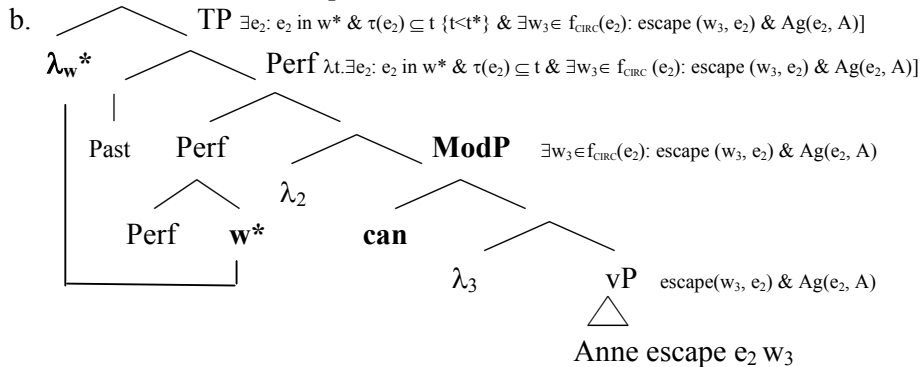
The last question that we need to address is why it is that root modals yield actuality entailments with perfective, but epistemics do not. Recall that sentences of the type illustrated below are ambiguous:

- (33) Anne a pu s'enfuir.
 Anne could-pfv escape.
 Root: *Anne was able to escape.*
 Epistemic: *It is possible that Anne escaped.*

With a root meaning, the modal is interpreted below Tense and Aspect and yields an actuality entailment, that is, it yields the uncancelable implication that the complement of the modal was actualized. In the case at hand, it implies that Anne did escape. With an epistemic meaning, the modal is interpreted above Tense/Aspect, and doesn't yield an actuality entailment. The sentence will still be judged true if Anne didn't escape in the actual world.

How does the actuality entailment arise with root modals and why are epistemics immune to it? The crucial factor that differentiates between epistemics and roots is the configuration of Aspect with respect to the modal. We saw that root modals are low modals, that is, with a root interpretation, the modal scopes below Aspect. Now, in this configuration, the world argument of Aspect is outside of the scope of the modal. Hence, it will have to be bound by the matrix default world binder (Percus 2000), or whatever mechanism is responsible for mapping to the actual world in matrix context. This yields an actual event:

(34) a. Anne a pu s'enfuir [circumstantial interpretation]
 'Anne was able to escape'

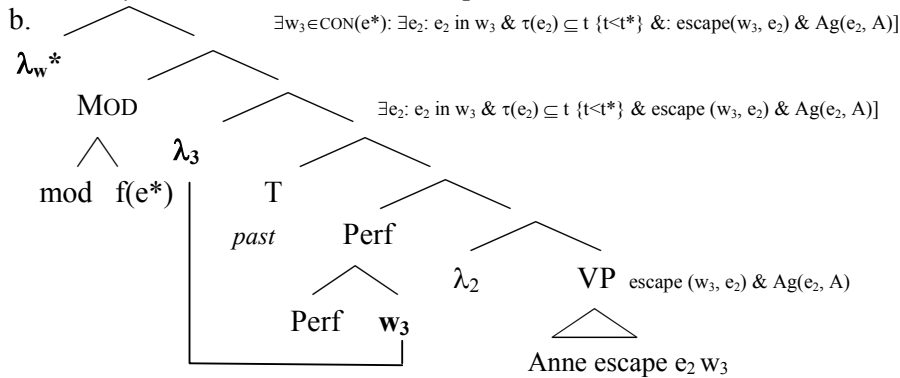


c. $\exists e_2[e_2 \text{ in } w^* \ \& \ \tau(e_2) \subseteq t \ \{t < t^*\}]. \ \exists w_3 \in f_{\text{CIRC}}(e_2): \text{escape}(w_3, e_2) \ \& \ \text{Ag}(e_2, A).]$
 'There is a past event **in the actual world**, and there is a world compatible with that event's circumstances where that event is an escaping event by Anne.'

We obtain an actual past event, which in some accessible world is an escaping event. For further details on what precisely that actual event is (i.e., why we take it to be an escaping event in the actual world), see Hacquard (2006).

