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Recent Advances in the Syntax and Semantics of Tense, Aspect and Modality

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edited by

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Introduction

Louis de Saussure, Jacques Moeschler and Genoveva Puskás

It's a fact that tense, aspect and modality form together one among the most recurring and active areas of research in contemporary syntax and semantics, as well as in other disciplines of linguistics. In 2004 was held in Geneva the 6th *Chronos* colloquium; this conference, given the important attendance, demonstrated how large the community of researchers in this field has grown. This book presents a very tight selection of papers in syntax and semantics (some of them with a eye on pragmatics, as in Jaszczolt's paper) that were initially delivered during this colloquium, some as keynote speeches (Asher and Stowell).

The main reasons for which many scholars focus on the threefold topic of tense, aspect and modality are of course numerous; let us name but a few of the most important ones.

First, the conceptual relations that hold between these three domains of research trigger the interest of scholars within all domains of linguistics, as well as outside linguistics, for example in philosophy of language.

Second, and as a result, the fact that the typical linguistic markers of any of these domains often, if not always, play a role in the neighbouring ones raises the questions of the status of these morphemes and of the conceptual underlying link and interplay between tense, aspect and modality.

Third, a large number of syntactic and semantic phenomena are concerned by the temporal-aspectual-modal level of representation: information about time, aspect and modality is part of virtually all sentences, and inflexion is quite widely considered as the very core of syntactic projections. Because of this very crucial situation and role in the sentence structure, temporal-aspectual and modal information concerns virtually any part of the sentence and this information has scope over the whole characterization of the eventuality denoted by the sentence. All this entails that semantics and syntax need to cope with a very complex flow of information, so that the syntax-semantics interface is constantly at question in this process. Needless to say, this highly complex interaction that takes place at the level of the syntax-semantic interface needs then to be articulated with pragmatic informa-

tion when the sentence expands in context to a full-fledged meaning, which raises in turn an array of problems.

Fourth, to a large extent, temporal, aspectual and modal contents do generally concern more than the single utterance in which they appear. Therefore, unlike predicates 'alone' or argument structure, time, aspect and modality call for an analysis that takes into account some degree of observation of data outside the considered sentence, either at the level of clausal Connection, or in the broader context – a job generally left to pragmaticists but which is also crucial for a number of semantic works. This last point shows how much these problems are addressable within different domains, ranging from syntax and morphology to pragmatics and, in the end, to discourse analysis. Reason for which, in this book, papers focus mostly on syntactic and semantic features determining temporal, aspectual and modal readings, some of them hinting incidentally at the pragmatic level.

The interplay of tense, modality and aspect places the researcher in front of methodological choices. How are we to deal with these concerns altogether? For example, tense and aspect are both about time, and can hardly be addressed without regard to neighbouring lexical and grammatical parameters such as time adverbs; aspect for itself can be envisaged both as a grammatical and as a lexical-semantic problem; as for modality, many theories are on offer with many points of disagreement (so to say).

Grammatical aspectual categories impose restrictions on their combination with particular lexical items bearing *semantic* aspectual properties, but with strong crosslinguistic variation. In English, grammatical aspect (in particlar perfective and imperfective) is sometimes assimilated with lexical aspect (aktionsart / telicity), because of the strength of these constraints: some sentence will call for an atelic description because of its grammatical imperfectivity or progressivity. In English, imperfective aspect is located, in fact, in *progressive* forms, which impose actually stronger restrictions on the lexical selection of the verb and its complements than imperfective itself. A sentence like *He was knowing Paul* seems odd while *He knew Paul* sounds natural in a stative-like interpretation (like *at that time, he knew Paul already*). In French, quite on the contrary, the perfective past cannot semantically enter into this combination without pragmatic accommodation: *Il connut Paul* doesn't allow for a durative / stative reading, so that the actually interpreted eventuality is changed to a punctual one (in general we get there an inchoative reading such as *He began to know Paul*). On the contrary, the usual form for a stative interpretation, in French, would be the 'real' imperfective past tense (*imparfait*). Since, in French, a progressive form also exists (although periphrastic), what belongs to imperfective as

such and what belongs to progressive proper can be more carefully discriminated (see Molendijk's paper and its summary further down).

As for mood or modality, its relation to temporal-aspectual features is even more complex. Modality obeys different kinds of principles according to the level at which one tackles it and according to the definition one gives to notions like epistemicity, possibility, necessity, obligation, and, in the end, to speaker's attitude and how the propositional content gets embedded into it (or sometimes the reverse). Should mood, in particular epistemic, be addressed as a subjective attitude on a proposition, as a 'distance' or a communication about the commitment of the speaker with regard to the proposition (see Jaszczolt's paper), or, in the more classical view, as a truth-conditional assertion valid in some possible world (as discussed in Asher and McCready's paper), etc.?

The volume starts with papers addressing specifically modal problems, then turns to tense, aspect and different problems relating to the structuration of temporal-aspectual information; however many of these papers also consider the wider problem of time-aspect-modality interrelation. Below, we give a detailed description of the volume's content.

The paper by Asher and McCready, (*Modals, emotives, and modal subordination)*, which is longer than the other contributions for the sake of logical formalization and the explanation of it, discusses in much detail the semantic interpretation of modal forms with a closer look at the Japanese modal system in which expressions bear both modal and evidential functions. Asher and McCready, notably, propose to apply SDRT modal semantics to show that it can account not only for modal words cross-linguistically, here to the example of Japanese, but also for complex problems of modal subordination, which occurs differently in English and Japanese, despite the similar modal content of their lexical units. At this point, the authors show how important it is to deal with larger structures and with general hypotheses regarding discursive connections in the considered languages. In particular, they show that inferences about discourse relations are crucial, and that they are licensed differently across languages. In Japanese, for instance, relations like *Cond-Result* can be obtained only with explicit marking whereas in English, they can occur through general rules of discursive inferences. They open, towards the end of their paper, to further 'wrinkles' about the combination of modal forms and emphatics in Japanese.

Discussing previous works on the past and perfect of modal verbs, Ronny Boogaart's paper (*The past and perfect of epistemic modals*) observes, with evidence from Dutch and English, that the past tenses of modal verbs such as 'can' and 'must' (*kunnen* and *moeten* in Dutch) allow for epis-

temic readings in free indirect speech contexts. Boogaart addresses the link beween aspect and modality: imperfectives are preferred in conditional, hypothetical and counterfactual contexts and dominate utterances representing allocentric speech, thought or perception. While such cases are not usually called 'modal' readings, Boogaart argues that both modal and imperfective readings require an 'evaluation point', be it epistemic or temporal. He relates this 'point' with the necessity, for an imperfective form, to anchor on an anaphoric non-imperfective antecedent (following the prevailing point of view within Romance linguistics). Imperfective forms and epistemic modality thus share, according to the author's view, the same semantic architecture. Boogaart further explains that the present perfect is not available for free indirect speech because of the non-simultaneity of the point of perspective; the epistemic reading is available when the complement (and not the verb) has a perfect form. Looking at apparent counterexamples found in the literature, where past forms are understood as present-epistemic utterances, he argues that they should be treated at the pragmatic level of actual language use, where people search for relevant interpretation and map the epistemic evaluation time onto the speech point.

In her paper (*Aspectual composition in idioms*), Sheila Glasbey tackles the much debated problem of the aspectual reading of idioms. The core discussion focusses on the question whether the aspectual class of idiomatic expressions can be derived compositionally, very much as in the case of literal expressions or should be considered as expressions whose aspectual class is lexically determined. Glasbey first shows that the aspectual class of a verb phrase used idiomatically turns out to be different from its non-idiomatic counterpart in the majority of cases. She argues that either idioms are non-compositional (which accounts for the difference in a simple, straightforward manner) or that the process of compositionality will have to lead to different results in the literal and the idiomatic cases. She argues against the claim (see McGinnis 2002) that the difference is 'accidental and pragmatic'. As idiomatic meanings involve non-literal meanings, it is the non-literal meaning of subparts of an eventuality which are considered. Indeed, literal meanings denote eventualities which lead to a given endpoint (typically in the case of accomplishments) but the idiomatic reading precisely does not come with this literal accomplishment (such as in the case of 'cry one's eyes out', for example). Interestingly, the result she obtains is then the opposite of what is claimed in e.g. McGinnis : it is the identity of aspectual class which is accidental. Therefore, Glasbey adopts an analysis of compositionality, but for new reasons : the aspectual composition takes place in idioms but the input and the results are different.

Björn Rothstein (*A modifed extended-now for the present perfect*) proposes a novel analysis of a number of phenomena which he groups under the label *perfect puzzle*. He observes that there are some seemingly unrelated questions revolving around the constraints on the present perfect which appear to be accounted for under a new treatment of perfect. He groups together the variability in modification by temporal adverbials expressing past, the apparent incompatibility of *since*-adverbials with adverbials such as *yesterday*, and the impossibility to modify both event and reference times of a perfect by position time adverbials. Although some of the phenomena have been dealt with independently (see e.g. Klein 1992), Rothstein's approach is an attempt to unify them. In order to do this, two basic revisions are proposed. First, Rothstein observes that the German data differs in a significant way from the Swedish and English one, in that the German present perfect can be used *in lieu* of a preterit. The *ExtendedNow* approach the author chooses gives a very clear result, in that German is claimed to have semantically dynamic boundaries of the perfect time span. The other important claim relates to the restriction in the occurrence of positional temporal adverbials. The author introduces the notion of p(ositional)-specific, which denotes temporal expressions which designate a specific point on the time axis. He claims that adverbs like *yesterday* are p-specific. He adopts the idea that positional temporal adverbials occur in specTP. Trivially, it then follows that the event time and reference time cannot both be specified by temporal adverbials. Finally, the interaction between p-specific adverbials and the use of perfect is accounted for by the fact that adverbials of this type restrict the points in time and either exclude or include the various components such as Speech time, Reference time and Event time. The (minimal) syntactic component contributes in an innovating way to the explanation of the behavior of adverbials in the perfect environment by resorting to structural mechanisms.

Arie Molendijk compares the French *passé simple* and *imparfait* tenses with the English simple past and past progressive, with regard to narrative discourses. His framework is DRT. Contrarily to Boogaart, he adopts a wide anaphoric view for which all non-compound past sentences are temporally calculated on the basis of an antecedent. He considers that the French *imparfait* and the English past progressive should not be compared at the temporal level since both express background simultaneity. His approach to this issue is that the difference between these tenses is basically aspectual: the French *imparfait* forces stative reading while the English past progressive forces activity readings. As for the difference between simple past and *passé simple*, it is primarily temporal, since the latter does not license simultaneity

between eventualities while the former does. Molendijk's explanation of the considered tenses develops through various types of formal combinations of eventualities licensed or unlicensed by the considered tenses. This explanation allows for an account of the fact that the French *imparfait* has a wider distribution than the past progressive, while the English simple past has a wider distribution than the French *passé simple*.

As a counterpoint to Rothstein's investigations, Stowell examines the interesting and complex question of the infinitival perfect in English (*Sequence of perfect*). The starting point is the observation that the *have+en* embedded infinitive can have two readings : either a tense-shifting one, which is what one could expect, or – and preferably – a 'simultaneous' present tense-like interpretation. Using an elaborate machinery, such as tools of analysis adapted from Klein (1992) and previous research on tense (Stowell 1995a, 1995b, 2006), the author shows that as opposed to main clauses, embedded tensed clauses with aspectual auxiliaries have the crucial property of destroying the past-shifting semantics associated with the past of the embedded clause, and yield some sort of simultaneous interpretation of the subordinate past. The same type of restriction occurs with embedded infinitives exhibiting the *have+en* form (1):

(1) Caesar is believed to have lived in Rome

Stowell claims that infinitival perfects behave like a past tense, despite the absence of tense marking. This obviously raises the question of what past tense it is. Crucially, Stowell adopts minimally the perspective that (i) tenses express 'temporal shifting (or lack thereof) with respect to a Reference Time', and that (ii) tenses are 'referential expressions analogous to pronouns, but referring to times rather than to individuals'. Stowell assumes that the temporal ordering function expressed in (i) is associated with the syntactic category T, and the temporal reference function described in (ii) is associated with the internal argument of tense (labelled TT). This implies a dissociation of the two components of tense and their assignment to two distinct syntactic positions. In this respect, his work in general and this paper in particular are major contributions to an extremely promissing field of research which crucially builds on the semantics-syntax interface. More directly, the claim that infinitives actually have tense may carry over to other phenomena, and open up a new perspective in the research on the relation between tense and aspect, and on the recently investigated *domain of inflected infinitives.*

Ricardo Etxepare and Kleanthes Grohmann (*Temporal and aspectual variation in adult root infinitives*) investigate a small but wide-spreading phenomenon, that of the Adult Root Infinitive, illustrated below :

(2) Me go to that party ? I would never do such a thing !

where the first part constitutes the Adult Root Infinitive, and the second, termed Coda, obligatorily appears and expresses the exclamative force of the utterance. The syntactic properties show that there are Connectivity relations between the two clauses, such as NPI licensing. This leads the authors to propose that both parts are in fact embedded under an exclamative Operator which functions as the root for the two clauses, and which binds event variables in both conjuncts. They propose an analysis in which the structure contains an impoverished CP layer and a deficient Infl (TP) layer.

The fact that the construction only tolerates some types of adverbs, such as aspectual, root modal, subject-oriented or temporal ones is immediately accounted for by the fact that the Infl domain is deficient; the impoverished CP layer accounts for the restriction of other left-peripheral elements, namely the fact that only some types of topicalisation (i.e. preposing to a left-peripheral position) are possible. A third important consequence of their analysis is the proposal that infinitives raise to different positions in different languages: whereas in Spanish it raises past the temporal head and targets the lowest CP head, the English infinitive does not raise. Thus the claim that verbs raise to different positions leads to the explanation of the differences across languages in terms of availability of an eventuality variable available for binding by the exclamative operator and to the variations in the position of modification by adverbials.

In their paper (*Economy constraints on temporal subordination*), Hamida Dermidache and Myriam Uribe-Utxebarria propose a general system of temporal relations in subordinate clauses derived from general economy principles and constraints, the *Temporal Computation Economy* (TCE) and the *Temporal Constraint on Semantic Subordination* (TCSS). The system of temporal interpretation is based on temporal primitives: EV-T for the interval defining the described event, ASP-T for the assertion-time, and UT-T for the utterance-time. Past, present and future references are defined within interval relations (*Past=UT-T after EV-T*, *Present=UT-T within AST-T*, *Future=UT-T before AST-T*). Temporal relations between the matrix and the subordinate clauses are computed from (i) a null-hypothesis (default reading) stipulating that the anchor-time, that is, time reference from which the subordinate reference time is computed, can be either UT-T (deictic anchoring) or the matrix AST-T (anaphoric anchoring) and (ii) the TCE and

the TCSS. The TCE states that a given temporal construal must be achieved in an optimal manner, and the TCSS that anchoring a subordinate clause into a matrix must yield an optimal output. As default anchor-times produce non-optimal outputs, resetting the anchor-time is a general strategy describing and explaining dependent and independent temporal subordinate sentences.

Kasia Jaszczolt (*Future time reference: Truth-conditional pragmatics or semantics of acts of communication?*) sets the discussion at the level of the semantic-pragmatic interface, arguing for default values when time remains unspecified lexically or grammatically. Jaszczolt proposes to integrate these pragmatic features into a dynamic semantic model of discourse such as DRT, and exploits a specific formal device to do this (the *merger representations*). She focuses on future time reference in English, and argues along the lines that i) future implies modality, and ii) that truth-conditions are crucially affected by pragmatic features. She then exploits Grice's unfinished work on the basic modal operator, which she suggests should have scope on eventualities. Associating modality with the *commitment* of the speaker to the proposition, and observing whether the information is linguistically provided or inferred, she provides a formal model, which shows operability for the analysis of complex phenomena such as the intrication of tense and modality in future-time utterances.

Pranav Anand and Valentine Hacquard's paper (*When the present is all in the past*) present a new version of a classical problem for the semantics of English, that is, the past interpretation of present tense in embedded clauses, as in *Washington said that he would promote a soldier who has fewer than five wounds*, where *has* is overlapping past reference. This case contrasts with the ordinary reading of present tense embedded in a past matrix sentence, where the interpretation of the present overlaps the speech point (*John said that Sue is pregnant*). Anand and Hacquard's paper gives a counter-argumentation against the classical view (Abush's *Upper Limit Constraint*) and uses on the contrary a polarity analysis, where the presence of a future (*will*) acts as an intervener between a past tense and a present tense in its scope. The Present-in-the-Past receives then an elegant polarity description and explanation, parallel to the positive polarity item case licensed by a quantifier in the scope of a negation (*No one said something*).

Finally, Carlota Smith (*Reference time without tense*) presents a crucial case of time reference assignment, where reference time is computed without the presence of tenses. Two languages are examined: Mandarin Chinese, which is a tenseless language, and Navajo, which allows sentences without temporal information. Carlota Smith's analysis of temporal reference uses a

classical Reichenbachian framework, in which situation time (SitT) – event point in Reichenbach – is to be computed from Speech Time (SpT) – speech point – and Reference Time (RT) – reference point. Her framework includes a *Deictic Principle* – from which situations are located with respect to SpT –, a *Bounded Event Constraint*– stating that bounded situations are not located at SpT –, and a *Simplicity Principle of Interpretation* – requiring to choose the interpretation requiring the least information inferred when temporal information is incomplete. In languages without tense, the relation of RT to SpT is pragmatically inferred, whereas linguistic forms involving RT are devoted to the coding of its relation to SitT. This situation contrasts with tensed languages, in which both relations are grammaticalized.

Modals, emotives, and modal subordination

Nicholas Asher and Eric McCready

1. Introduction

Many languages like Japanese have an elaborate modal system as well as a set of evidentials, and some expressions may have both a modal and an evidential function. Modals, evidentials and temporal expressions are closely related and have complex interactions, many yet to be explored. But certainly there are striking analogies that have already been exploited as in the similarities between tense logic and modal logic. Some have claimed in addition that tenses (e.g. past) are related to modal force (Iatridou 2000). To sort out this territory, we give first a provisional definition of modals, evidentials, and temporal expressions. Temporal expressions, among which we include tenses (in a suitably lax sense of *expression*), determine and may shift from the current time of the discourse the temporal parameter relevant to evaluating the truth of a sentence. Modals determine and may shift the world of evaluation for the sentence. Evidentials and emotives on the other hand don't determine or shift any parameter commonly accepted to be relevant to the determination of truth conditions but rather link the proposition within their scope to a set of premises or a real world situation that constitute the evidential grounds for the proposition. A language like Japanese has a wealth of particles that appear to have modal force but also may function as evidentials *-hazu*, *nitiganai* are two examples that will feature prominently in this paper. We'll investigate in detail the behavior of these modal/evidential expressions as well as the epistemic possibility particle *kamosirenai* not only with respect to their single sentence semantics but much more interestingly with respect to their discourse behavior. In particular we'll concentrate on how modal subordination works in Japanese. We asked eight Japanese speakers about various discourses involving modal subordination. The results show that modal subordination in Japanese is surprisingly different from modal subordination in English or German. At the end we look at how modal subordination is licensed by emotives in Japanese, something which hasn't been investigated in English or German.

2. Japanese modals

2.1. Background on Japanese tense and modality

The Japanese tense system has only two tenses, generally called past and nonpast, although some authors, for instance Ogihara (1989), take the nonpast tense to actually be underspecified with respect to temporal location in present or future. These tenses are shown in the following table. Thus any nonpast expression in Japanese in principle can have a futurate interpretation. This fact will be relevant to the discussion of modal subordination to follow in the next section.

Japanese Tenses:
- *ta* : past
- *u* : nonpast

Here we set the stage for considering how modal subordination phenomena are realized in Japanese by providing an analysis of three Japanese modal expressions: *kamosirenai*, *hazu-da*, and *nitigainai*. All of these expressions appear sentence-finally, as shown by the examples.

(1) a. *Kamosirenai* ◇:
neko-ga *sakana-o* *taberu* *kamosirenai*
cat-NOM fish-ACC eat might
'A cat might eat the fish.'

b. *Hazu-da* □:
neko-ga *sakana-o* *taberu* *hazu-da*
cat-NOM fish-ACC eat must-COP
'A cat will (definitely) eat the fish.'

c. *Nitigainai* □:
neko-ga *sakana-o* *taberu* *nitigainai*
cat-NOM fish-ACC eat must
'A cat will (definitely) eat the fish.'

Two of these modals, *kamosirenai* and *nitigainai*, are morphologically complex, though the sequences seem to be largely grammaticalized.

(2) a. *ka-mo-si-re-na-i*: Q-also-know-be.able.to-NEG-PRES
b. *ni-tigai-na-i*: DAT-wrong-NEG-PRES

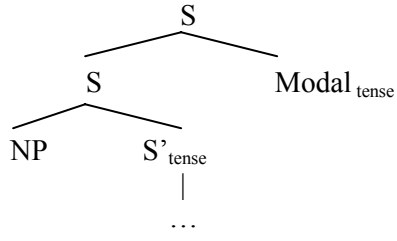
In addition, since *hazu* is grammatically a nominal expression, it must appear with the copula *da*. We do not consider instances of *hazu* in which it does not take a propositional complement, such as this one:

(3) *sonna* *hazu-ga* *nai*
that HAZU-NOM NEG-PRES
'That can't be right.'

It's very hard to find a good English equivalent of non-complement taking *hazu*. See Hirotani (1996) for more discussion of these uses of *hazu*.

Since these expressions take sentential complements, the range of tense possibilities is larger than that for English modals. Further, English modal auxiliaries take tenseless VPs as complement. Only the tense of the modal auxiliary must be taken into consideration when thinking about the interaction of tense of modals, which is quite complex (cf. Condoravdi 2002; Kaufmann 2004).

In contrast, Japanese sentences with modals have two tense positions, as this tree shows. We will refer to the position of tense in the embedded sentence as *internal tense* and the tense position on the modal as *external tense*.



This difference between English and Japanese affects possible interpretations of the modals. But here we will largely restrict ourselves to the basic meanings of certain modals.

2.2. *Kamosirenai*, *nitigainai* and *hazu*

Kamosirenai is very similar in meaning to English *might*. The necessity modals are more complicated in that they appear to have an evidential component. Johnson (2003) states that *hazu* is used when the speaker has good evidence for the claim being made, while *nitigainai* is associated with conclusions obtained by inference. Some support for this claim is provided by

the following minimal pair (thanks also to Junko Shimoyama). In these examples, the speaker is making a prediction about the weather, something about which most people cannot be assumed to have reliable evidence. However, when the sentence is produced by someone who has the capacity to interpret certain sensory input as direct evidence for how the weather will go later, speakers are inclined to accept use of *hazu*. These examples show that the felicity of *hazu* involves the reliability of the evidence available to the speaker – but also that the reliability of this evidence is judged by the interpreter.

(4) In null contexts:

a. *asita* *ame-ga* *furu* *nitigainai*
tomorrow rain-NOM fall must
'Tomorrow it will rain.'

b. #*asita* *ame-ga* *furu* *hazu* *da*
tomorrow rain-NOM fall must COP
'Tomorrow it will rain.'

(5) Context: speaker is a 75-year-old farmer who can invariably predict the next day's weather from the look of the sky on the previous evening. Then:

a. *asita* *ame-ga* *furu* *nitigainai*
tomorrow rain-NOM fall must
'Tomorrow it will rain.'

b. *asita* *ame-ga* *furu* *hazu* *da*
tomorrow rain-NOM fall must COP
'Tomorrow it will rain.'

These data provide pretty strong evidence that *hazu* is at least in part an evidential (cf. the best possible grounds for assertion needed for use of the Quechua evidential clitic *-mi*, cf. Faller 2002). We will discuss what this notion amounts to further in a later section.

Some additional support for this claim, syntactic and semantic, is provided by the following facts.

First, *hazu* seems to compete with evidentials for syntactic position, or perhaps is semantically incompatible with them due to redundancy. *Rasii* in this example is an evidential indicating hearsay. This judgment is reported by Moriyama (2001).[1]

(6) a. *ame-ga* *hidoi* *node* *siai-ga* *tyuusi-ni* *naru*
rain-NOM bad because match-NOM stop-DAT become
nitigainai
MUST
'Because the rain is bad, the match will be cancelled.'

b. ? *ame-ga* *hidoi* *node* *siai-ga* *tyuusi-ni*
rain-NOM bad because match-NOM stop-DAT
naru *hazu-da*
become MUST-COP
'Because the rain is bad, the match will be cancelled.'

c. * *ame-ga* *hidoi* *node* *siai-ga* *tyuusi-ni*
rain-NOM bad because match-NOM stop-DAT
naru *rasii*
become EVID
'Because the rain is bad, the match will supposedly be cancelled.'

Next, it is odd to use *hazu* in sentences that express the speaker's certainty based on inferencing (example from Moriyama 2001). Here, use of *nitigainai* is preferred.

(7) a. *kare-wa* *sootoo* *nemu-soo* *da.* *sakuya* *tetuya*
he-TOP very sleepy-looks COP. last.night all-nighter
sita *nitigainai*
did MUST
'He looks very sleepy. He must have pulled an all-nighter last night.'

b. *kare-wa* *sootoo* *nemu-soo* *da.* *# sakuya*
he-TOP very sleepy-looks COP. last.night
tetuya *sita* *hazu-da*
all-nighter did MUST-COP
'He looks very sleepy. He must have pulled an all-nighter last night.'

In this aspect *hazu* is a little bit like *must*. To quote Palmer (2001: 25), *must* is used "on the basis of evidence, e.g. that the office lights are on, that he is not at home, etc." (for *John must be in his office*), and is used only when the deduction is emphasized.

While it is clear that *hazu* and *nitigainai* differ with respect to evidential force, *nitigainai* also does not combine well with the evidential *rasii*. This indicates that both of these □ modals have an evidential flavor.

(8) a. * *John-wa* *suupaa* *ni* *it-tei-ru* *nitigainai*
John-TOP supermarket to go-PROG-PRES must
rasii
EVID
'It seems that John must be at the supermarket.'

b. * *John-wa* *suupaa* *ni* *it-tei-ru* *rasii*
John-TOP supermarket to go-PROG-PRES EVID
nitigainai
must
'It seems that John must be at the supermarket.'

Another interesting difference between the two □ modals is that *hazu* produces a counterfactual or doubting flavor when used in lawlike statements, but *nitigainai* does not:

(9) a. *2 tasu* *2 wa* *4 ni naru* *nitigainai*
2 added.to 2 TOP 4 to become must
'2 plus 2 must be 4.'

b. # 2 *tasu* *2 wa* *4 nin aru* *hazu* *da*
2 added.to 2 TOP 4 to become must COP
'2 plus 2 should be 4 (but…).'

In (9b), the impression is that either the speaker doesn't really believe that 2+2=4, or that he tried adding 2 and 2 and came out with something else, and is commenting on that fact (i.e. in a discourse like 'Hmm, that's odd.'). The implausibility of these two situations makes (9b) pragmatically rather weird. Once again there does seem to be this use with *must* in English as in the following example:

(10) My keys must be somewhere in this room (said when you haven't found them after quite a bit of searching).

We think the right explanation of this effect should go as follows. Assume, as seems correct based on the evidence presented above, that the use of *hazu* implies that the speaker has direct evidence for his claim, due to the evidential content of *hazu*. But then the speaker's use of the modal implies that he thinks the facts are open to doubt, for why else should he use the evidential (given that, unlike many languages (Palmer 2001), there is no grammatical requirement for doing so)? This kind of Gricean reasoning on the part of an interpreter leads to the conclusion that there must have been

some reason for this choice. The interpreter then considers *some* possible explanations for why the evidential was used: perhaps the speaker has some doubt about the truth of the proposition despite all the evidence pointing to it, or perhaps despite all the evidence something has gone wrong with a calculation. It's not entirely clear what the conclusion of the interpreter should be. But this indeterminacy fits with the kind of weirdness these examples exhibit: it's not obvious exactly what interpretation we should come up with, but it is clear that there is a mismatch between the speaker's beliefs and what we otherwise know about the world.

3. Past treatments of evidentials: Faller 2002

The best-known formal treatment of evidential constructions is that of Faller (2002). Cuzco Quechua has several enclitic suffixes that mark evidentiality or the nature of the speaker's justification for making the claim. Faller analyzes three suffixes in detail:

- *Mi*: the speaker has direct (perceptual) evidence for the claim.
- *Si*: the speaker heard the information expressed in the claim from someone else.
- *Chá*: the speaker's background knowledge, plus inferencing, leads him to believe the information in the claim true.

Some examples follow (from Faller 2002: 3). We have modified the gloss Faller provides for (11c) to reflect the modal meaning given in Faller's semantics.[2]

(11) a. *Para-sha-n-mi*
rain-PROG-3-MI
'It is raining. + speaker sees that it is raining'

b. *para-sha-n-si*
rain-PROG-3-SI
'It is raining. + speaker was told that it is raining'

c. *para-sha-n-chá*
rain-PROG-3-CHÁ
'It must be raining. + speaker conjectures that it is raining based on some sort of inferential evidence'

The enclitics *-mi* and *-chá* are relevant for our discussion of *hazu* and *nitigainai*. The Japanese expression *soo*+COP, which, like the modals we discuss, appears sentence-finally and behaves as a propositional modifier, also appears to have a semantics similar to that of enclitic *-si*. We will not discuss it in this paper, though we think that the treatment of *hazu* to be presented below will generalize well.

Faller uses Vanderveken's (1990) speech act theory for her analysis. Vanderveken's theory assigns speech acts three preconditions for successful performance. Faller takes evidentials to introduce additional content into the set of preconditions.

- Propositional content: restricted in instances such as promises.
- ILL: Illocutionary force (*assertion* for all examples we consider).
- SINC: sincerity conditions on successful performance of the SA. For assertions, that *Bel*(*s*, *p*) holds – that the speaker believes the content of the assertion.

In large part, Faller's analysis of *-mi* and *-chá* focuses on the sincerity conditions for the assertion. Essentially, *-mi* adds an additional sincerity condition to the assertion:

-Mi adds the condition *Bpg*(*s*, *p*) to SINC. *Bpg*(*s*, *p*): speaker has the best possible grounds for believing *p*. Faller does not attempt to make this notion precise, noting only that for externally visible events *Bpg* will ordinarily be sensory evidence, while for reports of people's intentions or attitudes hearsay evidence will often be enough.

Faller analyzes *-chá* as being simultaneously modal and evidential. As a result, the propositional content *p* is mapped to $\Diamond p$, as is the corresponding belief object *Bel*(*s*, *p*) in SINC. The condition *Rea*(*s*, *Bel*(*s*, $\Diamond p$)) is also added to SINC. *Rea*(*s*, *Bel*(*s*, $\Diamond p$)) indicates that the speaker's belief in the possibility of *p* follows from his own reasoning/inference.

While we believe that Faller's analysis of evidentials could also apply to Japanese case, we will develop an alternative since we take the evidential components of the modals to be presupposed. Further, it's not at all clear how sincerity conditions might interact with implicatures and the modal semantics. The Japanese data on modal subordination indicates that there are interactions and that they are subtle. Modern accounts of presupposition have investigated the interactions between presupposition and implicature, and this is another reason for adopting an account based on presupposition.

4. Background on modal subordination

While Japanese and Indo-European languages differ with respect to modal subordination, the basic phenomenon holds across all the languages we have looked at. The basic picture is this. Nonspecific indefinites introduced within the scope of a semantic operator such as negation or a modal are generally not available for coreference with anaphoric expressions in subsequent sentences (cf. (12-14a)). These facts have been well-known in formal linguistics since at least the early 1970s, when they were pointed out by Kartunnen (1976). In that paper, Kartunnen also showed that a class of counterexamples exists to the above generalization. In discourses when subsequent sentences also contain semantic operators compatible with the first, coreference can occur (12-14b):

(12) a. A wolf might come in. # It is hungry. (Roberts 1989)
b. A wolf might come in. It would eat you first.

(13) a. A thief might break in. # He will take the silver.(Roberts 1989)
b A thief might break in. He would take the silver

(14) a. Mary didn't buy a microwave. # It is white. (Frank, 1997)
b. Mary didn't buy a microwave. She wouldn't know what to do with it.

Roberts (1987) dubbed this phenomenon *modal subordination*, after the intuition that the second sentences of discourses like the above is interpreted in a context 'subordinated' to that introduced by the first semantic operator; that is, the operator is able to take scope over the second sentence. Indeed, Kartunnen states that discourses (12-14b) have the following general logical form, in which the first sentence functions as the restrictor of a conditional clause that has the entire remaining discourse as its consequent:

(15) IF S_0 THEN S_1, S_2, S_3...

In more recent years, a number of scholars have refined this intuition and formalized it (Kartunnen's paper was largely descriptive), generally using some form of dynamic semantics. Some of these approaches will be discussed in the next section. The general conclusion of this research has been that modal operators are able to license modal subordination because of their inherently quantificational structure, which incorporates an overtly

expressed scope and a covert restrictor (Kratzer 1981). This covert restrictor is then enabled to take its content from the previous sentence (with its operator).

However, virtually all researchers on the topic have considered only data from English and German, and to a lesser extent French (with the notable exception of Kurafuji 1999). It turns out that the facts in (some) non-Indo-European languages are quite different. Here we present new data on modal subordination in Japanese, in which the realization of modal subordination shows interesting and independent differences from the English/German case, and show how these differences can be linked to the resources each language has for expressing different types of modality; we will also show that pragmatic factors, as expressed in some cases by discourse particles, play a role in licensing modal subordination as well. Finally, we will show how the differences can be accounted for within a formal theory of modal subordination that uses the combination of Asher and McCready's (2004) notion of information states and SDRT discussed in the previous section.

We now turn to data on Japanese modal subordination.

5. Modal subordination in Japanese

Modal subordination in Japanese turns out to be basically very different from the English case, shown in (16).

(16) a. A wolf might walk in. It would eat you first.
b. A wolf might walk in. # It will eat you first.
c. A wolf must surely/ should walk in. It might eat you first
d A wolf might walk in. It might eat you first. But then it might not.

There is a striking difference between (16a) and (16b). In (16a) the use of the epistemic modal *would* enables the pronoun it to find its intended antecedent, the wolf introduced under the scope of the modal in the first sentence. (16c) shows that the modal *might* has the same effect as *would* in enabling the accessibility of the intended antecedent. Nevertheless, since *a wolf* occurs under the scope of the modal operator in that sentence, it is unavailable as an antecedent for the pronoun in nonmodal contexts, which is what standard dynamic semantics predicts. The accessibility of the antecedent under the scope of a modal to a pronoun also under the scope of a modal, however, was something that standard dynamic semantic accounts of

anaphora as well as more traditional accounts could not predict, and the accounts of Roberts (1989), Frank (1997) and Frank and Kamp (1997) provided significant insights into the semantics of anaphoric expressions.

Note that tense also plays a role in determining the felicity of modal subordination. Compare the following examples with (16c) above.

(17) a. A wolf might have walked in. It might have had big teeth.
b. A wolf might have walked in. It might have big teeth.

Although the judgments are subtle, it seems that (17a) admits a nonspecific (*de dicto*) reading for the indefinite *a wolf*, the modally subordinated reading. However, (17b) only allows for a *de re* reading of the indefinite on which it refers to a specific wolf.

Japanese modality seems to differ from its Indo-European counterpart in its ability to license modal subordination. The basic translation of Roberts' example into Japanese is infelicitous with a covert pronoun or the pseudo-demonstrative soitu (see Hoji et al. 2003 for more on the Japanese demonstrative system). Just as with English will, the futurate or pseudo-modal interpretation available for the nonpast tense is not enough to rescue the discourse:

(18) *ookami-ga* *kuru* *kamosirenai.* *#Ø/soitu* *anata-o* *taberu* *nitigainai*
wolf-NOM come might Ø/that-guy you-ACC eat surely
'A wolf$_i$ might come in. It$_i$ would eat you first.'

This discourse, however, becomes perfectly acceptable, when we introduce a particular context in which there was *evidence* that the wolf would eat you first. The introduction of such evidence also made the *nitigainai…nitigainai* story, which was judged largely unacceptable without this context, completely acceptable.

Somewhat marginal but still accepted by more speakers than not in our survey is the variation of our story where the order of modals is reversed: that is $\Box\Diamond(\exists\forall)$ rather than $\Diamond\Box(\exists\forall)$:

(19) *ookami-ga* *kuru* *nitigainai.* *Ø/soitu* *anata-o* *taberu* *kamosirenai*
wolf-NOM come surely Ø/that-guy you-ACC eat might
'A wolf$_i$ will / must surely/ should come in. It$_i$ might eat you.'

If we translated *nitigainai* by *would*, the result wouldn't sound that good in English either. *Would* requires some sort of situation affecting the epistemic possibilities to depend on. Nevertheless there are clear $\Diamond\Box$ sequences that are perfectly acceptable in English. Here's one from the web:

(20) The orbit of the asteroid, called 1950 DA, has been observed over a time frame spanning five decades. This allowed the researchers to project its approximate path farther into the future than is possible with most asteroids. The result: 1950 DA currently has at most a 1-in-300 chance of hitting Earth on March 16, 2880. Because 1950 DA is large – more than 1 kilometer (0.6 miles) across – the consequences would be grave and global. Clouds of debris would create a multiyear winter that would kill off many species and might even threaten civilization. (from *An Asteroid might hit Earth in 2880*, R. Britt, at www.space.com)

Note that the epistemic possibility introduced by *might* in the last sentence clearly depends on the *would* modality in this example.

When *nitigainai* is replaced by *hazu* in (19) the result is very marginal. This is quite different from *must*, which seems to be *hazu*'s closest English equivalent. We find the translation of (19) acceptable with *must*, and we've found that *must* supports modal subordination fine when the first sentence contains a stative:

(21) Lizzie must have made some friends now in Salt Lake. She might be going climbing with them this weekend.

(22) Lizzie might have found a route she likes at that cliff. It must be pretty hard.

Of all the standard modal subordination patterns that we examined, the only one that was judged acceptable by almost all speakers in an out of the blue context was the sequence of two *might* modals as in:

(23) *ookami-ga kuru kamosirenai. Ø/soitu anata-o*
wolf-NOM come surely Ø/that-guy you-ACC
taberu kamosirenai
eat might
'A wolf$_i$ might come in. It$_i$ might eat you.'

All the other modal variations on our discourse were rejected by more participants than not (though the survey indicates a large variation of acceptability among the speakers we surveyed).

5.1. Discourse markers and conditionals

Interestingly, the standard ◇□ pattern of modal subordination with *nitigainai* expressing the □ operator is felicitous when licensed by discourse markers (24) or conditional clauses (25), though the pattern nevertheless remains bad when *hazu* is used to express the □ operator.

(24) *ookami-ga* *kuru* *kamosirenai.* *sosite* *Ø/soitu*
wolf-NOM come might then Ø/that-guy
anata-o *taberu* *nitigainai*
you-ACC eat surely
'A wolf$_i$ might come in. Then it$_i$ would eat you.'

(25) *ookami-ga* *kuru* *kamosirenai.* *mosi* *Ø* *kitara*
wolf-NOM come might if Ø came-COND
Ø/soitu *anata-o* *taberu* *nitigainai*
Ø/that-guy you-ACC eat surely
'A wolf$_i$ might come in. If (one) did, it$_i$ would eat you.'

Use of *sosite* indicates that the discourse relations *Elaboration* or *Narration*/*Result* (here the latter) hold between the marked constituent and some previous constituent in the discourse. Note also the anaphoric relation between the covert pronoun in the conditional restrictor and the indefinite *ookami* 'wolf' in the first sentence.

6. Analysis

Our survey of the data suggests several themes that our analysis should address. First, we need to explain the differences between the modals in Japanese. We then need to understand the semantic mechanism at work in the felicitous examples. Finally, we need to address the question why it is necessary to overtly mark subordination in Japanese at least in certain cases.

– Differences between the modals in Japanese

– What is the semantic mechanism at work in the felicitous examples?
– Why is it necessary to overtly mark subordination in Japanese?

One clear observation is the marked difference in subordination behavior between *nitigainai* and *hazu* in the Japanese modal subordination patterns. Given the observations about the evidential content of *hazu*, we can explain with the idea that there are conflicts between the evidentiality requirements on the modals and their use in subordinated contexts, at least in the bare cases. Conditionals and *sosite* can then be characterized as one means of producing a 'link' for evidentiality. It is well known that Japanese has grammaticalized a number of linguistic phenomena that in European languages appear strictly through inferencing (e.g. *wa*-marking of topicality, Portner and Yabusita 1998). We hypothesize that this grammaticalization has also taken place at the level of discourse logical form, so that marking of discourse relations, attachment, etc. overtly is obligatory in certain circumstances. One area in which obligatory marking is found seems to be modally subordinate contexts. If this is correct, we have an explanation of why marking is necessary that fits into a broader picture of crosslinguistic variation.

In English, *might* introduces new epistemic possibilities that can be picked up by other modal propositions introduced later in the discourse. In Japanese, *kamosirenai* seems to work the same way given the results of our survey.

We believe that the compositional modal semantics provided here, in conjunction with SDRT ideas about discourse structure, gives an attractive account of the interaction between modality and discourse markers in the Japanese case.

7. Modal Semantics

To deal with modals, we will introduce a modal semantics, which we've argued elsewhere works well for English modals. Our structures $\mathcal{A}$ include a set of worlds and a set of epistemic possibilities $\mathcal{E}$ each element of which is a set of triples consisting of a world, an assignment and a set of epistemic possibilities. We will use these, together with the usual world and assignment pairs of dynamic semantics, to give a dynamic definition of satisfaction for the logical forms of sentences containing modals, which we'll assume to be written in a dynamic predicate logic containing modal operators.

To define each set of epistemic possibilities properly, we proceed inductively, since some operators relying on the set of epistemic possibilities may nest within others. We begin with some choice α of some set of world assignment pairs and use that choice to inductively build up more complicated sets of epistemic possibilities.

- Set $E_{\alpha,0} \subseteq \mathcal{P}(W \times \$)$, where \$ is the set of all assignment functions.
- $E_{\alpha,n+1} \subseteq \mathcal{P}(W \times \$ \times E_{\alpha,n})$
- $\mathcal{E}_\alpha \subseteq \mathcal{P}(\cup_{n\in\omega} E_{\alpha,n})$

Every set of epistemic possibilities $\mathcal{E}_\alpha$ is thus well-founded. Dynamic contexts that form the inputs to the interpretation of formulas are triples of $\langle w,f,\mathcal{3}_\alpha\rangle$ for some α. We refer to the third element of an information state σ as $3(\sigma)$, where 3 is a projection function from onto its third element. More generally, we make use of the projection functions 1, 2, 3 to pick out the world, assignment function or set of epistemic possibilities of a context element respectively. We adopt the constraint that epistemic possibilities at the outset include the actual world and the actual assignment, though updates with new epistemic possibilities may make the set of possibilities no longer include the actual world. So we will stipulate for the elements σ_0 of the initial context that: $\exists\sigma' \in \cup(3(\sigma_0))\ (1(\sigma_0) = 1(\sigma') \wedge 2(\sigma_0) = 2(\sigma'))$.

