

PART V: Anchoring– Tense and Epistemic Modality

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Anchoring

- Whatever situational description has been built up in the second phase, whether simple (no intermediate reference situation), or auxiliated (with intermediate 'reference' situation), the outermost situational variable needs to be explicitly related to the contextual anchor point, the speech time, in order to create something that has actual truth conditions.

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- This is classically seen as the job of tense, but in modal constructions, it is the modal itself that occupies the T position and therefore by hypothesis, also contributes information related to anchoring.
- Once we have gone through the proposal for anchoring with both tense and modals, we will give a proposal for epistemic modal meanings which I will argue operate on a sortally high prejacent of the semantic type of *anchored situations*.

Temporal Properties of Modals

- (1)
 - (a) John might go to the party.
 - (b) John might be in his office.
 - (c) John might have won the race.

One way to capture this is to specify the semantics for **MIGHT** directly in two versions, one forward shifting and the other non-shifting with respect to the possible worlds considered. One might even stipulate a third composite modal **MIGHT-HAVE** which requires the possible worlds to precede the utterance time.

Temporal Properties of Modals— A Classical View

Condoravdi (2002) gives the following three possible denotations corresponding to such a view (although, as will become clear, she herself proposes a more compositional treatment and unified conception of *might*). In the following MB designates the modal base that a modal depends on for its interpretation (Kratzer 1977).

(2) (a) Forward shifting modals:

$\text{MIGHT}_{MB}^1 \phi$ is true at $\langle w, t \rangle$ iff there exist w', t' such that w' in $\text{MB}(w, t)$, $t \prec t'$ and ϕ is true at $\langle w', t' \rangle$.

(b) Non-shifting modals:

$\text{MIGHT}_{MB}^2 \phi$ is true at $\langle w, t \rangle$ iff there is w' in $\text{MB}(w, t)$, such that ϕ is true at $\langle w', t \rangle$.

Backward-shifting modals:

$\text{MIGHT-HAVE}_{MB}^1 \phi$ is true at $\langle w, t \rangle$ iff there exist w', t' such that w' in $\text{MB}(w, t)$, $t' \prec t$ and ϕ is true at $\langle w', t' \rangle$.

Temporal Properties of Modals cont.

These three interpretations all take the present utterance time as the perspective, but this too is independently modifiable. In certain contexts the perspective of the modal can be shifted backwards, to say that at a particular point in time in the past, a modal statement was true. These cases are particularly clear when we look at Dynamic modality, where intuitively the moribund past tense on *could* actually seems to do some transparent semantic work (3).

- (3) In those days, John could easily swim 2 kilometers.

Temporal Properties of Modals cont.

But past perspective for the modal is also possible in embedded sentences for (future-meaning) *would* (4-a) and (epistemic) *might* (4-b), and the circumstantial version of *could* (4-c).¹

- (4)
- (a) Last year, John told me that he would quit his job.
 - (b) Last year, John told me that he might quit his job.
 - (c) Last year, John told me that he could take vacation any time he wanted.

¹See Stowell 2004 for a discussion of these facts and an argument that moribund past tense morphology on English modals actually is grammatically interpretable.

Perspectival Time vs. Evaluation Time

To distinguish between these two different aspects of the temporality of modal meaning, Condoravdi uses the terms *Perspectival Time* (PT) and *Evaluation Time* (ET):
Perspectival Time is the time at which the *potential* for the prejacent event is asserted,
Evaluation time is the time of the prejacent event itself.
This corresponds directly to the perspective situation s' and the embedded situation s_0 respectively in the current system.

Circumstantial Modality Always Forward Shifts

Condoravdi (2002) provides some important generalizations with respect to this patterning, which I demonstrate here. Firstly, deontic modality always forward-shifts, even with stative predicates.

- (5) (a) John can go to the party (if he does his homework).
Forward-shifted
- (b) John can be in London by noon (if he takes the early flight). *Forward-shifted*

Note that in my proposal for circumstantial modality given previously, the forward shifting property of circumstantial modals arises obligatorily because the construction of the notion of CHOICE within LIVE-ALTERNATIVES.