Epistemic modals are high modals, that is, they occur at a position higher than Tense and Aspect. In this configuration, the world argument of perfective Aspect will still be in the scope of the modal. Hence, no actual event is forced. The only requirement is that an escaping event occurs in some world compatible with what the speaker knows/believes:

(35) a. Anne a pu s'enfuir [epistemic interpretation]
 'It may be the case that Anne escaped'



c. $\exists w_3 \in \text{CONT}(e^*): \exists e_2: e_2 \text{ in } w_3 \ \& \ \tau(e_2) \subseteq t \ \{t < t^*\} \ \&: \text{escape}(w_3, e_2) \ \& \ \text{Ag}(e_2, A).]$
 'There is a world compatible with the content of my beliefs such that **there is an event in that world** which is an escaping event by Anne.'

We further saw in section 1, that root modals with imperfective Aspect do not force an actuality entailment. Following Bhatt (1999) I will assume that this is due to an extra layer of modality, provided by the imperfective itself, which is responsible for this lack of actuality entailment. It is a well-established fact that the imperfective is associated with a/some modal element(s), such as genericity, progressivity, counterfactuality, etc. (cf. Cipria and Roberts 2000, Ferreira 2005, among many others). I will assume that this modal element provides an additional layer of modality, which prevents the need for an actual event (For further details, see Hacquard 2006).

The upshot of this section is that actuality entailments occur when Aspect binds an event from above a modal. When Aspect is in the scope of a modal element (a high modal, or

a generic operator, etc...), no actual event is forced to occur: there is no actuality entailment. We can make sense of the fact that modals with a root interpretation yield the effect: a root interpretation occurs when the modal is low (i.e., below Aspect). On the other hand, because high modals (i.e., above Aspect) yield an epistemic interpretation, epistemics are immune to the effect.

5 Conclusion

We have seen that the same words can express epistemic and root modality. The challenge was to give these modal words a unified semantics that could still explain why epistemics and roots interact differently with Tense and Aspect. I proposed that modals were always relative to an event, rather than a world of evaluation. By relativizing modals to an event, we were able to derive otherwise unexplained restrictions on a modal's interpretation (i.e., time-individual constraints). By looking further at the type of event binders available at various syntactic positions, we could make sense of why only certain modal bases are available at certain positions.

Thus, we saw that when a modal is merged high, it is merged above Tense. In that case, the event argument of its modal base has to be bound by an attitude event (if embedded under an attitude) or by the speech event. It is thus relative to the speaker and the speech time, or the attitude holder and the attitude time. It furthermore can receive an epistemic interpretation, given that both the speech event and the attitude event have a set of beliefs associated with them (they have content). We finally saw that a high modal will also be immune to actuality entailments, given that it scopes above Aspect.

When a modal is merged low, it has to appear between Aspect and the VP. In that case, the event argument of its modal base has to be bound by Aspect, which quantifies over the VP event. It is thus relative to the subject and the time provided by Tense (the participant and running time of the event quantified by Aspect). It furthermore will not receive an epistemic interpretation, given that the VP event in a modal's complement usually doesn't have content, but will rather take a circumstantial interpretation. We finally saw that a low modal will yield actuality entailments with perfective Aspect, given that the modal scopes under Aspect, whose world argument will then need to be the actual world.