We now state our dynamic DPL style semantics in terms of our new context elements.

- $\sigma\|Rt_1,\ldots,t_n\|^{\mathcal{A}}\sigma'$ iff $\sigma = \sigma' \wedge \langle \|t_1\|^{\mathcal{A}}_{(1(\sigma),2(\sigma))}\rangle \in R^{\mathcal{A}}_{1(\sigma)}$
- $\sigma\|t_1{=}t_2\|^{\mathcal{A}}\sigma'$ iff $\sigma = \sigma' \wedge \|t_1\|^{\mathcal{A}}_{(1(\sigma),2(\sigma))} = \|t_2\|^{\mathcal{A}}_{(1(\sigma),2(\sigma))}$
- $\sigma\|\phi \wedge \psi\|^{\mathcal{A}}\sigma'$ iff $\sigma\|\phi\|^{\mathcal{A}} \circ \|\psi\|^{\mathcal{A}}\sigma'$
- $\sigma\|\neg\phi\|^{\mathcal{A}}\sigma'$ iff $\sigma = \sigma' \wedge \neg\exists w'', h\ \sigma\|\phi\|^{\mathcal{A}}\sigma \frac{1(\sigma)}{w''}, \frac{2(\sigma)}{h}$
- $\sigma\|\exists x\phi\|^{\mathcal{A}}\sigma'$ iff $\exists a \in A\ \sigma^{\frac{a}{x}}\|\phi\|^{\mathcal{A}}\sigma'$, where $\sigma^{\frac{a}{x}}$ is the result of replacing $2(\sigma)$ with $2(\sigma)^{\frac{a}{x}}$

So far nothing here is out of the ordinary. But we're missing something. As discourse proceeds we learn things and so refine and indeed revise our epistemic possibilities in light of what has been learned. Let us call the *discourse context* that set of triples that are the result of our output of the evaluation of successive sentence-tokens in a discourse. A discourse context is very much like an epistemic possibility – a set of world assignment, epis-

temic possibility pairs; and it contains the information of what has been said up to this point. Simplifying matters considerably, we take what has been said in discourse has having been established and accepted as part of the common ground (thus passing over all the problems of correction, denial and disagreement – but see Asher and Lascarides 2003 or Asher and Gillies 2003 for discussions of these phenomena). Thus, whatever is true or supported in such a discourse context should be reflected in the set of epistemic possibilities of those triples that are part of the discourse context.

To define this constraint, we follow Asher and McCready (2004) and introduce a notion of a *discourse update*, and auxiliary notions of *descendant satisfaction*, written $|=_d$ and revision. The notion of descendant satisfaction lifts our distributive semantics over context elements to sets of such elements (the term is due to Groenendijk *et al*. 1996, though SDRT develops the notion somewhat differently). Thanks to the work of Lewis (1973), Spohn (1988) and others, it is straightforward to define a revision function $\bigstar$ on epistemic possibilities if we assume a partial ordering on the elements of epistemic possibilities (see e.g. Lewis 1973). This partial ordering forms a system of spheres centered around each element σ. A set of such elements can also have a system of spheres $S(\epsilon) = \{\cup(S_n(\sigma)) : \sigma \in \epsilon\}$.

Definition of Descendance and Satisfaction by epistemic possibilities:

- σ has a ϕ descendant σ' iff $\sigma[\phi]\sigma'$
- $\langle \epsilon, \epsilon \rangle \models_d \phi$ iff every $\sigma \in \epsilon$ has a ϕ descendant in ϵ'
- $\|\phi\| = \{\langle \sigma, \sigma' \rangle : \sigma'$ is a ϕ descendant of $\sigma\}$
- Let $S_n(\epsilon)$ be the smallest sphere around ϵ such that elements in $S_n(\epsilon)$ have ϕ descendants. Then $\epsilon \bigstar \|\phi\| = \{\sigma : \exists \sigma' \in S_n(\epsilon)\ \sigma$ is a ϕ descendant of $\sigma'\}$.
  $\mathcal{E} \bigstar \|\phi\| = \{\epsilon \bigstar \|\phi\| : \epsilon \in \mathcal{E}\}$.

With these notions we can now turn to the central notion of discourse update.

Definition of Discourse Update:

- Let ϕ be a modal free formula. Then σ is a ϕ discourse update of σ' iff $\exists \sigma''$ such that $(\sigma'[\phi]^{\wedge} \sigma'' \wedge 1(\sigma) = 1(\sigma'') \wedge 2(\sigma) = 2(\sigma'')$ and $3(\sigma) = 3(\sigma') \bigstar \|\phi\| \wedge \forall \epsilon \in 3(\sigma) \forall \sigma'' \in \epsilon\ 2(\sigma'') =_x 2(\sigma)$ for all x free in ϕ)
- Let ϕ be a formula of the form *might* ϕ, *would* ϕ or $\phi \Rightarrow \psi$. Then σ is a discourse update of σ' iff $\sigma'\ [\phi]^{\wedge} \sigma$

The notion of discourse update helps us to evaluate sequences of formulae that are translations of our examples. For instance in evaluating (16a) and (16b), we check whether the translations of those formulae give us a sequence of coherent discourse updates, where a coherent discourse update is one where for some input σ there is a non-empty output. *Discourse update* is also the notion that we need to define *logical consequence*.

– Logical Consequence: Let Γ be a sequence of formulae. Then $\Gamma \models \phi$ iff for all $\mathcal{L}$ models $\mathcal{A}$ for all information states σ,σ' such that σ' is a Γ discourse update of σ there is a σ'' such that σ'' is a ϕ discourse update of σ''

A feature of discourse update that might strike one as odd is that modal formulas do not affect the epistemic possibilities in discourse update. But they don't need to, since they already do so in their basic semantics – that is, in how they affect dynamic transitions over σ. Here is the basic semantics for English *might* and *would*. The semantics of the epistemic modals can either test or change the second element.

– $\sigma[might\phi]_{\mathcal{A}}\langle 1(\sigma),2(\sigma),\mathcal{E}'\rangle$, where $\mathcal{E}'=\{\epsilon'\colon \exists\epsilon \in 3(\sigma)\langle\epsilon,\epsilon'\rangle \models_d \phi\}$, if there is such an ϵ;
$\sigma[might\phi]_{\mathcal{A}}\emptyset$ otherwise.
– $\sigma[would\phi]_{\mathcal{A}}\langle 1(\sigma),2(\sigma),\{\epsilon'\colon \exists\epsilon \in 3(\sigma)\langle\epsilon,\epsilon'\rangle \models_d \phi\}\rangle$,
if $\forall \epsilon \in 3(\sigma)\ \exists\epsilon* \langle\epsilon,\epsilon'*\rangle \models_d \phi$;
$\sigma[would\phi]_{\mathcal{A}}\emptyset$ otherwise.

Might intuitively involves an existential quantification over epistemic possibilities. And like all existentials in dynamic semantics, it has a special status – that of resetting, in this case, epistemic possibilities. But this resetting is dependent on a test of the input; if the previous epistemic possibilities admit an update with the proposition under the scope of the *might*, then the resetting proceeds – if not, the update fails in the sense of producing no descendants for the input. This semantics incorporates the idea that *might* ϕ tests the input epistemic state to see whether there are any possibilities that verify ϕ. But English *might* as well as *kamosirenai* are not simple tests; the information under the scope of the *might* operator transforms the epistemic possibilities in the input so that all the output epistemic possibilities support ϕ.[3] This dynamic resetting behaviour allows English existential modals to support modal subordination phenomena.

The Japanese existential modal *kamosirenai* behaves similarly to its English counterpart with respect to both modal subordination and evidentiality. So we'll take both to have the same semantics.

Let's now turn to a comparison of the universal or □ modals. *Would* at first glance appears to function as a simple test: if all the epistemic possibilities support ϕ, then *would* ϕ is true; otherwise not.

There is reason to question this simple semantics for *would*. In fact we want to argue that it has an evidential component as well. But it's difficult to see, and we haven't noticed it until looking at the Japanese □ modalities. To get a feel for evidential requirements it's better first to look at *must* and the Japanese □ modalities. Recall Palmer's characterization of *must* as requiring some sort of evidence. We can see a reflection of this evidential requirement in the modal subordination facts. *Must* is good with stative but less good with event introducing VPs. *Must* and *would* are not identical, as shown by the following examples.

(26) a. Someone must be at the store now. He might be buying something.
b. John might be at the store now. He must be buying a bottle of wine.
c. John must be at the store now. He might go to the park next.
d. John must go to the store now. He might go to the park next. (only a deontic reading for many speakers)

Statives are important especially for the first verb.

– Hypothesis: there is an evidential component to epistemic *must* (cf. the quote by Palmer) The evidential requirements of *must* cannot be very well satisfied except by present or past events (except for necessary truths – 2+2 *must always* = 4.)

If this hypothesis is correct, given that event-denoting complements of epistemic modals are always interpreted as futurate in the absence of the perfect and that statives are interpretable as either present-oriented or futurate (Condoravdi 2002), we get an explanation for why an epistemic reading is unavailable in (26d).

The Japanese existential modal *kamosirenai* behaves similarly to its English counterpart with respect to both modal subordination and evidentiality. So we'll take both to have the same semantics.

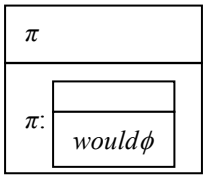
The semantics for the Japanese universal modals clearly differs from the semantics of *would* as we've sketched it. And the modal subordination behavior confirms some important differences. Neither *hazu* nor *nitigainai* have a reading dependent upon a ◇ modality in out of the blue or null contexts, whereas *would* certainly does. In certain contexts, however, *nitigainai* does have a modally subordinate reading, though *hazu* does not. We predict modal subordination to fail for Japanese with this semantics, but not because of the difference in the modal meaning of the particles *hazu* and *nitigainai*. Rather, the infelicity of the modal subordinations comes from a failure of the evidential presuppositions of the Japanese.

Evidentials have not received much study until recently in formal semantics and pragmatics. We think that the evidential components of the Japanese □ modalities are in fact presuppositions. The data is complex and we need to take a larger survey. But some very interesting facts and some intriguing questions already surface: why can the evidential presuppositions be apparently accommodated in the antecedent of a conditional (notice how *nitigainai-kamosirenai* and *hazu-kamosirenai* sequences are good in the conditionals) and in the presence of *sosite* but not in the null context? Furthermore there arises the question about why the presupposition of *hazu* can't be at all accommodated in the consequents of conditionals, while it can in the antecedent.

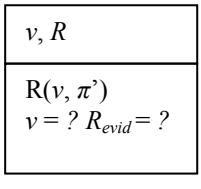
One thing that is apparent is that these modals have evidential presuppositions of differing strength. The evidential presuppositions of *nitigainai* are easily accommodated or bound in contexts where there is information sufficient, together with perhaps certain modal assumptions given by ◇ updates to support the proposition under *nitigainai*'s scope. That seems to be the appropriate generalization of our data about the *kamosirenai…nitigainai* in the "bare2" scenario where the relevant sort of evidence is supplied by the context.

(27) *nitigainaiϕ*

(27') *a*:



p:



Exactly what kind of evidence is required for *nitigainai* is not totally clear but it appears that this evidence need not be perceptually given and could be just what one is told about the situation. When it is given as part of the context as in the "bare2" set of examples, the presupposition is satisfied and affects via our update rules all of the epistemic possibilities. When the epistemic possibilities are reset or such that they support other information that together with the evidence allows us to derive the proposition under the scope of *nitigainai*, then we have an acceptable discourse.

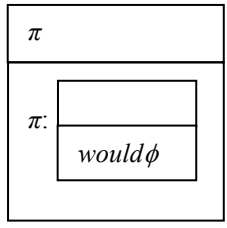
Nevertheless, it appears difficult for many Japanese speakers to accommodate this evidential presupposition, which we'll write for short as $\partial nitigainai\phi$. Exactly why that is isn't completely clear to us. Perhaps there is just less of a general willingness to accommodate presuppositions in Japanese (this needs to be tested carefully), or some sorts of evidential presuppositions can't be accommodated. But neither one of these explanations appears to be right to us. For it appears that $\partial nitigainai\phi$ does get accommodated in the presence of a conditional or *sosite*. Unlike the "bare2" cases there is no binding here that's obviously given. But the "bare1" examples show that the presupposition cannot be simply accommodated in at the "top" or veridical level. So the puzzle about accommodation here has to do with discourse constituency or with the way discourse structure and dependencies interact with evidential presupposition. We'll come back to this after we've looked at the presuppositions for *hazu*.

Hazu has a presupposition that the evidence is deictically given in the context (like the *-mi* particle of Quechua), i.e. the evidence is external and perceptible. Note however that what counts as good evidence is dependent on what the interpreter is willing to accept, which in turn depends on the context and on external factors and knowledge – as in the example with the farmer given previously, in which perceptual evidence for rain was sufficient to license *hazu* just in case the user of the evidential could be assumed to have the ability to 'back up' his assertion with additional facts about the situation. This variability is similar to that noted by Faller for Quechua *-mi*, which again brings out the similarity between the two.

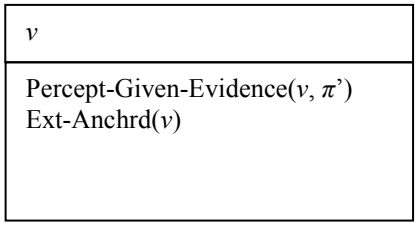
This presupposition cannot be bound to anything other than some situation in the context (which we think of as historically extended back into the past – i.e. as a sequence of Kaplanian contexts rather than simply as consisting of a world and some designated entities as in Kaplan (1989). The external anchoring device from DRT serves as a place holder for determining how this link to the context is made.

(28) $hazu\phi$

(28') *a*:



p:



This evidential presupposition can't be bound in the "bare2" context, because the wolf situation isn't perceptually given. However, why can't it be accommodated? Are these sorts of presuppositions that don't accommodate well like the presupposition of *too* in English? The answer is probably not. For Japanese speakers do accommodate both the presuppositions of *hazu* and *nitigainai* in a one sentence use. But in the case of a two sentence discourse with two evidential presuppositions, we get a marginal result. This too suggests that we haven't gotten to the bottom of our story. Evidential presuppositions interact both with modals and with discourse structure in a very curious way.

Before tackling the details of our story, let's go back to *would*. Could English *would* be a pure epistemic modal, unlike any of the other modals we've surveyed? That would be odd and we have several bits of evidence to show this isn't so. First stand alone uses of *would* like

(29) The bastard would do that.

imply at the very least that the speaker expected the untoward actions of the agent mentioned. It's only a small step to assume that these expectations represent the presence of certain evidence supporting the proposition within the scope of the modality. More tellingly is the inference from *might*ϕ to *would*ϕ. In our semantics, this inference is valid, and it also looks valid (depending on how you construe validity in the anaphoric framework) in the analyses of Franck and Roberts. But that isn't right. In fact if you hear a sequence like *might*ϕ *would*ϕ, it sounds like a *Correction*. It's clearly not a valid inference. What stops it from being a valid inference, we hypothesize, is the evidential presupposition of *would*ϕ. ∂(*would*ϕ) conflicts with an implicature of *might*ϕ, which is that a stronger modality with a stronger evidential presupposition *doesn't* hold. There seems to be also a more general rule about *how* evidential presuppositions are to be accommodated. It follows the basic rule that "just saying it doesn't make it so". We accommodate an evidential presupposition *before* any modal updates. This is because

the evidential requirement for *would* is required to be *actual* not just based on some epistemic possibility. Now if we attend to the inference from *might*ϕ to *would*ϕ – we see immediately that in certain structures and at certain elements ϵ, $\mathcal{E}(\epsilon)$ as well as ϵ itself will not support ∂(*would*ϕ) and so the attempted accommodation will not yield a non-empty discourse update. We stipulate that if the presupposition is not bound or accommodated, then the inference cannot go through. Thus, the evidential presupposition of would plays an important role in distinguishing *would* from *might*.

We now turn to a detailed examination of the various modal sequences in Japanese and attempt to analyze why certain readings are present and why certain readings are not or are only marginal.

7.1. Contrast 1: $\Diamond\Diamond$ and $\Box\Diamond$

Because we give no special evidential status to *kamosirenai*, we predict that a $\Diamond\Diamond$ sequence should work just as in English and should be felicitous.

However, that doesn't explain why the other *kamosirenai Continuations* are marginal. This may be because in Japanese it's simply not possible to establish a discourse link between these two constituents unless it's explicitly given. Of course in English it's easy to form discourse connections by using implicit clues. This issue certainly deserves more study. But what if this is false? Another hypothesis we advance tentatively is that in Japanese there is a rough shift from strong evidentials to weak evidentials within a modally dependent reading, unless there is a discourse break between the constituents marked by a particle (or the conditionalization which makes in effect *kamosirenai*ϕ not modally dependent on the $\Box$ modality in the previous constituent. It is clear that when we have a straight modally subordinate reading that the two constituents are related modally, and we might hypothesize that there's no need to make a real discourse connection. The second clause elaborates on the possibility focused on in the first clause. The Japanese data seems to show that in this case, we cannot accommodate two different evidential presuppositions – and indeed with *Elaborations*, the constituents form a semantic whole. Not so when we use *sosite* or the conditional. The two constituents are separate and not subordinately linked. Here the two evidential presuppositions can be (discourse locally) accommodated. The same goes with the stronger presuppositions of *hazu*.

7.2. ◇□

The evidential presuppositions of *nitigainai* are similar to those of *would*. So why do they behave so differently with respect to modal subordination? An answer is forthcoming if we examine the discourse connections in Japanese. These are crucial for satisfying the evidential presupposition, which is relational. Now if it's the case that *nitigainai*'s evidential presuppositions, as we have already argued, must be inferentially linked to the proposition under *nitigainai*'s scope, then it appears that, both in English and Japanese, one has to form the inferential link and that inferences about discourse relations are crucial. In English there's no problem about inferring a sort of *Conditional Result* which supports the inferential link from the proposition under ◇ together with accommodated material to the proposition under □. In fact there seems to be a default rule of the form below. Here *Epist_mod* indicates the presence of an epistemic modal, *Ant_anaph*(α,β) indicates a situation in which α contains an antecedent for some anaphoric element in β, and *Cond_Result* is a discourse relation combining elements of the semantics of *Result* (shown below) and conditionals.[4]

(30) $(\langle \tau, \alpha, \beta \rangle \wedge \mathit{Epist\_mod}(\alpha) \wedge \mathit{Epist\_mod}(\beta) \wedge \mathit{Ant\_anaph}(\alpha,\beta)) > \mathit{Cond\_Result}(\alpha,\beta)$

(31) $\mathit{Result}(\alpha,\beta) \Rightarrow \mathit{cause}(e_\alpha, e_\beta)$[5]

Here the semantics of *Cond-Result* mirrors in the discourse structure the semantic connection between the epistemic modals when they are attached to each other. This defeasible rule seems to be lacking in Japanese. The lack of such a rule would also explain why □◇ sequences are unavailable with a modal reading unless there are explicit discourse cues to indicate the appropriate relation.

But Japanese doesn't license such discourse relations unless they're explicitly marked. And without them, the evidential presuppositions can't be satisfied. The derivational link requires a certain sort of information flow, which is what the discourse structure gives us – whether as in *Narration* it's certain enabling relations or as in *Result* it's a causal or inferential dependency or as in *Elaboration* it's another type of inferential dependency. Only in the presence of such relations can the right connection between the evidential presuppositions of *nitigainai*(ϕ) (or wouldϕ) and ϕ be constructed. But in Japanese these relations must be explicitly marked in the discourse – not so in English. If this derivational link is explicitly made, the discourse becomes acceptable.

On the other hand, when given a context that provides evidence for the relevant statements under *nitigainai*, the felicity of the discourses improves dramatically (see the survey results in the appendix). In this case, *hazu*'s deictic presupposition isn't met even when the first modality is by hypothesis anchored. The reason for this may be that there is a conflict between the anaphoric dependency of the modal meaning of *hazu* and its deictic presupposition.

7.3. Contrast 2: No particle vs. discourse particle

The first hypothesis we explore is based strictly on discourse relations. The basic idea is that Japanese doesn't support a discourse relation appropriate to the satisfaction of the evidential presuppositions between the first and subsequent sentences of modal subordination constructions due to lack of a suitable inference rule; the connective, however, licenses and indeed forces the construction of an appropriate relation. Let's see how this idea can be spelled out.

This observation leads to the core of the discourse relation-based analysis. On this analysis, the conclusion is that Japanese lacks a defeasible rule of the sort specified above for English modal subordination. The idea here is that the connection between two modalized propositions does not support the script-like knowledge needed to infer the *Narration* relation; and, indeed, this relation does not seem to be supported in general, as shown by the infelicity of *Continuations* with *kamosirenai*.

Now, lacking a rule to connect modalized utterances, it is impossible to connect the content in the scope of the two modals in a way so as to satisfy the evidential presuppositions. The derivational link requires a certain sort of information flow, which is what the discourse structure gives us – whether as in *Narration* it's certain enabling relations (i.e. *occasion*) or as in *Result* it's a causal or inferential dependency or as in *Elaboration* a type of dependency based on subtype relations. Only in the presence of such relations can the right connection between the evidential presuppositions of *nitigainai*(ϕ) (or *would*ϕ) and ϕ be constructed. But unlike English, these relations must be explicitly marked in the discourse in Japanese. If this derivational link is explicitly made in the Japanese text, the discourse becomes acceptable. This fact suggests that it is indeed the difficulty of inferring discourse relations that causes problems in the modal subordination examples.

Let's consider just what particles do in fact improve modal subordination. There are at least three: *sosite* 'then', *sorede* 'that and', and *sorekara* 'after that'. One may note some morphological similarity between these

connectives: they all begin with the morpheme *so*, which is one of the *so*-series distal demonstratives. These forms can serve to pick out salient elements in the context of speech, like other demonstratives, but also have anaphoric functions, as noted by Hoji *et al*. (2003).

In the particular case of the particles, *so* serves as a propositional anaphor. *Sosite* means something like 'that and' or 'that then', *sorede* 'that and', and *sorekara* 'that after'. An idea that therefore immediately comes to mind is that the possibility of modal subordination here stems from this property of the connectives; in particular, the propositional anaphor picks up the content of the proposition in the scope of the modal, which is then 'transported' to the following sentence and can serve to satisfy the evidential presuppositions there. This is in effect a finer analysis of the discourse perspective.

Before going into the details, let's first lay out some background about propositional anaphora. Anaphors of propositional type seem to be able to ignore the ordinary DRT scope constraints on anaphora in Japanese and other languages in certain circumstances:[6] when the sentence they appear in is modified by a modal operator, appears in a conditional, or appears with the particles *yo* or *zo*. We show here an example with modal operators, as these are the cases we are concerned with here; we have already seen an instance of the conditional case in (24b). First let's consider the case where the demonstrative appears without an associated connective.

(32) a. *Taroo-wa ano bangumi-o miteiru kamosirenai*
Taro-NOM that show-ACC watch might
'Taro might be watching that show/It might be the case that Taro is watching that show.'
b. *iya, soo nitigainai*
no that must
'No, that must be right/No, he definitely will.'

Here, the second sentence does not claim that it is certainly the case that it might be that Taro watches that show; rather, it strengthens the claim made about Taro's watching that show in the first place. More formally, the second sentence doesn't mean *would*(*might*(φ)) but simply *would*(φ). This shows that *soo* is able to access the content under the scope of the modal. This can also occur in English.

(33) It might be the case that Taro is watching the show. No, that's definitely true/right.

The crucial point for us is that the Japanese anaphors can pick up the content under the modal when they themselves appear in a modalized sentence.

The same is true for the discourse connectives that contain *soo*, as shown by the original example with *sosite*, repeated here, and the following two with *sorede* and *sorekara*.

(34) a. *ookami-ga* *kuru* *kamosirenai.* *sosite* *Ø/soitu*
wolf-NOM come might then Ø/that-guy
anata-o *taberu* *nitigainai*
you-ACC eat surely
'A wolf$_i$ might come in. Then it$_i$ would eat you.'

b. *ookami-ga* *kuru* *kamosirenai.* *sorede* *Ø/soitu*
wolf-NOM come might then Ø/that-guy
anata-o *taberu* *nitigainai*
you-ACC eat surely
'A wolf$_i$ might come in. And then it$_i$ would eat you.'

c. *ookami-ga* *kuru* *kamosirenai.* *sore-kara* *Ø/soitu*
wolf-NOM come might that-after Ø/that-guy
anata-o *taberu* *nitigainai*
you-ACC eat surely
'A wolf$_i$ might come in. After that, it$_i$ would eat you.'

Now, if these observations are correct, the modal subordination data can be explained as follows. The propositional anaphor is able to access the content under the modal in the first sentence for its antecedent. This content is then, by monotonic inference on the discourse connective, connected to the second sentence by a discourse relation (either *Narration* or *Elaboration*, depending on the content of the second sentence; in these examples, it is *Narration*). The content of the propositional anaphor together with the discourse relation inferred then serves to satisfy the evidential presupposition of *nitigainai*.

One possible concern here is that we are mixing the points at which anaphora resolution and presupposition satisfaction occur. A standard assumption in dynamic semantics (and elsewhere) is that presuppositions must be satisfied or not before semantic computation can even take place. But if this is right, how can a propositional anaphor contribute to satisfaction even though it should not be resolved until after satisfaction takes place? There are two answers to this objection. First anaphora resolution may be understood as presupposition satisfaction or binding (Geurts 1999), and it is well

known that some presuppositions may depend for their satisfaction on the satisfaction of other presuppositions. The second answer lies in the nature of the presuppositions in our analysis. They put requirements on the input context, but the requirements themselves are underspecified; they contain anaphoric conditions. What this means is that the presupposition will be introduced prior to resolution of the propositional anaphor; but, since the ordering of resolution of anaphoric conditions is left underdetermined, it is perfectly possible to resolve the propositional anaphor before resolving the anaphoric content of the evidential presupposition. The problem thus evaporates when one considers the issue more deeply.

There are of course some contexts where modal subordination is supported without any discourse particle. When given a context that provides evidence for the relevant statements under *nitigainai*, the felicity of the discourses improves dramatically (see the survey results at the end of the chapter). So contextual effects can, as we know from the study of discourse relations, also license the construction of a discourse structure appropriate to satisfy the evidential presuppositions of *nitigainai*.

On the other hand, we continue to see a stark contrast between the modal subordinations involving *hazu* and *nitigainai*. Since *hazu* requires an external anchor, the anaphoric link together with a discourse relation like *Narration*, *Elaboration* or *Result* isn't sufficient to satisfy its presupposition, and infelicity results. *Hazu's* deictic presupposition isn't met even when the first modality is by hypothesis anchored. Imposing a *Result* relation between a first speech act and an assertion with *hazu* generates an implicature that the first speech act provides the best evidential grounds for the assertion, but *hazu*'s presupposition tells us otherwise. Note that such an account also explains why the hearsay modal *rasii* is infelicitous in conditional consequents, as in (6c).

This point may be mysterious but consider the following. *Result* and *Narration* have an information dependency of the second constituent on the first, a dependency that is reversed for a relation like *Explanation*. It is this information dependency that conflicts with the evidential requirements of *hazu*. Since *hazu*, and also other evidentials with deictic presuppositions, makes crucial reference to *extralinguistic* information, it makes sense that forcing dependence via discourse relations on linguistically introduced information results in conflicts with the evidential presupposition and infelicity.

The hypothesis about discourse relations works out nicely in several respects. However, there are some empirical difficulties. The most striking is: given that it is impossible to infer discourse relations across a sequence of

modalized sentences in Japanese, why is it that the ◇◇ sequence *kamosirenai-kamosirenai* is felicitous? One hypothesis is that since *kamosirenai* doesn't have any evidential presuppositions, we don't need a particular or strong relation to satisfy the evidential requirements of the modal. Perhaps there is just the bare *Continuation* relation that holds in the ◇◇ sequence but that's sufficient to license the modal subordination in that case. But then what about the unavailability of □◇ sequences with a modally subordinated reading unless there are explicit discourse cues to indicate the appropriate relation? This remains an unexplained fact. Perhaps discourse relations aren't the heart of the issue.

As stated above, *sosite* in (24) serves to mark *Narration*, *Elaboration* or possibly *Result* between the constituent α in its scope and some other discourse segment: $R(?,\alpha)$, where R is one of these three relations. For our modal subordination texts, the relevant relation is *Result* or even *Cond-Result*, as noted above. Since e.g. (24) includes only one other discourse segment, the first sentence γ, ? is resolved to this segment, giving $Result(\gamma,\alpha)$. The Resultative link suffices to fix the evidential requirements of *nitigainai*. This is because the evidential presupposition is a *relational one* between the information in the context plus perhaps some additional accommodated information and the proposition under the scope of the modal. Given what Johnson (2003) says about *nitigainai*, we could conceive of a notion of inference which takes into account *Result* relations as well as of course conditional dependencies (which via a Deduction theorem would represent *logical* inferences as well as perhaps others). Thus, the evidential requirements of *nitigainai* are met by the discourse structure in such cases or by the presence of a conditional, as in the next case to be considered. There is no clash between the modal anaphoric behavior of *nitigainai* and its evidential presupposition. Things are otherwise with *hazu*.

7.4. Conditional Dependence

We've seen that the conditional improves modal subordination cases in Japanese. Thus, it must somehow restrict the epistemic possibilities relevant to the interpretation of the modal in the consequent. Conditional repeated content serves to restrict the set of epistemic possibilities to those verifying the proposition in the scope of the first modal. In order to make this work out, we need an interpretation of the conditional where the evaluation of the antecedent affects the epistemic possibilities of the input state. There is independent evidence for this in both languages. Gillies (2004) argues that

conditionals have a modal flavor: more specifically, they should obey the following equivalence:

– $\neg(\phi \Rightarrow \psi) \leftrightarrow \Diamond(\phi \wedge \neg \psi)$

This suits us, because we have strong evidence that a conditional improves the interaction between Japanese modals. In Gillies's (2004) definition conditionals introduce tests on (our first component of) information states: a state σ will pass $\phi \Rightarrow \psi$ iff σ obeys the Ramsey test for this conditional – i.e. $\sigma + \phi + \psi = \sigma + \phi$. For us this doesn't reflect the fact that ψ can actually alter the information state – e.g., by having existential quantifiers in it. And we need to test epistemic possibilities in a given context not the discourse context itself. But we can get something equivalent by extending our notion of a descendant to a sequence of formulas. To say for example that σ has a ϕ, ψ descendant is just to say that σ has a ϕ descendant σ' and σ' has a ψ descendant σ''. The definition below ensures that all the epistemic possibilities of a given element of the discourse context together with the (actual) world and assignment support the conditional.

– $\sigma\,[\phi \Rightarrow \psi]_A\sigma$ iff every ϕ descendant of σ has a ψ descendant and $\forall \epsilon \in 3(\sigma)\forall \epsilon'$ such that $\langle \epsilon, \epsilon' \rangle \models_d \phi$, $\exists\, \epsilon''\langle \epsilon', \epsilon'' \rangle \models_d \psi$.

The conditional once again permits the accommodation of the evidential requirements of *nitigainai*. Given that we've said that *hazu* has a deictically anchored presupposition, the conditional once again generates a conflicting implicature with the deictic presupposition, resulting in infelicity of modal subordination.

7.5. Subordination and topics

The Japanese topic marker *-wa* improves the felicity of modally subordinated discourses, when it's attached to an overt pronoun coreferential with the indefinite in the first sentence of discourses like (16):

(35)

ookami-ga	*kuru*	*kamosirenai.*	{#*soitsu-ga*/?*soitsu-wa*}
wolf-NOM	come.in	might	it-NOM/it-TOP
anata-o	*taberu*	*nitigainai*	
you-ACC	eat	must	

'A wolf might come in. It must eat you first.'

Why should the topic marker improve modal subordination discourses in this way? One hypothesis is that modal contexts allow for construction of a subordinated discourse topic; use of a topic marker then could allow a pronoun to search such subordinated topics for possible antecedents in addition to the overall universe of discourse (top-level DRS) or highest topic.

8. Further wrinkles: Modal subordination with emphatics

Modal subordination is possible even without a modal when certain sentence-final emphatic particles are used, such as *yo*. Note that the tense of the second sentence is nonpast, meaning that a futurate interpretation is available (example due to Ken-ichiro Shirai).

(36)	*ookami-ga*	*kuru*	*kamosirenai.*	*Ø/soitu*	*anata-o*
	wolf-NOM	come	might	Ø/that-guy	you-ACC
	taberu	*yo*			
	eat	YO			

'A wolf$_i$ might come in. It$_i$ (will) eat you, man (rough gloss).'

The function of *yo* is still not well understood, but generally speaking seems to mark a proposition that the speaker takes to be either new or important information for the hearer (Suzuki Kose, 1997). Here it appears to indicate to the hearer that the sentence in its scope is a warning/caution, and so has special relevance for the hearer. The sentence with yo is used with a special intonation, but this intonation cannot license subordination by itself, showing that the particle serves as licenser. We do not discuss the role of intonation in this paper.

To conclude, modal subordination in Japanese is much more restricted than in English. The standard pattern requires an overt marker of subordination for the right epistemic possibility to be picked up. *Hazu* doesn't support modal subordination at all at least not in the standard cases. *Nitigainai* can support modal subordination only marginally in out of the blue contexts, though it works much better with discourse particles or conditionals.

We also note that some speakers find a distinction between overt and covert pronouns which we do not discuss in this paper.

Yo poses a problem to our and other analyses of modal subordination, because *yo* itself is not a modal particle. But then how can modal subordination be possible without a modal in the second sentence (36)?

To show that *yo* itself is not a modal, note that the perfectivity of (37) shows that the proposition is actual:

(37) *Taro-ga* *kinoo* *gakkoo-ni* *kita* *yo*
Taro-NOM yesterday school-DAT came YO
'Taro came to school yesterday.'

It turns out that subordination is also possible with the particle *zo*:

(38) *ookami-ga* *kuru* *kamosirenai.* *Ø/soitu* *anata-o*
wolf-NOM come might Ø/that-guy you-ACC
taberu *zo*
eat ZO
'A wolf$_i$ might come in. It$_i$ (will) eat you first, man (rough gloss).'

In future work, we will investigate the semantics of these particles and how this semantics facilitates modal subordination. There are also other modal particles that we intend to investigate. Evidentials and even expletives have, we think, a similar semantics in that they adjust epistemic possibilities. There are complex issues with the latter categories concerning their scope and at what level of interpretation they come into play (Potts 2003; Faller 2002). Faller and others have argued that evidentials are operators on speech acts and so don't interact with asserted content. While we find the latter claim unintelligible (since all implicatures interact with and depend on truth conditional content), we do think that the idea that they might work on the level of speech acts is worth pursuing. But in SDRT terms this means that they are discourse relations. The way Faller's tests (*Is that true?, That's not true*) work with discourse relations would lead us to believe that this is the case.

9. Acknowledgements

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Annexes

A. Survey Results

Continuation with *kamosirenai*:

Form	Sequence	√	?	*
Bare	k-k	7	0	1
	t-k	5	0	4
	h-k	4	3	2
Sosite	k-k	7	0	0
	t-k	5	0	2
	h-k	5	1	1
Conditional	k-k	5	0	1
	t-k	5	0	1
	h-k	4	1	1
Bare2	k-k	7	0	2
	t-k	4	2	3
	h-k	4	0	5

Continuations with *nitigainai*:

Form	Sequence	√	?	*
Bare	k-t	3	1	5
	t-t	4	1	4
	h-t	5	1	3
Sosite	k-t	5	0	2
	t-t	4	3	0
	h-t	5	1	1
Conditional	k-t	5	1	0
	t-t	5	0	1
	h-t	4	1	1
Bare2	k-t	6	0	3
	t-t	7	0	2
	h-t	5	1	3

Continuations with *hazu*:

Form	Sequence	√	?	*
Bare	k-h	0	2	6
	t-h	1	2	6
	h-h	4	1	4
Sosite	k-h	2	1	4
	t-h	2	1	4
	h-h	3	2	2
Conditional	k-h	2	1	3
	t-h	2	1	3
	h-h	2	1	3
Bare2	k-h	1	3	5
	t-h	1	4	4
	h-h	4	1	4

"Bare" refers to the circumstance where neither *sosite* or a conditional is present in S2. 'k' is for *kamosirenai*, 'h' for *hazu*, and 't' for *nitigainai*. So the sequence 'k-h' indicates a first sentence with *kamosirenai* and a second sentence with *hazu*.

The particular conditional used was *sositara*, morphologically *soo-si-tara* 'that-do-COND'. So it includes a specifically anaphoric element. *So-si-te* 'that-do-CONT' is similar. I think that this choice does not affect the results.

"Bare2" is the bare examples interpreted with a specific context intended to make the prediction in S2 plausible. Specifically the respondents were asked to evaluate the discourses…

> in a situation where the hearer (you) knows the following facts: a) you are on an island that is having a particularly harsh winter, b) the wolves in the area are ravenously hungry and c) you are sitting closest to the door, so you are the first person any wolf coming in will encounter. (from survey text)

Note that the sample size is slightly different for the two 'bare' sets and the *sosite* and conditional sets. The first few respondents were given a slightly simplified version.

Notes

1. The second author does not share this judgement, and neither do most native speakers we have consulted, suggesting that this may not be the strongest evidence. We reproduce it here because it shows that this kind of incompatibility appears at least in some dialects of Japanese.
2. Faller translates the sentence as "'It is raining' and the speaker conjectures that it is raining." This translation seems to us infelicitous, in a similar way to the well-known Veltman example '*It is not raining. It might be raining*' (Veltman, 1996). This infelicity suggests that making a conjecture about the truth of φ is incompatible with knowing that it is true.
3. It also differs from *accommodation* views of *might*, according to which *might* always enlarges the epistemic possibilities under consideration. On this view it rather refines certain epistemic possibilities that must be already in place.
4. This particular statement seems to be correct regardless of whether one accepts the hypothesis itself.
5. $\Rightarrow$ is a conditional in the language of information content, which is distinct from the glue logic used to infer discourse relations. See Asher and Lascarides (2003) for details.
6. See Asher (1993) for some relevant discussion of English propositional anaphors.

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The past and perfect of epistemic modals

Ronny Boogaart

1. Introduction

This paper addresses the interaction between tense, aspect and modality, as it is manifested in epistemic modal constructions in English and Dutch. I will start out by presenting two puzzles concerning the interaction between two of the categories – tense and modality – and then present one unified solution for these two puzzles in terms of the third category, aspect.

Modal verbs, by definition, allow for an epistemic reading, presenting an estimation of the likelihood that a proposition is true. However, this reading is not available in all tenses. More specifically, it has been claimed that neither the past nor the perfect of a modal verb allows for an epistemic reading (see, for instance, Condoravdi 2002 and Abraham 2001, respectively). In section 2, however, I will show that the past tense of the Dutch modal verbs *kunnen* ('can') and *moeten* ('must') does allow for epistemic readings, but only in (free) indirect speech. There are, then, two puzzles to be solved:

1. Why can the perfect of a modal not be epistemic?

2. Why is the past tense of epistemic modals restricted to (free) indirect speech?

Both phenomena will be argued to be a matter of aspect rather than tense, more specifically of the close link between imperfective aspect and subjectivity. In section 3, I will show that the general connection between imperfective forms and subjective, or 'perspectivized', information fits naturally within the anaphoric analysis of imperfective aspect that has a long-standing tradition in Romance linguistics (Berthonneau and Kleiber 1993 and references cited). I will argue that an epistemic modal reading is a specific instantiation of the perspectivized reading of the imperfective – which, in turn, is a specific instantiation of its strictly temporal reading. In section 4, I apply this idea to the past and perfect of epistemic modals. The

specific interpretation of these forms follows from the semantic constraints imposed by aspect, in combination with those imposed by tense and modality.

2. Tense and modality: Two puzzles

2.1. The perfect of epistemic modals

The incompatibility of perfect and epistemic modality can, of course, only be demonstrated for languages in which, unlike in English, modal verbs actually have a perfect form. This is true at least in Dutch, see the examples in (1b) and (2b):

(1) a. *Hij moet ziek zijn.*
He mustPRES ill be
'He must be ill.'
b. *Hij heeft ziek moeten zijn.*
He has ill must be
'He has been forced to be ill.'

(2) a. *Hij kan ziek zijn.*
He canPRES ill be
'He may be ill.'
b. *Hij heeft ziek kunnen zijn.*
He has ill can be
'He has been able to be ill.'

The examples in (1a) and (2a), containing a present tense of the modal verbs *moeten* ('must') and *kunnen* ('can'), could be either epistemic or non-epistemic. Still, because of the nature of the complement, presenting a situation that is beyond the control of the subject referent, the modal verb clearly prefers an epistemic reading in both instances. Nonetheless, the perfect form of these modals, in (1b) and (2b), can only get the non-epistemic reading. To be sure, these sentences are not ungrammatical, but the non-epistemic reading is somewhat odd for this particular predicate; paraphrases of (1b) and (2b) are "he has been obliged to be ill" and "he has been able to be ill".

For Dutch, these facts has been explained by pointing out that the perfect expresses past and that epistemic modality is necessarily present, since it concerns the judgment of a speaker at the moment of speaking (Nuyts

2000). More generally, in syntax, this intuition has been formalized as the claim that the functional projection for epistemic modality is hierarchically ordered above the one for tense, so that tense may be in the scope of epistemic modality, but not vice versa (Cinque 1999, Abraham 2001). However, to the extent that the Dutch present perfect indeed expresses past – which is in any case not the *only* thing it expresses – it still can not be the crucial impediment for an epistemic reading since the simple past tense *is* compatible with such a reading, albeit only in specific contexts. This brings us to the second puzzle.

2.2. The past of epistemic modals

The second puzzle, concerning the past rather than the perfect of epistemic modals, is a bit more complicated than the first one, for two reasons. First, the claim from the literature is not simply that the past tense of a modal verb does not allow for epistemic readings. In fact, it is undisputed that the past tense *form* of modal verbs may be epistemic, see (3), taken from Stowell (2004).

(3) *Jack's wife could not be very rich*.
= it IS not possible that Jack's wife is very rich
≠ it WAS not possible that Jack's wife was very rich

However, in such instances the morphological past tense is not semantically a temporal past tense: it does not express precedence with respect to the point of speech. In fact, as Stowell argues, the time of epistemic evaluation in (3) is still the moment of speech, not some moment preceding it. So the claim from the literature is not so much that the past tense as such is incompatible with an epistemic reading, but rather that the semantic category '(temporal) past' is incompatible with epistemic meaning – which is basicallly the same thing as has been proposed to 'explain' the perfect modal puzzle above.

The other reason that the situation for the past tense is a bit more complicated than it is for the perfect is that the claim for the past tense is not correct. There is an important group of counterexamples to the above generalization on the incompatibility of (semantic, temporal) past tense and epistemic modality, which does not exist for the claim about the perfect. Turning again to the Dutch equivalents of *can* and *must*, *kunnen* and *moeten*, let us consider the past tense equivalents of (1a) and (2a), in (4) and (5).