Epistemic Modality is Sensitive to Aktionsart

Epistemic modality is variable, but is sensitive to aktionsart: dynamic predicates induce forward shifting while stative predicates produce non-shifting readings.²

- (6) (a) John might go to the party, but I wouldn't count on it.
Forward-shifted
- (b) John might be in his office, but I wouldn't count on it.
Non-shifted or Forward-shifted

²What Condoravdi actually says is “The correct generalization is that modals for the present have a future orientation optionally with stative predicates and obligatorily with eventive predicates.” She claims further that this fact is independent of the flavour of modality in question. I have reason to doubt this latter claim and relativize her statement to epistemic flavours. In the case of circumstantial modality, it seems to me that stative predicates obligatorily forward shift just like dynamic ones.

Backshifting

Finally, back-shifting seems to be possible only in the context of additional linguistic material: the addition of the perfect auxiliary *have*, or the embedding under a past tense matrix predicate. In the former case, we find only epistemic modals.

- (7)
- (a) John must have won the race.
 - (b) John might have won the race.
 - (c) John could have won the race.
 - (d) John may have won the race.

Temporal Generalizations for English Modals: Evaluation Time

In the case of evaluation time, the generalizations depend on the type of modality and the aktionsart of the prejacent

	<i>Forward-shifted</i>	<i>Non-shifted</i>	<i>Backward-shifted</i>
<i>Epistemic</i>	YES	YES (States only)	YES (With <i>have</i> only)
<i>Circumstantial</i>	YES	NO	NO

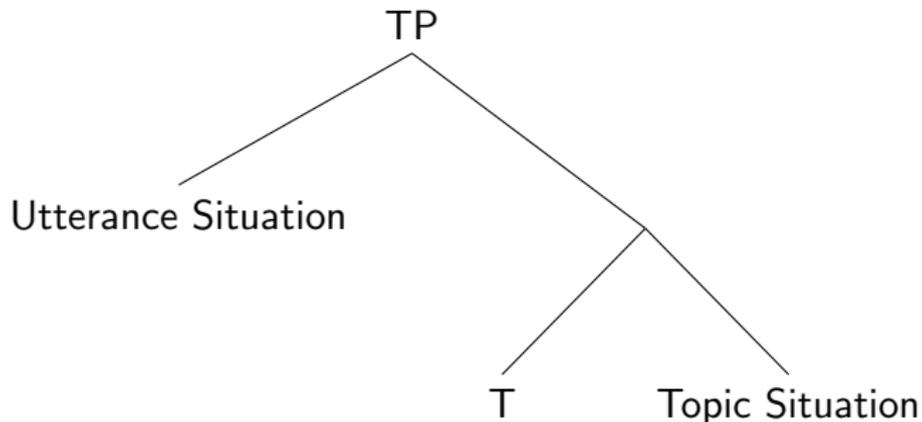
Temporal Generalizations for English Modals: Perspective Time

In the case of perspectival time, the generalizations depend on the particular modal and the kind of morphology it possesses.

	<i>Present</i>	<i>Past</i>
<i>must</i>	YES	NO
<i>may</i>	YES	NO
<i>can</i>	YES	NO
<i>will</i>	YES	NO
<i>might</i>	YES	YES (under embedding)
<i>could</i>	YES	YES (under embedding)
<i>should</i>	YES	YES (under embedding)
<i>would</i>	YES	YES (under embedding)

Generalized Anchoring at TP

Under the classical view of anchoring, the T head combines with a situational description (the Topic situation) and establishes a relationship between it and the utterance situation (see Figure 2). I will call this anchoring, and assume that tense relationships are just one possible instantiation of the anchoring relation (see Ritter and Wiltschko 2009).