References

- Bhatt, R.: 1998, 'Obligation and Possession', in H. Harley (ed.) *Papers from the UPenn/MIT Roundtable on Argument Structure and Aspect, MITWPL 32*. Cambridge, MA.
- Bhatt, R.: 1999, *Covert Modality in Non-Finite Contexts*. Ph.D. Thesis, UPenn.
- Brennan, V.: 1993, *Root and Epistemic modal auxiliary verbs*, Ph.D. Thesis, UMass, Amherst.
- Butler, J.: 2003, 'A Minimalist Treatment of Modality'. *Lingua* **113**, 967-996.
- Cinque, G.: 1999, *Adverbs and Functional Heads: A Cross-Linguistic Perspective*, Oxford Studies in Comparative Syntax. Oxford and New York: Oxford University Press.
- Cipria, A. and C. Roberts: 2000, 'Spanish *Imperfecto* and *Preterito*: Truth Conditions and Aktionsart Effects in Situation Semantics'. *Natural Language Semantics* **8**.
- Davidson, D.: 1967, 'The Logical Form of Action Sentences', in N. Rescher (ed.) *The Logic of Decision and Action*. Pittsburg: University of Pittsburg Press, 81-120.
- Drubig, H. B.: 2001, 'On the syntactic form of epistemic modality', ms.
- Ferreira, M.: 2005, *Event Quantification and Plurality*. Ph.D. Thesis, MIT.
- Feldman, F.: 1986, *Doing the Best We Can*. Dordrecht: Reidel.
- von Stechow, K.: 2001, *Advanced Semantics Seminar*, lecture notes, MIT.
- von Stechow, K. and T. Giliès: 2006. CIA Leaks, ms.
- von Stechow, K. and I. Heim: 2001. 'Notes on Intensional Semantics', ms., MIT.

- Ginzburg J. and I. Sag: 2001. *Interrogative Investigations: The Form, Meaning, and Use of English Interrogatives*. Stanford, CA: CSLI.
- Hacquard, V.: 2006, *Aspects of Modality*. Ph.D. Thesis. MIT.
- Hintikka, J.: 1962, *Knowledge and Belief*. Cornell University Press.
- Iatridou, S.: 1990, 'The Past, the Possible and the Evident', *Linguistic Inquiry* **21.1**, 123-129.
- Ippolito, M.: 2003, 'Presuppositions and Implicatures in Counterfactuals'. *Natural Language Semantics* **11**, 145-186.
- Kratzer, A.: 1977, 'What *must* and *can* must and can mean'. *Linguistics and Philosophy* **1**.
- Kratzer, A.: 1981, 'The notional category of modality' in H.-J. Eikmeyer and H. Rieser (eds.), *Words, Worlds, and Contexts. New Approaches in Word Semantics*. Berlin: de Gruyter.
- Kratzer, A.: 1991, 'Modality', in A. von Stechow and D. Wunderlich (eds.) *Semantik: Ein internationales Handbuch zeitgenössischer Forschung*. Berlin: De Gruyter, 639-650.
- Kratzer, A.: 1998, 'More Structural Analogies Between Pronouns and Tenses', in D. Strolovich and A. Lawson (eds.) *Proceedings of SALT VIII*. Ithaca, NY: CLC Publications, Cornell University.
- Krifka, M. 2001, Quantifying into Question Acts. *Natural Language Semantics* 9(1).
- Lewis, D.: 1968, *On the Plurality of Worlds*. Oxford: Basil Blackwell.
- Partee, B.: 1973, 'Some Structural Analogies Between Tenses and Pronouns'. *The Journal of Philosophy*.
- Percus, O.: 2000, 'Constraints on some other variables in syntax'. *Natural Language Semantics* **8**, 173-229.
- Rizzi, L.: 1997, 'The Fine Structure of the Left Periphery, in L. Haegeman (ed.) *Elements of Grammar*. Dordrecht: Kluwer.
- Speas, P.: 2004, 'Person (and Mood and Tense) and Indexicality'. Paper presented at the Harvard Workshop on Indexicals, Speech Acts, and Logophors, November 20, 2004.
- Stephenson, T.: 2005, 'Assessor Sensitivity: Epistemic Modals and Predicates of Personal Taste. In J. Gajewski, V. Hacquard, B. Nickel and S. Yalcin (eds.) *New Work on Modality*. MIT Working Papers in Linguistics 51. MITWPL.
- Tenny, C. and P. Speas (*to appear*) 'Configurational Properties of Point of View Roles'. In A. M. Di Scullio (ed.) *Proceedings of UQAM Asymmetry Workshop*.
- Westmoreland, R.: 1998, *Information and Intonation in Natural Language Modality*. Ph.D. Thesis, Indiana University.
- Wurmbrand, S.: 1999, 'Modal verbs must be raising verbs', in S. Bird, A. Carnie, J. Haugen and P. Norquest (eds.) *Proceedings of WCCFL 18*.