(4) *Hij moest ziek zijn.*
He mustPAST ill be
≠ it IS very likely that he is ill
= it WAS very likely that he was ill

(5) *Hij kon (wel eens) ziek zijn.*
He canPAST (PARTICLES) ill be
= it IS possible that he is ill
or it WAS possible that he was ill.

Dutch (5) does allow for the kind of epistemic reading that Stowell assigned to English (3) (*It IS possible that he is ill*), albeit only in the presence of the (untranslatable) particle combination *wel eens*. An authentic example from the internet is given in (6).[1]

(6) *Hij kon wel eens op het spoor van iets zijn.*
He canPAST PARTICLES at the track of something be
'He might be on to something'.

The past tense form *kon* ('could') in (6) does not express temporal precedence with respect to the moment of utterance but rather epistemic distance with respect to what is known to be true at the moment of utterance, much like *could* does in English (3). As I said, this reading is not crucial here since the past tense, on this reading, arguably does not constitute a 'real' (i.e. temporal) past tense. What is more important is that this 'present' epistemic reading is not the only possible epistemic reading of (5); (7) presents an example of a real past epistemic reading for *kunnen* ('can').[2]

(7) *Zij bad mij te gaan om hem op te zoeken; want zij had hem lief**; hij kon ziek zijn**, haar hulp behoeven.*
'She begged me to go and visit him, since she loved him, **he could be sick** and be in need of her help.'

In this example, the epistemic evaluation time for the interpretation of *kon* ('could') is not constituted by the point of speech, but is constituted by a point in time preceding the point of speech, namely the time of her begging presented in the first clause. The past tense on the epistemic modal simply indicates that the time of epistemic evaluation is past (cf. Fagan 2001 for similar examples from German).

Moreover, the sentence in (4), containing the necessity modal *moeten* ('must'), does not allow for the non-temporal reading of the past tense at all, and may still be epistemic. Note that the possible interpretations of Dutch (4) thus constitute the mirror image of English (3). An example of the epistemic use of past tensed *moeten* is given in (8).

(8) *Het moest wel een licht en lief geheim zijn.*
It mustPAST PART a light and sweet secret be
'The secret had to be a light and sweet one'.

Thus, contrary to the claim that the past tense of epistemic modals does not allow for a real past interpretation, the past tense of Dutch *kunnen* ('can') can be a temporal past semantically, as in (7), and the past tense of Dutch *moeten* ('must'), on the epistemic reading, must be a temporal past, as in (8).[3] This has been summarized below.

	epistemic evaluation time = S	**epistemic evaluation time < S**
***kunnen* ('can')**	YES	YES
***moeten* ('must')**	NO	YES

Figure 1. kunnen vs. *moeten*

At this point, one might still think that the temporal past reading is available for the Dutch modals mainly because these have not grammaticalized to the same extent as the English modals. For one thing, all Dutch modals at least have a morphological past form. However, on the basis of the Dutch examples that we found, it can easily be shown that the English modals, in similar contexts, do allow for a temporal past reading as well. This is evidenced for *could* in (9) and for *must* in (10).

(9) *The voices melted into his reality and he didn't realise that* ***he could be ill****, he didn't question whether it was real or not.*[4]

(10) *The parents thought their son was insane because he wanted to make a living selling and manufacturing Aeolian harps, beautiful stringed instruments that play eerie music when the wind blows through them. Why didn't he want to go to business school and take over Dad's business? Why didn't he want to be a doctor or a lawyer?* ***He must be ill****, mad or very bad!* [5]

The underlined clauses in (9) and (10) can only be paraphrased using a past tense, namely as "it *was* possible that he was ill" and as "he *had* to be ill" respectively.These examples, just like the Dutch examples in (7) and (8), thus present counterexamples to the claim that semantic past is incompatible with an epistemic reading of the modal verb.

However, there is obviously something special about these examples: all of them present instances of (free) indirect speech or reported thought. Some event of saying, thinking or believing is either given explicitly in a syntactically dominating clause, as in (9), or it can be inferred from the surrounding context, as in (7), (8) and (10). One could, therefore, save the hypothesis on the incompatibility of past and epistemic modality by assuming that the morphological past tense in these examples is not a real past tense semantically after all (Enç 1996, Abusch 1997, Fagan 2001).[6] One could do so by extending the *sequence of tenses* (SOT) analysis of indirect speech, as in (11), to include the cases of free indirect speech and reported thought in the examples above.

(11) *He said that he was ill.*

The morphological past tense that appears here would, on this analysis, be semantically empty (or, on an alternative account, semantically present), expressing simultaneity with an independently provided time in the past. In (9) and (11), this time is explicitly given in the matrix clause, whereas in (7), (8) and (10) this time is the time of some covert intensional predicate to be inferred from the context. I will not be pursuing this line of thought, mainly for the following reason. The SOT analysis of embedded tense leaves us with three different 'meanings' for the past tense:

1. Precedence with respect to the moment of utterance (or with respect to a shifted deictic center as in *he will say that he was sick*)
2. Non-temporal distance from the ground of the discourse, as in English (3) and in Dutch (6)
3. Present (or, at least, 'fake past')

Whereas it is easy to show that the 1st and the 2nd use of the past tense actually are based on one underlying meaning – beit in terms of some distance metaphor or in terms of times versus worlds, the third meaning forces us to give up on a unified analysis of the meaning of the past tense. In 4.1, I will show that such a bold move is not necessary to account for the 'marked' interpretation of epistemic modals in the past tense. In the remain-

der of this paper, I will show that epistemic modals, in fact, do not really behave differently from other *states* in discourse. So I am introducing here the third category, besides tense and modality: aspect. I will argue that in terms of aspect a unified explanation can be provided for both puzzles: the 'marked' interpretation of past tense epistemic modals in (7)-(10) (*puzzle 2*) and the lack of an epistemic reading for perfect modals, as in (1b) and (2b) (*puzzle 1*).

3. Aspect and modality

3.1. Aspect and anaphoric reference in English and Dutch

Since my solution to the two puzzles will crucially involve the notions of perfective and imperfective aspect as well as the concept of 'anaphoric temporal reference', it is unavoidable to start out with issues of terminology and definition. At least the following two issues need to be addressed:

1. What is 'anaphoric temporal reference'?

2. How is the distinction between perfective and imperfective aspect expressed in English and Dutch?

In the literature on tense and aspect, the notion of 'temporal anaphora' has been used to denote, at least, three qualitatively different things (Boogaart 1999). I am listing them below mainly in order to make clear that I am not using the term *anaphoric* for the phenomena in 1 and 2.

1. The use of the past tense in non-narrative discourse to present a 'definite' situation from the past (*I didn't turn off the stove*) (e.g. Partee 1973)
2. The use of the past tense in narrative discourse to present a coherent sequence of events from the past (e.g. Kamp and Reyle 1993)
3. A semantic property of imperfective aspect only: situations presented by means of imperfective forms always need to be linked to a reference time independently provided by the surrounding discourse; the situation is interpreted as simultaneous with (holding at) the reference time (e.g. Berthonneau and Kleiber 1993 and references cited there)

Whereas according to the approach in 1 and 2, the category tense *as such* is anaphoric, I am following a long-standing tradition in Romance linguistics by restricting the notion of temporal anaphor to the category of imperfective aspect; the approach was applied to English and Dutch in Boogaart (1999). If we, like Löbner (1988), use the Reichenbachian notion of R to represent the antecedent needed for an adequate use and intepretation of imperfectives, this results in the following representations for the semantic notions PERFECTIVE PAST and IMPERFECTIVE PAST.[7]

(12) a. PERFECTIVE PAST: E < S
(e.g. *he read a book*)
b. IMPERFECTIVE PAST: E,R < S
(e.g. *he was reading a book*, *he was ill*)

Among other things, this representation captures our intuition that imperfective past forms cannot be used to present 'all new' ('out of the blue') information, whereas perfective past forms can. Imperfective forms always expess simultaneity (E,R), whereas perfective forms, in fact, can not express simultaneity with any kind of reference point, as is evidenced by the sentences in (13) (perfective) and (14) (imperfective).

(13) a. *He said that he wrote a letter.*
b. *He met the guy who wrote the letter.*
c. *At 8 o'clock he wrote a letter.*
d. *When I came in, he wrote a letter.*
e. *I came into the room. He wrote a letter.*
f. *He writes a letter*

(14) a. *He said that he was writing a letter.*
b. *He met the guy who was writing a letter.*
c. *At 8 o'clock he was writing a letter.*
d. *When I came in, he was writing a letter.*
e. *I came into the room. He was writing a letter.*
f. *He is writing a letter.*

Situations presented by means of perfective forms can be either *before* or *after* a point in time given in the context, but they can never be interpreted as (going on) *at* such a temporal point – irrespective of this temporal point being provided by a matrix clause, a temporal adverbial, a *when*-clause, a preceding sentence, or by the moment of utterance itself (as in 13f and 14f).

Applying the anaphoric theory of imperfective aspect from Romance linguistics to English and Dutch immediately raises a further issue of terminology and definition: Which forms express perfective and imperfective aspect in English and Dutch, given that, in both languages, the present and past tense are aspectually unmarked? In (12), I have used the English simple past tense to illustrate both the semantic category of PERFECTIVE PAST (*he read a book*) and the category of IMPERFECTIVE PAST (*he was ill*). This illustrates that the English simple past tense as such is unmarked for grammatical aspect, or *viewpoint aspect* (i.e. the distinction between perfective and imperfective). In English, therefore, Aktionsart, sometimes labeled *lexical aspect* or *situation aspect*, is an important clue when deciding between a perfective and a imperfective reading. For lack of space, I cannot tell the whole story of the aspectual interpretation of unmarked tenses here (see Smith 1991; Boogaart 1999, 2004) but it suffices to note for now that, in English, event-clauses standardly get a perfective reading (see (13)), whereas states are standardly imperfective. In addition, the progressive verb form in English, as shown in (14), covers a subdomain of imperfective aspect, namely for events (and, to be precise, stage-level statives). This has been summarized in figure 2 below. The difference between English and Dutch is not crucial for the present discussion.[8]

Aktionsart	EVENT		STATE
Aspect	IMPERFECTIVE	PERFECTIVE	IMPERFECTIVE
English	*prog*	*simple tense*	
Dutch	*prog*	*simple tense*	

Figure 2. The expression of perfective and imperfective aspect in English and Dutch (Boogaart 1999)

Figure 2 intends to show that the aspectual interpretation of unmarked tenses follows from, on the one hand, lexical information (Aktionsart) and, on the other hand, the grammaticalization of marked forms, such as the progressive. Thus, for English, I will assume that (unmarked) statives are imperfective on the basis of lexical content, whereas events are usually perfective since the expression of imperfective aspect in event clauses has grammaticalized in an obligatory use of the progressive verb form.

3.2. From the temporal to the modal reading of imperfective aspect

There is a whole range of data to be found in the linguistic literature, ranging from formal syntactic work on *sequence of tenses* to discourse-pragmatic analyses of literary fiction, that point at a systematic connection between imperfective aspect and modality.[9] The (more or less) modal notions that have been associated with imperfective aspect can be divided in two groups, partly corresponding to two distinct research traditions. One the one hand, imperfective rather than perfective forms are typically used in conditional, counterfactual and hypothetical contexts – including also children's play and the narration of dreams (e.g. Fleischman 1995; Ippolito 2004: Giannakidou and Zwarts, to appear). On the other hand, it has been observed that imperfective forms dominate discourse representing speech, thought or perception of an individual other than the speaker (e.g. Ehrlich 1993, Fleischman 1995); Caenepeel (1989) even argues that *all* stative clauses in English, including all clauses containing a progressive or perfect construction, present 'perspectivized' information. Some perfective forms, in fact, are simply ungrammatical in contexts that explicitly introduce a perspective, as is evidenced by the French passé simple in indirect speech contexts (e.g. Landeweerd and Vet 1996).

My claim is that the strictly modal use of imperfectives and the 'perspectival' use – as well as, in fact, all other uses of imperfectives – are related; they are specific instantiations of the underlying anaphoric semantics of imperfective aspect. All that imperfective forms do, at the level of semantics, is impose the anaphoric constraint that the situation is simultaneous with some independently provided reference point R, as was represented in (12b).The fact that imperfective forms allow for such seemingly different readings – modal as well as non-modal – results mainly from the fact that the semantics of the form does not put any constraints on the source, or the nature, of this reference time. In the case of a *present* tense, R is standardly constituted by the point of speech (the reference point *par excellence*). In the case of an imperfective *past*, R may be a strictly temporal reference point, as provided by a *when*-clause or a temporal adverbial, or the time of an event presented in the preceding discourse, as demonstrated in (15a-c).

(15) a. *John came into the room. Mary was reading a book.*
b. *When John came into the room, Mary was reading a book.*
c. *Yesterday at 3 o'clock, Mary was reading a book.*

However, in past tense narrative discourse, R will ususally be a point of perspective, or a point of perception, that can not be identified with the time of any event mentioned explicitly in the preceding discourse. This is true even for the standard example of an overlapping state, given in (16a).

(16) a. *John entered the room. It was pitch dark in the room.*
b. *John switched off the lights. It was pitch dark in the room.*
c. *John switched on the lights. It was pitch dark in the room.*

If we simply assume that states overlap with surrounding events, then only the temporal interpretation of (16a) is correctly predicted; it was probably dark before, at, and after the moment at which John entered the room. On the most likely reading of (16b) and (16c), however, the state of darkness was holding *right after* or *right before* John's handling the light switch, respectively. Clearly, the relative ordering of these situations should be left to pragmatic inferencing. Semantically, however, the second sentence in (16a-c) expresses the same thing in all three instances: given that the sentence presents a state, and that states in English are standardly imperfective (see figure 1), the situation needs to be linked to an independently provided reference time. The most likely candidate in all three examples is constituted by a point of perspective (or point of perception), i.e. the point at which John noticed the room being dark. After all, even in (16a), there is no way of telling whether or not the room was already dark before John came in. As long as there is no indication to the contrary, we may assume that it was, but this follows from the principle of Relevance (Wilson and Sperber 1993) and should not be made part of the semantics of the second clause.

The subjective, perspectival reading of imperfective past forms in narrative discourse, such as the interpretation of *It was pitch dark in the room* in (16 a-c), is not usually called a 'modal' reading. Still, the fact that a point of perspective can act as reference time for the interpretation of an imperfective is a definite step towards what is traditionally considered 'modal'. In fact, an epistemic evaluation time may be considered a specific kind of perspective point, which, in turn, may be considered a specific kind of temporal reference point. This has been represented in figure 3 below.

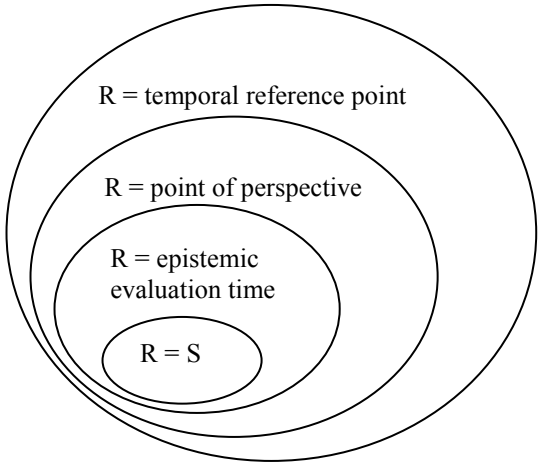

Figure 3. Different kinds of R allowed to function as antecedent time for the interpretation of imperfectives

Presumably, then, the fact that imperfectives have so many modal uses, whereas perfective forms quite generally lack them, can be ascribed to the anaphoric nature of imperfectives: they are capable of introducing a subjective point of view into the discourse, which may function as epistemic evaluation time. Put differently, modal readings require the temporal ordering relation of simultaneity – more specifically, simultaneity with a point in time that can function as point of evaluation for the truth-conditional content of the clause – but perfective forms are incompatible with any kind of simultaneity interpretation (see (13)), including simultaneity with a perspective point or an epistemic evaluation time.

We are now in a position to solve the two puzzles from section 1. I will start out with Puzzle 2 (section 4.1), since I think the interpretation of epistemic modals in the past tense is not principally different from the interpretation of other statives in discourse, such as *It was pitch dark in the room* in (16a-c). Afterwards, I will show how this is related to Puzzle 1, i.e. the incompatibility of perfect and epistemic modality (section 4.2).

4. Two puzzles solved

4.1. The past of epistemic modals

It is uncontroversial that epistemic modal verbs present states.[10] As can be seen in figure 1, unmarked states in English receive an imperfective reading. Given the semantics of imperfective aspect, in (12b), this means the situation needs to be linked to a reference time, which, in the case of an epistemic modal, needs to function as an epistemic evaluation time. In the case of a present tense epistemic modal, the point of speech will obviously fullfill that role perfectly. The point of speech may be regarded as a particular kind of epistemic evaluation time (see figure 2) – probably the protypical one, but still not the only possible one.

In the case of a past tense, we need to infer some reference point – distinct from and preceding the point of speech – from the context in order to arrive at a coherent reading, much like we did in (16a-c). However, not just any reference point can fullfill the role of epistemic evaluation time; in particular, a strictly temporal reference point, such as provided by a temporal adverbial or a *when*-clause, will not suffice. Simply put: there has to be *someone* evaluating the probability of the state of affairs holding or not. In the absence of an explicit intensional predicate, as in (9), one cannot but infer some event of thinking/believing to provide the reference time for the epistemic modal, which is what happens in (7), (8) and (10), repeated below.

(17) *Zij bad mij te gaan om hem op te zoeken; want zij had hem lief; hij kon ziek zijn, haar hulp behoeven.*
'She begged me to go and visit him, since she loved him, he could be sick and be in need of her help.'

(18) *Het moest wel een licht en lief geheim zijn.*
It mustPAST PART a light and sweet secret be
'The secret had to be a light and sweet one'.

(19) *(...) Why didn't he want to go to business school and take over Dad's business? Why didn't he want to be a doctor or a lawyer? He must be ill, mad or very bad!*

The mechanism is basically the same one as the one that provides a point of perception for a coherent reading of the sentences in (16). Thus, the

'marked' interpretation of epistemic modals in the past tense follows from the semantics of imperfective aspect and the specific requirement of an epistemic modal, which needs an epistemic evaluation time as reference point. The past tense in these examples does what it always does: it indicates that the reference point precedes the point of speech (R < S), i.e. not the moment of utterance but some moment in the past functions as epistemic evaluation time. In my view, there is thus no reason for claiming that the past tense of epistemic modals is in any way not a normal, real (temporal) past tense in these cases – at least, no more, or less, than there is for other past imperfective forms, including all states and progressives in English.

My claim that there is really 'nothing special' about tense and aspect of epistemic modals, does not entail that there is 'nothing special' at all about epistemic modal verbs, as compared to other lexical statives, including non-epistemic modals. An interesting difference was noted by Abusch (1997), see (20).

(20) a. *He said that he was ill.*
(simultaneous or backshifted)
b. *He said that he must/could/might be ill.*
(simultaneous)

In (20a), the complement clause presents a state. Given that lexical states in English are standardly imperfective (see figure 1), this means that the situation of him being ill is interpreted as 'going on' at a contextually given point in time. This reference point may be provided by the matrix clause ('he was ill at the moment he said he was'), but it may also be a point in time preceding the time of the matrix clause, resulting in the so-called 'backshifted' reading of (20a). (As in: 'He was not at my party three weeks ago. When I saw him again two days later, *he said he was ill*.') Both readings of (20a) are, of course, compatible with the anaphoric analysis of imperfective aspect argued for above and, in fact, we do not need any formal device such as *sequence of tenses* to account for them.

However, the embedded modal in (20b) can only get a simultaneous reading: the time of the matrix clause is necessarily interpreted as providing the time of epistemic evaluation for the embedded modal. There does not seem to be a 'backshifted' reading available for (20b) in the same way as there is for (20a). This, then, may be taken as an argument against treating the past tense of epistemic modals in the same way as the past tense of other lexical statives; apparently, the embedded past tense in (20b) cannot express 'past of past'.

Where does this restriction on the temporal interpretation of epistemic modals come from? In my view, it follows from the earlier observation that epistemic modals do not allow for just any point in time to function as reference time. More specifically, they need an epistemic evaluation time. If the tense of the modal is present tense, then the epistemic evaluation time is automatically constituted by the point of speech. Being the prototypical reference point, it takes priority over any other candidate reference time that one could think of. Now, it seems that the matrix time in (20b), which is, in many respects, like a shifted 'point of speech' (S'), has a priviliged status as epistemic evaluation time, similar to the one assigned to the actual point of speech. In a way, asking why the embedded modal in (20b) takes the matrix time as evaluation time is just like asking why a present tense modal takes the utterance time as evaluation time: it is there, as the epistemic evaluation time *par excellence*, and it can not be overruled. For 'ordinary' statives, as in (20a), including non-epistemic modals, the choice of reference time is not as constrained as it is for epistemic modals: they merely need a *temporal* reference point and the matrix clause may provide one (after all, a perspective point is *also* a temporal reference point, see figure 2), but so may the preceding discourse. While imperfective forms invariably express simultaneity with a point of reference (E,R), tense and lexical content may impose constraints on the nature and the source of the reference point.

4.2. The perfect of epistemic modals

Turning, finally, to the question why the perfect of a modal, as in (1b) and (2b), repeated below, does not allow for an epistemic reading, there is one remaining terminological issue that may cause confusion: *perfect* should not be equated with *perfective*.

(1) b. *Hij heeft ziek moeten zijn.*
He has ill must be
'He has been forced to be ill.'

(2) b. *Hij heeft ziek kunnen zijn.*
He has ill can be
'He has been able to be ill.'

The difference between the two notions can be most easily demontrated by means of the English sentences in (21)

(21) a. *He was reading a book* IMPERFECTIVE PAST
b. *He read a book* PERFECTIVE PAST
c. *He has read a book* PRESENT PERFECT

The semantics of PERFECTIVE PAST and IMPERFECTIVE PAST were given in (12). The semantics of PRESENT PERFECT is a bit more complicated since these compound verb forms in English and Dutch present two situations rather than one. In addition to a situation in the past, as expressed by the past participle, the present perfect, by means of the present tense auxiliary, presents a state holding at the moment of utterance. It could thus be argued that the present perfect combines perfective and imperfective meaning: the past participle expresses perfective aspect (an event E1 completed before the moment of utterance), whereas the finite verb form presents a state (E2) and thus, following figure 1, gets an imperfective reading. The reference point at which the imperfective state presented by means of the finite verb form is holding, is obviously constituted by the point of speech. This can be summarized as in (22).[11]

(22) PRESENT PERFECT E2 < E1,R,S

Now, in (1b) and (2b) the modal verbs *moeten* ('must') and *kunnen* ('can') appear as the non-finite part of the perfect construction, represented by *E2* in (22).[12] Thus, they get a perfective rather than an imperfective reading. Consequently, as can be seen in (21), the situations (E2) are not interpreted as going on at some reference point in the past. Thus, there is no point in time in the past available for E2 to function as perspective point or epistemic evaluation time. The semantics of present perfect is incompatible with free indirect speech/reported thought readings since these readings require simultaneity with a point of perspective, leaving only a non-epistemic reading for the perfect modals in (1b) and (2b).[13] Which is what we set out to explain.

In contrast to (1b) and (2b), the sentences in (23), where the complement of the modal verb rather than the modal verb itself has a perfect form, of course do allow for an epistemic reading. In fact, just like their English equivalents, they prefer it over non-epistemic readings.

(23) a. *Hij moet ziek geweest zijn.*
He mustPRES ill to bePST PART to beINF
'He must have been ill.'

b. *Hij kan ziek geweest zijn.*
He canPRES ill to bePST PART to beINF
'He may have been ill.'

This is understandable since in (23) the modal verb presents a state holding at the present moment; it is simply the moment of utterance functioning as epistemic evaluation time, just like in (1a) and (2a). Since the perfect complement expresses anteriority, the sentences in (23) are *present* evaluations about a *past* event, but this reading is not available for (1b) and (2b). In the latter pair of sentences, the modal verb does not occur as the (present imperfective) finite part of the perfect construction, which is a precondition for taking the moment of utterance as time of epistemic evaluation for the modal.

As a counterexample to the claim that the perfect of a modal verb is incompatible with an epistemic reading, the Danish example in (24) is sometimes quoted (for instance by Vikner 1988, Eide 2001 and Stowell 2004).

(24) *Der har måsk nok kunnet være tale om en fejl.*
There has maybe PTL canPERF be talk of a mistake.
'It might have been a mistake'

The original source of this example is a note in Davidsen-Nielsen (1990: 213, nt.3), who calls it 'rare'; Vikner labels it as 'not completely unacceptable' (1988: 6). Eide adds similar examples from Norwegian, but claims the phenomenon is restricted to 'non-standard Norwegian dialects' (2001: 124). As for Dutch, epistemic instances of perfect modals, much like the Danish one in (24), are not very difficult to find. Actual examples for *moeten* ('must') and *kunnen* ('can') are given in (25) and (26).

(25) *Hij heeft veel onderzoek moeten doen voor dat boek.*[14]
He has much research must do for that book
'He must have done a lot of research for that book.'

(26) *Frankrijk ontkent niet dat het vertoon van strijdmachten de aanzet heeft kunnen zijn voor de recente verandering in de houding van de Iraakse autoriteiten.*[15]
'France is not denying that the display of armed forces may have triggered the recent change in the attitude of the Iraqi authorities.'

Even though in (25) and (26), like in (24), the modal verb occurs as the non-finite part of a perfect construction, the sentences get an epistemic reading, as should be clear from the English translations.[16]

And yet, the examples do not invalidate the analysis of perfect modals given so far. I argued that the past participle is aspectually perfective and does, therefore, not make available a reference point in the past to function as perspective point or epistemic evaluation time. Thus, a reported speech/thought reading, like the one that has to be assigned to epistemic modals in the past tense, is not compatible with the semantics of present perfect as given in (19). Now, the epistemic reading of (24)-(26) is not in any way like the epistemic reading of past tensed epistemic modals, such as those in (7)-(10). In fact, the epistemic interpretation of the perfect modals is exactly like the interpretation of the present tensed modals with a perfect complement in (23). Thus, the time of epistemic evaluation in (24)-(26) is the moment of utterance, not some moment preceding it. (At least in this respect, they could be compared to English (3) and Dutch (6)). In the words of Vikner (1988: 7): "In spite of appearances, it is the main verb that is in the perfect rather than the modal".

So why are the perfect modals in (24)-(26) interpreted as if they were present tense modals with a perfect complement? Presumably, this is the only way out for hearers who are, in these instances, confronted with contradictory information. One the one hand, the form of the modal rules out a past epistemic reading like the one that is available for modals in the past tense. On the other hand, the lexical content of the complement in these examples rules out a non-epistemic reading. (Or, at least, makes such a reading highly unlikely.) For many people, therefore, sentences such as (24)-(26) are anomalous and my analysis of perfect modals can explain why this is so. However, in actual language use, cooperative hearers, guided by the search for an 'optimally relevant' interpretation, will have no problem in arriving at the intended reading of these sentences, i.e. a reading in which the time of utterance is the time of epistemic evaluation. Such a reading does not take much processing effort, since the time of utterance is always given by the discourse situation and it is the prototypical (and perhaps default) time of evaluation anyway (see figure 2). Even though my analysis of the data in (24)-(26) is begging the question of *why* people would use these forms instead of the forms in (23) that show a more direct match between form and meaning, it should be clear that these examples do not really constitute counterexamples to the solution proposed for Puzzle 1. If anything, in fact, they confirm the incompatibiliy of the perfective past form, including the past participle form, of a modal verb and a past epistemic reading.

5. Conclusion

The reason that perfect modals resist an epistemic reading is not so much that epistemic modality is incompatible with, or cannot be in the scope of, past, but rather that epistemic modality is incompatible with perfective aspect. In order to get an epistemic reading for a modal verb, it is not necessary that the verb has present tense (or has a present-like interpretation, as in (3) and (6)), but it *is* required that the verb is imperfective. It may be present tense, taking the time of utterance as time of epistemic evaluation, or it may be imperfective past, in wich case a past time of evaluation has to be provided by, or be inferrable from, the context (Puzzle 2). Perfective past – and this includes the participial part of the perfect construction – is incompatible with epistemic meaning since, on the one hand, 'past' rules out the time of utterance as epistemic evaluation time and, on the other hand, 'perfective' rules out a reading of simultaneity with any kind of reference point, including simultaneity with a point of perspective or an epistemic evaluation time in the past. Constraints on the interpretation of the past and perfect of epistemic modals thus follow naturally from the individual constraints independently imposed by tense, aspect, and modality:

(i) the semantics of past tense, and the participial part of the perfect construction, require the temporal ordering relation of precedence;
(ii) imperfective aspect requires simultaneity with an independently provided reference point, whereas perfective forms are incompatible with such a reading;
(iii) the semantics of epistemic modality requires the reference point to be an epistemic evaluation time.

In section 2.2, I suggested that the aspectual constraint in (ii) may also be used to explain the more general connection between imperfective aspect and modality. While it seems straightforward that the anaphoric requirement of imperfectives enables 'subjective' and 'perspectivized' readings (as represented in figure 2), more work needs to be done in order to extend the analysis to include the use of imperfective rather than perfective forms in, for instance, hypothetical and counterfactual or, more generally, non-veridical contexts (Ippolito 2004; Giannakidou and Zwarts to appear). Moreover, our analysis should not exclude the possibility of perfective forms being used in modal contexts, as can be quite frequently observed in Slavic languages.[17]

Notes

1. Source: http://www.geocities.com/speijk_nl/4.html.
2. Taken from the novel *De Schaapherder* by J.F. Oltmans, available at: http://cf.hum.uva.nl/dsp/ljc/oltmans/schaaphe/bisschop.html
3. The different behaviour of *kunnen* and *moeten* constitutes a third puzzle, but one that seems relatively easy to solve: since epistemic *moeten* expresses a high degree of probability (close to certainty), its epistemic semantics is incompatible with the non-temporal reading of the past tense, which expresses epistemic distance (uncertainty), i.e. a low degree of probability – thus leaving only the temporal reading of the past tense for *moeten*. For *kunnen*, there is no such incompatibility. For this verb, then, the present/past alternation may be used to express different *degrees* of distance with respect to what is known to be true at the moment of utterance, such as in (2a) versus (5).
4. Source: http://www.dr-bob.org/babble/social/20011117/msgs/14228.html
5. Source: http://www.soteria.hu/min05.htm. English more often uses the morphological past *had to* instead of 'present' *must* in these contexts. Indeed, for some native speakers, the last sentence of (10) can only be an instance of direct speech, containing a present tense.
6. For German, Fagan argues that, in addition, the present tense of epistemic modals is not a semantic present either: "it simply satisfies the formal requirement that German sentences have a tensed verb" (2001: 218).
7. Perfective (*he read a book*) should not be equated with perfect (*he has read a book*). I will turn to the interpretation of the perfect in section 4.2.
8. The situation for Dutch is similar in the sense that unmarked states receive an imperfective reading. However, since the expression of imperfective aspect for events by means of progressive-like constructions has not grammaticalized in Dutch to the same extent as it has in the English progressive, unmarked event clauses may sometimes get an imperfective reading in Dutch. In English this is not so, since the expression of imperfective aspect by means of a progressive verb form is obligatory in event clauses, as can be seen in *Table 1*.
9. Discussion here is restricted to research on Romance and Germanic languages. It should be noted that the Slavic languages provide clear counterexamples to such generalizations on aspect and modality, see e.g. Boogaart and Trnavac (2004) on conditional imperatives in Russian.
10. A nice illustration of this is provided by the verb *to promise*, as well as by its Dutch equivalent *beloven*, which presents an event in its non-epistemic use (*he promised to be home on time*), but a state in its pseudo-modal, epistemic use (*he promised to be a great piano player*) (Abraham 2001).
11. This may be abbreviated as the essentially Reichenbachian notation: E < R,S.
12. To complicate matters, they get the form of infinitives in Dutch – the 'IPP effect' – but that need not concern us now.

13. To the extent that the present perfect does allow for modal-like readings, such as 'evidential', 'inferential' or 'deductive' readings that have been attested for the perfect in various languages, these can all be ascribed to the stative, and thus imperfective, present tense part of the construction: the occurence of a past situation is inferred on the basis of evidence available at the moment of utterance (R=S).
14. Noted in personal conversation. The speaker confirmed that she meant to convey the 'present epistemic' reading that is captured by the English translation.
15. Source: http://www.ambafrance-nl.org/article.php?id_article=2480
16. Native speakers' judgments about the Dutch examples vary: some people find them unacceptable, or at least non-standard, like Eide (2001) claims for similar examples from Norwegian.
17. See, for instance, Boogaart and Trnavac (2004) on conditional imperatives in Dutch and Russian, and Trnavac (2006) for more examples, Cf. also Tahara (2000) on 'subjective' uses of the French perfective *passé simple*.

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Aspectual composition in idioms[1]

Sheila Glasbey

1. Idiom aspect

Jackendoff (2002: 167) observes that, while idioms have been traditionally treated by grammarians as a relatively marginal phenomenon, there are probably as many of them as there are adjectives, and theories of linguistic structure and processing had therefore better pay heed to them. One particularly interesting feature of idioms is way that their aspect (or aspectual class) is determined, and the contribution that this makes to sentential aspect and hence to the temporal structure of discourse. In this paper we will take a close look at idiom aspect and how it is derived, seek to dispel some misconceptions and, at least, make clear the need for further study.

It has recently been argued (McGinnis 2002, 2005) that the aspect of an idiomatically interpreted verb phrase is derived by a process of aspectual composition, just as it is in non-idiomatic cases. This has been used as a basis for various theoretical arguments involving the lexical properties of idioms and their constituents, and the interaction with syntax. We wish to take a step back and examine the original claim more closely.

McGinnis (2002, 2005) appears to assume, first of all, that if aspect were compositional in idioms, then we would expect a verb phrase used in an idiomatic sense to have the same aspectual class as the corresponding verb phrase used in a non-idiomatic sense. We will call the non-idiomatic sense, for simplicity, the 'literal' sense, while acknowledging that this opens up an (idiomatic) can of worms concerning literal meaning that we will not attempt to deal with here. We take issue with McGinnis' assumption, arguing that it *is* possible to view aspect as being compositional in at least some idioms, while at the same time allowing for the *result* of the aspectual composition to be different in the idiomatic and the literal cases. This enables us to explain the observation that, in a number of cases, the aspectual class of a verb phrase used idiomatically is different from that of the same verb phrase used in a literal sense – while being able to maintain that idiom aspect can, at least in some cases, be regarded as compositional.

Consider, firstly, the verb phrase 'paint the town red', which is often used idiomatically and means, according to the Longman Dictionary of Idioms (Longman 1979), "have a very enjoyable time, esp. in a lively and

noisy manner". This phrase, according to our intuitions and those of our informants,[2] combines readily with temporal *for*-adverbials to form sentences such as:

(1) *Mary and her friends painted the town red for a few hours [id].*

Note that '[id]' conveys that 'paint the town red' receives an idiomatic interpretation in this example. We looked for examples of this idiom combined with a temporal *for*-adverbial in a web search using the *Google*© search engine. An example found is:

(2) *Board the Chiva Arubanita Party Bus … and paint the town red for six hours [id].*
(http://travel.discovery.com/destinations/fodors/aruba/tips.html, consulted 6/05/03).

Our intuitions confirm the acceptability of this example, and thus we judge that it is possible to combine the idiomatic use of 'paint the town red' with a temporal *for*-adverbial.

By contrast, the idiom 'paint the town red' does not, according to our intuitions and those of our informants, combine readily with temporal *in*-adverbials. Thus (3) is very difficult, or perhaps impossible, to interpret:

(3) *??Mary and her friends painted the town red in a few hours [id].*

We ignore here the inceptive reading where 'in a few hours' measures the time between some contextually defined instant and the beginning of the painting. Similarly, we see that (4) is not at all easy to interpret:

(4) *??It took Mary and her friends a few hours to paint the town red [id].*

According to standard tests for aspectual class (e.g. Vendler 1967; Dowty 1979), the eventuality described by 'Mary and her friends painted the town red'[3] is, therefore, an activity rather than an accomplishment. Now compare a *literal* interpretation of 'paint the town red':

(1) *a. ?Mary and her friends painted the town red for a few hours [lit].*

Note that '[lit]' conveys that 'paint the town red' is interpreted literally here.

Since it may be difficult for the reader to ignore the idiomatic interpretation and focus on the literal one, we will replace 'red' in (1a) by 'green'. In order to make the scenario more plausible and even more clearly non-idiomatic, we will also replace 'town' by 'shed', assuming that the aspectual class of the eventuality described by the literally-interpreted sentence is not thereby affected.

(1) *b. ?Mary and her friends painted the shed green for a few hours [lit].*

It is now clear that (1b) is unacceptable or, at best, marginal. (1c), on the other hand, is perfectly acceptable:

(1) *c. Mary and her friends painted the shed green in a few hours [lit].*

We see, therefore, that 'Mary and her friends painted the town/shed red/green', on a literal interpretation, describes an accomplishment and not an activity. Thus we have an example of a phrase which has, when interpreted literally, a different aspectual class from when it is interpreted as an idiom. This is, we believe, a clear counter-example to McGinnis' claim (2002) that aspectual class is the same in literal and idiomatic interpretations. However, since McGinnis (2005) disputes the conclusions we draw from these examples, as presented in our earlier paper, (Glasbey 2003), we will now address her objections in detail.

McGinnis (2005: 9) accepts that there is an aspectual difference between the idiomatic and non-idiomatic readings in the above examples, but she claims that this difference is 'accidental and pragmatic, not a difference in principle'. She claims that an example like (1b) becomes acceptable in the context of a scenario where painting something green (or red) is regarded as an activity with no salient endpoint. This, she points out, is 'unusual in ordinary life', but examples may be constructed, she claims, where the activity reading becomes acceptable. She offers such an example – a scenario where workers are painting a large stage set and one of them says 'We painted the set red for a couple of hours, but then the director realised it looked boring'. While McGinnis regards this example as acceptable, we and our informants find it quite odd and difficult to interpret. McGinnis claims that the syntactic context licenses both the telic and atelic readings here, and that it is a matter

of pragmatics whether either is excluded. We contest this: while agreeing that there are verb phrases which license both telic and atelic readings ('climb the mountain' is a much-discussed example), we do not believe that this is the case with 'paint the shed green' and similar resultative constructions. Resultatives are generally taken to be telic (see, for example, Levin and Rappaport Hovav 1996: 70) and we see no reason to question this.

Moreover, our claim that aspectual class may differ between idiomatic and non-idiomatic interpretations is not based solely on this one example. We offer a number of examples in the remainder of the paper where, once again, aspectual class differs between the two interpretations. McGinnis (2005) does not attempt to explain these observations.

Let us now consider how to interpret our findings. Since the aspect conveyed by the literal interpretation is presumably derived by the conventional process of aspectual composition (as described by Krifka 1992, Smith 1991/1997 and others), one possible conclusion is that the aspectual class associated with the idiomatic interpretation is non-compositional, i.e., not derived by the usual process of aspectual composition. This, however, is not the only possible conclusion, as will be seen shortly.

According to the generally-accepted process of aspectual composition, the aspectual class of (the eventuality described by) a complete sentence is derived by combining, in an order specified by the grammar, properties of the verb, its tense (etc.), its object argument(s), any specified resultative state ('green' in (1c)), its subject argument, any adverbial modifiers, and various 'thematic relations' between the object and the eventuality (see later). An analysis such as that of (Krifka 1992) predicts, correctly, that 'Mary and her friends painted the shed green' describes an accomplishment. McGinnis' claim is that the aspectual class of idiomatically-described eventualities is also compositional. As discussed above, she apparently takes this to mean that the idiomatic 'Mary and her friends painted the town red' would also describe an accomplishment – i.e. that the aspectual class is the same under an idiomatic interpretation as under a literal interpretation (McGinnis 2002: 668).

Our example (1) therefore suggests that either aspect is not compositional for expressions interpreted idiomatically, or that the process of composition, for some reason, may lead to different results in the idiomatic and the literal cases. We will eventually decide in favour of the latter, and we will explain what the 'for some reason' entails.

As mentioned above, we have identified a number of additional examples where aspectual class differs between idiomatic and literal readings. We will now present these, beginning with some which fall into the class

described by Jackendoff (1997a) as 'fake object resultatives'. Syntactically, these appear to be resultatives, but the resultative state, on the idiomatic interpretation, is not "real". Examples include:

(5) *I cried my eyes out for some time and then I went back to work. (http://members.aol.com/wolfie1030/instinct.html,consulted 30/4/03).*

'I cried my eyes out' here describes an activity (hence its compatibility with the temporal *for*-adverbial). Yet 'I cried my eyes out', would, if taken as a literally-interpreted resultative, be expected to describe an accomplishment. That is, if aspectual class were derived by the usual compositional processes, with the usual inputs, we would expect an accomplishment. However, no examples were found in a web search in which 'cried X's eyes out' combines with a temporal *in*-adverbial. We are aware, of course, that negative data from a web search is not to be relied on; however, this finding is backed up by other data such as the fact that 'I cried my eyes out [id]' fails standard tests for accomplishments (e.g. '??It took me two hours to cry my eyes out [id]'.) Intuitively, the reason for this is that there is no clearly-defined, natural endpoint to an eventuality of (idiomatically) crying one's eyes out. That is, there is no time point in the domain described by the idiom which corresponds to the point at which, in the domain described by the literal interpretation, one's eyes actually fall out as a result of the crying. In order to be an accomplishment, of course, an eventuality must have such a clearly defined natural endpoint. The lack of such an endpoint makes the eventuality an activity instead. The idiom 'to cry one's eyes out' does not convey such a natural endpoint – it simply means, according to (Longman 1979), "to cry a great deal".[4] Once again, then, we have a mismatch between the aspectual class of the eventuality on a literal interpretation (henceforth 'literal eventuality') and that on an idiomatic interpretation (henceforth 'idiomatic eventuality').

We make similar observations with a number of other idiomatically-interpreted expressions, where, in each case, corpus usage and speaker intuitions strongly suggest an activity, while literal interpretation would give an accomplishment.

Consider 'sang X's heart out [id]'. Examples such as (6), found in our web search, show that this idiom can be combined with a temporal *for*-adverbial:

(6) *Patsy sang her heart out for over two minutes.* (http://www.patsyclinehta.com/excerpts.htm, consulted 6/05/03).

No examples were found where 'sang X's heart out' combines with a temporal *in*-adverbial, and indeed such a construction sounds very odd:

(7) *??Patsy sang her heart out in two minutes/hours/days.*

Once more, then, we have a construction which describes an accomplishment under a literal interpretation and an activity under an idiomatic interpretation.