Anchored vs. Unanchored Situations in the Current System

In the present system, ANCHORING is simply the existential closure of spatiotemporal location for the outermost situational variable, achieved by relating it explicitly to the utterance situation. The proposition is thus identical to the existential closure of the f_d variable. What results is a constituent that denotes a property of current utterance. The utterance d , has arguments Speaker and Hearer that, like the utterance situation itself are indexically bound. Constituents larger than TP in the clause will be properties of the utterance situation and will be written according to the following schema, for a particular situational description s by the second phase:

$$(8) \quad \lambda d \exists f \exists Q [Q(f)(d) \wedge \text{Source}(d) = \text{'Speaker'} \wedge \text{Goal}(d) = \text{'Hearer'}]$$

Where Q stands for the predicate of situational properties already built up by the second phase.

Anchoring via PAST

To give a concrete example without auxiliaries, consider the simple sentence *Vidar ate the chocolate*. We assume that the final AspP (maximal constituent in the second phase) for that sentence has the denotation:

$$(9) \quad [[\text{AspP}]] = \lambda f \lambda d \exists e [\text{Utterance}(d) \wedge f(d)(e) \wedge \perp \text{Vidar eat chocolate} \perp(e)]$$

The temporal predicate PAST contributed by the morphology here, anchors the situation to the utterance as shown in (10).

$$(10) \quad [[\text{TP}_{\text{past}}]] = \lambda d \exists f \exists e [\text{Utterance}(d) \wedge f(d)(e) \wedge \text{PAST}(f) \wedge \perp \text{Vidar eat chocolate} \perp(e) \wedge \text{Source}(d) = \text{'Speaker'} \wedge \text{Goal}(d) = \text{'Hearer'}]$$

Anchoring via PAST

In this framework, the PAST predicate must be a predicate over spatiotemporal properties rooted in d , f_d , and we can specify it informally as follows.

- (11) \forall eventualities e and speech events d , such that $f(d)(e)$,
PAST(f) is true iff the temporal parameter of e *precedes*
the temporal parameter of d .

Anchoring via PRESENT

In the case of the present tense, I will assume for reasons that will be obvious as we proceed that the present tense contributes the information that the outermost situational variable is anchored to the utterance time via identity, and moreover that the utterance time is abstractly represented as a moment, not as an interval. This is because the English present has the peculiar property that it only combines felicitously with states, and I will continue following Taylor (1977) in assuming that the crucial distinguishing property of states is that they are able to be true at a single moment. Thus for the present tense sentence *Vidar likes sushi*, we would have the denotation in (12)

- (12) Vidar likes sushi.

$$[[TP_{pres}]] = \lambda d \exists f \exists e [\text{Utterance}(d) \wedge f(d)(e) \wedge \text{PRESENT}(f) \wedge \perp \text{Vidar like sushi} \lrcorner(e) \wedge \text{Source}(d) = \text{'Speaker'} \wedge \text{Goal}(d) = \text{'Hearer'}]$$

Anchoring via PRESENT

Where the PRESENT is a property of f , a relation between e and d , defined informally as in (13)

- (13) \forall eventualities e and speech events d , such that $f(d)(e)$, PRESENT(f) is true iff the temporal parameter of e is *identified with* the temporal parameter of d , the moment of speech.

Generalized Anchoring

In the case of our perfect and modalized sentences, the same T semantics applies— the innermost situational variable only gets anchored *via* the reference situation s' , which is the one that is directly affected by the tense predicate.

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Temporal information such as PAST, or PRES in English perform the shift from properties of situational properties, to properties of the utterance.

But as we also know, modals in English all behave distributionally as if they end up high in the clause: they invert in questions, they precede negation and do not require *do*-support, and they are unique in the clause. They must also be anchoring elements.

Generalized Anchoring

To accommodate the modals we will need to generalize our approach to tense slightly.

Types of Anchoring

\forall eventualities e and speech events d , such that $f(d)(e)$,
 INDEX(f) is true iff the temporal parameter of e is strictly
 identified with the temporal parameter of d , the speech time.

\forall eventualities e and speech events d , such that $f(d)(e)$,
 ANAPH(f) is true iff the temporal parameter of e is resolved
anaphorically, either by binding from something in the lin-
 guistic context, or to some purely discourse contextual topic
 time or world.

Two Types of Modals

Anaphoric modals allow their perspective situation to be coreferent with a matrix situation under embedding.