The idiomatic expressions 'yelled X's head off' and 'poured X's heart out' behave in a similar way. But note, interestingly that it may be marginally acceptable to say:

(8) *?Patsy poured her heart out in two hours, on the phone to her sister.*

However, we did not find any such examples in our web search. But notice that (9) sounds much better:

(9) *It took Patsy two hours to pour out her heart on the phone to her sister.*

Why should (8) and (9), at least according to our intuitions, be marginally acceptable? We suggest that it may be because it is marginally possible to identify a natural endpoint to the process of (idiomatically) pouring out one's heart. Taking the idiom to mean (following Longman 1979) "to tell all one's personal worries, problems, feelings, etc." then it is possible, at least in principle, to see this process as having a natural endpoint when all the worries, problems, feelings and so on have been expressed. Thus there is, perhaps, a weak counterpart in reality to the contents of the sufferer's figurative heart. This provides, in turn, a counterpart to the end of the literal process of pouring out the contents of that heart. This may be enough to make 'pour X's heart out [id]' describe, at least in some contexts, an accomplishment, and therefore be acceptable in combination with an *in*-adverbial.

It is interesting to note that the addition of 'completely' improves both (8) and (9), at least on our judgement. We are not sure why this should be. Perhaps 'completely' emphasises the fact that an endpoint is salient. But notice that the addition of 'completely' does not make (7) any more acceptable – suggesting that the eventuality must already have a potential endpoint, which is merely emphasised, rather than being introduced, by 'completely'.

All the examples considered so far have been cases of Jackendoff's (1997a) class of 'fake resultatives'. There are other idioms, however, which do not belong to this class and which also show an aspectual mismatch between the literal and the idiomatic interpretations.

Consider the idiom 'drive one's pigs to market', which means, according to (Longman 1979), to "snore". According to Krifka (1992) and others, the presence of the location adverbial 'to market', pinpointing the endpoint of the journey, makes 'Fred drove his pigs to market', interpreted literally, an accomplishment. And indeed, if we take the literal interpretation, then we can readily say:

(10) *Fred drove his pigs to market in two hours [lit].*

Compare (11), which is not acceptable:

(11) *??Fred drove his pigs to market for two hours [lit].*

On the other hand, (10) is not good on the idiomatic interpretation. If the sentence refers to Fred's snoring, then (11), rather than (10), is acceptable. Thus we have another example where the idiomatic interpretation gives rise to an activity, while the literal interpretation gives an accomplishment. We might speculate at this point (we return to this later) that the reason for this mismatch may be that there is no counterpart in reality to the destination described in the pretence world as 'to market'. There is no inherent, natural endpoint to the process of snoring.

Interestingly, there is an idiom 'to saw logs' that means "to sleep" (or sometimes "to snore") mentioned in (Nunberg, Sag, and Wasow 1994: 497). Here, the aspectual class of 'Fred sawed logs' is the same on both the literal and idiomatic interpretations. In either case, 'Fred sawed logs for two hours' is acceptable and 'Fred sawed logs in two hours' is not. Here, in both cases, we have an activity. But the reason that the literal interpretation gives an activity is because 'logs' is a bare plural – the process of sawing logs (as opposed to that of sawing "six logs" or "the logs") does not have a natural endpoint. Thus it appears, here, almost accidental or coincidental that the literal and idiomatic interpretations have the same aspectual class.

Another idiom where the aspectual class differs between the literal and idiomatic interpretations is 'drowned X's sorrows'. This appears to describe an activity rather than an accomplishment on its idiomatic interpretation – of course, there is no literal interpretation, since sorrows are not *really* living things which can be drowned.

(12) *Fred drowned his sorrows for a few hours.*

(13) *??Fred drowned his sorrows in a few hours.*

According to our intuitions and those of our informants, (12) is acceptable but (13) is not. Now compare 'drowned X's rats',[5] interpreted literally, which appears to describe an accomplishment:

(14) *?Fred drowned his rats for a few hours.*

(15) *Fred drowned his rats in a few hours.*

Unfortunately, we were unable to find any such examples in our web search, so our claims here rest only upon our own judgments and those of our informants. The majority of the latter agreed with us in finding (14) unacceptable, but a minority found (14) marginally acceptable or even (in one case) fully acceptable, on the assumption that Fred had a very large number of rats. This is why we label (14) with a single '?'.

Taking the majority view, and leaving aside the interesting issue of why not all informants agree in this case, we have here another example of a mismatch of aspectual class for an idiom. A similar "explanation" presents itself – there is no natural endpoint to the process of drowning one's sorrows, given that the idiom means (according to Longman) "to seek escape from one's sadness, distress, etc., by drinking alcohol". Unless we can envisage the drinking process as having an inherent endpoint at which the final sorrow disappears,[6] then drowning one's sorrows seems to describe an activity. This contrasts with 'drowning one's rats', where there is presumably a natural endpoint corresponding to the ending of the life of the last rat.

2. Towards an explanation

McGinnis (2002) claims, as we have seen, that idioms show compositionality of aspect. We agree, with some reservations to be discussed below, but for different reasons. McGinnis argues that if idiom aspect is compositional, then the aspectual class will be the same on idiomatic and literal interpretations. We will now show that this is not the case – that aspectual composition may still take place in idioms (although it is perhaps more naturally viewed as occurring in some kinds of idioms than others – see later) but that the input to such aspectual composition, and therefore the results of it, may be different in the literal and the idiomatic cases.

We remarked earlier that in cases like 'paint the town red', we have a literal eventuality which has a natural endpoint – the point at which the town becomes completely red[7] – and an idiomatic eventuality which has no corresponding natural endpoint. Further to this, we observe that not only does the literal eventuality have a natural endpoint but it has what Krifka (1992) calls the *gradual patient* property (sometimes referred to as *incremental theme*). This means that the "progress" or "temporal development" of the eventuality corresponds to a gradual or incremental change in the state of one of the participants of the eventuality – in this case the degree of redness of the town, measured, perhaps, as the proportion of the paintable area of the town which has so far been painted. Roughly speaking, as the painting proceeds, the town gets progressively redder. There is no corresponding gradual patient property in the case of the idiomatic eventuality. Now, according to Krifka's (1992) account of aspectual composition, thematic properties such as gradual patient are part of the input to the process of aspectual composition. Such properties explain why 'Fred stroked the cat' is an activity, while 'Fred washed the cat' is an accomplishment. The subject NP, the object NP, and the verb tense are identical in the two cases. All that is different is the fact that washing the cat involves a gradual change of state of the cat, towards a state of cleanliness, whereas stroking the cat involves no such gradual change in the state of the cat. Or, perhaps we should say, no such *necessary* gradual change, since it is possible, of course, to envisage all sorts of things, such as that the cat gradually falls asleep.

Now, if we follow Krifka in assuming that the input to the compositional process involves not only properties of the subject NP, object NP, verb, adverbials, etc, but also thematic relations such as *gradual patient*, then the latter may well be different in the idiomatic interpretation of a phrase from that in the literal interpretation. We have just seen this in the case of 'paint the town red' – there is a gradual patient relation in the literal case but not in the idiomatic one.

Of course, for many idioms, the thematic relations may well be the same in the idiomatic and the literal interpretations. Consider:

(16) *Fred painted a bleak picture of the city.*

This may be read either literally or as an idiom. In either case, it can be used to describe an accomplishment, given that we may add an *in*-adverbial on either interpretation.

(17) *Fred painted a bleak picture of the city* ***in a couple of hours*** *[lit, id].*

Note, however, that on the idiomatic interpretation 'Fred painted a bleak picture' may also combine with a *for*-adverbial – for example:

(18) *Fred painted a bleak picture of the city for a few minutes, after which he turned to extolling its virtues.*

Restricting ourselves to the accomplishment interpretation, we see that in both the literal and the idiomatic cases there seems to be a gradual patient relation between the state of completion of the "picture" (be it a literal picture or a verbal one) and the progress of the event of creating it. It is interesting to note, too, that the picture exists in both cases – on the literal interpretation there is a "real" physical painting, and on the idiomatic interpretation there is something, such as a verbal description, which is described as a picture. Contrast this with 'paint the town red' where no equivalent of "the town" exists on the idiomatic interpretation.[8]

This suggests, returning to our earlier idea, that some of the cases[9] where the idiomatic aspectual class corresponds to the literal aspectual class are those where counterparts exist in the domain of idiomatic interpretation to the objects in the domain of literal interpretation, *and* where the thematic relations between those objects and the eventuality are the same in the literal and the idiomatic cases. These cases appear to correspond with those idioms that Nunberg, Sag, and Wasow (1994) classify as *idiomatically combining expressions*. These are idioms "whose parts carry identifiable parts of their idiomatic meanings" (1994: 497). Nunberg, Sag, and Wasow give as an example 'John was able to pull strings to get the job', where 'pull strings' means something like "exploit personal connections", and 'pull' can be seen to correspond to "exploit" and 'strings' to "personal connections".[10]

Idioms which do not have identifiable "parts" in this way are called *idiomatic phrases* by Nunberg, Sag, and Wasow (1994). They include expressions such as 'to saw logs', where there is no identifiable equivalent in the domain of idiomatic interpretation (domain of reality) to the logs in the domain of literal interpretation (pretence domain). Nunberg, Sag, and Wasow (henceforth NSW) suggest that these idioms must be entered in the lexicon as complete phrases, since, as a consequence of the fact that they do not have identifiable semantic parts, they cannot undergo passivisation, topicalisation, ellipsis and similar operations.

So, perhaps we want to think of certain types of idioms (NSW's *idiomatically combining expressions*?) as undergoing aspectual composition, while others (*NSW's idiomatic phrases*?) are in the lexicon as complete phrases, with their aspectual class information attached.

But as Jackendoff (2002) points out, the idea of storing an idiom in the lexicon as a complete phrase is not a straightforward one. Idioms come in many shapes, sizes and forms. Some are complete verb phrases, such as 'saw logs' and 'kick the bucket', or complete sentences, like 'That's the way the cookie crumbles' (Jackendoff 2002: 169, example 12(c)). Many others are incomplete verb phrases (etc.), such as 'take PRON's pigs to market', where PRON is a variable to be filled by a possessive pronoun, and 'V NP's head off' where V is a verb such as 'drink', 'talk', etc., and NP is a possessive pronoun (this example is from Jackendoff 2002: 173). Idioms which are incomplete in this sense were named by Fillmore *et al*. (1988) 'formal idioms', as opposed to 'substantive idioms', which are lexically complete. Croft and Cruse (2004) rename formal idioms 'schematic idioms' and it is their term that we will adopt.

Thus for schematic idioms, idiom meaning must be stored in the lexicon in a manner that will allow further composition with the meaning of other linguistic material. This has implications for the determination of idiom aspect, as we will show below.

If idiom meaning can further compose with meaning from other linguistic elements – as must surely be the case – then, however the aspectual class of an idiomatic phrase such as 'take X's pigs to market' is determined, this aspectual information must be in a form capable of combining with further aspectual information from other parts of the sentence. If the sentence has progressive aspect, for example, as in 'John was taking his pigs to market' then the progressive aspect will contribute to the overall aspectual class of the sentence. Thus, when we speak of the possibility of the aspectual class of an idiom being 'stored in the lexicon' we need to be precise about what we mean. Rather than storing the aspectual class, as such, of a schematic idiom, aspectual features such as those employed in (Krifka 1992), would be needed.

We can now turn to the matter of whether we would, indeed, ever need to store the aspectual properties of an idiom in the lexicon. We saw above that, provided the correct thematic relations are used for the idiomatic interpretation, aspect can always be computed from the individual components of the idiom. But in the case of (NSW) idiomatic phrases like 'take X's pigs to market', it seems rather strange to think of doing this. Assuming for a moment that the idiomatic meaning is associated with this phrase in the lexicon, then the individual meanings of 'pig' and 'market' do not take part in the meaning composition. Thus it seems odd to think of thematic relations (which, one imagines, must be somehow derived from world knowledge) existing between idiomatic pigs and an idiomatic market – when there

are no counterparts in reality to the pigs and the market. We find it much more intuitive to envisage lexical storage of the aspectual class of this type of idiom, in a form which, as explained above, can combine with other aspectual information from elsewhere. Thus we tentatively suggest that, in the case of NSW's *idiomatic phrases*, it is more natural to think of aspectual information being attached to the complete lexical phrase, i.e. stored in long term memory. For NSW's *idiomatically combining expressions*, on the other hand, we can much more readily conceive of a process of aspectual composition, along the same lines as "normal" (non-idiomatic) aspectual composition, but involving potentially different thematic relations. Indeed, this might fit quite neatly with the suggestion in (Croft and Cruse 2004: 251–252), following (Nunberg *et al*. 1994), that idiomatically combining expressions can be regarded as undergoing semantic composition, where the meaning elements to be combined correspond to the "idiomatic meanings" of the constituent parts. This means that, for example, in composing the meaning of an idiomatically combining expression like 'spill the beans', one takes the idiomatic meaning of 'spill' (i.e. "divulge") and the idiomatic meaning of 'the beans' (i.e. "the information", or similar) and combines them to give the meaning of the complete idiom. Following this route would allow us to specify the thematic relation between the object and the event, as in (Krifka 1992), for the idiomatic use, without requiring it to be the same as the thematic relation between the object and the event in the non-idiomatic use. Further work is needed to establish whether thematic relations do sometimes differ in this way between idiomatic and non-idiomatic uses – but it seems at least possible, and the option is available should we need it.

We accept, however, that the question of whether such aspectual information is stored in long term memory or whether it is computed in working memory (or similar) during processing is a vexed one, and it may be impossible to answer. Jackendoff (2002) suggests that the pertinent question is 'What aspects of an utterance *must* be stored in long term memory [i.e. in the lexicon] and what aspects *can* be constructed online in working memory?' (Jackendoff 2002: 152). Jackendoff is not speaking in particular about aspect, but the principle seems applicable. In that case, perhaps the best we can do is to say that we have no reason to believe that idiom aspect cannot be determined online, at least for one class of idioms (NSW's idiomatically combining expressions), provided that the appropriate input in terms of thematic relations is available to the process of aspectual composition.

As a final complication, consider the following example:

(19) *John will saw logs until the cows come home [id]*.

Taking 'until the cows come home' to have the idiomatic interpretation "endlessly; for an immeasurable period" (Longman 1979), we would presumably need to combine the atelic aspect of 'saw logs [id]' with the 'until' phrase to give a verb phrase with overall telic aspect. This is an interesting case of aspectual information from one idiom being required to compose with that of another. We see no reason why this is not compatible with the idea of the aspectual class of 'X saw logs' and that of 'until the cows come home' being stored lexically, but care would need to be taken to ensure that the results of the composition are correct.

Having pointed out some possible complications associated with lexical specification of the aspect of idiomatic phrases, we will leave further discussion of this matter for future work. The main point to be taken from our analysis is that aspectual composition does appear to be possible in principle for at least a subset of idioms. How well this meshes with other types of semantic composition requires further investigation.

Also worth considering are the implications of our findings for theories of the lexicon and its interaction with syntax, especially as this issue is addressed by McGinnis (2002). McGinnis takes what she regards as the compositionality of idiom aspect to support Halle and Marantz's (1993) theory of Distributed Morphology (DM). DM uses Levin and Rappaport Hovav's (1998) division of meaning into two components – *structural* and *idiosyncratic*. The idea is that the structural component interacts with the syntax, and the idiosyncratic component makes fine-grained distinctions irrelevant to the syntax. In McGinnis's words (2002: 667): "…[DM] maintains that the structural components of meaning are bundled into lexical items manipulated by the syntax, while idiosyncratic components are added post-syntactically… This… predicts that the syntactic derivation of idioms has semantic consequences."

One of these consequences, McGinnis argues, is that aspect is predicted to be compositionally derived in idioms. In her words again (2002: 668): "…it predicts that even if a VP has a non-compositional idiosyncratic meaning, it will have a compositional structural meaning. Specifically, it will have the same aspectual properties as any VP with the same syntactic properties".

McGinnis contrasts DM with Jackendoff's (1997b) theory of Representational Modularity (RM), which treats idioms as involving an arbitrary mapping between conceptual structure and syntactic structure. RM has both structural and idiosyncratic meaning encoded at the level of conceptual structure. This means that both types of meaning will be subject to arbitrary mapping – thus predicting that aspect will be non-compositional in idioms.

Since we agree that at least some idioms appear to undergo aspectual composition, at least in principle, then we could see our account as offering support for DM. But the proviso must be made that thematic relations may differ between the literal and the idiomatic interpretations, and the resulting aspectual class may therefore differ, too. And if we choose to regard NSW's *idiomatic phrases* as not undergoing aspectual composition but as having their aspectual information stored in some pre-computed form in the lexicon, then our conclusions only partially support DM, and there may be a class of idioms that are best regarded as exemplifying RM. We suspect, however, that the division may not be as clear-cut as this and that both theories may require revision in the light of future investigations on idioms in general and idiom aspect in particular.

3. Conclusion

The main point of this paper is the relatively simple conclusion that aspectual class may differ between literal and idiomatic interpretations of the same phrase or sentence – which is clearly *contra* (McGinnis 2002). But we need not necessarily take this to mean that aspect in idioms is never compositional. Provided we use the correct thematic relations, then idiom aspect can, at least for one class of idioms, be seen as determined by a process of composition. We remain agnostic, and may have to do so indefinitely, about whether and when such information is stored rather than being computed online. Perhaps psycholinguistic investigations will eventually give some answer to this question, or perhaps there is no answer even within the same individual, since for various reasons such information could perhaps sometimes be computed, or sometimes be "looked up". Certainly, one can readily accept differences between individuals, or individuals at different stages of development, in this respect. But we see no reason, in principle, to rule out aspectual composition for at least some idioms. The deeper implications for competing theories such as Marantz's DM and Jackendoff's RM remain to be explored.

Notes

1. Many thanks to John Barnden, Alan Wallington and Mark Lee for helpful comments and discussion. I appreciate also the comments and questions from

participants at Chronos VI, Geneva, September 2004. This paper is a development of some of the ideas in (Glasbey 2003).

2. In a small, informal survey, to which no statistical significance can be attached.
3. We take aspectual class to be a property of eventualities – an eventuality being a cover term for an event or state. Also, note that we use 'aspectual class' to classify both eventualities and the verb phrases (or larger linguistic constructions) that describe them. While this strikes us as somewhat unsatisfactory, it is line with conventional uses in the literature, and is done for ease of expression. We trust it will not cause any confusion.
4. As a reviewer points out, expressions like 'cry X's eyes out' may be seen as "conventionalised hyperbolae" or exaggerations.
5. Apologies to rat lovers for the unfortunate content of this example.
6. This may just be possible, on our judgement. It would involve being able to "count one's sorrows" and to envisage their being dissolved or consumed, as a gradual process (though not necessarily one by one) as the drinking proceeds. Presumably one would then be able to say, at a certain point 'I have drowned all my sorrows now'. This does not seem impossible, but has some feel of a joke, or a creative metaphorical extension, about it, as though the idiom is being deliberately stretched too far. Such extensions are very interesting, but we will not investigate them here.
7. Clearly, whatever is meant by 'completely red' will be influenced by pragmatic considerations such as which objects/buildings are capable being painted and/or seen as conventionally being painted.
8. Perhaps this is not entirely true. It has been suggested to us that the idiom 'paint the town red' may be inappropriate when the celebratory activity is not seen as taking place in, at least, some "centre of social activity" such as a town or city. Consider, for example, trying to use the phrase to describe a riotous evening of celebration among a group of friends at home. Perhaps, at least, the act of "going out somewhere" is required. Do we have a partial breakthrough of literal meaning into the idiomatic meaning here? If so, this raises the issue of how the worlds of literal and idiomatic/metaphorical description interact. For discussion of this matter from a rather different perspective, see (Barnden *et al*. 2004).
9. But only some of them…in others, as we saw earlier, the aspectual class is the same purely by coincidence.
10. Nunberg, Sag and Wasow (1994) reject the term 'compositional', used previously by them and others to refer to such idioms, on the grounds that it can be interpreted in a variety of different ways and may cause confusion.

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A modified *ExtendedNow* for the present perfect[1]

Björn Rothstein

1. Introduction

Although the present perfect(s) in English, Swedish and German denote anteriority, only the latter can be modified by certain positional temporal adverbials expressing pastness (cf. (1a), (1b) and (1c)). Klein (1992) dubbed this phenomenon *the present perfect puzzle* (PPP).

(1) a. **Sigurd has come yesterday.*
b. **Sigurd har kommit igår.*
Sigurd has come yesterday
c. *Sigurd ist gestern gekommen.*
Sigurd is come yesterday

The PPP is restricted to the present perfect. The sentences in (1) and (1b) become fine when used in the pluperfect or in other perfects:

(2) a. *Sigurd had come yesterday.*
b. *Sigurd hade kommit igår.*
Sigurd had come yesterday
c. *Sigurd war gestern gekommen.*
Sigurd was yesterday come

There are further puzzles about the perfect. It is actually impossible to combine *since*-adverbials with adverbials such as *yesterday* in sentences containing a perfect. As far as I am aware of, this phenomenon has never been related to the PPP.

(3) a. **Since last week, Sigurd had come yesterday.*
b. **Sedan förra veckan hade Sigurd kommit igår.*
Since last week-the had Sigurd come yesterday
c. **Seit letzter Woche war Sigurd gestern gekommen.*
Since last week was Sigurd yesterday come

Further, it is impossible to modify both the event time and the reference time of a perfect by adverbials denoting a position in time:

(4) a. **At seven, he had left at six.* (Klein 1992)
b. **Klockan sju hade han gått klockan sex.*
Clock-the seven had he gone clock-the six
c. **Um sieben Uhr war er schon um sechs*
At seven clock was he already at six
Uhr abgefahren
clock left

There is no approach I am aware of that can account for all these *perfect puzzles*.[2]

The PPP has been the topic of a long discussion in the, mostly semantic and pragmatic, literature (among others Klein (1992), Portner (2003), Pancheva and Stechow (2004)), but all approaches I know of are problematic. Hence, I consider the PPP to be still unresolved.

The aim of this paper is to investigate the PPP. In section 2, I show that none of the prior analyses of the PPP can account for the Swedish data. Section 3 introduces the meaning of the present perfect in English, Swedish and German. Section 4 is about temporal adverbials. In the following sections, I show that only a combined syntactic and semantic account can resolve the PPP and the other *perfect puzzles*.

2. Prior analyses

Lack of space prevents me from discussing prior investigations into the PPP in detail. I only note that all prior analyses are problematic and I therefore consider the PPP to be still unresolved.

Most analyses try to account for the PPP by looking at its composition. The standard view is that languages differ with respect to the PPP as their present tenses differ (cf. Klein 1992, Portner 2003, Pancheva and Stechow 2004). Languages whose present tense can be used to express pastness, present and future do not have a PPP. The present tense is analysed as tenseless and therefore does not impose restrictions on the adverbial selection of the present perfect. Languages whose temporal meaning of the present tense is more restricted display the PPP.

A problem for those accounts is Swedish. When we look closer at the present tense in Swedish and German, it can be shown that both pattern in

exactly the same way: they can be used to denote pastness with *since*-adverbials, present and future. Their meaning is therefore identical.

(5) a. *Han sover.*
He sleeps
b. *Er schläft.*
He sleeps

(6) a. *I morgon reser jag till Washington.*
Tomorrow travel I to Washington
b. *Morgen reise ich nach Washington.*
Tomorrow travel I to Washington

(7) a. *Jag är lärare sedan 1990.*
I am teacher since 1990
b. *Ich bin seit 1990 Lehrer.*
I am since 1990 teacher

Analyses motivating the PPP by the present tense predict that languages with identical present tense meanings should pattern identically in the present perfect. Swedish shows that this is not borne out. The present tense(s) in both languages have an identical meaning, but Swedish display the PPP and German does not. The PPP can therefore not be explained on the basis of the present tense.

3. The meaning of the present perfect

3.1. How many meanings does the German present perfect have?

There are two major uses of the German present perfect. In (8), it has a perfect or resultative interpretation. Substitution by the preterite is not possible. In (9), it is used in a context where the preterit is also possible. It is highly debated whether the German present perfect has a single uniform meaning that covers these two uses or if it is ambiguous between (8) and (9) (see for discussion Ehrich 1992, Thieroff 1992, etc.).

(8) *Jetzt, wo Sigurd angekommen ist, feiern wir.*
Now where Sigurd arrived is celebrate we
'Now that Sigurd has arrived, we'll celebrate.'

(9) *Sigurd ist gestern in Tübingen angekommen*
Sigurd is yesterday in Tübingen arrived
und gleich weiter nach Stuttgart gereist.
and at-once again for Stuttgart left
'Sigurd came to Tübingen yesterday. He immediately left for Stuttgart.'

Temporal uses of the present perfect such as in (9) are not possible in Swedish and English.

While (10) allows for a simultaneous and an anterior reading of the embedded tense relative to the reference time of the matrix verb, (11) only allows an anterior reading. In other words: (10) has the readings that Fritz thinks at 8 o'clock that it is 8 o'clock or that he thinks so at a point in time later than 8 o'clock. (11) has only the second reading. From an approach assigning two distinct meanings, a preterit and a perfect meaning, to the present perfect, we expect the present perfect always to be able to substitute for the preterit tense without any change of meaning. As this is not the case, the present perfect has not the same meaning the preterit tense has. Rather, the present perfect has a single uniform meaning covering both its perfect and preterit uses.

(10) *Fritz dachte, dass es 8 Uhr war.* (Stechow 1999: 98)[3]
Fritz thought that it 8 o'clock was
'Fritz thought that it was 8 o'clock.'

(11) *Fritz dachte, dass es 8 Uhr gewesen ist.*
Fritz thought that it 8 o'clock been is
'Fritz thought that it had already been 8 o'clock.'

3.2. The meaning of the present perfect[4]

For reasons I present elsewhere (cf. Rothstein 2005a, 2005b, 2005c), I assume an *ExtendedNow* approach to the perfect which I combine with Reichenbach's ((1947) 1966) approach to tense.

Reichenbach distinguishes between three points in time. A sentence is uttered at the moment of speech (S). The eventuality denoted by the main verb obtains at the event time (E). To account for the pluperfect (and according to Reichenbach's view for all other tenses as well) a further point in

time is needed, the reference time (R). (R) is the point in time relative to which (E) is located. Take, for instance, the following example:

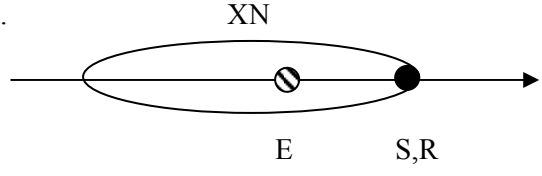
(12) *Als er nach Hause kam, hatte sie bereits gespült.*
When he to home came had she already done-the-dishes
'When he came home, she had already done the dishes.'

The time of doing the dishes is interpreted as being prior to the time of coming home. Hence, the event time of the pluperfect is evaluated relative to the event time of the preterit tense or in other words, the event time of coming home serves as a reference time (R) for the pluperfect sentence.

The meaning of the present perfect is analysed in terms of an *Extended-Now*-analysis (XN). Traditionally, the XN is a time interval ending at the speech time. Hence, the right boundary (RB) of XN is simultaneous to (S). The left boundary (LB) is underspecified. Somewhere within the XN is the event time (E) located (see McCoard 1978, Iatridou, Anagnostopoulou and Izvorski 2001). This will be represented by E ⊆ PTS. The meaning I assume for the English present perfect is as follows:

(13) English present perfect:

a.



b. R = S & XN (LB, RB) & RB = S & E⊆ XN

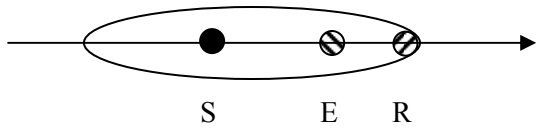
This meaning can however not be transferred to German and Swedish, as the present perfect in these languages can be used as a future perfect. The most plausible reading (14) has is that the conference will not have ended before the moment of speech (S), but after (S) and prior to the time denoted by *morgen* 'tomorrow'.

(14) *Morgen hat die Konferenz bereits aufgehört.*
Tomorrow has the conference already ended
'The conference will have ended by tomorrow.'

The reference time set by the tense of the auxiliary can therefore be after (S), but not before (S). I represent this by R ¬ < S. To account for the future use of the German present perfect, the right boundary of RB can not be at (S), but must end at (R). This will be represented by RB = R. As XN does not automatically end at the moment of speech, the interval the perfect introduces will be called in accordance with Iatridou, Anagnostopoulou and Izvorski (2001) *perfect time span* (=PTS).

(15) Swedish present perfect

a.



b. R ¬ < S & PTS (LB, RB) & RB = R & E ⊆ PTS

In the *ExtendedNow* approach, universal perfects are treated as perfects whose event time holds throughout the entire PTS including (R). An example is the English (16) where the speaker still loves his addressee at the moment of speech.

(16) *I have always loved you*

But when it comes to universal perfects like the German (17), the traditional XN approach makes wrong predictions. As the context suggests, the 'living in Germany' can clearly not continue at the moment of speech.

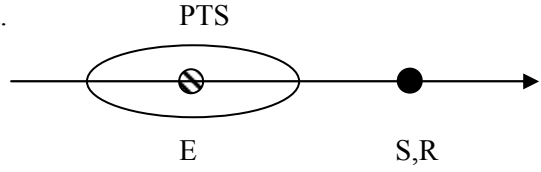
(17) *Er hat immer in Deutschland gewohnt,*
He has always in Germany lived
aber vor kurzem ist er nach England gezogen.
but before recently is he to England moved
'He always lived in Germany, but he has moved to England recently.'

Uses of the present perfect such as in (17) are not possible in English and Swedish. To account for (17), I follow Pancheva and Stechow (2004) who allow PTS to be separated from the reference time of the tense of the auxiliary in German. This has the advantage that universal perfects can be treated as perfects whose event time holds throughout the entire PTS, but not nec-

essarily at the moment of speech or more generally at the reference time set by the tense of the auxiliary. If I understand Pancheva and Stechow (2004) correctly, they do not allow the left boundary and the right boundary of PTS to be simultaneous. I represent this by LB < RB. As will become clear in the following, this is an important difference to my approach.[5]

(18) German present perfect (Pancheva and Stechow 2004):

a.



b. $R \neg < S \;\&\; PTS\,(LB, RB) \;\&\; LB < RB \;\&\; RB <| R \;\&\; E \subseteq PTS$

My approach differs from Pancheva and Stechow (2004) in the following point: the length of PTS varies due to the different readings of the German present perfect. In the default, the right boundary (RB) of PTS is simultaneous with the final subinterval of the event time (E). (RB) can be stretched to points in time later than (E) whenever this is necessary, for instance, in the context of certain adverbials or certain tenses. Moreover, I assume that the left boundary of the *perfect time span* is identical with the initial subinterval of the event time denoted by the present perfect. LB can also be stretched to points in time earlier than (E) when required by certain adverbials or context. Hence, the positions of LB and RB are not fixed, they are dynamic.

LB and RB can be identical as with *Aktionsarten* lacking the subinterval property such as *ankommen* 'to arrive', (E) is reduced to a single point in time. As in the default, LB is simultaneous to the initial and RB simultaneous to the final subinterval of (E), it follows that LB and RB can be identical. I therefore assume that the length of PTS and (E) are identical in the default.

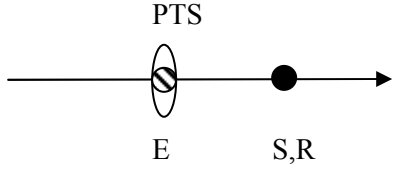
Evidence for this approach comes from examples with coordinated universal perfects. In (19), the studying and the working do not end simultaneously, although this seems to be required by the adverbial *gleichzeitig* 'at the same time'. Therefore, the right boundary of PTS must be dynamic (cf. Rothstein (2005a) and (2005c) for further arguments). Presumably, the studying and the working did not begin at the same time as well. LB must therefore also be dynamic.

(19) *Er hat immer gleichzeitig studiert und gejobbt.*
He has always at-the-same-time studied and worked
Aber dann hat er erst mit dem Studieren und dann
but then has he first with the studying and then
mit dem Jobben aufgehört.
with the work stopped
'He always studied and worked at the same time. But then, he first stopped studying and then stopped working.'

The meaning of the German present perfect I assume is therefore as follows:

(20) German present perfect:

a.



b. $R \neg < S$ & PTS (LB, RB) & $LB \leq RB$ & $RB <| R$ & $E \subseteq PTS$

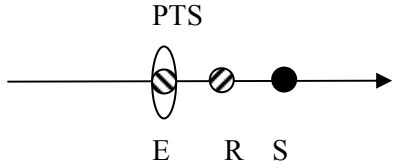
It is possible to combine adverbials such as *always* with the pluperfect in English, Swedish and German much in the same way as this is possible with the German present perfect:

(21) a. *He had always lived here, but recently…*
b. *Han hade alltid bott här, men alldeles nyligen …*
He had always lived here but particle recently
c. *Er hatte immer hier gewohnt, aber vor kurzem …*
He had always here lived but recently

I therefore conclude that the *perfect time span* the pluperfect introduces behaves much like the *perfect time span* of the German present perfect. The argumentation for the *ExtendedNow* approach is the same as for the present perfect and won't be repeated here. I assume the following meaning of the English, Swedish and German pluperfect:

(22) English, Swedish and German pluperfect:

a:



b: $R < S$ & PTS (LB, RB) & $LB \leq RB$ & $RB <| R$ & $E \subseteq PTS$

We will now turn to the classification of temporal adverbials.[6]

4. On temporal adverbials

Temporal adverbials can be roughly divided into three groups. Durational adverbials restrict the duration of temporal entities (*zwei Tage lang* 'for two days'). Positional temporal adverbials locate the position of temporal entities (*gestern* 'yesterday'). Frequency adverbials quantify over temporal entities (*einmal* 'one time'*, immer* 'always').

Durational and frequency adverbials are possible with the present perfect, cf. (23) to (25). They will be neglected here.

(23) *Han har varit två gånger i Paris.*
He has been two times in Paris
'He has been to Paris two times.'

(24) *Jag har alltid älskat dig.*
I have always loved you
'I have always loved you.'

(25) *Han har bott tre år i London.*
He has lived three years in London
'He has lived in London for three years.'

The *present perfect puzzle* is restricted to a subclass of positional temporal adverbials. Adverbials that denote a definite position on the time axis are not allowed with the present perfect in both Swedish and English (cf. Klein 1992 for English, SAG (1999, 4: 237) for Swedish).

Klein (1992: 544) claims that an expression is *p(ositional)-definite* if its lexical content explicitly specifies a definite position of a time span in relation to the speech time, but this notion of *definite position* remains vague.

Where is actually the exact borderline between p-definite and p-indefinite expressions? Adverbials like *just now* should refer to more definite position on the time axis as *in the 1990s*. Therefore, it is surprising that the latter is odd in present perfect sentences, while the former are fine. Remaining somewhat vague, I modify Klein's (1992) definition of *p-definite*. I introduce the term *p-specific*:

(26) A temporal expression is *positional-specific* (p-specific) iff its lexical entry explicitly denotes a specific temporal position on the time axis relative to the speech time and iff it is a possible answer to the question *when exactly*.

It follows from (26) that adverbials like *yesterday* are p-specific. *Yesterday* fixes a p-specific position in the past as it denotes the day before the day that contains the speech time. *Yesterday* also serves as an answer to the question *when exactly* and it is substitutable by a positional calendaric adverbial. If *today* is the tenth of 10th September 2004, *yesterday* is the 9th September.

Before is a p-inspecific adverbial as it is not a possible answer to the question *when exactly* satisfying the degree of information asked for.

(27) A. *When exactly were you in Paris?*
B. *? Before. / ✓ Yesterday.*

To conclude, the *present perfect puzzle* is restricted to p-specific adverbials denoting pastness.

5. How many positional temporal adverbials are possible with a perfect?

Klein (1992) observes that the event time and the reference time of a given utterance cannot both be p-definite (p-specific in my terms):

(28) **At seven, he had left at six.*

This leads Klein (1992) to postulate the following constraint:

(29) P-definiteness constraint: Within an utterance, (E) and (R) cannot be both *p-definite*.

But as (30) to (32) show this has nothing to do with whether the adverbials in question are p-specific or not. Hence, there must be a more general constraint as the *p-definiteness-constraint*.

(30) **At seven, he had left at six.*

(31) **At some time, he had already left at six o'clock.*

(32) **At some time, he had already left before.*

Klein (1992) claims that the *p-definiteness-constraint* is pragmatic, because from a semantic point of view nothing excludes (E) and (R) to be both p-definite at the same time. In (30), it can be perfectly true that he left at six and that this is true at seven as well. It is, however, not clear from which independent pragmatic principle the *p-definiteness-constraint* is derived.

A further problem is that it actually seems possible to have both a p-definite reference time and event time within a sentence. From Klein's assumption, it should be ungrammatical, but it is not.

(33) *Renate said at three o'clock that Sigurd had left at two o'clock.*

(33) suggests that the p-definiteness constraint or in my words, the p-specificity constraint is a syntactic constraint as it is limited to the syntactic boundaries of a clause. Consider (34). From a semantic point of view there is absolutely no difference between (33) and (34). Both state that there is a point in time, three o'clock, at which it is true that Sigurd left at two o'clock. But while in (33) there is only one temporal adverb per clause, in (34) we have two of them. I therefrom conclude that the *p-specificity constraint* is a syntactic constraint.

(34) *Renate said at three o'clock that Sigurd now had left at two o'clock.*

To account for (33) and (34), I will follow current syntactic assumptions about adverbials. I consider tense to be a functional head T^0 in the extended projection of the verb (cf. among others Cinque 1999, Alexiadou 1997, 2000). According to this assumption, T^0 hosts temporal morphemes that get associated with the verbal stem in languages like French via V-to-T raising.

There are two prominent approaches to the position of adverbials in the syntactic tree. According to the more "traditional" view, there are different positions for adverbials in a sentence and they are introduced in the syntac-

tic structure via adjunction. This means free recursive adjunction to any category (among many others Pittner 1999). I call this analysis the *adjunct based approach*. Adjunction has been challenged by the recent assumption that adverbs occupy specifier positions of functional projections (cf. Alexiadou 1997 and Cinque 1999, 2004). According to this view, adverbials, although they are optional, are seen as an integral part of the sentence. This is the *specifier based approach*. Yet, in the literature there has been a long-standing debate as to which of the two accounts is to be preferred (see contributions in Alexiadou 2004 and references there). In the following, I defend a specifier based approach to (temporal) adverbials.

The main evidence for the assumption that adverbials occupy specifier positions of functional projections is that, cross linguistically, the possible number, type and order of the different adverb classes is limited. This follows directly from the standard phrase structure. As maximal projections only have one specifier and as they display a rigid order, this can easily be explained by *specifier based approaches*. Given that there seems to be no immediate syntactic restriction for adjunction, *adjunct based approaches* will have difficulties to explain this (without relying on stipulation, cf. Cinque 2004 and references there).

Adjunct based approaches sometimes derive the order of adverbs by independent semantic scope principles. A problem for those accounts is the pair of Italian examples from Pittner (2000) given below (quoted from Cinque 2004: 685). Why do the scope principles allow the order in (35), but prohibit the one in (35)?

(35) *E' probabile che sia per me una sfortuna che Gianni è stato licenziato.*
'It's probable that it is unfortunate for me that G. has been fired.'

(36) **Probabilmente Gianni è sfortunatamente stato licenziato.*
'Probably G has unfortunately been fired.'

Adjunct based approaches also have problems accounting for the possible number of adverbs of the same type per sentence. There is, for instance, only one positional temporal adverbial possible in a sentence (see Smith 1978: 43; Pittner 1999; Alexiadou 1997: 111 and the discussion of (33) and (34)). As argued above, the ungrammaticality of (34) can only be derived by a syntactic constraint. Treating positional temporal adverbials as adjuncts cannot however explain (34) as adjunction is an unlimited recursive syntactic process (cf. (37)).

(37) *The car with the red colour from New York on the street over there*

The *specifier based approach* easily copes with (35) to (37). Given that (35) is a complex sentence consisting of at least two clauses, there exist two different functional projections of which the two adverbials can occupy the specifier positions. As there is only one clause in (36), there is only one position available for the adverbs. The same is true for (33) and (34). I therefore follow the *specifier based approach* for adverbials (cf. contributions in Alexiadou 2004 for further discussion).

Tense and positional temporal adverbials interact. Not any tense can combine with any positional temporal adverbial. (38) is odd because *gestern* p-specifies a point in time before (S) and the present tense p-specifies (S). Following Alexiadou (2000), I take this interaction to be evidence that positional temporal adverbials are located in Spec TP.[7]

(38) **Yesterday, I am to France.*

Given the general assumptions about phrase structure and adverb placement, we can formulate a constraint for the available number of positional temporal adverbials.[8] First, there is only one specifier per maximal projection and second, positional temporal adverbials must be hosted in Spec TP. Given that any phrase can only have one specifier, it follows that there can be only one positional temporal adverbial per sentence (Alexiadou 1997: 111). This immediately explains why the event time and the reference time cannot both be specified by positional temporal adverbials, be they p-specific or p-inspecific.[9]

So far, I have postulated a syntactic restriction on the number of positional temporal adverbials. Durational and frequency adverbials can co-occur with positional temporal adverbials in sentences containing a perfect. It has been shown that these are related to aspect and behave like quantificational elements (Alexiadou 1997; Cinque 1999). They therefore do not occur in Spec TP which makes the co-occurrence with positional temporal adverbials possible:

(39) *Um 10 Uhr war er schon einmal in der Bar gewesen*
At 10 o'clock was he particle one-time in the bar been
'At 10 o'clock, he had already been one time in the bar.'

(40) *Im März hatte er bereits vier Wochen lang*
In-the march had he already four weeks long

Urlaub gemacht. Es blieben ihm nur noch
vacation made It remained him only particle
drei Urlaubstage für den Rest des Jahres.
three vacation-days for the rest of-the year
'He had already gone on a vacation for four weeks in March. He had only three days of vacation left for the rest of the year.'

Following recent assumptions in syntactic theory, we have found an explanation for the restriction on event time and reference time modification in perfect sentences. We now turn back to the *present perfect puzzle*.

6. On the present perfect puzzle

In section 3, I argued that there is a difference with respect to the localisation of RB. In German, RB may precede (R) or be identical with it. In the English and Swedish present perfect, RB is always simultaneous to (R). As for the pluperfect in all three languages, RB may precede (R) or be simultaneous to it. In my eyes, the relation between the position of RB and the PPP is the key to the solution of the *perfect puzzles*.

The *ExtendedNow* approach defines the *perfect time span* as follows: Somewhere within PTS is (E). In other words: the position of (E) is p-inspecific. We can think of this as a semantic requirement that (E) can hold at any point in time within PTS. In case of the English and Swedish present perfect, this means that (E) can hold at any point in time within PTS up to or at (R) as RB is identical with (R). But this is no longer the case, if the position of (E) is restricted by a p-specific adverbial that denotes a point in time prior to (R). Take, for instance, the ungrammatical (41):

(41) **Sigurd has come to Tübingen yesterday.*

PTS comes with the semantic requirement that (E) can potentially hold at any point in time within PTS up to or at (R).[10] *Yesterday*, on the other hand, requires (E) to be located somewhere within the day before the day that contains the moment of speech. This means that (E) can hold neither before *yesterday* nor after *yesterday*. This is a clear contradiction: while PTS requires that (E) can obtain at other points in time as denoted by *yesterday*, *yesterday* excludes this.

There is no such ban against p-inspecific adverbials that modify (E). Adverbials such as *before* are fully compatible with the requirement that (E) can hold at any point in time within PTS.

The present account correctly predicts p-specific adverbials including the moment of speech to be possible with the present perfect:

(42) *This week, he has been to the movies twice.*

This week includes (S) and by substitution (R). The left boundary of PTS is underspecified. This means that LB can be located somewhere within *this week*. Therefore, *this week* is compatible with the requirement that (E) can potentially hold at any point in time within PTS up to or at (R).

In German, RB is not identical with (R). PTS is dynamic. In cases like the following, no contradiction results between the time interval denoted by *gestern* 'yesterday' and PTS. As RB is dynamic, event time modification by p-specific adverbials is compatible with the requirement that (E) can potentially hold at any point in time within PTS. As we have seen in section 3, there is a default for the setting of RB. In the default, RB is identical to the final subinterval of (E). Therefore, (E) can potentially hold at any point in time within PTS.

(43) *Sigurd ist gestern nach Tübingen gekommen.*
Sigurd is yesterday to Tübingen come
'Sigurd came yesterday to Tübingen.'

There is a further argument favouring the present approach and making it superior to all other analyses of the PPP. It can also account for (3) which I repeat here:

(44) **Since last week, Sigurd had come yesterday.*

It is not possible to combine *since*-adverbials with p-specific adverbials in sentences containing a perfect. Event time modification by p-inspecific adverbials turns however out to be grammatical:

(45) *Since September 11, he only has been on one single Sunday to New York.*

According to the standard assumption, *since*-adverbials modify the left boundary of PTS. In (44), *yesterday* modifies (E). Now, the same semantic requirement as for the *present perfect puzzle* applies. PTS comes with the requirement that (E) can potentially hold at any point in time within PTS. But the p-specific adverbial restricts the position of (E). This turns out to be incompatible with the former requirement. In (44), (E) obtains *yesterday*. It can therefore not obtain at any point in time from *last week* on up to (R).

The advantage of the present account is obvious: it can account for the restriction on the occurrence of positional temporal adverbials and *since*-adverbials and also for the PPP. As far as I am aware of, the correlation between these two *perfect puzzles* has never been seen.

7. Conclusion

In this paper, I have argued that there is no immediate correlation between present tense and the *present perfect puzzle*. As the German and Swedish present tenses pattern in exactly the same way, but as their present perfects do not, the present tense cannot be the source of the *present perfect puzzle*.

The adverbial selection of the English and Swedish present perfect suggests that only p-specific adverbials are allowed with the present perfect. These are defined as follows:

(46) A temporal expression is positional-specific (p-specific) iff its lexical entry explicitly denotes a specific temporal position on the time axis relative to the speech time and iff it is a possible answer to the question *when exactly* satisfying the degree of information asked for.

I have argued for a partly syntactic and partly semantic approach to the *perfect puzzles*. Syntax restricts the available number of positional temporal adverbials, semantics accounts for the *present perfect puzzle* and the ban on the co-occurrence of p-specific adverbials and *since*-adverbials in sentences with the perfect.

Notes

1. Parts of this article have been presented at *Gurt 2004* (Washington), *Svenskans beskrivning 27* (Växjö), *Chronos VI* (Geneva), the *workshop on tense and aspect* (Paris), *Högre seminariet i nordiska språk* (Göteborg) and *the 21th Scandinavian Conference of Linguistics* (Trondheim). I also had the opportunity to discuss parts of the paper with Artemis Alexiadou, Brenda Laca, Sabine Iatridou, Elisabet Engdahl, Carola Trips, Tom McFadden, Arnim von Stechow and Hans Kamp. None of them should be held responsible for my views on the topic.

2. The term *perfect puzzles* is borrowed from a talk by Roumyana Pancheva at the University of Tübingen on February 11, 2004. She does, however, not use it for the data in (1) to (4).
3. Cf. also LATZEL (1977a: 141).
4. For expository reasons, I represent McCoard (1978), Iatridou *et al*. (2001) and Pancheva and Stechow (2004) in the notation of my own formalism.
5. "RB <| R" means that RB may be before (R) or touch it.
6. For the explanation of the cross linguistic variation of the perfects in English, Swedish and German, see Rothstein (in preparation).
7. The standard analysis for Spec TP is that it hosts NPs to check EPP. Given that temporal positional temporal adverbials also occur in Spec TP, Spec TP has dual nature (Alexiadou (2000: 69)). It licenses both nominative case and hosts positional temporal adverbials. Cross-linguistically, there are two options: either a subject or the temporal adverbial moves overtly to Spec TP. This depends on language individual parameters. Overt movement of the positional temporal adverbial to Spec TP is optional as these contain, to speak in syntactic terms, interpretable features.
8. For present purposes, I neglect word order and movement, cf. Alexiadou (2000) for detailed discussions.
9. I consider multiple adverbials such as in (1) to be instances of one single adverbial, see also Hornstein (1990: 24–29), Pittner (1999: 88–90, 188–190) and Steinitz (1969: 126–131) for further discussion on multiple adverbials.
   (1) *Am Mittwoch war er letzte Woche um vier Uhr hier*
   On-the Wednesday was he last week at four o'clock here
10. (E) can however not be entirely included in (R), because this would be the meaning of the present tense. Therefore, at least one subinterval of (E) must hold before (R). On the so called universal uses of the present perfect where part of (E) holds at (R) see Iatridou, Anagnostopoulou and Izvorski (2001) and Rothstein (2005c).

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The passé simple / imparfait of French *vs* the simple past / past progressive of English

Arie Molendijk

1. Introduction

My contribution to this volume is about the P(assé)S(imple) / IMP(arfait) of French and the S(imple) P(ast) / P(ast) Prog(ressive) of English. I will be particularly (but not exclusively) interested in the temporal relationships that can be established by these tense forms in narrative discourse. My approach is a discursive one, in the sense that the propositions I will put forward can be embedded in a DRT-like theory (Asher and Bras 1993 and others). But I will not focus on formal problems in this paper, since the treatment of the linguistic facts will take much of the space I dispose of here.

I will first do some abstract reasoning about the temporal relationships in narrative discourse. I will argue that Past Tense sentences containing a non-compound tense form express either simultaneousness or posteriority with respect to their T(emporal) A(ntecedent) (section 1).

As both IMP of French and PProg of English express simultaneousness with respect to TA (section 2), the main difference between those tense forms cannot be treated at the level of temporality. My claim is that this difference is basically aspectual. As for the difference between PS of French and SP of English (also section 2), it is primarily a temporal one. An interesting observation that can be made here concerns the possibility of using SP of English (and not PS of French) to express simultaneousness between eventualities.

Before ending (section 5), I will deal more specifically with a number of interesting linguistic facts that support the claims put forward in sections 1 and 2. These facts will be treated in sections 3 and 4.

2. A default rule for Past Tense sentences

My starting point will be the following claim, which I present as a default rule for Past Tense sentences (containing a non-compound tense form) in narrative discourse:

(1) If a language has a tense form F for explicitly expressing the Reichenbachian configuration 'E,R<S' (cf. Reichenbach 1966, who uses '-' instead of '<'), then a Past Tense sentence P containing F expresses either simultaneousness or temporal progression (posteriority) with respect to its TA, where TA is the temporal antecedent of the sentence. Normally, TA is an eventuality with which the sentence establishes a rhetorical relationship in the sense of Asher and Bras (1993), Molendijk and Vet (1995), and others.[1]

It should be observed here that TA does not necessarily correspond with R. In a sequence like 'when John looked at Mary, she smiled at him', the temporal antecedent of the main clause reporting the smiling is the temporal clause mentioning *John look at Mary* (since the main clause establishes a rhetorical relationship with the temporal clause: relationship of 'consequence', see Molendijk and Vet 1995). This implies that *she smile at ...* is posterior to TA=(the clause reporting) *John look at Mary*. At the same time, the sentence mentioning *she smile at ...* is NOT posterior to 'its' R, since R and E temporally coincide in the case of Past Tense sentences containing a non-compound tense form. This means that 'when John looked at Mary, she smiled at him' should be analyzed as TA<E,R<S, where E represents the smiling, TA: the 'looking'.

(1) does not distinguish between certain possibilities that present themselves in the case of simultaneousness between E and TA: E may temporally contain TA, or TA may contain E. We will see that distinguishing both possibilities is relevant for both French and English.

3. Non-compound Past Tenses in French and English

There are two major types of simultaneousness, as can be illustrated by the (English) sentences of (2):

(2) E ⊇ TA:
a. *John came in. He was singing*
(comes out as '⊃ ': *he sing* ⊃ *John come in*: proper inclusion)
b. *When the police interrogated John, Mary was playing in the garden*
(comes out as '⊇ ': *Mary play ...* ⊇ *the police interrogate ...* : improper inclusion)

E ⊂ TA: c. *John was reading the book. He noticed (= while reading) that ...*
(*he noticed* is (properly) included in *John read the book*)

So we can modify the default rule given in section 1 as in (3):

(3) Default rule for a given Past Tense sentence P (containing a non-compound tense form) in narrative discourse:
P expresses '⊇', '⊂' or '>' with respect to TA, i.e. E ⊇ TA or E ⊂ TA or E > TA.

Now, I argued in Molendijk (2005) that, in French and English, 'E ⊇ TA' is expressed by IMP sentences and PProg sentences, respectively (for French, cf. Martin 1971, Molendijk 1990, 1993, 1995, 1996; for PProg, see also Dowty 1986):

(4) IMP (French) and PProg (English): E ⊇ TA

Example:

(5) *Jean entra. Il chantait*.
'John came in. He was singing'

So the relationships that are 'left over', so to say, for PS of French and SP of English, are (i) temporal inclusion, in the sense that E is properly included in TA, and (ii) posteriority:

(6) PS (French) and SP (English): E ⊂ TA or E > TA
('⊇' is already taken by IMP and PProg, so '⊂' and '>' are 'left over' for PS and SP)

Examples:

(7) *Jean lisait le journal. Il s'aperçut que ...*
'John read the book. He noticed that' ... ('⊂')

(8) *Jean tomba. Il se fractura les jambes*
John fell. He broke his legs ('>')

This is a slight simplification of the facts. In Molendijk 2005, I argued that there is a fundamental difference between IMP and PProg that can be informally described as in (9):

(9) An IMP sentence mentions what is simply 'the case' at the moment of time TA with which it establishes simultaneousness.

A PProg sentence *explicitly* mentions what is 'going on' at the moment of time TA with which it establishes simultaneousness.

Ongoingness implies that an eventuality is presented as possibly undergoing internal changes at or around a moment of time *t*. It means absence of completion. As for the notion of 'being the case at *t*', it is neutral with respect to ongoingness. This implies that something which is the case at a moment of time *t* may be 'ongoing' (*à 8 heures, il travaillait* / 'at 8 o'clock he was working') or 'not ongoing' (*à 8 heures, il était dans le jardin* / 'at 8 o'clock, he was in the garden') at *t*. 'Being the case at *t*' can be related to simple truth: it roughly corresponds with 'true at *t*'.

What I have said amounts to saying that PProg sentences do not report eventualities of type 'state' (everybody seems to agree that IMP sentences do), but eventualities of type 'activity'. In terms of aspect shift and coercion (De Swart 1998), this means what is said in (10):

(10) IMP turns eventualities into states (if they aren't already).
PProg turns eventualities into activities (if they aren't already)[2]

If what I have said about the difference between IMP and PProg is correct, then, theoretically, there is a possibility left for SP of English that has not been not given in (5), namely to express simultaneousness of the 'non-ongoing' (and the non-inclusive) type. So we would end up as in (11):

(11) a. PS (French): E $\subset$ TA or E > TA.
b. SP (English): E $\subset$ TA or E > TA **or E $\supseteq$ TA** (' $\supseteq$' without ongoingness).
c. IMP (French) and PProg (English): E $\supseteq$ TA
(where PProg: ongoing; IMP: not necessarily ongoing).

Note: PS of French should not be able to express '$\supseteq$ 'without ongoingness, since IMP can already express this. SP of English should be possible here, since '$\supseteq$ 'without ongoingness is 'left over' by PProg.

If my abstract reasoning is mirrored by the facts, then we have something that does not only imply the existence of certain similarities between IMP of French and PProg of English, but also between PS of French and SP of English, and between IMP of French and SP of English, see (12), which automatically follow from (11):

(12) (i) Both PProg (English) and IMP (French): E $\supseteq$ TA
(PProg: with ongoingness; IMP: with or without ongoingness)
(ii) Both SP (English) and PS (French): E > TA or E $\subset$ TA
(iii) Both SP (English) and IMP (French): E $\supseteq$ TA (so SP and IMP may be 'linguistic partners' if no ongoingness is involved).

These are interesting facts, since people always stress the similarities between IMP and PProg (see Kamp and Rohrer 1983, Jayez 1999, for instance), but they hardly talk about similarities of the kind mentioned in (12ii) and (12iii).

Of course, much of what I am saying here is abstract reasoning. So let us look (more) specifically at the linguistic facts. I will first examine what I have said about IMP and PProg.

4. The imparfait of French and the Past Progressive of English

My claims about these forms (see (9) imply, among other things, what is said in (13):

(13) If TA corresponds with an instant (for instance, the time referred to by a SP/PS sentence of type achievement):

(i) E $\supseteq$ TA (i.e. E=TA or E $\supset$ TA) for IMP sentences;
('=': exact temporal coincidence)
(ii) E $\supset$ TA for PProg sentences
(So E = TA is excluded for PProg here, since otherwise the PProg eventuality would be 'punctual', which is incompatible with ongoingness)

(13) predicts that we can say something like (14), in French, which indeed we can:

(14) *Quand il entra, une heure* ***sonnait***

whereas we don't easily say, in English:

(15) *When he entered the room, the clock ?**was striking** one*

And indeed we don't. (15) would only be natural if the story were about clocks having long individual strikes, so to say. Of course, (15) would have been completely natural if we had put something like '… the clock was striking 10'.

The assumptions made in (9) about IMP and PProg also imply that:

(16) If TA corresponds with an interval (for instance, the time referred to by a **'**non-achievement' sentence)**:**
E ⊇ TA for both IMP sentences and PProg sentences
(So E = TA is not excluded for PProg here, since it does not imply 'punctuality' for the PProg eventuality)

(16) correctly predicts that not only IMP, but also PProg can be used in cases in which an eventuality is supposed to properly or improperly contain a TA of type 'interval', see (17):

(17) a. *When the police interrogated John, Mary was playing in the garden*
b. *Quand la police interrogea Jean, Marie **jouait** dans le jardin*
c. *When John crossed the street, he **was smoking** a cigar*
d. *Quand Jean traversa la rue, il **fumait** un cigare*

In these examples, the Pprog eventuality does not necessarily properly contain TA, contrarily to what we have seen in (13).

Another consequence of the claims made about IMP and PProg concerns (18):

(18) IMP can be used in frequentative contexts
PProg cannot: frequency opposes to ongoingness[3]

(18) predicts that (19a) is rather unnatural, which indeed it is, whereas (19b) is completely normal:

(19) a. *The king died at the age of 88. During two weeks, the newspapers published panegyrics of the deceased, in which they #**were***

praising *his caution, his courage and hundred other qualities which he had never had*

b. *Le roi mourut à l'âge de 88 ans. Pendant deux semaines, les journaux publièrent des panégyriques du défunt, où on* ***vantait*** *sa prudence, son courage et cent autres qualités qu'il n'avait jamais eues*.

Finally, the claim according to which PProg expresses ongoingness, whereas IMP reports something that is simply supposed to be the case at a given moment of time, seems to imply what is said in (20):

(20) An IMP sentence may be attached to an 'implicitly mentioned' TA a PProg sentence cannot: 'ongoingness' and this type of anchoring are incompatible notions

Let me first say something about the possibility for IMP to be anchored to a not-explicitly mentioned TA. I have argued elsewhere (see, for instance, Molendijk 2005) that this possibility presents itself when this TA is temporally implied or presupposed by the discourse[4]. For instance, we can say:

(21) *M. Dupont prit la parole. Il* ***parlait*** *de ses réussites sportives, de son héroïsme, et de cent autres qualités qu'il n'avait pas. (Et il ne parla que de ça pendant le reste de la soirée)*
'Mr. Dupont take (PS) the floor. He talk (IMP) about his sports achievements, about his heroism, and about hundreds of other qualities he didn't have. (And he speak (PS) about nothing else for the rest of the evening)'

Despite the fact that the eventuality of the second sentence does not coincide, temporally, with the one mentioned in the first sentence, IMP is natural, since the eventuality can be attached to what is implied by the first sentence. It can be attached indeed to something like *M. Dupont parler* (*Mr. Dupont speak*), temporally implied by *M. Dupont prendre la parole* (*Mr. Dupont take the floor*). This explains why the second sentence is felt as descriptive, not as moving time forward. Now, with respect to the possibility of anchoring eventualities to not-explicitly mentioned entities, the following observations can be made. In (21), *parlait* cannot easily be replaced by *était en train de parler*, see (22):

(22) *M. Dupont prit la parole. Il ?**était en train de parler** de ses réussites sportives, de son héroïsme, et de cent autres qualités qu'il n'avait pas. (Et il ne parla que de ça pendant le reste de la soirée)*
'Mr. Dupont take (PS) the floor. He be (IMP) in the process of speaking about his sports achievements, about his heroism, and about hundreds of other qualities he didn't have. (And he speak (PS) about nothing else for the rest of the evening)'

In (22), which explicitly presents the talking as going on (*en train de ...*: 'in the process of'), we cannot interpret the second sentence as pertaining to the time of what is implied by the first sentence. This is what makes (22) unnatural. Apparently, ongoingness and anchoring to things that are not explicitly mentioned are incompatible notions.

If I am right about this, we have a straightforward explanation for the difference between sentences like (23a) and (23b), (24a) and (24b), etc., as the reader can see for himself now:

(23) a. *Jean se mit à marcher. Il **avançait** lentement*
b. *John started to walk. He ?**was advancing** slowly*

(Cf. 'John started to walk. He *was advancing* rather slowly when, suddenly ....'. In this case, there is no anchoring to something implicit, but to the 'when-clause': *cum inversum*).

(24) a. *Mon père saisit le fusil. Il le **tenait** sans beaucoup de confiance*
b. *My father took the gun. He ?**was holding** it without assurance*

French examples (23a) and (24a) are perfectly natural, since anchoring to a non-explicited TA is possible if the sentence that has to be anchored does not explicitly express ongoingness. (23b) and (24b), on the other hand, are bad, since the ongoingness expressed by PProg does not allow such anchoring (cf. what has been said about (22)).

So far for IMP of French and PProg of English. Let us discuss now what I have said above about PS (French) and SP (English).

5. The passé simple of French and the Simple Past of English

Let us take a look again at what has been said in (11), partially) repeated here as (25):

(25) a. PS (French): E ⊂ TA or E > TA.
b. SP (English): E ⊂ TA or E > TA **or E ⊇ TA** ('⊇' without ongoingness)

It is easy to find examples that illustrate E ⊂ TA and E > TA for both PS of French and SP of English:

(26) a. *Il se promenait avec sa femme. Il lui expliquait les signes du Zodiaque et lui **montra** Mars, point brillant dans le ciel* ('⊂': *montrer Mars* properly included in *expliquer les signes ...*)
b. *He was taking a walk with his wife. He explained the signs of the Zodiac to her and **showed** her Mars, ….* ('⊂' : *show Mars* properly included in *explain the signes ...*)

(27) a. *Sa femme l'abandonna. A partir de ce jour, il se **sentit** seul* ('>')
b. *His wife left him. From that day on, he **felt** lonely* ('>')

As for the part of (25) that is written in bold characters, this is the most interesting part, since it makes English SP a cousin, in certain situations, of French IMP. Here are some examples illustrating 'E ⊇ TA' for SP of English:[5]

(28) *But Tonzillo still arranged to drive his lover to their usual rendezvous at Duck Island. Outside, it **rained**, turning the soil into a muddy morass. Inside the car, the two lovers were warm.*

(29) *"What a night!" he said. It was a horrible night indeed. The wind **howled** around the house.*

(30) *"You do him an injustice," said her brother, producing Tryon's letter. "He did not get off unscathed. He sent you a message." She turned her face away, but listened while he read the letter…*

(31) *... this ranch is going to hold the Harts and their friends – and NO ONE ELSE. Tell that to your pals!" Stanley held his cigarette between his fingers, and blew smoke through his nostrils while he **watched** Good Indian turn his back and walk away.*

An interesting observation that can be made here about certain semantic differences between English and French tense forms concerns the fact that,

in these examples, the author could have used PProg instead of SP, whereas the French equivalents of these examples would only allow IMP (not PS). Let me first focus on English.

My claims about English tenses predict that both SP and PProg are possible in (28)-(31), since both forms can be used to express '⊇', as we have seen. The difference is purely aspectual: neutral with respect to ongoingness in the case of SP *vs* ongoingness in the case of PProg. This raises the following question. For pragmatic reasons, an 'ongoing-presentation' of the eventualities we are talking about seems the most 'natural' thing to do, in examples like (28)-(31). How should we explain, then, that we can nevertheless use SP, implying that we can 'neutrally' refer to these eventualities? I think there is nothing special going on here. Consider states like *be a bad boy*, *have a good time* etc. The natural thing to do would perhaps be to present them as such, i.e. as not ongoing. Yet, we can view them as ongoing, and say things like 'you are being a bad boy', 'I am having a good time'. In much the same way, eventualities like the ones reported by (28)-(31) may be neutrally referred to, aspectually speaking, even if an 'progressive' presentation would seem more natural.

As for French, my claims about the difference between IMP and PS provide a straightforward explanation for the fact that IMP, but not PS, would have been used in the French equivalents of (28)-(31): IMP, but not PS, can be used to express '⊇'. This leaves the question of how the eventualities are to be viewed in (28)-(31) (as going on or as being simply the case) as something that is undetermined in French.

Having said this, I realize that the last word has not been said yet about the matter. One of the problems that arise with respect to (28)-(31) is why we can present an eventuality both as ongoing or as simple being true in certain cases, whereas in other cases an 'ongoing presentation' is the only natural one. Why do both possibilities present themselves in a case like (32), whereas in (33), the use of PProg is rather unnatural, at least, in an interpretation implying simultaneousness of the eventualities?

(32) *She listened while he **read/was reading** the letter*

(33) *When I came in, he (#)**read/was reading** the letter*

At this stage, I don't have an adequate explanation for this phenomenon, which seems to be somehow connected to the nature of the temporal antecedent of the sentence. In (32), the antecedent of *he read the letter* has a certain 'length': the listening (=TA of *he read ...*), being of type 'activity', can

be conceived of as taking some time. In (30), on the other hand, TA (= *he come in*: achievement) cannot easily be viewed as such. This might be an explanation for the fact that the only natural temporal reading of (33), with the Simple Past 'read', is an interpretation according to which the eventualities follow each other in time.

6. Conclusion

In the preceding lines, I proposed a rule for Past Tense sentences (containing a non-compound tense form) according to which these sentences express '⊇', '⊂' or '>' with respect to their TA in narrative discourse. I also argued that both French IMP sentences and English PProg sentences express '⊇' with respect to TA, the only difference between these forms being that French IMP sentences report what is the case (i.e. simply true) at a given moment of time *t*, whereas English PProg sentences mention what is going on at *t*. This led me to the conclusion that the PS of French and the SP of English 'should' express '⊂' or '>' or, in the case of SP of English, '⊇' of the non-ongoing type. I argued that my claims and certain implications that can be attached to these claims were supported by a number of interesting linguistic phenomena that were treated in the preceding sections. For instance, 'E ⊃ TA' is excluded for PProg sentences if TA 'is' an instant, whereas IMP sentences do not exclude this temporal structure in this case. Contrary to what can be said about IMP, the use of PProg is not natural in frequentative contexts. IMP sentences, but not PProg sentences, may be anchored to a not explicited TA. These facts imply that IMP has a larger distribution that PProg. On the other hand, English SP 'should' have a larger distribution than French SP, since it follows from my rules that SP can be used (and indeed it can, as we have seen) for expressing 'E ⊇ TA' in certain cases.

Notes

1. '<': anteriority. The only exception to this rule seems to be sentences having an aoristic meaning. Type: 'he always was and will always be my best friend' ('il fut et reste mon meilleur ami'). In these cases, the sentence expresses anteriority with respect to TA=the moment of speech.
2. The Vendlerian classes (Vendler 1967) are used as properties of (eventualities referred to by) whole sentences here.

3. Frequency is purely static by its very nature, whereas ongoingness is not. This explains the oddity of a sentence like 'he is sometimes teasing her', and also why frequentative sentences can be used in the 'Simple Present', just like states in general: 'he sometimes teases her' (cf. Molendijk and De Swart 1998). Utterances containing 'always' ('he is always teasing her') are an exception to the rule.
4. Temporal implications are posterior to what implies them. Temporal presuppositions are anterior to what presupposes them. For these notions, see, for instance, Molendijk 1993 and 1996.
5. Examples (25), (27) and (28) are taken from www.capitalcentury.com/1939.html, www.online-literature.com/charles-chesnutt/house-behind-the-cedars/19/ and www.worldwideschool.org/library/books/lit/romance/GoodIndian/chap25.html, respectively.

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Sequence of perfect

Tim Stowell

1. Introduction

In this article I will argue that the English infinitival perfect (*have*+*-en*) functions as a true past tense in at least some cases, reviving an old analysis (Hoffman 1966). I will review Hoffman's three main arguments for this position, and reject two of them while accepting the third. In addition, I will show that the infinitival perfect resembles the English preterit *past* in exhibiting a "simultaneous" present-tense-like interpretation when embedded within a main clause containing past tense. This type of interpretation, a paradigmatic example of "sequence of tense", is commonly assumed to be possible only with finite tenses. The broader implication is that infinitival clauses may contain tenses – at least past tense.

2. Temporal argument structure and interpretation

In a main clause, tenses conventionally convey a temporal relation between the actual Utterance Time (UT) and what Klein (1994) calls the "Topic Time". In simple sentences lacking auxiliary verbs, Klein's Topic Time (TT) corresponds roughly to Reichenbach's (1947) traditional notion of the "event time" (ET), but in sentences containing aspectual auxiliary verbs, the TT is a time related to the ET by the aspectual semantics of the auxiliary.

Following previous work, I assume that tenses are dyadic predicates expressing a temporal ordering relation holding between two time-denoting arguments. I refer to the external argument of a tense as its Reference Time argument (RT); the internal argument of the tense is Klein's TT. In a main clause, the RT of a tense denotes the actual UT. Thus a main clause tense orders the UT in relation to the TT. Past tense is assumed to be a temporal ordering predicate meaning 'after'; it orders its external RT argument (denoting the UT) after its internal argument (the TT).

In (1a-c), the past tense locates the actual UT after the TT:

(1) a. *Max ate an apple*.
b. *Max had eaten an apple*.
c. *Max was eating an apple*.

In (1a), there is no aspectual auxiliary, so TT and ET coincide; thus, the past tense orders the UT after the ET (the time interval of the apple-eating event). In (1b) and (1c), the periphrastic aspectual auxiliary constructions express a temporal ordering relation between the TT and the ET. The periphrastic perfect *have*+*-en* resembles the preterit past tense in expressing anteriority, or past-shifting; just as *past* locates UT after TT, so *have*+*-en* locates TT after ET. The periphrastic progressive *be*+*-ing* locates the TT within the ET; here the TT denotes a sub-interval of ET.

Consequently (1b) and (1c) involve reference to three distinct times UT, TT, and ET, represented schematically in the traditional time-line diagrams in (2), where time flows from right to left:

(2) a. UT – TT – ET (1b)

b. UT – [TT]
|
$[...x...]_{ET}$ (1c)

In subordinate clauses, tenses work somewhat differently. First, they may be used to express a relation between the TT of the subordinate clause and a time other than the actual UT. Typically the 'other time' in question is the ET of the matrix clause, as in (3):

(3) *Bill said that Max ate an apple*.

In (3), the main clause *past* locates the UT after the main clause TT. Since there is no aspectual auxiliary in the main clause, the main clause TT (TT-1) is the main clause ET (ET-1, denoting the time at which Bill spoke). The subordinate complement clause also contains no aspectual auxiliary, so its TT (TT-2) coincides with its ET (ET-2, denoting the time at which Max ate an apple). If the past tense in the complement clause (Past-2) functions like its main clause counterpart (Past-1), it should order the complement clause Reference Time (RT-2) after TT-2 (=ET-2). Since sentence (3) must be understood to unambiguously locate ET-1 after ET-2 , RT-2 must denote the same time as ET-1, since Past-2 orders it after TT-2. We can capture this by assuming (4):

(4) The RT of a complement clause is controlled (bound) by the main clause ET-1.

The temporal interpretation of (3) is represented schematically in (5):

(5) UT/RT-1 – TT1/ET1/RT-2 – TT2/ET2
past-1 past-2

Thus, (3) reports a prior event of Bill uttering (1a), where the complement clause (*that Max ate an apple*) faithfully conveys the content of (1a) (*Max ate an apple*).

3. Finite SOT: simultaneous interpretation of *past* in finite complement clauses

A second difference between main clause and complement clause tense interpretation is illustrated by sentences (6a) and (6b):

(6) a. *Bill said that Max had eaten an apple*.
b. *Bill said that Max was eating an apple*.

If the complement clause past tense (Past-2) in (6a-b) were semantically equivalent to its counterpart in (3), we would expect that ET-1 should control RT-2, and that Past-2 should order ET-1/RT-2 after TT-2. In (6a), the complement clause perfect *have+-en* should then locate TT-2 after ET-2, while the complement clause progressive *be+ing* should locate TT-2 within ET-2. Thus we should expect temporal interpretations along the lines of (7a-b), with both sentences making reference to four distinct times:

(7) a. UT/RT-1 – TT-1/ET-1/RT-2 – TT-2 – ET-2 (6a)
past-1 past-2 perf

b. UT/RT-1 – TT-1/ET-1/RT-2 – TT-2 (6a)
past-1 past-2 | ← prog
$[...x...]_{ET-2}$

While it is possible to understand (6a-b) in this way in certain restricted circumstances discussed below, the most salient interpretation of (6a-b)

involves reference to only three distinct times, where TT-2 coincides with TT-1/ET-1/RT-2, as in (8):

(8) a. UT/RT-1 – TT-1/ET-1/RT-2/ TT-2 – ET-2 (6a)
past-1 perf

b. UT/RT-1 – TT-1/ET-1/RT-2/ TT-2 (6a)
past-1 | ← prog
$[...x...]_{ET-2}$

The interpretation associated with (8a-b) is one in which the past-shifting semantics of Past-2 is entirely absent, as though the complement clause *past* were being interpreted as a present (zero) tense rather than as a past tense. (For concreteness I assume that present tense expresses coincidence, or simultaneity, between RT and TT.) Thus, (6a) can be used to report a prior event of Bill uttering (9a), and (6b) can be used to report a prior event of Bill uttering (9b):

(9) a. *Max has eaten an apple*.
b. *Max is eating an apple*.

In the same way, (10a) can be used to report a prior event of Bill uttering either (10b) or (10c):

(10) a. *Bill said that Max was in Paris*.
b. *Max is in Paris*.
c. *Max was in Paris*.

The 'simultaneous' interpretation of subordinate clause *past* is an instance of the phenomenon of Sequence-of-Tense (SOT), involving distinctive correspondences between meaning and morpho-syntactic form in complement clause tenses falling under the scope of a higher past tense, especially in contexts involving indirect discourse, reporting speech or mental attitudes.

There are two well-known distributional restrictions on the simultaneous interpretation of the preterit *past*. The first is that it is possible only when the clause containing the *past* is embedded within a main clause containing another (past-shifting) past tense, as in (6). The second is that it is possible only when the TT argument of *past* contains a stative predicate, as in (10a), or perfect or progressive aspect, as in (6a-b), or a temporally quantified or habitual predicate, as in (11):

(11) a. *Bill said that Max ate an apple every day*.
b. *Bill said that Max ate apples*.

Suppose that there is an aspectual super-category STATIVE, comprising conventional stative predicates, predicates headed by perfect or progressive aspect, and temporally quantified or habitual predicates. This class contrasts with episodic eventive predicates (of all aspectual subclasses, including activities). We need not be concerned here with the semantic principles defining this grouping here. Now, the constraint on the simultaneous interpretation can be expressed descriptively as in (12a) or (12b):

(12) a. The internal argument of a temporal-ordering predicate expressing simultaneity must be the time of a STATIVE eventuality.
b. The internal argument of a temporal-ordering predicate expressing simultaneity may not be the time of a (non-STATIVE) episodic eventive eventuality.

The STATIVE constraint in (12) applies to other simultaneous tense interpretations as well. In particular, it also applies to uses of finite *present* in sentences such as (13a-b), as is well known:

(13) a. *#Max eats an apple*.
b. *#Bill will say that Max eats an apple*.
c. *Max is eating an apple*.
d. *Bill will say that Max is eating an apple*.
e. *(Bill will say that) Max eats apples every day*.

Here the TT must contain a STATIVE predicate, as in (13c) and (13e). Sentences (13a) and (13b) are anomalous; they cannot be interpreted as non-progressive analogues of (13c) and (13d), with the present tense conveying simultaneity between RT (UT) and TT (ET) in (13a) and between RT-2 (ET-1) and TT-2 (ET-2) in (13b). Sentences like (13a) are appropriate as headlines, where the understood tense is that of a recent past (past-shifting, rather than simultaneous), or as captions on photographs or illustrations, where there is no interpretation of simultaneity between the time of the event depicted and any other time.

I have suggested elsewhere (Stowell 1995a, 1995b, 2006) that the past-shifting and simultaneous interpretations of the English preterit *past* in sentences like (6a), (6b) and (10a) involve two distinct tenses; the past-shifting

reading involves a true past tense, while the simultaneous reading involves a distinct "zero" or (non-indexical) "present" tense. I call the former tense PAST and the latter tense PRESENT. While this might suggest that the finite preterit *past* is ambiguous between two lexical meanings (PAST and PRESENT), I suggest instead that *past* should be thought of as a temporal analogue of a determiner heading a time- (or event-) denoting expression, but also incorporating a polarity marker, indicating that the phrase it heads falls within the semantic scope of a true PAST tense.

On this view, true semantic (past-shifting) PAST tense is covert (null); *past* is just the head of the TT argument, falling under the scope of PAST. When *past* occurs as the head of a main clause TT, the true tense of the clause must be PAST in order to license *past*. But when *past* occurs as the head of a complement clause TT, it can be licensed by falling under the scope of a main clause PAST, in which case the covert tense of the complement clause is free to be either PAST (past-shifting) or PRESENT (simultaneous). Completing the picture, the morpheme *present* does not convey PRESENT (simultaneity), rather, it is also the head of a TT argument, but it conveys the opposite polarity relation of *past*: the TT that it heads may *not* fall within the semantic scope of PAST.

When a complement clause contains *past*, and the TT is STATIVE, as in (6a-b) and (10a), the tense is normally interpreted as if it were simultaneous PRESENT, as we have seen. But a complement clause containing *past* and a STATIVE TT can also be understood to contain a true past-shifting (non-SOT) PAST, locating the matrix event time after the TT, thus resembling the interpretation of *past* with an episodic eventive TT in (3). As noted by Boogaart (1995), however, this is possible only when the subordinate clause TT is understood to be simultaneous to a time already under discussion in the prior discourse; I will refer to this discourse-supplied time as the DT. For example (10a), repeated here, can be used to report Bill's testimony in a criminal trial:

(10) a. *Bill said that Max was in Paris*.

In this context, the DT is the time of the alleged crime, and Bill asserts that Max was in Paris at the DT. Thus, even on the past-shifted reading of *past*, the STATIVE TT must be understood to be simultaneous with some other time. The same is true with all other subtypes of STATIVE predicates; they must normally be construed as simultaneous with some other time, either with the main clause ET-1 (when the tense conveys simultaneity) or with a DT.

This raises the question whether the morpheme *past* ever conveys actual temporal past-shifting with TTs of STATIVE eventualities (as it clearly does with TTs of episodic eventive eventualities). The answer is "yes". On the past-shifted readings of sentences like (6a-b) and (10a), where the TT is simultaneous with a DT, the DT must be understood to be prior to the main clause ET – the time at which Bill spoke in (10a). This must be the effect of the past-shifting interpretation of *past* within the complement clause, since without this it should be possible for the TT to be simultaneous with a DT that is subsequent to the matrix ET.

It is a matter of controversy exactly how SOT works and whether the phenomenon is restricted to intensional contexts associated with predicates of speech, belief, and modality. In this paper I will ignore these issues as much as possible, focusing instead on the parallel between SOT interpretations of *past* in finite complement clauses exemplified in (6a), (6b) and cases involving non-finite *have*+*-en* to which I now turn.

4. Infinitival tense?

Infinitival clauses are traditionally assumed to differ from finite clauses in three major respects. First, infinitival clauses (at least in English) lack any overt manifestation of subject-verb agreement. Second, infinitival clauses (at least in English) lack overt nominative subject DPs; the subject DP is typically either absent or null, though in some cases non-nominative subjects are possible. Third, infinitival clauses are widely, though not universally, believed to lack tense.

That infinitives do not contain tense is, of course, the traditional view. It directly accounts for the obvious fact that conventional tense affixes do not appear in them. On the other hand, from a semantic point of view, infinitives can express the same basic temporal ordering relations that are conventionally expressed in simple finite clauses by *past*, *present*, and the future modal *will*. To convey past-shifting, infinitives use the bare perfect, composed of the root form of the auxiliary *have* and a past participial complement (*have*+*-en*), as in (14a). To convey simultaneity (14b) or future-shifting (14c), infinitives require no additional morphology at all.

(14) a. *Sam believed Mary to have left*.
b. *Sam believed Mary to be in Paris*.
c. *Sam expected Mary to leave*.

So are infinitives really tenseless, or do they harbor tenses after all? More concretely, do infinitives contain overt or covert syntactic elements that should be categorized as tenses, conveying the semantic notions of past, present, and future? The answer depends, first and foremost, on how one defines "tense".

From a semantic perspective, three main ideas have been advanced:

(15) i. Tenses express temporal shifting (or lack thereof) with respect to a Reference Time (RT); the RT is the Utterance Time (UT), at least in main clauses.
ii. Tenses are referential expressions analogous to pronouns, but referring to times rather than to individuals.
iii. Tenses should be distinguished from aspects in being absolute, or indexical, always taking the UT as the RT.

(15i) expresses the traditional, intuitive, view that tenses express the basic notions of past, present, and future. (15ii) captures a number of syntactic parallels between tenses and pronouns, and has been widely influential, especially in the semantics literature. Advocates of this view generally also accept (15i), but assume that the temporal-shifting function is subordinate to the referential function, taking temporal shifting to be the main component of a restriction on the reference of the tense. (15iii) is controversial, both with respect to the analysis of English tenses and with respect to the analysis of so-called relative tenses in many languages. These ideas have been adopted in various combinations in specific theories of tense that have been advanced in the literature.

To convince all tense theorists that infinitives contain tenses, it would be necessary to show that infinitives contain elements conveying a semantics that corresponds to all three of (15i-iii). I will not do that in this paper, but I do intend to argue that infinitival perfect behaves like a past tense by either of the first two definitions (15i-ii). The infinitival perfect plainly does not behave in a way consistent with (15iii), but I do not believe that (15iii) should be taken to be a necessary property of true tenses.

In what follows I will assume the theory of tense that I have advocated elsewhere (Stowell (1995a,b, to appear)). The theory assumes that the functions associated with (15i) and (15ii) are syntactically dissociated from each other. The temporal ordering function (15i) is assigned to the category Tense (T), while the temporal reference function (15ii) is assigned to the time-denoting arguments of Tense, notably to the TT argument. Contrary to (15iii), I assume that tenses are *not* intrinsically absolute or indexical; in-

dexical interpretations of subordinate clause tenses arise when the application of overt or covert (LF) movement applies, moving the subordinate TP or CP out of the scope domain of one or more higher tenses. This type of movement can be triggered by various factors (including the need to express *de re* reference).

To account for the phenomenon of SOT, I further assume (16i-iii):

(16) i. The English tenses PAST and PRESENT are covert (phonetically null).
ii. The morphemes *past* and *present* are temporal analogues of determiners, the heads of TT arguments referring to times.
iii. *past* and *present* differ from each other in encoding a scopal polarity relation to PAST: *past* must fall under the scope of PAST, whereas *present* may not.

By (16i) and (16ii), the English finite "tense" morphemes *past* and *present* are not true tenses (expressing temporal ordering relations) but rather heads of the TT arguments of tenses. The *past/present* contrast expresses a scope relation to true PAST tense, similar to the traditional account of the *any/some* contrast (that it expresses a scope relation to negation or a downward-entailing operator). This approach agrees with Partee (1973) and Enc (1986, 1987) in claiming that the English morphemes *past* and *present* are (the heads of) time-denoting expressions (as in 15ii), but it disagrees with their accounts in claiming that these morphemes do not directly express any temporal ordering function (15i), even as a restriction on the referential function.

It is sometimes asserted that past-shifting tenses have an "absolute" (indexical) tense interpretation whereas past-shifting aspects have only a relative time-shifting interpretation. The absolute/relative distinction hinges on whether the tense is interpreted indexically or not; in our terms, this depends on whether the RT of the tense denotes the actual UT or some other time such as the main clause ET. But the finite preterit *past* in the subordinate clauses in (3), repeated here, has a relative, rather than an absolute, interpretation, so it cannot be that only absolute tenses are true tenses.

(3) *Bill said that Max ate an apple*.

The same is true of *past* and *present* in examples like (17):

(17) a. *John will/might say that Max tricked him*.
b. *John will/might say that he is thirsty*.

Furthermore, present and past tenses in Japanese have relative, rather than absolute, interpretations when they occur in subordinate clauses, as in (18a-b), just like *have+-en* in an English infinitival complement. The same is also true of tenses in relative clauses in Japanese, as in (18c).

(18) a. *Taroo-wa* [$_{CP}$*Hanako-ga* *Tookyoo-ni* *i-ta* *to*]
Taro-TOP Hanako-NOM Tokyo-LOC be-PST COMP
it-ta.
say-PST
'Taro said that Hanako was (=had been) in Tokyo.' (Past shifted only)

b. *Taroo-wa* *Hanako-ga* *Tookyoo-ni* *i-ru*
Taro-TOP Hanako-NOM Tokyo-LOC be-NONPST
to *it-ta*.
COMP say-PST
'Taro said that Hanako was (*lit.* = is) in Tokyo.' (Simultaneous)

c. *Taroo-wa* *waratte* *i-ru* *otoko-o* *mi-ta*.
Taro-TOPIC laughing be-NONPST man-ACC see-PST
'Taro saw a man who was/is laughing.'