- (14)
- (a) Vidar thought that he could win the race.
 - (b) Vidar thought that he should get a prize.
 - (c) Vidar thought that he would win the race.
 - (d) Vidar thought that he might get a prize.

Two Types of Modals

Indexical modals force their perspective situation to be identified with the utterance situation.

- (15)
- (a) ? Vidar thought that he may win a prize.
 - (b) ? Vidar thought that he must win a prize.
 - (c) ? Vidar thought that he can win the race.
 - (d) ? Vidar thought that he will win the race.
 - (e) ? Vidar thought that he is deserving of a prize.

Anchored Denotations for Modals: *Must* vs. *Should*

- (16) $[[TP_{must}]]$ = $\lambda d \exists f' \exists s' \exists f \exists s_0 [\text{State}(s') \wedge \wedge f(d)(s_0) \wedge \perp u$
 $\perp(s_0) \wedge f'(d)(s') \wedge \text{INDEX}(f') \wedge \dots]$
- (17) $[[TP_{should}]]$ = $\lambda d \exists f' \exists s' \exists f \exists s_0 [\text{State}(s') \wedge \wedge f(d)(s_0) \wedge \perp u$
 $\perp(s_0) \wedge f'(d)(s') \wedge \text{ANAPH}(f') \wedge \dots]$

What About Epistemic Modality

- (18) (a) Jane might be in Edinburgh.
(b) Jane must be in Edinburgh.

In this case, the notion of uncertainty or potential seems to lie in a different dimension. As Condoravdi (2002) has already noted, epistemic modality involves quantification over 'worlds' that occur at the same time as the perspectival world. Epistemic modality is not necessarily forward-oriented in the way that circumstantial modality is.

Anchoring at T with *Must* (No Intermediate Reference/Perspective Situation)

I propose that the source of epistemic readings is precisely that the modal attaches *after* the anchoring of the situation to the utterance, and where *f* has already been resolved and no circumstantial alternatives are generated.

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Taking the case of *must* first, if *must* lexicalizes T it will contribute indexical information with regard to the temporal variable of the situational description constructed up to that point:

$$(19) \quad [[AspP]] = \lambda f \lambda d \exists e [\text{Utterance}(d) \wedge f(d)(e) \wedge \perp u \lrcorner(e)]$$

Anchoring at T with *must*

An indexical specification of f here would give rise to the TP in
(20)

$$(20) \quad [[TP_{pres}]] = \lambda d \exists f \exists e [\text{Utterance}(d) \wedge \text{INDEX}(f) \wedge f(d)(e) \\ \wedge \text{LU}(e) \wedge \text{Source}(d) = \text{'Speaker'} \wedge \text{Goal}(d) = \text{'Hearer'}]$$

The Modal Contribution of *must*

Now, we also want the epistemic interpretation of *must* to be related in a systematic way to the interpretation already given for circumstantial *must* in terms of unique CHOICE among LIVE-ALTERNATIVES. Intuitively, the difference between the present tense TP and the epistemic modal meaning actually contributed by *must* is that of a set of live-alternatives not for a topic argument introduced lower down, *but for the speaker herself* because of her incomplete direct knowledge of the facts. This is expressed intuitively in (21).

(21) **Epistemic Must:**

The proposition expressed is the *only* CHOICE for the speaker in the utterance situation *d*, given the alternatives open to her, consistent with her knowledge.

Relativizing the notion of CHOICE to the Speaker

The defining feature of epistemic meanings is that the **live alternatives** with respect to which a CHOICE is being made are not alternatives related to ways in which the world might unfold in the future, but alternatives related to *what the fact of the matter is* at a particular world and time. The alternatives are at least in part due to ignorance, not to the radical indeterminacy of the future. Also, there is no separate introduction of a perspectival situation here—the perspectival situation is the utterance situation itself, d.

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Denotation for Epistemic *Must*

Of course, in principle, the speaker has a completely open choice of what to assert about the world. She could choose to say *I am hungry* or *It is snowing like crazy outside*, or she could choose to say *Jane must be in Edinburgh*. The alternatives open to the speaker are in principle endless, and this cannot be what the CHOICE predicate of the modal meaning is operating over. It seems to me that the 'alternatives' here must be the simple assertoric options related to the Question Under Discussion (QUD) related to the discourse.

(22) $[[\text{TP}_{ep-must}]]$ = $\lambda d \exists f \exists e [\text{State}(e) \wedge \wedge f(d)(e) \wedge \perp u \perp(e) \wedge \text{INDEX}(f) \wedge e \text{ is the ONLY assertoric CHOICE for the speaker of } d.]$

Where the LIVE-ALTERNATIVES for the speaker are the different assertions possible given the discourse Question Under Discussion.

Different Epistemic flavours depending on QUD

We can see that the epistemic modal force of a modal like *must* can indeed vary drastically given the discourse context, even when confined as it is to making an assertion about the current world and time. Consider the following mini-dialogues.

- (23) A: Is John in his office?
B: Yes, he must be.
- (24) A: Who is in the office now?
B: Mary must be. She always gets there by 8,
- (25) A: Where is Mary?
B: She must be in the office.

Aktionsart Sensitivity of *Must*

However, we do have additional evidence that the temporal specification of *must* is being employed at the TP level and does not require the introduction of an intermediate reference variable. A fact noticed in Ramchand (2014) is that under its epistemic reading, *must* is confined to stative prejacent.

- (26)
- | | | |
|-----|--------------------------------|------------------------------|
| (a) | Jane must be in Edinburgh. | <i>epistemic and deontic</i> |
| (b) | Jane must be writing her book. | <i>epistemic and deontic</i> |
| (c) | Jane must write that book. | <i>deontic only</i> |
| (d) | The book must be written. | <i>deontic only</i> |

Denotation for Epistemic *Might*

(27) Jane might be in Edinburgh

(28) **Epistemic Might:**

The proposition expressed is one CHOICE for the speaker at a contextually salient world time pair $\langle w, t \rangle$, given the alternatives open to her, consistent with her knowledge.

This means that the speaker has grounds for thinking that the proposition has a chance of being true, although she does not know it directly.

Dynamic Modality in a CHOICE Model

Dynamic modality by hypothesis is in the domain of D_μ where event properties are confined to those that are abstractions over space and time, whatever we say about John's alternatives here must not be dependent on any actual swimming events either before now or in the future.

This means that the notion of ability or the notion of disposition is a primitive event property, which can compose with other event properties to create 'the ability to V' and 'the disposition to V' respectively. I suspect that the English habitual is in fact the default specification of the latter meaning.

- (30) (a) John can swim. *Dynamic*
 'John possesses the property of having $\langle \textit{Johnswim} \rangle$ in his abilities to put in train'
- (b) John swims *Habitual*
 'John possesses the property of having $\langle \textit{Johnswim} \rangle$ in his disposition to put in train.'

Dynamic Modality as Primitive/Conceptual

Causational relationships among subevents are the analogue of the flow of time in the domain of particulars.

Basically 'ability' in the force dynamical domain to effect a change is paralleled by circumstantial facilitation (an option) in the spatiotemporal domain.

'Disposition' in the force dynamical domain is paralleled by circumstantial prediction (only option) in the spatiotemporal domain.

The hypothesis is that these primitive conceptualizations involving choice and potential are reused via metaphoricization to encode more abstract situational versions of these basic meanings. The metaphor involves the relativization of the notion of potentiality and disposition to situational live options, or epistemic options.

Dynamic Modality as Primitive/Conceptual

Notice that when derivational morphemes such as *-er* or *able* apply to verbal root symbols, the meanings generated have precisely the kind of pseudointensionality that we have come to expect from the first phase. They are further evidence that the basic meanings of potential and disposition are available at the level of lexical concept formation which is crucially abstracted away from actual real world instantiations.