The same is true of tenses in many languages. One can, of course, maintain that none of these are true tenses because of their non-indexical character, but given the non-indexical character of the English tenses in (3) and (17), it is doubtful that the indexicality criterion (15iii) can be maintained.

Tenses in relative clauses have been claimed to have an indexical interpretation, but Abusch (1988) showed that this was not the case for relative clauses construed *de dicto* or *de se*, suggesting that the scope construal of the relative clause is responsible for the indexical tense interpretation when the relative clause is construed *de re*. I will therefore assume that tenses do not have to be indexical in order to count as true tenses.

In Section 5, I will argue that infinitives containing the bare perfect must be assumed, in some cases, to contain a (covert) counterpart to the same semantic formative PAST that is associated with finite clauses containing the preterit *past*. If true tenses are temporal ordering predicates as in (15i), then it is the presence or absence of these elements (rather than the morphemes *past* and *present*) that determines whether infinitives are tensed or tenseless. Those who would defend a referential semantics for tenses, as in (15ii), might object that this criterion alone is insufficient. Although I have suggested that the temporal reference function should be associated with the

TT argument of a tense rather than with the tense itself, I will argue in Section 6 that the infinitival perfect behaves like the finite preterit *past* in functioning as the head of a referential TT argument. The argument is based on the observation that the infinitival perfect behaves like the finite preterit past in exhibiting a simultaneous (SOT) interpretation. The broader conclusion is that infinitival clauses containing the perfect must be assumed, in some cases at least, to contain a past tense regardless of whether one assumes a predicative theory of tense of the sort I have advocated, or a referential theory of tense of the Partee/Enc variety.

5. The ambiguity of the infinitival perfect

5.1. Past tense vs. perfect aspect

If infinitives were really tenseless, the nonfinite perfect in (19) would have to convey only an aspect, and not a true (PAST) tense.

(19) *Max believes Sam to have left*.

However, there is little empirical content to this claim unless one can show that the semantics associated with the finite preterit *past* morpheme is fundamentally different from that of the infinitival perfect, in a way that follows naturally from the assumption that *past* conveys a true tense and that the infinitival perfect does not.

The idea that the infinitival perfect is, or can be, a true past tense was proposed by Hoffman (1966). Working within the framework of the Standard (*Aspects*) theory, Hoffman assumed that infinitival clauses are derived transformationally from finite clause Deep Structure sources. He derived infinitival *have*+*-en* from three distinct finite sources – the preterit *past* (*-ed*), the present perfect (*has*+*-en*), and the past perfect (*had*+*-en*) – so that (20) corresponds to any of (21a-c):

(20) *Caesar is believed to have lived in Rome*.

(21) a. *It is believed that Caesar lived in Rome*.
b. *It is believed that Caesar has lived in Rome*.
c. *It is believed that Caesar had lived in Rome*.

Deep Structure was assumed to be the sole syntactic level of representation at which semantic interpretation occurs (the syntactic locus of the syntax-semantics interface, in Minimalist terms.) Hoffman's theory thus predicted that the infinitival perfect should be able to behave like any of the finite tense constructions in (21a) and (21c) with respect to semantic tests distinguishing the tense constructions from each other. It also predicted that the infinitival perfect should display ambiguous syntactic behavior corresponding to its three sources, depending on the stage in the derivation at which the infinitive is created and distinctions among the three distinct tense constructions are neutralized.

Before proceeding further, it should be noted that there are two very different ways of interpreting Hoffman's insight theoretically. First, it could be, as he has it, that the infinitival perfect has three distinct subtypes, corresponding more or less directly to its three finite counterparts in (21). Translating his claim into the present framework, this would imply that infinitival perfect clauses may contain any of the following three combinations: (a) a past tense; (b) a present tense and a perfect; (c) a past tense and a perfect. All three interpretations involve the presence of a tense within the infinitive: a past tense in (a) and (c), and a present tense in (b). This interpretation of the ambiguity of (20) assumes, of course, that infinitival clauses may contain tense. An alternative interpretation of (20) and (21), compatible with the traditional assumption that infinitives are tenseless, would be that the infinitival perfect in (20) is simply vague, rather than ambiguous, along the dimension of the distinctions among the finite tense constructions in (21). Of course, some combination of the two approaches might turn out to be correct.

5.2. Specific past time adverbs: infinitival perfect as past

Hoffman's diagnostic tests were stated as descriptive generalizations, and were not given an explicit syntactic or semantic analysis. First, to show that the infinitival perfect can behave like the preterit past and unlike the present perfect, he pointed out that it can co-occur with "a time adverb [that] designates a past time point, e.g. *at 3 p.m. yesterday*". This is the familiar restriction on the English present perfect involving referential definite past-time adverbs, illustrated in (22):

(22) a. *He came last Tuesday*.
b. **He has come last Tuesday*.
c. *He is rumored to have come last Tuesday*.

It should be noted that the past perfect and future perfect both differ from the present perfect in not being subject to this restriction. Still, the infinitival perfect in (22c) cannot naturally be interpreted as either a past or future perfect, so Hoffman is probably correct in claiming that the infinitival perfect in (22c) corresponds semantically most closely to the preterit past. But whether the test in (22) specifically diagnoses the presence of a syntactic or semantic counterpart to a past tense in the infinitive is another matter. Insofar as the definite time-adverb restriction applies specifically to the present perfect, it could be that the infinitive simply contains a bare (tenseless) perfect, which might be expected to behave like the finite future and past perfects in not being subject to a restriction that applies only when the present tense is involved. Thus, the test in (22) turns out not to be decisive.

5.3. *Now*: infinitival perfect as present perfect

Hoffman's second test was intended to show that the infinitival perfect can behave a finite present perfect – and unlike a finite preterit past or past perfect – in being compatible with the time-adverb *now*. Actually, I think that Hoffman's description of the facts is insufficiently fine grained. The past perfect is compatible with a non-indexical relative (narrative past-time) interpretation of *now*, indicated by ^, in (24c) and (25c); the same interpretation arises, somewhat marginally without a prior discourse context, with the preterit past in (25a) and with the future perfect in (24d) and (25d).

(23) a. *He is reported/believed to have drunk a gallon of vodka by now.*
b. *He is alleged/believed to have finished eating now.*

(24) a. **(It is reported that) he drank a gallon of vodka by now.*
b. *(It is reported that) he has drunk a gallon of vodka by now.*
c. *^(It is reported that) he had drunk a gallon of vodka by now.*
d. *^(It is expected that) he will have drunk a gallon of vodka by now.*

(25) a. *^(It is alleged that) he finished eating now.*
b. *(It is alleged that) he has finished eating now.*
c. *^(It is alleged that) he had finished eating now.*
d. *^(Is is expected that) he will have finished eating now.*

Example (24a) is worse than (25a) presumably because the preterit past in combination with an episodic eventive VP is incompatible with any completive adjunct PP headed by *by*, as illustrated by (26):

(26) ??*(It is reported that) he drank a gallon of vodka by 5 o'clock*.

In any case, the correct descriptive generalization about *now* seems to be that an indexical interpretation is possible if the clause containing it contains the present perfect but not if it contains the preterit past or the past or future perfect.

Does this tell us that the infinitival perfect in (23) contains a counterpart to the present perfect? Unfortunately, the answer is less clear than what Hoffman claimed. If the test specifically diagnoses the presence of a present tense within the clause, then the answer is "yes". If, on the other hand, the test simply diagnoses the absence of a past- or future-shifting tense, i.e. the absence of a tense or modal shifting the topic time (TT) away from the present (UT), then the answer is "no", since the hypothesis that infinitives are tenseless is compatible with the latter claim. Can one choose between these views? To resolve this the first step is to formulate a more articulate theory of the basis of the relevant constraint on the indexical interpretation of *now*. When a time adverbial occurs with a perfect it can in principle associate either with the ET or with the TT (the so-called result state time). In the case of an indexical adverb like *now*, the only option is the result time. When the TT is the complement of a past tense (on either a past-shifted or simultaneous-past reading), or of a future modal, the TT cannot refer to the UT and indexical *now* is excluded. The question of whether the infinitival perfect in (18) contains a counterpart to the present tense thus hinges on whether a present tense is required within the clause in order for perfect to provide a TT that the indexical *now* can associate with. I see no reason to believe that this must be the case, so it must be concluded that Hoffman's second test is also indecisive.

5.4. Double past-time adjuncts: Infinitival perfect as past perfect

Hoffman's final test intended to show that the infinitival perfect can correspond uniquely to the finite past perfect with a particular combination of temporal adjuncts, as in (27) and (28):

(27) *He is rumored to have seen her [only once before] [when I met him]*.

(28) a. **It is rumored that he saw her only once before when I met him*.

b. **It is rumored that he has seen her only once before when I met him*.
c. *It is rumored that he had seen her only once before when I met him*.

The test works because the two adjuncts have to associate with distinct past times. The adjunct *when*-clause in (27) and (28c) is associated with the TT (the perfect result time). It contains a past tense, so the TT must itself be in the past. This is what excludes the present perfect in (28b). The first adjunct, *only once before,* is existentially quantified, binding an event or ET variable, and it internally locates ET in the past relative to another time T' (ET is before T'). Now, T' is covert, but it is anaphorically bound by the TT (the perfect result time) in (27) and (28c). Since the two adjuncts modify distinct past times, they are incompatible with the preterit past in (28a) since it lacks an aspectual auxiliary, its ET functions as its TT, and it fails to provide two distinct time-denoting arguments for the adjuncts to modify. Now, since the infinitival perfect in (27) is compatible with this combination of adjuncts, it must provide two distinct time-denoting arguments for the adjuncts to modify. In principle, the past-shifting perfect should provide them.

Must we assume that the infinitive contains a past tense in addition to the perfect? At first glance, the answer might appear to be "no", on the following grounds: as long as there is no present tense in the infinitive, one might assume that the TT (the perfect result time) is free to refer to any time, past or present; if it picks out a past time, it can be compatibly modified by the past-tense *when*-clause, and its ET can of course be bound by the existentially quantified adjunct. On closer inspection, however, the answer must be "yes", since an ECM infinitive with a STATIVE TT cannot normally receive a past-shifting interpretation:

(29) *He is rumored to be tall*.

Here the content of the infinitival clause must have an indexical present-tense interpretation. Now, while one can attribute a past-shifted ET to the perfect aspect in the infinitive in (27), once cannot attribute a past-shifted TT to it on the basis of the perfect aspect alone. Therefore the infinitival perfect in (27) must contain a past-shifting tense to locate the TT in the past in (27), exactly as Hoffman claimed. The same is true of somewhat simpler examples like (30):

(30) *John is believed to have already left when I met him*.

Thus it seems that Hoffman's third test provides positive evidence in favor of the view that infinitival perfects must be capable of encoding a past tense, at least in combination with a pure perfect aspect. How exactly the infinitival perfect manages to encode *two* past-shifting tenses in (27) and (30) will be addressed in Section 7.

Chris Collins (personal communication) has suggested that the examples in (27) and (29) might be assumed to involve simple iteration of the perfect, as in (31), with subsequent reduction of *have had* to *have* in (27) and (29) as a type of haplology:

(31) a. %*He is rumored to have had seen her [only once before] [when I met him*].
b. %*John is believed to have had already left when I met him*.

Collins points out correctly that examples like (31) are common in many dialects, and are abundantly provided by web searches, in examples such as the following:

(32) *Unfortunately, a company ... appears to have had already gone out of business by then*.

Though many speakers (including me) find examples like (31) and (32) utterly ungrammatical, they are clearly attested for many speakers; I do not know whether this correlates with geographically defined dialects or is a matter of idiolectal variation.

Even granting a haplology analysis of (27) and (29) along the lines that Collins suggests, one might still conjecture that true iteration of the perfect is not in general permitted (e.g. in finite clauses) in dialects that allow (31) and (32), in which case the first perfect in these examples might be argued to correspond to an independent past tense. However, examples of iterated perfects in finite clauses turn up with surprising frequency in web searches (with both present perfect and past perfect), in examples like those in (33):

(33) a. *Hoboken has had begun planning discussions about options for clearly identifying certain routes as through-traffic bypasses*
b. *The JISC had approved the funding to begin in August, although Liverpool had had begun work already*.

So it seems that iteration of the perfect is possible in some dialects and that this is a plausible analysis of the infinitival examples in (31) and (32).

But whether (27) and (29) in the standard dialect involve an iterated perfect that undergoes haplology is another matter. The haplology rule in question would have to be arbitrarily confined to infinitives, since the present perfect in finite clauses can never be construed as an iterated perfect in examples like (34a):

(34) *John has left. (not: "It has been the case that John had left")*

It is less easy to rule out an iterated perfect interpretation for the past perfect in a finite clause, but if it were possible, then examples such as (35) ought to be possible, with the first adjunct associating with the event time (the time at which John saw her) and the second and third adverbials associating with the result-times of the two perfects:

(35) *John had seen her [only once before] [when I met him] [when I left]*.

I find such examples impossible to parse, suggesting that the putative iterated perfect and its associated rule of haplology is disallowed in finite clauses. While it is hypothetically possible that this is allowed specifically in infinitives, I consider this possibility unlikely.

6. Infinitival Sequence of Tense

6.1. Sequence of Perfect

A different kind of argument for the presence of a past tense within infinitives comes, surprisingly, and ironically, from cases where the infinitival perfect seems to lack any past-shifting interpretation at all. These are cases, hitherto unnoticed to my knowledge, where the infinitival perfect behaves like an SOT preterit past, allowing a simultaneous (relative present, or "zero") tense interpretation when embedded under a past tense main verb:

(36) a. *Caesar (had) actually believed his wife to have been in Rome at that time*.
b. *Caesar (had) once alleged Pompey to have been a scoundrel*.
c. *After the battle, Caesar appeared to his soldiers to have been unwell*.

Although a past-shifting interpretation for the infinitival perfect is possible here, it is not required; (36a-b) are ambiguous along the simultaneous vs. past-shifted interpretation in exactly the same way as their finite counterparts in (37a-b) are:

(37) a. *Caesar (had) actually believed that his wife was in Rome at that time*.
b. *Caesar (had) once alleged that Pompey was a scoundrel*.
c. *After the battle, it appeared to his soldiers that Caesar was unwell*.

Although the past-shifted interpretation is favored in (36), as the simultaneous interpretation is favored in (37), both interpretations are possible in both cases. (I find that the simultaneous reading is slightly more natural in (36a) and (36b) when the main clause contains the past perfect, though the reading is still possible with the simple past.)

Comparing (36a) and (36c) to (38a) and (38c), we find that the examples in (38) are temporally unambiguous, having only a simultaneous interpretation:

(38) a. *Caesar (had) actually believed his wife to be in Rome at that time*.
b. *Caesar (had) once alleged Pompey to be a scoundrel*.
c. *After the battle, Caesar appeared to his soldiers to be unwell*.

Many speakers prefer (38) over (36) to express a simultaneous reading, but (36) allows it too.

Given the analysis of SOT summarized above, the facts suggest that the infinitival perfect, like the finite preterit *past*, actually functions not as a past-shifting tense, but rather as the referential head of a TT argument, incorporating a PAST polarity marker indicating that it falls under the scope of a (covert) PAST. On the past-shifted reading, the PAST licensing the infinitival perfect polarity item resides within the infinitive; on the simultaneous reading, the infinitival perfect polarity item is licensed by the main clause PAST, and the infinitive contains a covert PRESENT tense instead.

There does seem to be a very subtle difference between (38) and the simultaneous reading of (36), though it is not clear to me precisely what is involved. This difference may be related to the contrast between (39) and (40):

(39) a. *John told me yesterday that next week his mother would believe him to have been sick*.
b. *John told me yesterday that next week he would claim to have been sick*.

(40) a. *John told me yesterday that next week his mother would believe that he was sick*.
b. *John told me yesterday that next week he would claim that he was sick*.

Whereas (40) allows a simultaneous (present) tense interpretation of the most deeply embedded clause, relative to the event time of the clause immediately containing it, this does not seem to be possible for the infinitival perfect in (39). Examples like (40), originally due to Kamp and Rohrer (1983), were cited by Abusch (1988) as evidence against the view that the simultaneous (SOT) reading of *past* actually involves an indexical past tense. That an analogous simultaneous reading is apparently impossible in (39) might be taken as evidence for the opposite view. This, however, would be a surprising conclusion to draw about the infinitival perfect, since it would entail that the infinitival clause contains an indexical (past) tense where the finite clause in (40) does not. In any case, the available interpretation in (39) is not an indexical past, but rather a past-shifted reading relative to the event time of the clause immediately containing it. The same is true of (41), without the indexical adverb in the intermediate clause:

(41) *Caesar told Mark Anthony that his wife would believe him to have been in Rome*.

Rather, it seems that the infinitival perfect disallows a simultaneous (SOT-type) reading when the future-shifting *woll* intervenes between the perfect and the PAST tense that licenses the SOT effect, unlike the situation with finite *past* in (40). This suggests that there is a locality condition governing the licensing of infinitival SOT that does not constrain finite SOT.

Infinitival control clauses often have a future-shifting tense interpretation relative to the event time of the main clause control verb. In these contexts, Stowell (1982) assumed the presence of a future-shifted tense within the infinitive; Wurmbrand (2005) suggests that in such cases there is a covert infinitival counterpart to *woll* (which she takes not to be a true tense). These views turn out to be indistinguishable, given a theory of tense along the lines of (15i). In (42), the future-shifting 'tense' (semantically equivalent to

woll) places the infinitival topic time (equivalent to ET) subsequent to the infinitival reference time RT:

(42) *Caesar (had) expected/hoped/wanted/promised to be in Rome when his wife arrived*.

In these contexts I find that a simultaneous (non-past-shifted) reading of the infinitival perfect is possible, though it involves simultaneity with the future-shifted time introduced by the infinitival counterpart of *woll*, rather than with the matrix event time associated with the intensional verb:

(43) *Caesar (had) expected/hoped/wanted/promised to have been in Rome when his wife arrived*.

Example (43) has a counterfactual flavor that is somewhat less favored in (42), so it is possible that, when the infinitival perfect licenses a simultaneous reading in future-shifted infinitives, the perfect is used to encode counterfactuality. In this respect, the infinitival perfect again resembles the preterit *past* in a finite clause, which allows a present-tense construal in weakly counterfactual conditionals, such as (44):

(44) *If John was here, he would be hiding somewhere*.

Interpretations essentially parallel to (43) are also observed in finite complements as in (45a), where the covert future-shifter is replaced by *would* (formed by combining *past* with *woll*):

(45) a. *Caesar (had) expected/hoped/promised that he would have been in Rome when his wife arrived*.

b. *Caesar (had) expected/hoped/promised that he would be in Rome when his wife arrived*.

Thus it seems that the intervention effect that blocks the simultaneous reading of the infinitival perfect in (39) and (41) does not arise when the intervening future-shifter occurs in the same clause as the infinitival perfect. I will leave it to future research to determine the nature of the intervention effect and whether its mitigation in (43) and (45a) is due to the infinitival perfect being licensed by a counterfactual operator or a covert subjunctive mood within the infinitive.

Either way, these simultaneous and/or counterfactual interpretations associated with the infinitival perfect are parallel to the behavior of the preterit *past* in finite clauses, and unlike the semantics usually associated with perfect aspect. This is also consistent with the view expressed in (15ii) that the time-denoting aspect of past tense, rather than its past-shifting semantics, is essential to its status as a tense.

6.2. Sequence of tense triggered by the infinitival perfect

Another way of using SOT to diagnose the status of the infinitival perfect as a variant of PAST tense is to show that it triggers SOT in finite clauses falling within its scope domain. Brugger and d'Angelo (1994) use this test to argue that the finite present perfect in Italian is ambiguous between two distinct interpretations; they treat one of these as a true past tense, and the other as a non-past-tense perfect aspect. The latter they take to involve an abstract formative TERM (indicating something like perfectiveness). Only the former (past tense) usage of the present perfect licenses a simultaneous interpretation of a past (imperfect) tense in a subordinate clausal complement. They cite a couple of other diagnostic tests distinguishing between the two interpretations of the perfect, which correlate reliably with the SOT-triggering test. Rather than citing their Italian examples and summarizing the somewhat complex interactions that they involve, I will simply construct contrasting examples in English that seem to behave similarly.

In (46a), the English perfect conveys a true past-shifting interpretation, and licenses finite SOT in its complement; in (46b), on the other hand, the English perfect apparently does not behave like a past tense with respect to SOT licensing; the complement clause in (46b), unlike its counterpart in (46a), does not allow a simultaneous (SOT) reading.

(46) a. *John has often believed/thought/said that he was unhappy*.
b. *John has (now) realized/accepted that he was unhappy*.
c. *John (had already) realized/accepted that he was unhappy*.

Applying this test to the infinitival perfect, we see that it can behave like the preterit *past* and the past-shifting perfect in licensing SOT in a finite complement clause:

(47) a. *John is believed/known/alleged to have claimed that he was unhappy*.

b. *John is believed to claim that he was unhappy*.

Once again, the infinitival perfect behaves like the infinitive contains a past tense capable of triggering SOT (i.e. of licensing a past polarity item in a finite clausal complement), though in this respect it does not differ from the (past-shifting) reading of the present perfect in (46a).

7. Tying up a loose end

It remains to provide an account of the past-perfect-like interpretation of the infinitival perfect in examples like (27) and (30), repeated here:

(27) *He is rumored to have seen her [only once before] [when I met him]*.

(30) *John is believed to have already left when I met him*.

The most natural move to make is to assume that the infinitival perfect polarity item is licensed by two past-shifting tenses within the infinitive. One way of thinking about this is to assume that one of these is a counterpart to a finite PAST, while the other is a counterpart to the past-shifting semantics normally associated with the perfect. Though, on this view, these past-shifting formatives are covert, their presence does not come for free; perhaps because of economy considerations, their presence must be licensed by an overt PAST polarity element (past in a finite clause, and perfect in an infinitive).

This in turn raises the question whether all instances of the perfect, in finite and non-finite clauses alike, functions as a PAST polarity item (excluding cases where the perfect polarity item is licensed by TERM or by a subjunctive/counterfactual operator). This does seem to be a viable option, though it must be noted that, when the perfect occurs in its finite form, it never triggers a past-perfect interpretation analogous to what we find in (27) and (30). But this can be accounted for by the fact that finite clauses must contain either *past* or *present*, which either licenses a past tense independently (*past*) or excludes it (*present*). These polarity items are absent from infinitives, so the nonfinite perfect is free to license two past-shifting tenses in examples like (27) and (30). Even in infinitives, this interpretation is accessible only when two temporal adjuncts are present, suggesting that economy considerations prevent the perfect polarity item from licensing more

than one covert past-shifting tense unless the absence of a second past-shifting tense would cause the derivation to crash.

This implies that the past-shifting semantics associated with perfect aspect is really parallel to the past-shifting semantics associated with finite past tense, since both can be assumed to arise from a covert tense induced by the polarity requirements intrinsic to the finite preterit past or infinitival perfect.

8. Conclusion

In this article I have argued, in the spirit of Hoffman (1966), that the infinitival perfect may function like the finite preterit *past*. The particular instantiation of this idea adopted here is that the infinitival perfect, like the preterit past, is actually not a tense, but rather a PAST polarity item, serving as the head of a time-denoting expression, rather than as a true past-shifting tense. The infinitival perfect can be licensed by a covert PAST residing inside or outside the infinitive. The upshot is that infinitival clauses must be assumed to contain at least one type of tense (namely, PAST), lending some support to the view that infinitives may contain other tenses as well (simultaneous/present or future-shifting). Infinitival clauses differ from finite clauses, however, in lacking an overt counterpart to finite *present*, which (as I have suggested) encodes the opposite polarity relation to that expressed by *past*. The latter element, rather than PRESENT tense *per se*, sometimes gives rise indirectly to indexical tense interpretations, when it occurs under the syntactic c-command domain of a higher PAST tense.

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Temporal and aspectual variation in ARIs

Ricardo Etxepare and Kleanthes K. Grohmann

1. Introduction

In this paper, we want to raise theoretical awareness of and hopefully further interest in a marginal construction in colloquial registers of adult grammars which we refer to as *adult root infinitive (ARI)*. By studying the grammatical properties of RIs in adult grammars, we set ARIs apart from the well-known phenomenon of root or optional infinitives in child language (Rizzi 1993/4; Wexler 1994), to which they may, but need not, be related. Our concentration on adult RIs is justified by the pertinent syntactic and semantic properties we present. We pursue a cross-linguistic approach, contrasting Romance and Germanic varieties, and present an analysis of ARIs extending earlier stages of our research (Grohmann and Etxepare 2003). Here we will explore some very clear predictions cross-linguistically, where we focus on the availability of verb-raising beyond Infl (T) and selected issues that arise from it.

The phenomenon at hand is illustrated below with our main languages, English (1) and Spanish (2), where the verbal predicate of an apparently independent root clause appears in infinitival form, even in the presence of an overt subject. However, the subject is not obviously Case-marked (accusative in English), and the entire ARI must be followed by a Coda (see section 2 for more discussion of these and other properties).

(1) *Me go to that party?! I would never do such a thing!* English (En.)
(2) *Yo ir a esa fiesta?! Jamás!* Spanish (Sp.)

Other Romance (3) and Germanic (4) languages exhibit the phenomenon of ARIs as well:

(3) a. *Io andare alla festa?! Mai!* Italian (It.)
b. *Jo anar al cinema?! Vinga, hombre!* Catalan (Ct.)
c. *Eu ir ao cinema?! Antes morto!* Galician (Gl.)
d. *Eu ir a la festa?! Que piada!* European Portuguese (EP)

e. *Eu ir a la festa?! Que piada!* Brazilian Portuguese (BP)
f. *Moi aller au cinema ?! Jamais!* French (Fr.)

(4) a. *Ich zu der Party gehen?! Nie im Leben!* German (Gm.)
b. *Ik naar dat feestje gaan?! Dat nooit!* Dutch (Dt.)
c. *Jeg gå på festen?! Aldri i liv-et!* Norwegian (Nw.)

For adult registers of English it was Akmajian (1984) who first drew attention to this grammatical phenomenon, which he dubbed 'Mad Magazine' sentences since, he suggested, such structures are predominantly found in comic-style contexts (see also Lambrecht 1990). In line with our previous characterization (Grohmann and Etxepare 2003), we call these *root infinitives*, on a par with the at first glance possibly similar phenomenon in child language, but for current purposes refer to them as *adult root infinitives*, a term intended to denote RI proper (the infinitival part demarcated by *?!* in our presentation) plus Coda (the expression that follows, indicated by *!*). We also note that their use is not restricted to comic-style contexts, as our examples demonstrate clearly. In on-going work (Etxepare and Grohmann, in progress), we address both the wider context of RI-structures, including Mad Magazine sentences (which do not seem to require a Coda), and the child language phenomenon (which essentially has different properties altogether).

The goals (and contents) of this paper can be summarized as follows:

(i) to define the most prominent properties of ARIs concerning their phrase structure and lending themselves to our analysis (section 2);
(ii) to investigate a number of clear predictions of this analysis cross-linguistically, in particular the relevance of verb-raising into a high position in some Romance varieties (section 3); and
(iii) to consider a sample of extended infinitival constructions found in Romance varieties with relevance to the issues raised here (section 4).

2. An analysis for ARIs

2.1. Basic structure of ARIs

The two main languages considered here, Spanish (as a representative of Romance) and English (initially at least as a representative of Germanic), will serve as a first illustration of our analysis:

(5) a. *Pedro comprar vino?! No me lo creo!*
Peter buy.INF wine NEG I CL believe
b. 'Peter buy wine?! I don't believe that!'

Assuming a rough clausal architecture like the one in (6) below, and building on evidence from adverbs and syntactic behaviour in the left periphery (see the following for a basic set of data), we make the following assumptions (supported by detailed argumentation in Grohmann and Etxepare 2003):

– the Comp-layer is severely impoverished (with a single CP-related projection in Spanish, which, following Uriagereka 1995, we call FP)
– the Infl-layer is deficient in at least Tense (TP > ModP > AspP > *v*P)

(6) $[_{CP}$ Spec C^0 $[_{FP}$ F^0 $[_{TP}$ Spec T^0 $[_{ModP}$ Mod^0 $[_{AspP}$ Spec Asp^0 $[_{vP}$ v^0 VP]]]]]]

Furthermore, it can be observed that ARIs are incomplete without what we call the Coda. We note that ARIs are necessarily followed by a clause that provides the assertoric force of the sentence:

(7) a. *Yo fregar los platos otra vez?! Ni hablar!*
I do.INF the dishes again no say
b. 'Me do the dishes again?! No way!'

For example, there are clear connectivity effects between these two clauses which we illustrate for Spanish with negative polarity items:

(8) a. ??*Comprar yo nada en esa tienda?! Por supuesto!*
buy.INF I anything in that shop of course
b. *Comprar yo nada en esa tienda?! Lo dudo!*
buy.INF I anything in that shop it I.doubt
'Me buy anything in that shop?! ??Of course! / √I doubt it!'

We take this fact to show that the two clauses are attached to a single root. This root is the exclamative operator, which has as its restriction the RI (orthographically signaled by '?!'), and as its predicate the assertoric clause

(what we call the "Coda" of the RI). The ARI is thus presented in terms of a tripartite quantificational structure (cf. Partee 1991 and subsequent work):

(9) [Excl [Root Infinitive] [Coda]]

The exclamative operator binds an event variable in both conjuncts. The structure presents a quantificational configuration akin to that of "donkey-sentences" (for recent discussion, see, among others, Chierchia 1995, Partee 1995, Partee, Hajičová, and Sgall 1998); a detailed semantic account can be found in Etxepare and Grohmann (2005). This brief discussion allows for the following internal structure of the RI-part of the ARI (i.e. ARI minus Coda):

(10) $[_{FP}$ topic F^0 $[_{TP}$ subject$_i$ T^0 $[_{ModP}$ adverb $[_{Asp1P}$ adverb $[_{Asp2P}$ adverb $[_{vP}$ t_i *v* $[_{VP}$…]]]]]]]

Let us now briefly consider some of the data that justify this restricted clause structure. As argued in Grohmann and Etxepare (2003), adverbs are acceptable in ARIs if they are aspectual, root modal, subject-oriented, or temporal (with an interesting wrinkle on the latter which we will discuss below) – and ungrammatical if they are propositional or epistemic:

(11) a. *María levantarse habitualmente a las seis?!*
Mary rise.INF.REFL usually at the six
b. Mary usually get up at 6am?!

(12) a. *Pedro comprar eso necesariamente?!*
Peter buy.INF that necessarily
b. *Peter necessarily buy that?!*

(13) a. *Comprar yo eso a propósito?!*
buy.INF I that on purpose
b. *Me willingly buy that?!*

(14) a. *Juan leer esas cosas en aquellos tiempos?!*
John read.INF those things in old times
b. *John read that sort of thing back in those days?!*

(15) a. **El Athletic afortunadamente ganar la liga?!*
the Athletic luckily win.INF the league
b. **Athletic [Bilbao] luckily win the league?!*

(16) a. **María probablemente ir allí?!*
Mary probably go.INF there
b. **Mary probably go there?!*

With respect to the left periphery, we can observe that topicalization is unacceptable in English, but grammatical in Spanish if resumed by a clitic (clitic left dislocation). We take this as indication that clitic left dislocated elements sit in a slightly lower position than bona fide topics (here identified as [Spec,FP] as opposed to [Spec,TopP]) – prototypical exponents of Comp-phenomena like hanging topic left dislocation, focalization, or *wh*-questions are simply out in either language:

(17) a. *Las elecciones ganarlas Schröder?!*
the elections win.INF.CL Schröder
b. **The elections, Schröder win?!*

(18) a. **Juan, el tio comprarse un Ferrari?!*
John the guy buy.INF a Ferrari
b. **John, that guy buy a Ferrari?!*

(19) a. **BROCCOLI comprar él?!*
broccoli.FOC buy.INF he
b. **BROCCOLI him buy?!*

(20) a. **Quién comprar un Volkswagen?!*
who buy.INF a Volkswagen
b. **Who buy a Volkswagen?!*

2.2. Temporal variation in ARIs

ARIs across languages vary as to the kind of temporal modification they admit. English does not permit modification to a deictic point in the past like (21b), for example, whereas the Spanish equivalent in (22b) is perfectly well-formed and can be interpreted as intended:

(21) a. *John read that sort of thing back in the old days?! No way!*
b. **John read that sort of thing yesterday?! No way!*

(22) a. *Juan leer eso en aquellos tiempos?! Ya me extraña!*
b. *Juan leer eso ayer?! Ya me extraña!*

Interestingly, Spanish and English also differ as to how far the infinitival raises – and it is this difference which we ultimately capitalize on to account for the difference in (21)-(22). In Spanish, unlike in English, the infinitival raises past the temporal head, as argued by e.g. Kayne (1991) and Uriagereka (1995), to target the head of a low CP projection that Uriagereka calls FP: the lowest Comp-related head F^0.

The explanation of this phenomenon we already offered in previous work (Grohmann and Etxepare 2003) relies on the raising of the infinitival to F^0 and on the complex structure of ARIs. Here, as there, we follow Baker and Travis (1997) who claim that deictic tenses are similar to definite determiners and define a domain which is opaque for quantification. In languages where the infinitival remains below deictic T^0, the eventuality variable (sitting on the lexical verb) is not accessible for quantification, and the structure is semantically deviant. In languages where the infinitival raises beyond T^0, the eventuality variable carried by the infinitival is free to be bound by the exclamative operator, and the sentence is good.

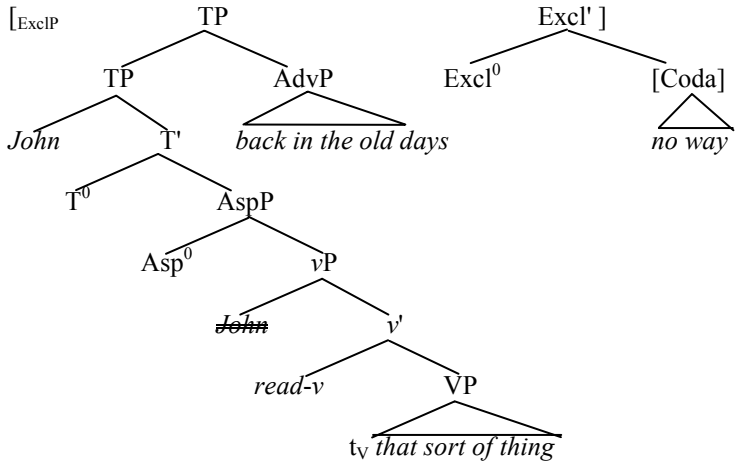
The relevant structural representation of licit temporal, but (crucially) non-deictic, modification in English is given in (23) for (21a). For simplicity – and the specifics will not affect our line of argumentation, and we believe neither will a potential revision of our basic clause structure assumed here – we assume that temporal modifiers are left- or right-adjoined to TP. With nothing intervening, and regardless of whether AspP is present or not in this case, the exclamative operator ($Excl^0$) can bind the eventuality variable on the lexical verb *read* (by assumption, in v^0) (Strikethrough font indicates a moved copy; subscripted *t* is used for traces of a relevant head element, something we will briefly return to below).

This contrasts with illicit deictic temporal modification of the past, illustrated with *yesterday*, where T^0 is [deictic] and, with the [def]inite specification of Asp^0, thus blocks licensing of the event variable carried by the lexical verb (in v^0) by the exclamative operator; see (24) below.

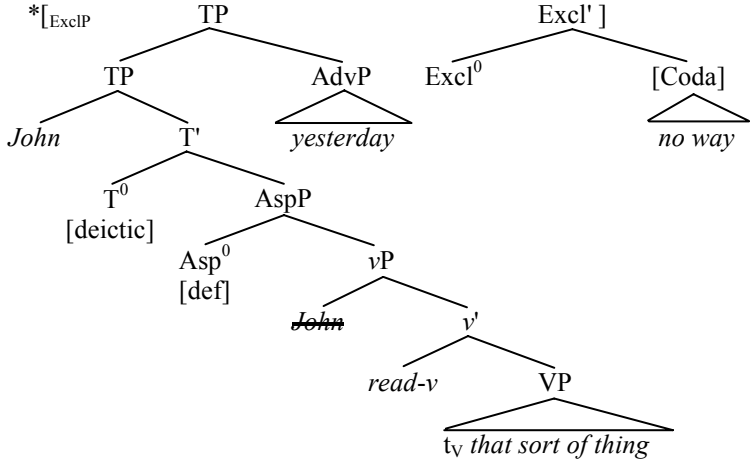
In Spanish, on the other hand, the infinitival verb carrying the event variable raises all the way to F^0, outside the scope of Asp^0 and T^0, where it can always be licensed by $Excl^0$ (cf. (22b)); see (25) below.

(26) below, then, summarizes the main difference between languages that work like Spanish and those that work like English in (dis)allowing deictic temporal modification:

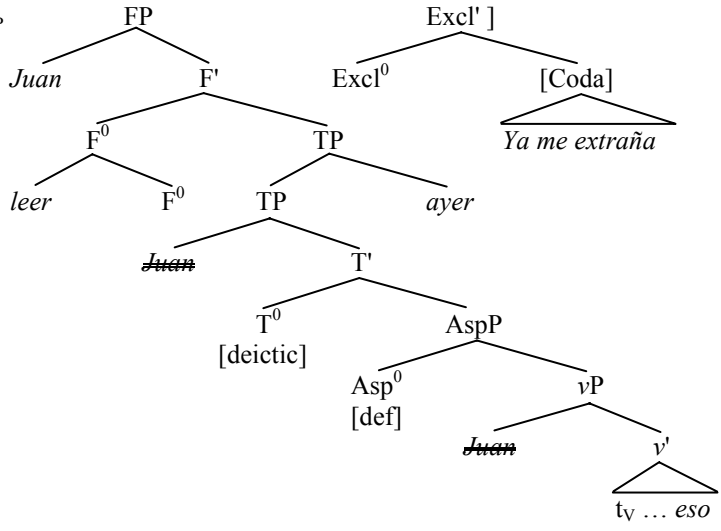
(23)


[ExclP
TP
Excl']
TP
AdvP
Excl0
[Coda]
John
T'
back in the old days
no way
T0
AspP
Asp0
vP
John
v'
read-v
VP
tV that sort of thing

(24)


*[ExclP
TP
Excl']
TP
AdvP
Excl0
[Coda]
John
T'
yesterday
no way
T0
[deictic]
AspP
Asp0
[def]
vP
John
v'
read-v
VP
tV that sort of thing

(25)



(26) a. [ExclP [FP [V+F^0] [TP …]] [Excl' Excl^0 [Coda]]]
Spanish ARI
b. [ExclP [TP … [VP …V…] …] [Excl' Excl^0 [Coda]]]
English ARI

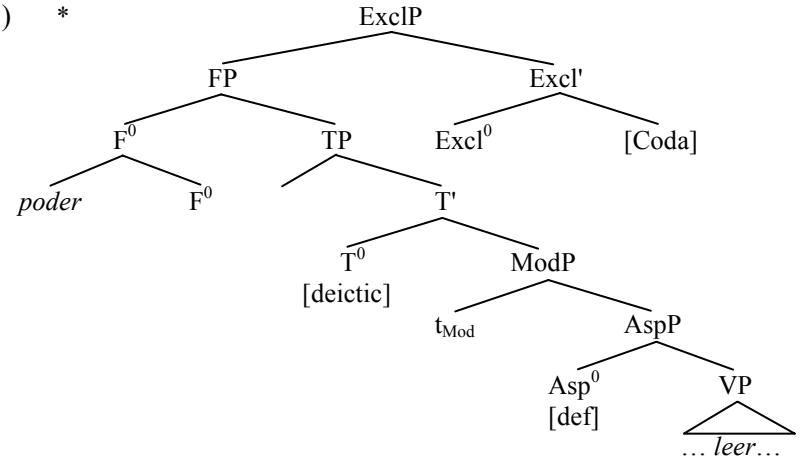
Note also that in Spanish, ARIs with a lexical modal do not allow deictic past adverbs:

(27) a. **Juan* ***poder*** *leer* *un* *libro* ***ayer****?!*
John can.INF read.INF a book yesterday
'John be able to read a book yesterday?!'
b. *Juan* ***leer*** *un* *libro* ***ayer****?!*
John read.INF a book yesterday
'John read a book yesterday?!'

The problem lies obviously not in the lexical modal itself (which is compatible with deictic past adverbs otherwise), but rather in the ARI. Somehow, ARIs with lexical modals in Spanish behave like English ARIs concerning modification by deictic adverbs.

We take (28) to be the structure of the ungrammatical ARI with a lexical modal (27a):

(28) *



The fact has now a straightforward account: in a complex structure such as (28) it is the lexical modal which raises outside the domain of deictic Tense. The lexical infinitival verb remains in situ, and therefore the event variable it carries cannot be linked to the exclamative operator due to the intervention effect of the Tense-Aspect domain.

Before we continue with our investigation of the predictions made by this analysis (which is basically carried over from Grohmann and Etxepare 2003), a brief note is in order with regard to our treatment verb raising. In the structural representations used throughout, we indicate the verb's base position with t_V and its surface position with the spelled out lexical item. We thus ignore the specifics of "verb raising" – whether it takes place through strict head-to-head movement (as under traditional approaches) or through some other means (such as recent suggestions of PF-movement or variations thereof). What is important to us is that the lexical verb is always interpreted in its surface position, whereas the features or properties of functional heads such as Asp(ect) and T(ense) are interpreted in Asp^0 and T^0, respectively. The exact mechanics will be addressed in Etxepare and Grohmann (in progress).

3. Cross-linguistic predictions

The correlation between the position of the infinitival and the possibility of deictic temporal modification in Spanish and English is strengthened by its

comparative bite. It extends to other languages in the Romance and Germanic families. The Romance languages seem to divide into two groups which respectively show the properties of Spanish on the one hand and English on the other: on the Spanish side line up Galician, Catalan, and Italian; European and Brazilian Portuguese, French (and all Germanic languages) seem to exhibit the properties shown for English. For lack of a better term, we bundle these languages into two groups, Group I and Group II, and subsequently we will concentrate on the properties of ARIs in these languages listed in (i)-(iv):

- Group I: Spanish, Galician, Catalan, Italian
- Group II: Portuguese, French, (all) Germanic

(i) availability of deictic temporal modifiers;
(ii) quantificational restrictions on the subject;
(iii) relative position of infinitival to aspectual and temporal ad verbs;
(iv) co-occurrence of complementizer and infinitival in control structures.

3.1. Availability of deictic temporal modifiers

ARIs as represented by some Romance and Germanic languages in (29) to (31) present an interesting variation in temporal modification in the Romance area: whereas ARIs in Italian, Spanish, Catalan, and Galician (29a-d) allow adverbial modification by past temporal adverbs, their European and Brazilian Portuguese counterparts do not, and pattern in this regard with French (30a-c) as well as German, Dutch, Norwegian, and English (31a-d):

(29) a. *Io andare alla festa* ***ieri****?!* *Stai scherzando!* It.
b. *Yo ir a la fìesta* ***ayer****?!* *Estás de broma!* Sp.
c. *Jo anar al cinema* ***ahir****?!* *Vinga, hombre!* Ct.
d. *Ir de chea eu* ***onte****?!* *Toleas!* Gl.
'Me go to the party / cinema yesterday?! You must be joking!'

(30) a. **Eu ir a la festa* ***ontem****?!* EP.
b. **Eu ir ao festa* ***ontem****?!* BP
c. **Moi aller à la fête* ***hier****?!* Fr.
'Me go to the party yesterday?! (You must be joking!)'

(31) a. **Ich* ***gestern*** *zur Party gehen?!* Gm.
b. **Ik* ***gisteren*** *naar dat feestje gaan?!* Dt.
c. **Jeg gå på fest-en* ***i går****?!* Nw.
d. **Me go to the party* ***yesterday****?!* En.
'Me go to the party yesterday?! (You must be joking!)'

3.2. Quantificational restrictions on the subject

Some languages show quantificational restrictions in pre-infinitival position. These are identical to the kinds of restriction imposed on a class of quantifiers in topic position. We propose that those languages that do not permit such subjects preceding the infinitival do not place the preverbal QPs in canonical subject position ([Spec,TP]), but in a higher topic position (such as ([Spec,TopP]). This suggests that the relevant position is beyond TP, and therefore that the infinitival itself must have raised beyond T. The same quantificational expressions are possible after the infinitival. As it turns out, the languages identified as Group I exhibit such restrictions:

(32) a. ****Ognuno / Tutti / Nessuno*** *comprare una macchina?!* It.
b. *(Non) comprare* ***ognuno / tutti / nessuno*** *una macchina?!*
'Everyone / All / No one buy a car?! (Impossible!)'

(33) a. ****Cada uno / Todo el mundo / Nadie*** *comprar um coche?!* Sp.
b. *(No) comprar* ***cada uno*** */* ***todo el mundo*** */* ***nadie*** *un coche?!*
'Each one / Everyone / No one buy a car?!

(34) a. ??***Cada professor / Tothom / Ningú*** *comprar un Volkswagen?!* Ct.
b. *(No) comprar* ***cada professor*** */* ***tothom / ningú*** *un Volkswagen?!*
'Every professor / All / No one buy a Volkswagen?!'

(35) a. ??***Cada um / Todo o mundo / Ninguem*** *comprar um carro?!* Gl.
b. *(Nao) comprar* ***cada um*** */* ***todo o mundo / ninguem*** *um carro?!*
'Everyone / All / No one buy a car?!'

These restrictions do not apply to the languages from Group II (with the exception of French *personne* and *tout le monde*):

(36) ***Cada um / todo o mundo / ninguem*** *comprar um carro?* EP
'Everyone / All / No one buy a car?! Impossible!'

(37) ***Cada um / Todo o mundo / Ninguem*** *comprar um carro?!* BP
'Everyone / All / No one buy a car?! Impossible!'

(38) a. ***Chacun acheter*** *un/son vélo? Je crois pas!* Fr.
'Each one buy a/his bicycle?! I don't think so!'
b. ****Tout le monde / Personne*** *acheter un vélo?*
'Everyone / No one buy a bicycle?! Impossible!'

(39) %***Alle / Jeder / Niemand*** *ein Auto kaufen?!* Gm.

(40) ***Allemaal / Iedereen / Niemand*** *een auto kopen?!* Dt.

(41) ***Alle / Enhver / Ingen*** *kjöpe (en) bil?!* Nw.

(42) %***All / Everyone / No one*** *buy a car?!* En.

These findings support our analysis in the following sense: if in the language belonging to the Group II the infinitival only raises to an TP internal position, there is no reason for the pre-infinitival subject to behave as a topic. None of the quantificational restrictions operating in Group I languages in that same context should apply here, as seems to be the case.

3.3. Position of the infinitival with regard to adverbs

Aspectual adverbs arguably occur relatively low in the clause structure (see e.g. Cinque 1999) and give us an idea where the left edge of VP is situated – and whether V has raised or not. The languages that form Group I require aspectual adverbs to follow the infinitive:

(43) a. *Gianni* ***(*spesso)*** *comprare* ***(spesso)*** *mele* ***(spesso)****?!* It.
'John often buy apples?!'
b. *Gianni* ***(*qualche volta)*** *comprare* ***(qualche volta)*** *mele* ***(qv)****?!*
'John sometimes buy apples?!'
c. *Gianni* ***(*sempre)*** *comprare* ***(sempre)*** *mele* ***(sempre)****?!*
'John always buy apples?!'

(44) a. *Juan **(*a menudo)** comprar **(a menudo)** manzanas **(a m.)**?!* Sp.
b. *Juan **(*a veces)** comprar **(a veces)** manzanas **(a veces)**?!*
c. *Juan **(*siempre)** comprar **(siempre)** manzanas **(siempre)**?!*

(45) a. *Juan **(??sovint)** comprar **(??sovint)** pomes **(sovint)**?!* Ct.
b. *Juan **(??a vegades)** comprar **(?a vegades)** pomes **(sempre)**?!*
c. *Juan **(??sempre)** comprar **(?sempre)** pomes **(sempre)**?!*

(46) a. *Juan **(*a miudo)** comprar **(a miudo)** manzanas **(a miu.)**?!* Gl.
b. *Juan **(*a's veces)** comprar **(a's veces)** manzanas **(a's veces)**?!*
c. *Juan **(*siempre)** comprar **(siempre)** manzanas **(siempre)**?!*

Germanic languages in Group II behave in exactly the opposite way, as expected. The facts are particularly relevant for English and Norwegian, which have surface SVO order. Romance languages in Group II behave in this regard like Group I languages. Here we must assume partial raising of the infinitival verb to T or some *v*P-external projection (see e.g. Laenzlinger 1998 for brief discussion). Interestingly too, some adverbs are just impossible in ARIs of Group II, whatever their position. We leave this issue for further research.

(47) a. *Joao **(*frequentemente)** biber **(frequentemente)**?!* EP
b. *Joao **(*as vezes)** ir **(*as vezes)** a restaurantes caros?!*
c. *Joao **(*sempre)** ir **(sempre)** a restaurantes caros?!*
'John drink often / go sometimes / always to nice restaurants?!'

(48) a. *Joao **(*frequentemente)** ir **(?frequentemente)** ao cinema?!* BP
b. *Joao **(*sempre)** ir **(sempre)** ao cinema?!*
c. *Joao **(*as vezes)** ir **(??as vezes)** ao cinema?!*
'John go often / sometimes / always to the movies?!'

(49) a. *Pierre **(*souvent)** acheter **(souvent)** des pommes?!* Fr.
b. *Pierre **(*de temps à autre)** acheter **(de t. à autr.)** des pommes?!*
c. *Pierre **(*toujours)** acheter **(toujours)** des pommes?!*

(50) a. *Peter **(oft)** Äpfel **(*oft)** kaufen?!* Gm.
b. *Peter **(manchmal)** Äpfel **(*manchmal)** kaufen?!*
c. *Peter **(immer)** Äpfel **(*immer)** kaufen?!*

(51) a. *Peter **(vaak)** appels (***vaak**) kopen?!* Dt.
b. *Peter **(soms/zo en dan)** appels (***soms/zo en dan**) kopen?!*
c. *Peter **(steeds/alsmaar)** appels (***steeds/alsmaar**) kopen?!*

(52) a. *Peer **(ofte)** kjöpe (***ofte**) epler?!* Nw.
b. *Peer **(iblant)** kjöpe (***iblant**) epler?!*
c. *Peer **(alltid)** kjöpe (***alltid**) epler?!*

(53) a. *Peter **(often)** buy (***often**) apples?!* En.
b. *Peter **(sometimes)** buy (***sometimes**) apples?!*
c. *Peter **(always)** buy (***always**) apples?!*

3.4. Position of the infinitival in control complements

This section expands on the findings first reported in Kayne (1991), who argued for a higher Infl-position in some Romance languages (namely, Italian and Spanish), but not others (French). He proposed adjunction to T' for those languages. Uriagereka (1995) recasts this proposal in more regular phrase structural terms as adjunction to F^0 (arguably the lowest functional head in the C-domain). Kayne's proposal was based, among other facts, on the availability of sequences such as the ones in (54), where the infinitival seems to occupy a position immediately following the overt complementizer, but higher than the subject position, occupied by PRO. The languages in Group I all allow that configuration:

(54) a. *Io no se si **andare** al cinema.* It.
b. *No sé si **ir** al cine.* Sp.
c. *Jo no se si **anar** al cinema.* Ct.
d. *Eu no se si **ir** al cine.* Gl.
I not know if go.INF to.the cinema
'I don't know if to go to the movies.'

Group II-languages simply do not allow this kind of structure:

(55) a. **Eu nao sei si **ir** ao cinema.* EP
b. **Eu nao sei si **ir** ao cinema.* BP
c. **Je ne sais pas si **aller** au cinema.* Fr.

(56) a. **Ich weiss nicht ob ins Kino zu **gehen**.* Gm.
b. **Ik weet niet of naar de bioscoop te **gaan**.* Du.

c. **Jeg vet ikke om* ***gå*** *på kino.* Nw.
d. **I don't know if to* ***go*** *to the movies*. En.

We take these differences to point to only one property: Group I-languages exhibit verb raising to a high position, a head position beyond T. This position we identify as F^0, the lowest C-head. Group II languages raise the infinitival to a TP internal position.

3.5. Periphrastic forms

Our analysis also accounts for the fact that periphrastic perfects are generally out in ARIs:

(57) a. **Juan haber comprado un libro?! Imposible!*
b. **John have bought a book?! Impossible!*

In our terms, what raises to F in Spanish is the auxiliary *haber* 'have'. But the eventuality variable carried by the infinitive remains under the perfective structure – and as such should be (and is) inaccessible for quantification.

The ban against perfect auxiliaries has an exception in Galician, European Portuguese, and Brazilian Portuguese, where the auxiliary, unlike the general *habere* in Romance, is *ter*.

Ter-periphrastic perfects are possible in ARIs:

(58)	a.	(?)*Eu*	***ter***	*ido*	*ao*	*cinema?!*	BP
		me	have.INF	gone	to.the	movies	
	b.	*Eu*	***ter***	*gañado*	*a*	*final?!*	Gl.
		me	have.INF	won	the	final	
	c.	*Eu*	***ter***	*ido*	*ao*	*cinema?!*	EP
		me	have.INF	gone	to.the	movies	

'Me have gone to the movies / won the final?!'

A possible account of this difference is that unlike, say, Spanish *haber*, Galician/Portuguese *ter* contributes its own eventuality variable, and is in this sense akin to Spanish *tener*:

(59) *Tener yo la partida ganada?! Qué más quisiera!*
have me the match won that more I.wished
'That I should be already about to win the match?! I wish!'

This should be related to Giorgi and Pianesi's (1997) claim that Portuguese *ter* is a lexical verb (but see e.g. Gonçalves 1995 or Schmitt 2001). But if Portuguese *ter* is a lexical verb contributing an eventuality variable itself, then this eventuality variable should be free for quantification, since it is not buried under a perfective operator. That both *ter* and *tener* may indeed carry an eventuality variable themselves is suggested by the following contrast between *haber* and *tener* (in Spanish, where both structures should have the same interpretation):

(60) a. *[El **tener** para este domingo la liga ganada tres*
the have.INF by this Sunday the league won three
meses antes] parece un imposible.
months earlier looks an impossible

b. **[El **haber** ganado la liga para este domingo*
the have.INF won the league by this Sunday
tres meses antes] parece un imposible.
Three months earlier looks an impossible
'To have won the league by this Sunday three months earlier looks like an impossible thing.'

We interpret this contrast as showing that Spanish *tener*, unlike *haber*, introduces a further eventuality variable which can be independently modified temporally. Galician/Portuguese *ter* allows identical cases, as illustrated here with Brazilian Portuguese:

(61) *No proximo domingo o seu time ja ter*
in next Sunday the his team already have.INF
ganhado o campeonato há tres semanas!
won the league ago three months
'His team have already won the league next Sunday three months ago!'

But if Portuguese *ter* is a lexical verb contributing an eventuality variable itself, we would expect this eventuality variable to be free for quantification, since it is not buried under a perfective operator. We would also expect then that, unlike the simple infinitives in (30) repeated here as (62b) for European Portuguese, the structures with *ter* should allow modification by a deictic temporal adverb of the past like *yesterday*. And they do:

(62) a. *Eu ter ido a la festa ontem?!*
me have.INF gone to the party yesterday
b. **Eu ir a la festa ontem?!*

4. Tripartite quantifications and aspectual constraints

In this final section, we will look at some interesting Spanish infinitival constructions beyond the ARI-phenomenon. To recap, our account of the aspectual and temporal restrictions on ARIs relies on the presence of a tripartite quantificational structure. If the account proposed is right in its more general terms, we should really expect to see the following:

(i) other quantificational or operator constructions should exist which allow RIs and where the same restrictions are operative;
(ii) these effects should disappear in configurations which do not involve a restricted quantification.

We will now show that, as regards Spanish, both predictions are right.

4.1. Tacit conditional structures

Consider the following contrast:

(63) a. (?)[*Trabajar los obreros en domingo*] *sería el fin*
work.INF the workers on Sundays would.be the end
del estado de bienestar.
of.the welfare.state
'The workers work on Sundays would be the end of the welfare state.'

b. *[*Trabajar los obreros en domingo*] *es el fin del*
work.INF the workers on Sundays is the end of.the
estado de bienestar.
welfare.state
'The workers work on Sundays is the end of the welfare state.'

Whereas (63a), with a shifted past in the matrix clause typical of conditional structures, admits an RI, (63b) with present tense in the matrix does

not. One way to account for this difference is to say that (63a) involves a conditional structure, itself a canonical tripartite quantification (see Partee 1995, Chierchia 1995, and references therein).

As the data in (64) illustrate, (63a) does allow deictic pasts – but perfective forms in this type of construction are disallowed, as shown in (65):

(64) a. ?[Trabajar **ayer** los obreros] habría sido el
work.INF yesterday the workers would.have been the
fin del estado de bienestar.
end of.the welfare.state
'The workers work yesterday, that would have been the end of the welfare state.'

b. ?[*Trabajar* ***hoy*** *los obreros*] *sería el fin del*
work.INF today the workers would.be the end of.the
estado de bienestar.
welfare.state
'The workers work today, that would be the end of the welfare state.'

c. ?[*Trabajar* ***mañana*** *los obreros*] *sería el fin del*
work.INF tomorrow the workers would.be the end of.the
estado de bienestar.
welfare state
'The workers work tomorrow, that would be the end of the welfare state.'

(65) *[***Haber trabajado*** *los obreros*] *habría sido el fin*
have.INF worked the workers would.have been the end
del estado de bienestar.
of.the welfare.state
'The workers have worked, that would have been the end of the welfare state.'

4.2. Prepositional infinitive clauses

Spanish (and also Catalan) possesses prepositional infinitival clauses which modify the temporal structure of the matrix clause (see e.g. Hernanz 1982, 1999 and Rigau 1995):

(66) a. *Al venir Pedro, todos empezaron a murmurar.*
P.ART come.INF Peter everyone started to mutter
'When Peter came, everyone started to mutter.'

b. *Al desmayarse Pedro, María gritó.*
P.ART faint.INF Peter Maria screamed
'When Peter fainted, Maria screamed.'

As observed first by Rigau (1995), if we insert a perfect auxiliary in the prepositional infinitive clause, the infinitival is not interpreted as a temporal modifier, but as a causal one:

(67) a. *Al haber venido Pedro, todos empezaro a murmurar.*
P.ART have.INF come Peter, everyone started to mutter
'Since [= Because] Peter had arrived, everyone started to mutter.'

b. *Al haberse desmayado Pedro, María gritó.*
P.ART have.INF.CL fainted Peter, Maria screamed
'Since [= Because] Peter had fainted, Maria screamed.'

The same happens if we insert the modal verb *poder*:

(68) a. *Al poder venir Pedro, todos empezarán a murmurar.*
P.ART can.INF come.INF Peter, everyone started to mutter
'Since [= Because] Peter will be able to come, everyone will start to mutter.'

b. *Al poder desmayarse Pedro, Maria gritó.*
P.ART can.INF faint.INF.CL Peter, Maria screamed
'Since [=Because] Peter is able to faint, Maria screamed.'

That is, in all contexts where a deictic modifier of the past like *yesterday* is not available, the infinitive cannot be linked to the matrix tense. This could be accommodated in our analysis if we consider the infinitival clause as providing a restriction for a Tense determiner, itself a binary operator which binds an eventuality variable in both its restriction and its matrix. We leave those constructions for further research.

5. Concluding remarks

In this paper, we looked at ARIs, or adult root infinitives – that is, infinitival structures used as root clauses by adult speakers. Presumably, ARIs occur in colloquial contexts, but we did not address the use of such structures in more detail than noting that, when used felicitously, they are necessarily followed by a Coda, an exclamation of sorts that provides the assertoric force of the sentence.

We provided an analysis of ARIs by presenting them as tripartite quantificational structures akin to that of donkey sentences. The relevant binary operator in these cases is an exclamative operator with scalar properties (as first proposed in Grohmann and Etxepare 2003, then refined in Etxepare and Grohmann 2005, building on Portner and Zanuttini 2003). We have explored the predictions that an unselective binding analysis makes cross-linguistically, and shown that intriguing temporal differences which cut across a number of Romance and Germanic languages can be keyed to the structural position of the infinitival in those languages.

Finally, the paper briefly sketches some future avenues of research where restrictions similar to those on ARIs are shown to hold of other binary operator constructions. Further research will show how far these different types of constructions should be assimilated to one another, and whether the phenomena observed in Spanish hold for other languages as well – presumably those of Group I.

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Economy constraints on temporal subordination[1]

Hamida Demirdache and Myriam Uribe-Etxebarria

0. Introduction

A leading question in investigations of tense and aspect is whether the principles governing the grammar of temporal relations constitute an independent linguistic level (as proposed, for instance, in Hornstein 1990, for tense), or can be subsumed under primitives, principles and constraints independently motivated (in the spirit of Zagona 1990; Stowell 1993). We defend here the latter approach.

The grammar of temporal relations can be reduced to a uniform set of semantic and syntactic primitives. Tenses, aspects and time adverbs are dyadic predicates of spatiotemporal ordering, establishing topological relations – inclusion, subsequence or precedence – between time-denoting arguments. Spatiotemporal predicates project their time arguments into the syntax as temporal DPs or *Zeit*-Phrases (in the sense of Stowell 1993). As any regular DP, Zeit-Ps can be modified and enter into anaphoric relations. (See Demirdache and Uribe-Etxebarria 1997, 2000, 2002, 2004, 2007; henceforth D and UE).

We further propose that general economy principles govern the steps in (and the representations generated by) the temporal computation of a given sentence. The typology of temporal construals, as well as the tense concord restrictions, arising with different combination of tenses in matrix and subordinate clauses follow directly from two economy constraints: *Temporal Computation Economy (TCE)* and the *Temporal Constraint on Semantic Subordination (TCSS)*.

1. The syntax of temporal relations

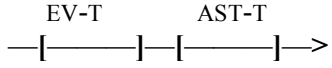
D and UE argue that tenses, aspects and time adverbials can be uniformly defined in terms of elementary and isomorphic semantic and structural relations. We start by briefly explicating this proposal.

1.1. Tenses, aspects and time adverbs as spatiotemporal predicates

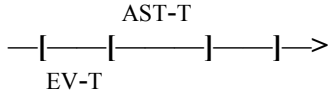
The role of viewpoint aspect is to focus a subinterval in the temporal contour of the event described by a sentence (Smith 1991). Why does aspect focus a time span in the interval defining the described event (EV-T)? Because aspect is a spatiotemporal predicate, with the meaning of *after*, *(with)in* or *before*, ordering two time intervals: the EV-T and "the time to which the assertion of a sentence is confined, for which the speaker makes a statement" — that is, the Assertion-Time (AST-T), following Klein (1995). This ordering relation can be one of subsequence, precedence or inclusion.

Subsequence yields Retrospective aspect: when ASP° orders the AST-T *after* the EV-T, as in (1a), the described event is viewed as completed prior to a reference-time (the AST-T). *Inclusion* yields Progressive aspect: when ASP° orders the AST-T *within* the EV-T, as in (1b), focusing a subinterval of the EV-T including neither its initial, nor its final bounds, the described event is viewed as unbounded, ongoing at a reference-time (the AST-T). *Precedence* yields Prospective aspect: when ASP° orders the AST-T *before* the EV-T, as in (1c), the described event is viewed as future relative to a reference-time (the AST-T).

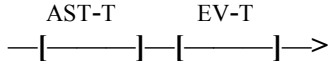
(1) a. *Retrospective* (AST-T *after* EV-T)



b. *Progressive* (AST-T *within* EV-T)

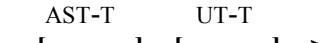


c. *Prospective* (AST-T *before* EV-T)



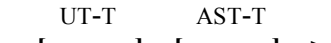
Tense, just like aspect, is a spatiotemporal predicate with the meaning of *after*, (*with)in* or *before*.[2] It serves to order the AST-T relative to a reference-time – typically, utterance-time (UT-T) in matrix clauses. This ordering relation can be one of subsequence, precedence or inclusion. *Subsequence* yields Past: T° orders the UT-T *after* the AST-T, as in (2a). *Inclusion* yields Present: T° orders the UT-T *within* the AST-T, as in (2b). *Precedence* yields Future: T° orders the UT-T *before* the AST-T, as in (2c).

(2) a. *Past* (UT-T *after* EV-T)



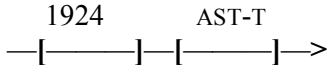
b. *Present* (UT-T *within* AST-T)

c. *Future* (UT-T *before* AST-T)



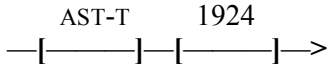
Time adverbs, just like tenses and aspects, are uniformly analyzed as spatiotemporal predicates —that is, as PPs headed by a spatiotemporal predicate with the meaning of *after*, (*with)in* or *before*. They serve to modify, restrict the temporal reference of the time of the event for which the speaker makes an assertion (that is, the AST-T). How do they restrict the temporal reference of the AST-T? By establishing a topological relation between two time spans: the AST-T and the time designated by their internal argument – *e.g. 1924* in (3). This ordering relation can, once again, be subsequence, precedence or inclusion.

(3) a. AST-T *after* 1924



b. AST-T *within* 1924

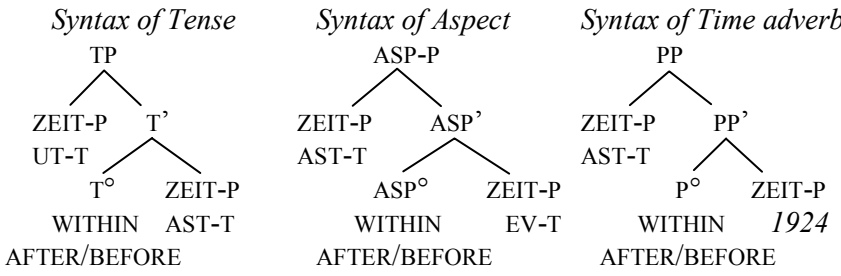
c. AST-T *before* 1924



1.2. The syntax of spatiotemporal predicates

Tenses, aspects and time adverbs project their time arguments in the syntax as temporal DPs or *Zeit*-Phrases. The phrase structure in (4) assigns isomorphic structural representations to tense, aspect and time adverbs: the functional heads T°, ASP° and P° each establish ordering relations between their (respective) external and internal time-denoting arguments.

(4)



D and UE extend the analysis in (4c) to all time adverbs, whether they surface realized as PPs [$_{PP}$ *after Easter*], bare NPs [$_{PP}$ ∅ *Sunday*], or clausal adjuncts [$_{PP}$ *after Zoey arrived*].

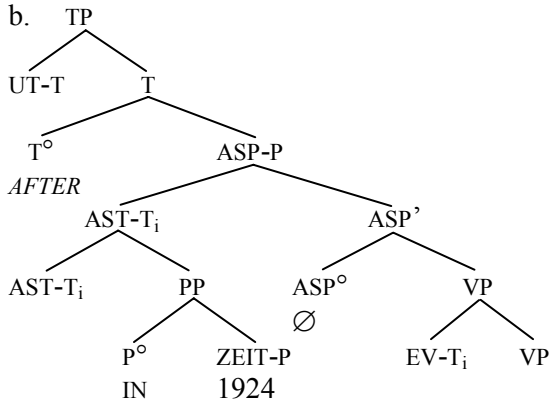
1.3. When there is no morphological aspect

The role of ASP° is to specify the temporal relation holding between the AST-T and the EV-T. When there is no morphological aspect, the relation between the AST-T and the EV-T is established via *anaphora***.** This proposal is illustrated in (5) with a simple past sentence.

Past tense in (5b) is the spatiotemporal predicate *after*. It orders the UT-T (its external argument) *after* the AST-T (its internal argument), yielding the temporal ordering in (6a). The role of aspect is to establish the temporal relation holding between the AST-T (its external argument) and the EV-T (its internal argument). There is, however, no morphological aspect under ASP°. The relation between the AST-T and the EV-T is therefore established via *anaphora*: the AST-T in (5b) is coindexed with the EV-T. Coindexation entails coreference. The proposal that the ordering relation between the AST-T and the EV-T is established via coreference in (5) automatically explains the *perfective* viewpoint of the simple past in English. Coreference yields an ordering of exhaustive coincidence: the AST-T and the EV-T denote the same time span, as illustrated in (6b).

(5) a. *Zoey left in 1924*

b.



(6) a. AST-T UT-T
—[———]———|—>

b. *Anaphora*
AST-T=EV-T UT-T
—[————————]———|—>

c. *Temporal modification*
AST-T=EV-T UT-T
—[———[————————]———]—|—>
1924

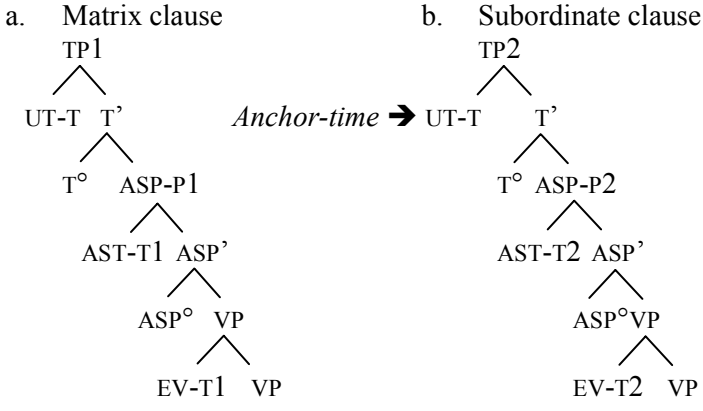
The PP *in 1924* serves to further restrict the temporal reference of the past AST-T in (5b). Just like any regular restrictive modifier, it is base generated adjoined to the argument that it modifies – that is, the AST-T. The modifier restricts the reference of the AST-T (its external argument) by ordering this interval within the time denoted by *1924* (its internal argument). Modification by a time adverb yields the temporal construal in (6c). Zoey's departure is located in the past, in 1924.

Assuming that time-denoting arguments are temporal DPs/ZeitPs, the null hypothesis is that they can be modified and enter into anaphoric relations, just as any DP can. Under the above proposal, this is indeed the case. (i) Time adverbs are modifiers of the ZeitPs projected in the syntax as arguments of tense and aspect. (ii) Coreference between the AST-T and the EV-T yields perfective viewpoint.[3]

2. Economy constraints on temporal subordination

We now turn to the question of the temporal anchoring of a subordinate clause into a matrix clause. In an independent or matrix clause, the external argument of T° (in (4a) above) denotes the UT-T. However, in a subordinate clause, the external argument of the subordinate tense is not always UT-T. That is, it can be identified with a time argument in the matrix clause (either the AST-T or the EV-T). We call the external argument of tense in a subordinate clause the *anchor-time*. When the anchor-time denotes UT-T, as in (7b), we will say that the subordinate clause is *deictically* anchored into the matrix clause. As we shall see, deictic anchoring yields an *independent* temporal construal of the subordinate clause.

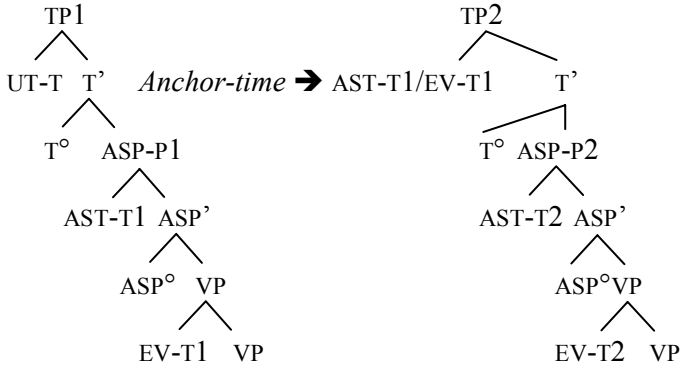
(7) *Deictic anchoring of a subordinate clause*



When the anchor time denotes either the matrix AST-T or EV-T, as in (8b), we will say that the subordinate clause is *anaphorically* anchored into the matrix clause. Anaphoric anchoring will yield a *dependent* temporal construal of the subordinate clause.

(8) *Anaphoric anchoring of a subordinate clause*

a. Matrix clause b. Subordinate clause



The null hypothesis is that the anchor-time can, in principle, be set to either UT-T (deictic anchoring) or the matrix AST-T (anaphoric anchoring). For concreteness, we take the default setting for the anchor-time to be UT-T. The anchor-time can, however, be reset to the matrix AST-T. We assume resetting of the anchor-time to be free, as long as the resulting derivation satisfies the two optimality conditions in (9). We take these conditions to govern the steps in (and the representations generated by) the temporal computation of a given sentence.

(9) a. *Temporal Computation Economy (TCE)*[4]
A given temporal construal must be achieved in an optimal manner.
No step in the temporal derivation may be semantically vacuous, temporally uninformative. Each step must yield a temporally distinct interpretation.

b. *Temporal Constraint on Semantic Subordination (TCSS)*
Anchoring a subordinate clause into a matrix must yield an optimal output.
The output is optimal when the times for which the speaker makes a statement – that is, the matrix and subordinate AST-Times – end up intrinsically ordered relative to each other.

Since the anchor-time in a subordinate clause can be set either deictically or anaphorically, five logical possibilities arise:

(10) a. *Anaphoric* anchoring *enforced* ⇒ *deictic* anchoring *excluded*
b. Both *anaphoric* and *deictic* anchoring are available and yield *distinct* temporal construals
c. Both *anaphoric* and *deictic* anchoring are available and yield *undistinguishable* temporal construals
d. *Deictic* anchoring *enforced* ⇒ *anaphoric* anchoring *excluded*
e. Both *anaphoric* and *deictic* anchoring are excluded

In the following sections, we shall see that each of these possibilities is instantiated and accounts for complementary paradigms. (10a-c) explain the typology of temporal construals arising with different combinations of tenses in matrix and complement clauses. (10d-e) explain the tense concord restrictions holding between tenses in matrix and adjunct clauses.

3. Typology of construals in complement clauses

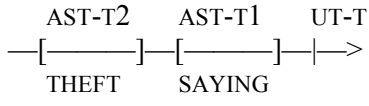
We first show how the proposal in section 2 derives the typology of construals in complement clauses. We consider here only complement clauses with *eventive* verbs.

3.1. Anaphoric anchoring enforced (deictic anchoring excluded)

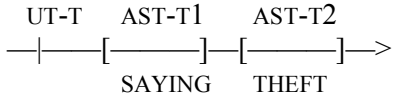
Consider the combinations of matrix and subordinate tenses in (11). As is well known, (11a) only allows the construal in (12a) where the time of Lou's theft is past shifted relative to the past time of Max' saying. Conversely, (11b) only allows the construal in (12b) where the time of Lou's theft is future shifted relative to the future time of Max' saying.

(11) a. PAST under PAST: *Max said that Lou stole the ring*
b. FUT under FUT: *Max will say that Lou will steal the ring*

(12) a. PAST under PAST



b. FUTURE under FUTURE



The tense combinations in (11) enforce a *dependent* construal of the complement clause: its situation-time is dependent on (that is, past/future shifted relative to) the situation-time of the matrix clause. To understand why a dependent construal is enforced, let's run through their respective derivations, given in parallel in (13-14).[5]

Consider first *past* under *past* in (13). The matrix past takes the UT-T as its external argument and the matrix AST-T (AST-T_1) as its internal argument, ordering the UT-T *after* AST-T_1, as shown in (13i). The anchor-time of the subordinate clause has been set to its default value: UT-T. The subordinate past thus takes the UT-T as it external argument and the subordinate AST-T (AST-T_2) as its internal argument, ordering the UT-T *after* AST-T2, as in (13ii).

Deictic anchoring

(13) PAST under PAST

i. *Matrix:* Max PAST say
AST-T1___UT-T

ii. *Complement:* Lou PAST steal
Anchor-time=UT-T
AST-T2___UT-T

iii. *Output of steps (i-ii)* ⇒ TCSS violated
No ordering established between AST-T1 & AST-T2

(14) FUTURE under FUTURE

i. *Matrix:* Max FUT say
UT-T___AST-T1

ii. *Complement:* Lou FUT steal
Anchor-time=UT-T
UT-T___AST-T2

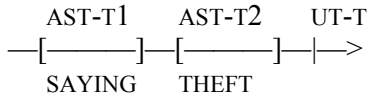
iii. *Output of steps (i-ii)* ⇒ TCSS violated
No ordering established between AST-T1 & AST-T2

Now, at the output of steps (13i-ii), AST-T_1 and AST-T_2 have each been ordered in the past relative to UT-T. They remain, however, *unordered* relative to each other. The same is true in (14). At the output of the derivation,

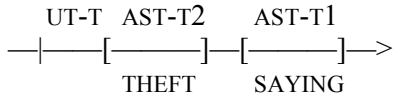
AST-T_1 and AST-T_2 have each been ordered in the future relative to UT-T, but remain *unordered* relative to each other. Recall that temporal derivations are subject to the optimality condition in (9b). The TCSS filters temporal derivations that fail to secure an ordering of the matrix and subordinate AST-Ts. Deictic anchoring in (13-14) is thus ruled out, since it fails to yield a temporally optimal output.

Crucially, if deictic anchoring were allowed in (13-14), then the construals in (15) would be freely generated. That is, since the matrix and subordinate AST-Ts in (13) remain unordered relative to each other, then the *past* time of Lou's theft could either follow (15a) or precede (12a) the *past* time of Max's saying. The reading in (15a), however, is unavailable: the theft in (11a) cannot be understood as temporally subsequent to the time of saying.

(15) a. PAST under PAST



b. FUTURE under FUTURE



The same reasoning extends to (11b) with a future in both the matrix and subordinate clauses. Deictic anchoring in (14) would allow the *future* time of Lou's theft to either precede (15b) or follow (12b) the *future* time of Max's saying. The reading in (15b), however, is unavailable: the theft in (11b) cannot be construed as preceding the time of saying.

Recall, however, that the anchor-time can be reset from its default value (UT-T) to the matrix AST-T. Resetting the anchor-time to AST-T_1 ensures a relative ordering of the two AST-Ts, as shown below.

Anaphoric anchoring

(16) PAST under PAST

i. *Matrix:* Max PAST say
AST-T1___UT-T

ii. *Complement:* Lou PAST steal
Anchor-time=AST-T1
AST-T2___AST-1

iii. *Output of steps (i-ii)* ⇒ optimal
AST-T2___AST-T1___UT-T

(17) FUTURE under FUTURE
   i. *Matrix:* Max FUT say
      UT-T___AST-T1
   ii. *Complement:* Lou FUT steal
      Anchor-time=AST-1
      AST-1___AST-T2
   iii. *Output of steps (i-ii)* ⇒ optimal
      UT-T___AST-T1___AST-T2

The matrix past in (16i) orders the UT-T *after* AST-T_1. The anchor-time of the subordinate clause has been reset to AST-T_1. The subordinate past in (16ii) now takes AST-T_1 as its external argument, ordering it *after* AST-T_2. Anaphoric anchoring ensures a relative ordering of the AST-Ts: the time of the theft (AST-T_2) precedes the past time of saying (AST-T_1) in (16iii). The same is true in (17). Anaphoric anchoring in (17ii) secures a relative ordering of the AST-Ts: the time of the theft (AST-T_2) follows the future time of saying (AST-T_1) in (17iii).

Summarizing, the tense combinations in (11a) and (11b) do not allow the *independent* construals in (15a) and (15b), where the situation-time of the complement clause is past/future shifted relative to UT-T (but not relative to the matrix situation-time). Why is resetting the embedded anchor-time to the matrix AST-T enforced with these tense combinations? Because anaphoric anchoring secures a relative ordering of the matrix and subordinate AST-Ts.

3.2. Anaphoric and deictic anchoring yield distinct temporal construals

We will now see that resetting the embedded anchor-time from its default value (UT-T) to the matrix AST-T is not always enforced. With the tense combinations in (18), resetting the anchor-time will be a *legitimate* and *free* option.

(18) a. PAST under FUTURE:
      Max will say that Lou cheated
   b. PRESENT under FUTURE:
      Max will say that Lou is cheating
   c. *will/would* alternation under PAST:
      Max said that Lou will/would cheat

Consider first the temporal derivation of (18a) given in (19).

(19) *Max will say that Lou cheated*

i. *Matrix*: Max FUT say
UT-T___AST-T1

ii. *Complement*: Lou PAST cheat
Anchor-time=UT-T
AST-T2___UT-T

ii'. *Complement*: Lou PAST cheat
Anchor-time=AST-1
AST-T2___AST-T1

iii. *Output of steps (i-ii)* ⇒ optimal
AST-T2___UT-T___AST-T1

iii'. *Output of steps (i-ii')* ⇒ optimal
a. UT-T___AST-T2___AST-T1
b. AST-T2___UT-T___AST-T1

The matrix future orders the UT-T *before* the time of saying (AST-T_1), as shown in (19i). Setting the anchor-time to UT-T yields the temporal ordering in (19ii), where the time of cheating (AST-T_2) is past relative to UT-T. Steps (i-ii) yield the temporal output in (19iii), which satisfies the TCSS since the AST-Ts are ordered relative to each other (AST-T_2 precedes AST-T_1). Note that, under the resulting construal in (19iii), the time of cheating (AST-T_2) is necessarily a *past* time.

Now, consider the alternative derivation in (19ii'-iii') where the anchor-time has been reset to AST-T_1. The embedded past now orders AST-T_1 *after* AST-T_2. Recall that resetting the anchor-time is free as long as it satisfies the economy conditions in (9). The TCSS is satisfied since anaphoric anchoring secures a relative ordering of the AST-Ts: the time of cheating (AST-T_2) precedes the time of saying (AST-T_1). The TCE will be satisfied if anaphoric anchoring is temporally informative – that is, yields a construal temporally distinct from the construal obtained via deictic anchoring. This is indeed the case. Anaphoric anchoring yields the output in (19iii') where the time of cheating remains unordered relative to UT-T and, thus, can be construed as a *future* time. In contrast, deictic anchoring yields the output in (19iii) where the time of cheating has been ordered in the past relative to UT-T and, thus, cannot be construed as a *future* time.

We now turn to the derivation of (18b), repeated in (20), with a *present* embedded under a *future*. Setting the anchor-time to UT-T yields the construal in (20iii) where the time of cheating (AST-T_2) coincides with UT-T. Resetting the anchor-time to AST-T_1 in (20ii') yields the temporally distinct construal in (20iii') where the time of cheating coincides with the future time of saying.

(20) *Max will say that Lou is cheating*

i. *Matrix*: Max FUT say
UT-T___AST-T1

ii. *Complement*: Lou PRES cheat
Anchor-time=UT-T
UT-T
|
AST-T2

ii'. *Complement*: Lou PRES cheat
Anchor-time=AST-1
AST-T1
|
AST-T2

iii. *Output of steps (i-ii)* ⇒ optimal
UT-T___AST-T1
|
AST-T2

iii'. *Output of steps (i'-ii')* ⇒ optimal
UT-T___AST-T1
|
AST-T2

Both anaphoric and deictic anchoring are thus, once again, allowed since they each ensure a relative ordering of the AST-Ts (thus satisfying the TCSS), and are temporally informative, yield distinct temporal construals (thus satisfying TCE).

We now show that resetting of the anchor-time can have an overt morphological reflex. This, we argue, is what underlies the *will/would* alternation, as the derivation of (18c) given below illustrates.

(21) *Max said that Lou will/would cheat*

i. *Matrix*: Max PAST say
AST-T1___UT-T

ii. *Complement*: Lou FUT cheat
Anchor-time=UT-T ⇒ WILL
UT-T___AST-T2

ii'. *Complement*: Lou FUTcheat
Anchor-time=AST-1 ⇒ WOULD
AST-T1___AST-T2

iii. *Output of steps (i-ii)* ⇒ optimal
AST-T1___UT-T___AST-T2
iii'. *Output of steps (i'-ii')* ⇒ optimal
a. AST-T1___ AST-T2___UT-T
b. AST-T1___ UT-T___AST-T2

Assuming *will* and *would* are derived from the abstract predicate WOLL (Ogihara 1996), the *will/would* alternation is a mere morphological reflex of the setting of the embedded anchor-time. When the anchor-time is set to UT-T, as in (21ii-iii), the time of cheating (AST-T_2) is a future time, and *will* surfaces. When the anchor-time is anaphorically set to the matrix AST-T, as in (21ii'-iii'), the time of cheating is ordered in the future relative to the time of saying (AST-T_1) but remains unordered relative to the UT-T, and *would* surfaces.

3.3. Anaphoric and deictic anchoring yield undistinguishable temporal construals

Finally, when the tense of the matrix is the present, as in (22), the dependent vs. independent construal of the complement CP can no longer be distinguished, as the derivation in (23) illustrates.

(22) FUTURE/PAST/PRESENT under PRESENT:
Max says that Lou will cheat/cheated/is cheating

(23) *Max says that Lou will cheat*
i. *Matrix*: Max PRES say
UT-T
|
AST-T1
ii. *Complement*: Lou FUT cheat
Anchor-time=UT-T
UT-T___AST-T2
ii'. *Complement*: Lou FUTcheat
Anchor-time=AST-1
AST-T1___AST-T2
iii. *Output of steps (i-ii)* ⇒ optimal
UT-T___AST-T2
|
AST-T1

iii'. *Output of steps (i-ii')* ⇒ optimal

UT-T

|

AST-T1___AST-T2

In (23i), the matrix present orders the UT-T *within* AST-T_1. The anchor-time is set to UT-T. The embedded future thus orders the UT-T *before* AST-T_2, as in (23ii). Deictic anchoring yields the temporal construal in (23iii) where the time of saying (AST-T_1) coincides with UT-T and precedes the time of cheating (AST-T_2).