- (31) John is a swimmer/John is a smoker *Disposition*
 This avocado is edible/This movie is unbearable. *Potential*

Relativization of Modal Interpretation

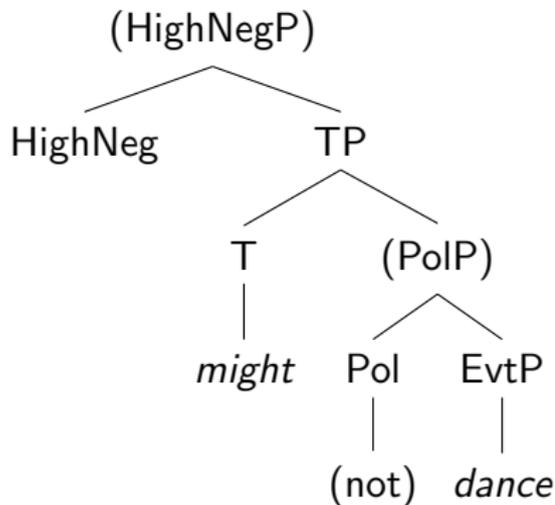
<i>Zone</i>	<i>Choice Pivot</i>	<i>Source of Uncertainty</i>
Conceptual (Dyn)	Actor	Inherent Causal properties of
Spatiotemporal (Circ)	Situational Topic	Undecidedness of Future Circ
Assertoric (Epist)	Speaker	Lack of Complete Knowledge

Why CHOICE? Why such a drastic shift in ontology?

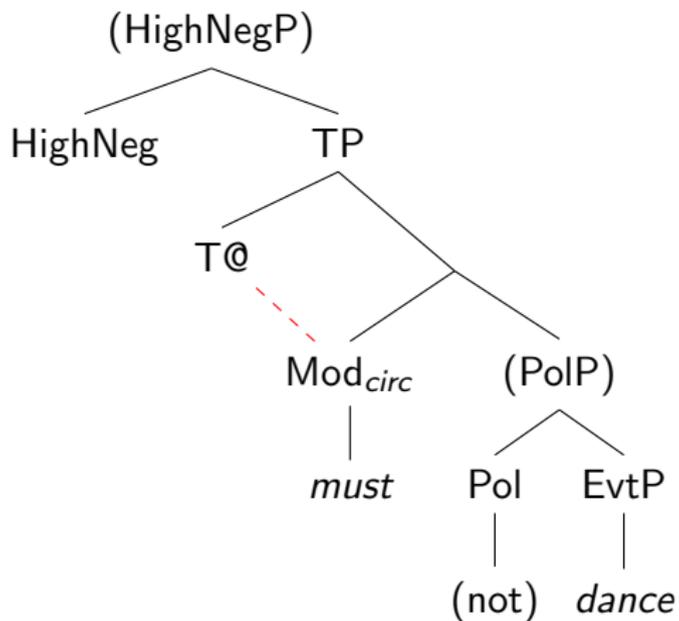
- Unification of meaning across the three major sortal zones of the clause, with the lowest/lexical meaning as ‘basic’— the ontology tracks morphosyntactic complexity
- Relativization of possibility to the choice of pivot
- Part of a whole system that allows the temporal interpretations and aktionsart sensitivities of modals to fall out compositionally instead of being stipulated on a modal by modal basis.
- Solves the ‘weakness’ of universal modals puzzle
- Solves the puzzle of the interaction of deontic modality with disjunction

Tree for Epistemic Modal

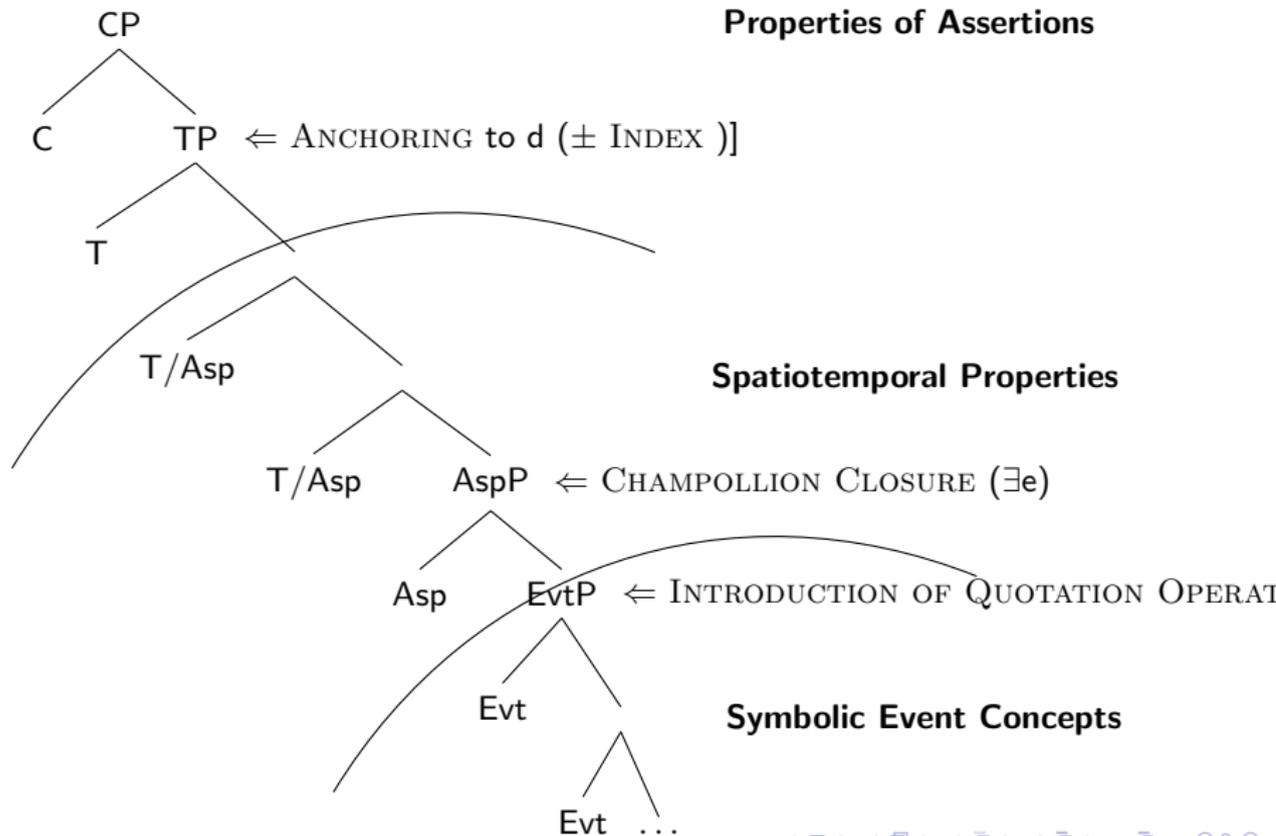
The following phrase structure trees schematically show the possibilities for attachment for epistemic and circumstantial modals respectively. In the diagrams, spans are represented by dotted lines, the @ sign is the Brody-an diacritic representing the position of linearization for span.



Tree for Circumstantial Modal



Semantic Zones and Syntactic Domains



Summary of Formatives in Symbolic (Event Concepts) Zone

Verb root, participle in *en/ed*
-ing
Manner and instrumental adverbs
Dummy *be*, Dynamic modality
'constituent' negation.

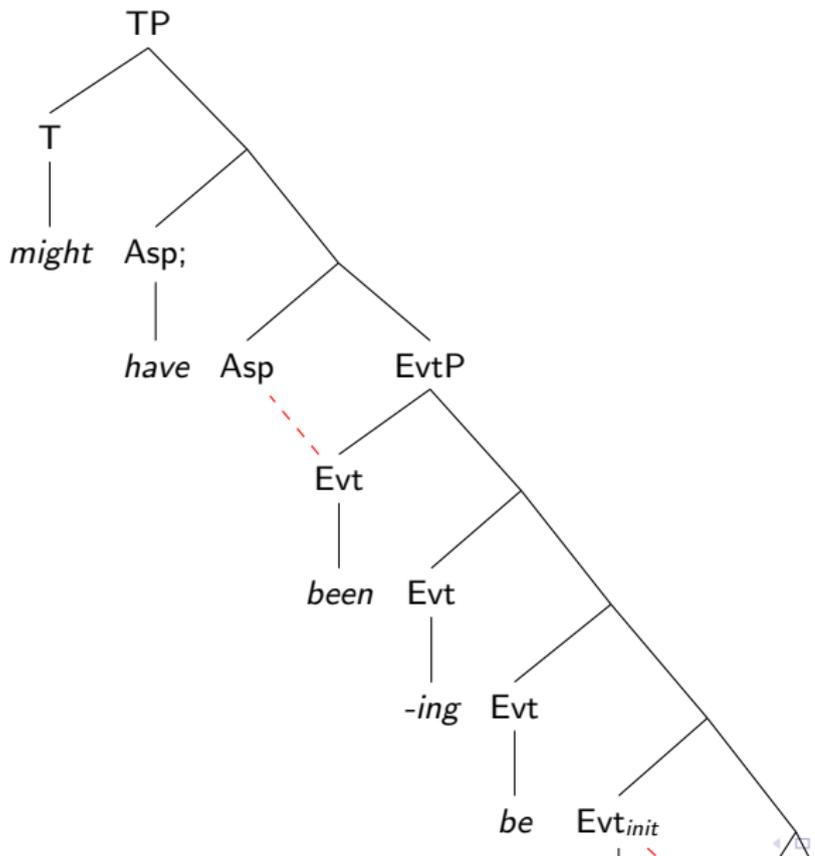
Summary of Formatives in Spatiotemporal Properties Zone

Clausal polarity
Circumstantial modality
Perfect *have*
Temporal adverbs

Summary of Formatives in Properties of Assertions Zone

'High negation'
Epistemic modality
Speaker oriented adverbs.

Vidar might have been being chased.



Open Questions and Further Research: The Nominal Domain

There is a lot of work on the cartography of the nominal extended projection that shows that here too, there is an intriguing typologically robust order to the construction of DPs from base lexical items (Cinque 2004, Zamparelli 2000, Borer 2005, Dékaný 2012, Pfaff 2015). My assumption here is that nominal projections too are partitioned into a symbolic D_{μ} domain and a higher domain of instantiation, where I assume both reference, and case reside.

In order to gain the advantages of Champollion closure at EvtP for the interaction with quantification more generally, we need to assume crucially that quantified nominal projections are not merged in complete form within the EvtP.

In order to understand the relationship between the two extended projections, we need to adopt a view of phrase structure that involves merging of minimal nominal structures in the lowest minimal part of the verbal extended projection together with higher copies that contain more and more functional information. A detailed exposition of the interleaving of nominal and verbal functional sequences to build the proposition is a topic for further research. Perhaps along the lines of (Williams 2003, Sportiche, Svenonius 2004).

On the Universal vs. The Language Specific

The zones should be universal, since they are designed to account for robust crosslinguistic generalizations in the first place. However, there are a number of features of the auxiliary ordering analysis in English that are clearly language specific.

The presuppositional/conceptual semantics of the language particular lexical items that spell out those zones is of course a matter that is up to each language. In particular, the specific spans spelled out by individual lexical items are specific to the language and the particular vocabulary item. Idiosyncratic facts about English, for example, include the fact that all modals have a T feature and do not have corresponding uninflected entries. The English present tense also turns out to be special and I have speculated that this is one reason why it makes such liberal use of auxiliation in building derived states for anchoring.

Language specific selectional facts must sit on top of the more minimalistic universal spine in this sense (See also Ramchand and Svenonius 2014 and Wiltschko (2014) for discussion of the same general idea).

The Search for Explanations and Connections to Mind/Brain

The new ontology proposed here offers hope of a more systematic connection with T psycholinguistics and neurolinguistics because it takes the denotations of individual pieces more seriously and unifies cases of polysemy.

The introduction of the symbolic zone has clear internalist implications for the storage and deployment of lexical items and how they are used in combination with functional items in real time production and comprehension. Traditional formal semantic representations on the other hand make no predictions (deliberately I suppose) about brains or processing.

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