Consider the alternative derivation in (23ii'-iii'), where the anchor-time has been reset to AST-T_1. The embedded future now orders AST-T_1 *before* AST-T_2. Note, however, that anaphoric anchoring in (23i-ii') and deictic anchoring in (23i-ii) yield temporally identical construals. Resetting the anchor-time in (23ii') is thus semantically vacuous, temporally uninformative and, consequently, ruled out by TCE, which requires each step in a temporal derivation to be temporally informative.

4. Anchoring temporal adjunct clauses

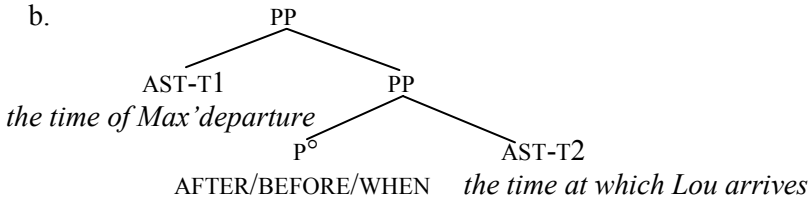
Temporal adjuncts differ from complements in one important respect. We have seen that complement clauses can yield *dependent* construals, where the situation-time of the subordinate CP is anaphorically dependent on the situation-time of the matrix. Indeed, with certain tense combinations, the dependent construal is the only construal available (Section 3.1). In contrast, temporal adjuncts always yield *independent* construals: the situation-time of the subordinate CP is never anaphorically dependent on the situation-time of the matrix. We argue that this difference between complement and adjunct clauses need not be stipulated as it falls out automatically from the economy principles in (9).

4.1. Deictic anchoring enforced (anaphoric anchoring excluded)

Temporal adverbial clauses, just like any time adverb, are analyzed as PPs headed by a spatiotemporal predicate (Section 1.2). The head of this PP is the temporal connective itself – that is, *after*/*before*/*when* in (24a). Temporal adverbial clauses serve to restrict the temporal reference of the matrix AST-T (AST-T_1) by ordering AST-T_1 *after*/*before*/*within* the AST-T of the adjunct

clause (AST-T_2), as roughly illustrated in (24b).[6] Note that, just like any regular restrictive modifier, these PP modifiers are base generated adjoined to the argument that they modify.

(24) a. *Max left before/after/when Lou arrived*

b. 

The temporal connective *after* specifies that the ordering relation between the time of Max's departure (AST-T_1) and the time of Lou's arrival (AST-T_2) is one of subsequence, whereas *before* specifies that this relation is one of precedence. Finally, the connective *when* specifies that the ordering relation is temporal coincidence.

We now explain why temporal adjunct clauses are never anaphorically dependent on the matrix CP. To understand why, let's run through the temporal derivation of (24a). We first compute the temporal construals of the matrix and adjunct clauses, as in (25i-ii). We then compute the temporal contribution of the connective, as in (25iii).

The matrix past tense orders the UT-T after the matrix AST-T (AST-T_1), as shown in (25i). The time of Max' departure is thus a past time. Turning to the adjunct clause. Let's assume, at this stage, that the anchor-time of the adjunct is set to its default value: UT-T. The subordinate past tense thus orders the UT-T after the subordinate AST-T (AST-T_2), as in (25ii). Lou's arrival is thus also a past time. Note that these two first steps yield a temporal ordering where both the matrix and the adjunct AST-Ts are ordered in the past but, crucially, remain unordered relative to each other.

(25) *Max left before/after/when Lou arrived*

i. *Matrix:* Max PAST leave
AST-T1___UT-T

ii. *Adjunct:* Lou PAST arrived
Anchor-time=UT-T
AST-T2___UT-T

iii. *Output of steps (i-ii)*
No ordering established between AST-T1 & AST-T2: Both intervals are ordered in the past relative to UT-T but remain unordered relative to e.o.

We then compute the temporal contribution of the temporal connective. Recall that the connective serves to order the matrix and subordinate AST-Ts relative to each other (see (24b)). As shown in (25iv), the connective *before* orders the past AST-T_1 *before* the past AST-T_2, while *after* orders the past AST-T_1 after the past AST-T_2. Finally, *when* ensures coincidence between the two past AST-Ts.

(25) iv. *Compute the temporal contribution of the connective*

a.	BEFORE	AST-T1___AST-T2__UT-T	optimal output
b.	AFTER	AST-T2___AST-T1__UT-T	optimal output
c.	WHEN	AST-T1___UT-T | AST-T2	optimal output

The derivations in (25) converge since they yield licit outputs, satisfying both economy conditions in (9). The TEC is satisfied since each step in the temporal derivation is informative, and the TCSS is satisfied because the matrix and adjunct AST-Ts end up ordered relative to each other. Note, in particular, that the ordering relation (*precedence/inclusion/subsequence*) between the matrix and adjunct AST-Ts is established by the temporal connective itself.

We now run through the derivation of (24a), assuming this time that the anchor-time is anaphorically set to the matrix AST-T, as in (26). Computing the temporal construal of the matrix yields the ordering in (26i) where the time of Max' leaving (AST-T_1), is ordered by past tense prior to UT-T. Computing the temporal construal of the adjunct yields the ordering in (26ii), where the time of Lou's arrival (AST-T_2) is ordered in the past relative to the time of Max' leaving.

(26) *Max left before/after/when Lou arrived*

i *Matrix:* Max PAST leave
AST-T1___UT-T

ii *Adjunct:* Lou PAST arrived
Anchor-time=AST-T1
AST-T2___AST-T1

iii *Output of steps (i-ii)*
AST-T2___AST-T1___UT-T

iv *Compute the temporal contribution of the connective*

a. BEFORE AST-T1___AST-T2
uninterpretable output: violation of the TCSS

b. WHEN AST-T1
|
AST-T2
uninterpretable output: violation of the TCSS

c. AFTER AST-T2___AST-T1
vacuous output: violation of TCE

We then compute the temporal contribution of the connective. The connective *BEFORE* in (26iva) requires that AST-T_1 *precede* AST-T_2 but this requirement contradicts the ordering (*subsequence)* established between AST-T_1 and AST-T_2 at the output of steps (i-ii), given in (iii). Therefore, no ordering between the AST-Ts can be established, in violation of the TCSS, and the derivation crashes. By the same line of reasoning, we exclude anaphoric anchoring of the *WHEN*-clause in (26ivb) since it also yields contradictory ordering requirements.

Consider now (26ivc). The connective AFTER orders AST-T_1 *after* AST-T_2. The resulting derivation, however, is filtered by the economy principle in (9a): TCE. In particular, step (ivc) of the derivation is illicit because it yields an output temporally non-distinct from the output of steps (i-ii), given in (iii). The generalization that emerges is simple. When a temporal adjunct is merged into a matrix, the ordering relation between the AST-Ts must be established by the temporal connective itself, since the role of the connective is precisely to order the matrix and adjunct AST-Ts (see (24b) above). Anaphoric anchoring in (26ivc) is illicit because the ordering relation between the AST-Ts (*subsequence*) has already been established at step (ii) of the derivation by *past tense* in the adjunct. At step (iv), the connective AFTER then fails to determine the temporal ordering of the AST-Ts. It is thus temporally uninformative, vacuous, and TCE is violated.

We started off section 3 by discussing the backward/forward shifted readings that obligatorily arise with the complement clauses in (11). We argued that anaphoric-anchoring is enforced with either a past or a future in both the matrix and complement clauses, in order to ensure an intrinsic ordering of the matrix and subordinate AST-Ts, as illustrated in (27). When the anchor-time is reset to the matrix AST-T, as in (27iii), the derivation converges because past tense (that is, the predicate *after*) ensures a relative ordering of the AST-Ts.

(27) *Backward-shifted* reading: complement clause
Max said that Lou stole the ring
i. Max PAST SAY: AST-T1___UT-T

ii. Lou PAST STEALE AST-T2___UT-T
Output of (i-ii) ⇒ no ordering of the AST-Ts
iii. Resetting the anchor-time: AST-T1 $\text{AFTER}_{\text{TENSE}}$ AST-T2

In contrast, adjunct clauses are always deictically-anchored into the matrix. Deictic anchoring ensures that backward/forward shifted construals in *after/before* clauses are established *via the temporal connective itself*, as illustrated in (28).

(28) *Backward-shifted* reading: adjunct clause
Max left after Lou arrived
i. Max PAST LEAVE: AST-T1___UT-T
ii. Lou PAST ARRIVE AST-T2___UT-T
Output of (i-ii) ⇒ no ordering of the AST-Ts
iii. Temporal contribution of the connective:
AST-T1 $\text{AFTER}_{\text{CONNECTIVE}}$ AST-T2

Anaphoric anchoring of the adjunct (at step (28ii)) would have violated TCE because *past tense* in the adjunct would then itself determine the ordering relation (*subsequence*) between the AST-Ts: AST-T1 $\text{AFTER}_{\text{TENSE}}$ AST-T2. Step (28iii) would thereby be temporally vacuous, uninformative. The connective *after* would fail to determine the ordering of the AST-Ts, since this relation is already established by past tense, via anaphoric anchoring. Adjunct clauses thus contrast sharply with complement clauses where the relation between the matrix and subordinate AST-Ts can (and in certain configurations, *must*) be established via *anaphora*.

4.2. Tense concord restrictions: anaphoric and deictic anchoring both excluded

Specific tense-concord restrictions obtain between the tense of a matrix clause and the tense of a temporal adjunct clause, as illustrated in (29).

(29) a. Simple past in the matrix and adjunct
Max left after/before/when Lou arrived
b. Simple past in matrix, future in adjunct
**Max left before/after/when Lou will arrive*
c. Future in matrix, simple past in adjunct
**Max will leave after/before/when Lou arrived*

We argue that there is no need for tense specific rules and constraints to account for these restrictions, contra Hornstein (1990). These restrictions fall out uniformly from the economy conditions in (9).

We have already seen why the combination *past* in the matrix and *past* in the adjunct in (29a) yields a grammatical output (assuming deictic anchoring of the adjunct clause; see the derivation in (25)/(28)). The question then is why the tense combinations in (29b-c) are ungrammatical. Consider first the derivation of the illicit (29b) given below.

The matrix past orders the UT-T *after* the time of Max's departure (AST-T_1), as shown in (30i). The subordinate future orders the UT-T *before* the time of Lou's arrival (AST-T_2). These two steps yield the ordering in (30iii) where the time of Max' leaving precedes both UT-T and the time of Lou's arrival.

(30) **Max left before/after/when Lou will arrive*

i. *Matrix:* Max PAST leave
AST-T1___UT-T

ii. *Adjunct:* Lou FUT arrived
Anchor-time = UT-T
UT-T___AST-T2

iii. *Output of steps (i-ii)*
AST-T1___UT-T___AST-T2

We then compute the temporal contribution of the connective, as shown in (30iv). The connective BEFORE in (30iva) orders AST-T_1 *before* AST-T_2. This last step, however, is filtered by TCE since it yields a construal temporally non-distinct from the construal achieved at the preceding step of the derivation (30iii). In other words, *Max left before Lou will arrive* is illicit because the order between the matrix and adjunct AST-Ts is *already* established by the respective tense in each clause. The temporal connective is thus semantically, temporally vacuous: it fails to establish the relative ordering of the matrix and adjunct AST-Ts.

(30) iv. *Compute the temporal contribution of the connective*

a. BEFORE AST-T1___AST-T2
vacuous output: violation of TCE

b. AFTER AST-T2___AST-T1
uninterpretable output: violation of the TCSS

c WHEN AST-T1
|
AST-T2
uninterpretable output: violation of the TCSS

The connective AFTER in (30ivb) requires that AST-T_1 *follow* AST-T_2, but this ordering requirement contradicts the ordering (*precedence*) established between AST-T_1 and AST-T_2 at the output of steps (i-ii), given in (30iii). The derivation thus violates the TCSS, as it fails to secure an ordering of the matrix and subordinate AST-Ts. By the same line of reasoning, we filter step (30ivc): the connective *WHEN* requires the AST-Ts to coincide, but this requirement contradicts the ordering established at the output of steps (30i-ii).

Finally, we run through the derivations of the ungrammatical (29c) given below. The matrix future orders the UT-T *before* the matrix AST-T_1, as shown in (31i). The subordinate past orders the UT-T *after* AST-T_2, as in (31ii). These two steps yield the ordering in (31iii) where the time of Lou's arrival (AST-T_2) precedes both UT-T and the time of Max's leaving (AST-T_1).

(31) **Max will leave after/before/when Lou arrived*

i. *Matrix:* Max FUT leave
UT-T___AST-T1

ii. *Adjunct:* Lou PAST arrived
Anchor-time = UT-T
AST-T2___UT-T

iii. *Output of steps (i-ii)*
AST-T2 ___ UT-T ___ AST-T1

iv. *Compute the temporal contribution of the connective*

a. *AFTER* AST-T2___AST-T1
vacuous output: violation of TCE

b. *BEFORE* AST-T1__AST-T2
uninterpretable output: violation of the TCSS

c. *WHEN* AST-T1
|
AST-T2
uninterpretable output: violation of the TCSS

We then compute the temporal contribution of the connective, as in (30iv). The connective AFTER orders AST-T_1 *after* AST-T_2. This step of the derivation, however, is filtered by the TCE since it yields an output temporally non-distinct from the output of steps (i-ii), given in (iii). *Max will leave after Lou arrived* is thus illicit because the order between the matrix and adjunct AST-Ts is already established by the respective tense in each clause. The temporal connective is thus semantically, temporally vacuous.

The connective BEFORE in (31ivb) orders AST-T_1 *before* AST-T_2. The resulting derivation crashes because it yields contradictory ordering require-

ments: AST-T_1 is required to follow AST-T_2 in (iii) and to precede it at step (iv). Therefore, no ordering between the AST-Ts can be secured. By the same line of reasoning, we exclude step (31ivc) since it also yields contradictory ordering requirements.

We conclude that the tense concord restrictions illustrated in (29) arise when both anaphoric and deictic anchoring of the adjunct clause are excluded. This happens for either of two reasons: (i) a step in the temporal derivation is vacuous/uninformative, thus violating TCE; or (ii) anchoring fails to secure a relative ordering of the matrix and adjunct AST-Ts, thus violating the TCSS.

We have argued that the grammar of temporal relations can be derived from independently motivated primitives, principles and constraints. In particular, both the typology of temporal construals and the tense concord restrictions, arising with different combination of tenses in matrix and subordinate clauses, be it complement or (temporal) adjunct clauses, follow from general economy constraints.

Notes

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2. See Stowell (1993) for the proposal that tense is a dyadic predicate of spatio-temporal ordering with the meaning of *after*, (*with)in* or *before*. D&U-E extend this proposal to both aspect and time adverbs.
3. D and UE (to appear) argue that anaphora between the AST-T and the EV-T can be construed as either coreference or binding. Coreference yields perfective viewpoint whereas semantic binding yields *neutral* viewpoint aspect (in the sense of Smith 1993).
4. TCE is inspired by Fox's (2000) Economy Principles (on Scope and Variable Binding), which are designed to ensure that a given semantic interpretation is achieved in an optimal manner –that is, "with no more effort that is necessary".
5. Recall that in a clause with no morphological aspect, the AST-T and EV-T always coincide (Section 1.3). For expository reasons, we henceforth simplify the temporal schemas for simple tenses, ignoring the EV-T when it coincides with the AST-T. The temporal schemas in, say (13), should thus be understood

as shorthand for (i-ii):

i EV-T1=AST-T1___UT-T

ii EV-T2=AST-T2___UT-T

6. For reasons of space, we cannot give the full structure of temporal adjunct clauses, but see D and UE (2002, 2004) for a detailed analysis. Note, in particular, that the internal argument of the connective has, on the surface, the syntax of a clause and not of a DP (as is the case with PP modifiers such as *before/after/in the fall*). D and UE analyze the clause introduced by the connective as a covert temporal relative headed by the AST-T of the adjunct CP. Under this analysis, the internal argument of the connective in (24) is, in fact, a Zeit-P ultimately denoting the subordinate AST (AST-T_2), as roughly illustrated in (24b).

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Future time reference: Truth-conditional pragmatics or semantics of acts of communication?*

Kasia M. Jaszczolt

1. Introduction and overview

The treatment of temporal reference in Discourse Representation Theory (henceforth, DRT, Kamp and Reyle 1993) is still work in progress and contains many unresolved questions. One of these questions is how to account for temporal reference that cannot be derived from the overt grammatical or lexical indicators of time. The temporal specification of an eventuality (represented in DRT as a state or an event) relies on information overtly specified in the sentence by means of grammatical markers of tense and aspect or by temporal adverbials. But, as is well known, some temporal information may come from the context of the utterance or discourse, some may also be assumed by default in the absence of overt indicators in the sentence. These pragmatic indicators of temporality are particularly important where there is a possibility of multiple reading of a construction or where the context suggests that there is a mismatch between the temporal information conveyed by the grammar and the temporal information intended in the given context. Needless to say, such pragmatic indicators are indispensable for languages without obligatory marking of tense or aspect – or both.[1]

In this paper I propose how such pragmatic information can be incorporated in dynamic semantics modelled on DRT. For this purpose I use the example of future time reference in English and attempt to provide semantic representation of expressions with regular future, futurative progressive, and so-called 'tenseless future' (Dowty 1979).

I propose a reanalysis of the type and degree of contextual input to discourse representation structures (DRSs) in such a way that they allow the pragmatic input to be regarded on a par with temporal information coming from grammar and the lexicon. Such pragmatics-rich representations of acts of communication (called *merger representations*, Jaszczolt 2003, 2005, 2006) differ from DRSs in the conception of the interaction between semantics and pragmatics and in particular in the sources of meaning information

they distinguish. Next, I apply merger representations to expressions of futurity. In order to do so, I briefly state the reasons for supporting the view of futurity as modality and introduce a modal operator to merger representations (henceforth MRs) that accounts for all the three ways of expressing futurity introduced earlier. In the final part, I compare and contrast the foundational assumptions of the two currently dominant orientations pertinent to the issue of 'pragmatization' of semantics: truth-conditional semantics of DRT and the so-called truth-conditional pragmatics (Recanati 2003, 2004) and conclude that representing various ways of expressing futurity requires a truth-conditional account of meaning that allows for a contribution of information coming from pragmatic sources to truth conditions as understood in post-Gricean pragmatics rather than, as is normal practice in semantic theories, going 'beyond truth conditions' where the latter are applied to the output of syntactic processing. Consequently, I conjecture that such an incorporation of the pragmatic indicators of futurity can be accommodated within a semantic theory when the dependence of the latter on the syntactic structure is relaxed according to the guidelines provided in merger representations.

2. Future time reference

Futurity can be expressed in a variety of ways in English. In (1), it is expressed by means of an auxiliary *will*.

(1) *Tom will play at the Royal Albert Hall tomorrow night*.

In (2), present continuous is used for future time reference. This use is called *futurative progressive*.

(2) *Tomorrow night Tom is playing at the Royal Albert Hall*.

In (3), simple present is employed. This use is sometimes called *tenseless future* (see Dowty 1979) and this is the term I employ here.

(3) *Tomorrow night Tom plays at the Royal Albert Hall*.

Sentence (4) makes use of a periphrastic construction.

(4) *Tom is going to play at the Royal Albert Hall tomorrow night*.

The use of the auxiliary *will* for future time reference is relatively well researched (see e.g. Enç 1996; Dahl 1985; Abush 1988; Ogihara 1996).[2] *Will* is also well accounted for in DRT because it conforms to the requirement that when the auxiliary *will* is present, the eventuality is placed in the future with respect to the utterance time:

> …[the feature] TENSE has three possible values, *past*, *present*, and *future*, signifying that the described eventuality lies before, at, or after the utterance time, respectively. The value of TENSE for a given sentence S is determined by the tense of the verb of S. When the main verb is in the simple past, TENSE = *past*; when it is in the simple present, TENSE = *pres*; and when the verb complex contains the auxiliary *will*, TENSE = *fut*. (Kamp and Reyle 1993: 512–513).

Meaning representations of DRT, i. e. DRSs, are built on the foundation of the syntactic configuration. In other words, syntactic processing of a sentence (or, in dynamic approaches, of a string of sentences in discourse) leads to the establishment of the initial structure of discourse referents and discourse conditions. Such a representation must contain temporal information conveyed by the grammar and the lexicon: "The algorithm must represent the temporal information that is contained in the tense of a sentence and in its temporal adverb (if there is one)." Kamp and Reyle (1993: 512).

Examples (1) and (4) conform to this desideratum: auxiliary *will* and the periphrastic construction 'be going to + *verb*' can be accounted for by means of a suitable algorithm. On the other hand, the futurative progressive and 'tenseless future' are much more problematic. The future time reference of (2) and (3) cannot easily be derived from a formal rule. The default use of the form in (2) is present time reference with continuous progressive aspect, while that of (3) is present time reference, normally with non-progressive or habitual/iterative aspect, largely depending on the adverbial, as well as on the aspectual class of the verb.[3] In what follows, I shall focus on (2) and (3) as compared with (1), but not so much with respect to the nuances of meaning they convey in addition to conveying futurity, but rather mainly with reference to (i) the amount and (ii) particular sources of the *pragmatic input* required in order to use such expressions with future-time reference. As will become obvious from the discussion, the explanation of the differences in meaning between (1), (2) and (3) is a by-product of their analysis. The reason for this is that their future-time reference is explained by the modal character of the conveyed statements and the degree, or relative strength, of this modality in each of the sentences.

3. Pragmatic input to meaning representations

The next step is to take a stance concerning the object of which truth conditions are predicated. To repeat, in DRT, like in other formal semantic theories, truth conditions pertain to the logical form which is itself the output of sentence grammar. Then, the semantics can extend 'beyond' the truth conditions to account for, for example, the reference of indexical expressions. This orientation is sometimes classified as the 'semantization' of the pragmatic input to representations of meaning (see e.g. Levinson 1995; 2000). On the other hand, in post-Gricean pragmatics, truth conditions are predicated of utterances.[4] The representation of meaning is then a logical form of the sentence that can be suitably developed in order to resemble the meaning intended by the speaker – or, rather, the meaning understood by the addressee as intended by the speaker. The input to the truth-conditional analysis is then *what is said* (Recanati 1989), or an *explicature* (Sperber and Wilson 1995; Carston 1988). Now, I remarked in Section 2 that in order to give an account of future time reference performed by means of futurative progressive or 'tenseless future' as in (2) and (3) respectively, we have to have a way of incorporating pragmatic inference into the analysis of meaning. It seems that post-Gricean approaches, on which truth conditions are predicated of what is said, provide a suitable framework. What we have there is the so-called 'pragmatization' of truth conditions: truth conditions pertain to utterances. The consequence of this view is that there is no need to derive *all* the constituents of the representation of which truth conditions are predicated from the logical form. Some of the developments of the logical form may not pertain to any 'slots' in the logical form; they are, to use Recanati's (2004) expression, top-down, rather than bottom-up:

> …even if the semantic value of a word is fixed by language (and context, if saturation [i.e. filling in indexicals, 'unarticulated constituents', KJ] is necessary), composing it with the semantic values for other words often requires help from above [top-down process]. It is semantic composition which has a fundamentally pragmatic character. (Recanati 2004:139).

Such top-down processes result in embellishments of the logical form that are not triggered by the grammar but instead are results of inferences from the initially derived representation. On the first glance, it would seem that the advantages of this pragmatic move are unsurpassed. But truth-conditional pragmatics does not come with a strict formal procedure of deriving meaning. What it gains by opening the door to pragmatic inference, it

loses in the domain of precision and clarity of formalization. So, the question arises, can we preserve the precision of the DRT algorithms and open it to the output of pragmatic inference that would account for, for example, futurative progressive and 'tenseless future'? In other words, are DRT and truth-conditional pragmatics compatible? Can the first be enriched with the insights of the latter?

On the first sight, the answer is negative: while DRT goes 'beyond' truth conditions in the construction of DRSs, truth-conditional pragmatics applies a truth-conditional analysis to what is said, the meaning of the sentence that is enriched with the result of various kinds of pragmatic inference: (i) those for which the syntax gives us an indication that there is some pragmatic task to be performed, as in reference assignment to deictic expressions in (5), as well as (ii) those for which no such syntactic trigger exists, as the narrowing of the domain of quantification in (6). Symbol '+>' stands for 'conversationally implicates':

(5) *He* is *here now*.

(6) *Everybody* came to the party. +> *Everybody who was invited* came to the party.

On a closer analysis, though, it seems that the formal apparatus of DRT can also be applied, so to speak, 'one level higher', to the output of processing the structure of the sentence combined with what is pragmatically implied in the discourse. There are some serious conceptual hurdles to overcome, the main one being the level at which compositionality is predicated. I present a detailed defence of compositionality on the post-inference level elsewhere and am not going to discuss this issue here.[5] In what follows, I confine my task to proposing how the discourse referents and conditions of DRT, amended with a modal operator, can be applied to such a 'post-pragmatic inference' representation in order to account for futurative progressive and 'tenseless future'. The framework that combines the orientation of truth-conditional-pragmatics and the semantization of meaning of DRT is already being developed and is called Default Semantics (Jaszczolt 1999a, b, 2002, 2003, 2005, forthcoming). I shall use this framework in what follows.

Default Semantics (henceforth DS) uses an adapted and extended formalism of DRT but applies it to the output of the merger of these sources of meaning. The representation of the truth-conditional content is a merger of information from (i) word meaning and sentence structure, (ii) conscious pragmatic processes, and (iii) default meanings. Utterance processing can

now be captured as on Fig. 1. Stage 1 pertains to the processing of what is said (our MR), and Stage 2 to the processing of implicatures. Two types of default interpretations are distinguished in Default Semantics: defaults pertaining to the properties of the human cognitive mechanism (cognitive defaults) and defaults that arise as a result of an experience of social and cultural patterns in a community (social-cultural defaults).

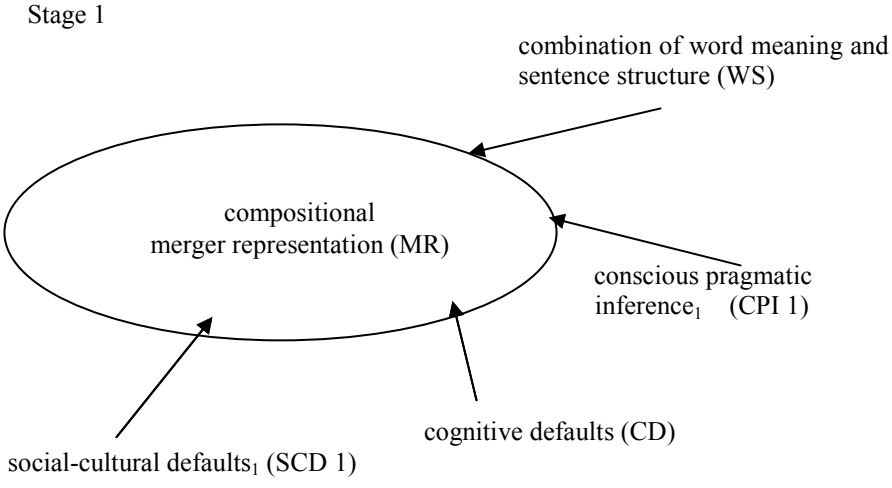

Figure 1. Utterance interpretation in Default Semantics (adapted from Jaszczolt 2005: 73)

Now, in DRT, sentence (1) repeated below, obtains a DRS as in Fig. 2. 'e⊆t' stands for 'event *e* is temporally included in time *t*', and 'n<t' for 'the present time *n* precedes the time *t* of the event'.

(1) *Tom will play at the Royal Albert Hall tomorrow night.*

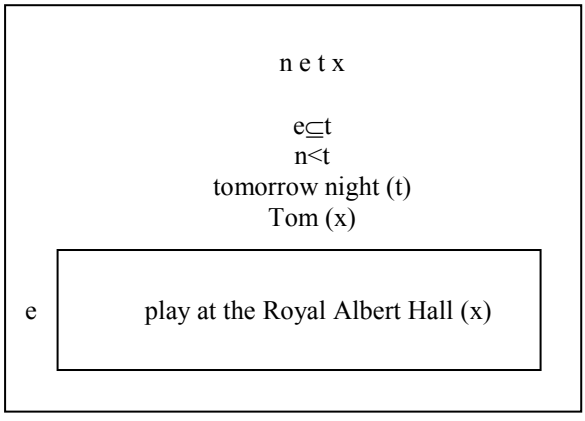

Figure. 2. The DRS for sentence (1)

However, constructing an analogous DRS for sentences (2) and (3) would be problematic. The verb forms 'is playing' and 'plays' do not normally indicate that the eventuality should be placed in the future. This information has to be inferred from the temporal adverbial 'tomorrow night', or, in its absence, it has to be pragmatically inferred from the situation of discourse. Now, MRs of DS account for such pragmatic input. They can also account for the differences in meaning between (1), (3) and (4). Such MRs are the topic of Section 4.

4. Future time reference in merger representations

Examples (1) - (4), albeit all pertaining to a future event, differ in their meaning. (1) and (4) are closer to being neutral as to expressing the commitment to the future event than (2) and (3). Leaving the periphrastic expression in (4) aside, let us now compare (1), (2), and (3). Futurative progressive in (2) is normally associated with the sense of planning.[6] 'Tenseless future' in (3) is quite restricted in use and comes with a strong commitment on the part of the speaker to the truth of the future event. In other words, 'Tom plays a concert tomorrow' means that the speaker has strong reasons to believe that the event will take place. The differences in meaning between these three ways of expressing the future are not vast. They essentially pertain to the strength of the speaker's commitment. So, we would expect a semantic theory to be able to capture this similarity and account for the different strength with which the statements are made.

Now, in semantic terms, commitment to the eventuality is best handled as modality – possibility, necessity, or simply the kind of evidence one has for making a claim.[7] In DS, we shall assume that futurity is best handled by a modal operator. Unlike the past and the present, the future shares many properties with what are undisputable epistemic or deontic modal contexts (see e.g. Enç 1996; Jaszczolt, 2006). I shall thus attempt to cater for all three ways of expressing futurity exemplified in (1)-(3) by means of introducing a modal operator on events, loosely modelled on Grice's (2001) acceptability operator. The latter proposal can be summarised as follows. According to Grice's Equivocality Thesis, all modal expressions can be subsumed under one general category. More precisely, in his unfinished investigation, Grice attempted to derive practical (deontic) and alethic modalities from a common core of acceptability by means of introducing an operator on propositions:

> Acc ⊦p 'it is (rationally) acceptable that it is the case that *p*'

and

> Acc !p 'it is (rationally) acceptable that let it be the case that *p*'.

Leaving aside Grice's incomplete argument for their common source, let us focus on *Acc* itself and the possibility of its utilisation for (1)-(3). We have to make two adjustments though. Firstly, if *Acc* applies to alethic modalities, let us assume that it will also apply to epistemic modalities since, conceptually, the latter are, so to speak, 'alethic modalities' seen from the perspective of human cognition. Next, and more importantly, in view of the earlier discussion of the need to incorporate pragmatic inference into the unit of which truth conditions are predicated (MR), let us form an acceptability operator on *events*, written as *ACC e*. At this point we can attempt to introduce this operator to the semantics – first conceptually, and then formally.

As was observed earlier, simplifying somewhat, (1)-(3) differ in the degree of commitment to the prospect that the stated eventuality is going to take place. We can represent this degree by means of the degree *n* of the modality Δ. In the following simplified neo-Davidsonian[8] logical form, Δ^n stands for the degree n of granularity of Δ as in ?(7):

?(7) $\exists\Delta\exists e\exists n(\Delta^n \,\&\, ACC_\Delta{}^n$ (Playing-at-the-Royal-Albert-Hall (e) & Subject (Tom, e) &Tomorrow-night (e)))[9]

Δ can take on Grice's '⊢' or '!' for 'it is the case that…' and 'let it be that…'. But, since we do not want to commit ourselves to Grice's 'alethic/practical' divide, we allow for the possibility that *ACC* may require more types of Δ. The latter issue cannot be resolved quickly, it is a topic for an in-depth, data-based investigation. So, let us assume that for the purpose of investigating futurity, Δ = ⊢. We can now construct a *unified*, general MR for regular future, futurative progressive, and 'tenseless future' as in Fig. 3. The value *n* is left unspecified and can vary between those ascribed to (i) regular future where the commitment is weak and modality high; (ii) futurative progressive where the commitment is higher and modality weaker; and (iii) 'tenseless future' with the strongest commitment and weakest modality. In Fig. 3, the subscript CD stand for cognitive defaults, and WS for the combination of word meaning and sentence structure, which are two of the sources of information that contributes to MR depicted in Fig. 1. [ ] stand for the material to which these sources pertain.

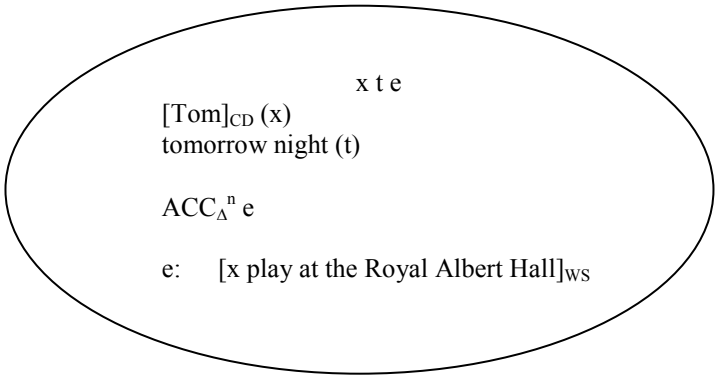

Figure 3. Generalized MR

Now, the strength of the speaker's commitment in each of these three ways of expressing futurity can be placed on an indicative scale as in Fig. 4. The '1' end of the scale signifies the strong commitment to e that comes with the speaker's strong informative intention. Strong commitment means, *a fortiori*, low degree of detachment from the stated eventuality, and hence 'low degree' of modality. The '0' end corresponds to the weak commitment and therefore 'strong' epistemic modality. In Fig. 4, tf, fp, and rf stand for 'tenseless future', futurative progressive, and regular future respectively. The absolute values for *tf, fp* and *rf* are, naturally, not specified. Their rela-

tive values are all that matters – and, possibly, all that can be conjectured without substantial empirical research.

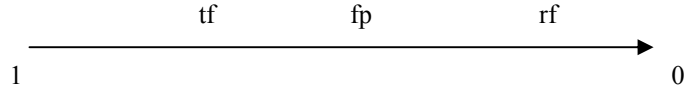

Figure 4. Gradation of commitment and modality for *tf, fp*, and *rf*

The MRs for (1)-(3) can now be constructed as in Figs (5)-(7). The superscript *n* has been replaced by the value (degree) of modality that is carried by the forms *rf*, *fp*, and *tf* respectively.

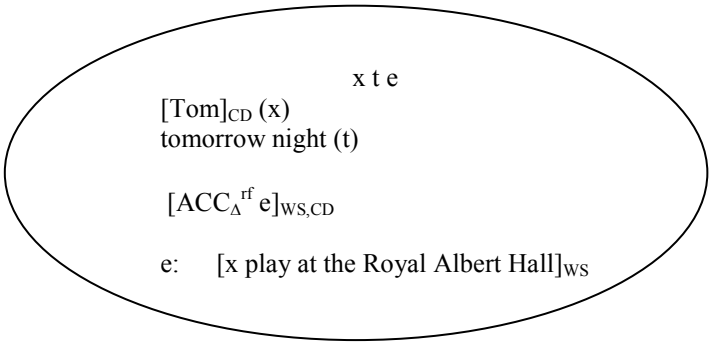

Figure 5. Regular future

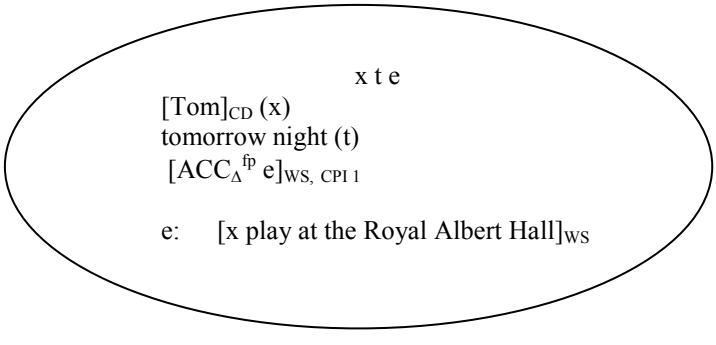

Figure 6. Futurative progressive

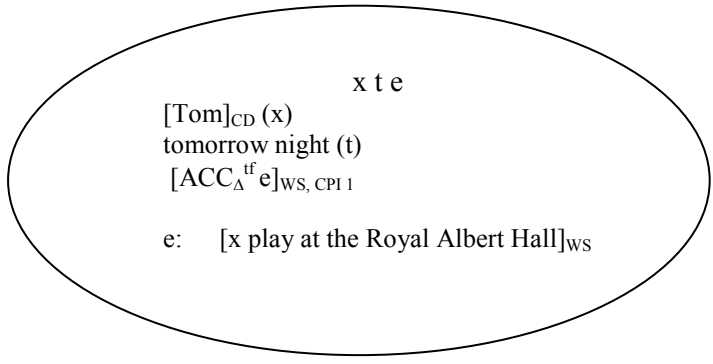

Figure 7. Tenseless future

A disclaimer is due at this point. I am not claiming that this is the only way in which top-down pragmatic inference can be accounted for in a a theory of discourse interpretation. There are, of course, many possible ways of incorporating contextual information into semantic representations. It is also possible that solutions to the futurity problem that are closer to the theoretical assumptions of DRT can be construed – in DRT itself or in one of its offshoots. The advantage of the proposal presented here is that we are able to account for all three ways of expressing futurity by means of one modal operator. Moreover, operator *ACC* is also applicable to other clearly modal uses of *will* such as the epistemic and dispositional necessity in (8) and (9) respectively.

(8) *Tom will be playing a concert now*.
(9) *Tom will sometimes play out of tune during the rehearsals to annoy the conductor*.

But this is a separate topic that I discuss elsewhere.[10]

5. Conclusions

Non-standard ways of expressing future time reference such as futurative progressive and 'tenseless future' pose a difficulty for semantic theories in that there is a mismatch between the temporal information carried by the grammatical form of the verb and the temporal information carried by the utterance. The most obvious way to overcome this difficulty is resorting to a

post-Gricean pragmatic account according to which truth conditions are predicated of utterances, as in Recanati's truth-conditional pragmatics. However, what is gained in the power of the theory, is lost in its formalization. I proposed here to use the insights of truth-conditional pragmatics concerning the unit of which truth conditions should be predicated and apply the amended and extended formal apparatus of DRT to such 'pragmatics-rich' representations, that is MRs of DS. I have analysed in DS the three types of expressing futurity, proposing a general notion of modality, modelled on Grice's Acc, that subsumes various expressions of futurity (*rf, fp, tf*). Grice's *Acc* was translated into the DS-theoretic operator ACC_{Δ}^{n}. I showed that ACC_{Δ}^{n}, combined with CD and CPI 1, allows for representing the degrees of modality and the degrees of informative intentions associated with the acts of communication that make use of these different forms.

6. Final remarks: How much pragmatics?

This analysis is only a sketch of a proposal and leaves many unresolved questions. In fact, it opens up new problems for the semantics/pragmatics interface. The main problem has already been mentioned: in order to apply the formalism of DRT, however amended and extended, to representations that incorporate the output of top-down pragmatic inference, one has to rethink the issue of compositionality in semantic theory. This is a topic for a separate discussion. All that has to be said here is that it seems perfectly acceptable to assume that compositionality has to be understood as a methodological principle and assumed at some level or other. The semantic theory will have to follow suit in order to accommodate such compositionality. Or, in the words of Groenendijk and Stokhof (1991: 93), "…it is always possible to satisfy compositionality by simply adjusting the syntactic and/or semantic tools one uses, unless that is, the latter are constrained on independent grounds." The question as to whether methodological compositionality is also a compositionality of content, i.e. whether it is 'really' there in mental representations conceived of as merger representations, is still work in progress.[11]

The next problem concerns the degree of the contextual contribution allowed in representing what is said. According to the standpoint called by Recanati (2004) quasi-contextualism, any pragmatic inference that contributes to the addressee's recovery of what is said by the speaker is allowed. According to more radical contextualism, this contextual contribution to the representation of what is said is even mandatory.[12] Default Semantics goes a

little further in allowing pragmatically derived information not only to *add* to the information arrived at through the syntactic processing of the sentence, but also *block* it. In other words, for example, 'is playing' in (2) need not result in the default interpretation as present progressive, but instead the grammatical form interacts with the meaning of the temporal adverbial 'tomorrow night' and with the result of pragmatic inference from the situation and produces, by merger, a future time reference of the event. The form 'plays' in (3) is processed analogously. It remains to be seen whether a semantic theory in which the dependence of the mental representation on the output of syntax is substantially relaxed can be worked out for other problematic constructions and phenomena.[13]

Notes

∗ Earlier stages of the project on futurity as modality were reported in the coference papers Jaszczolt 2003, 2006, and Chapter 6 of Jaszczolt 2005.

1. In Thai, for example, markers of tense and aspect are not obligatory. See e.g. Srioutai (2004), forthcoming a, b.
2. See also Jaszczolt (2005), Chapter 6 and forthcoming for detailed references.
3. See e.g. Comrie (1976); Jaszczolt (2002), Chapter 13; Rothstein (2004).
4. See e.g. Carston (1988), (2002); Sperber and Wilson (1995); Recanati (1989), (2004).
5. See Jaszczolt (2005), Chapter 3.
6. Cf. e.g. the infelicity of (i):
   ?(i) Tom is suffering from a headache tomorrow night.
7. See also Palmer (1986) for evidentiality as modality. This degree of commitment is what we have to represent.
8. See Parsons (1990).
9. This is not the only way of representing the type of *ACC*. If we were to depart from the Montagovian tradition of the operator-based analysis and adopt the stance that temporality is to be expressed as an argument of predication, the logical form would change accordingly. I adopt the operator analysis as it best captures the degrees of intentionality and intentions that differentiate between the different expressions of futurity in (1)-(3).
10. See Jaszczolt (2005) and 2006.
11. The literature on this topic is vast. See Jaszczolt 2005, Chapter 3 for references. For the compositionality of content see e.g. Schiffer 2003 and Recanati 2004.
12. Cf.: "...Quasi-Contextualism (...) considers the minimal proposition as a theoretically useless entity which plays no role in communication." Recanati

(2004: 86) and "According to Contextualism (...) there is no level of meaning which is both (i) propositional (truth-evaluable) and (ii) minimalist, that is, unaffected by top-down factors." Recanati (2004: 90).

13. This was attempted in Jaszczolt (2005), Part II, devoted to various applications of DS.

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When the Present is all in the Past[1]

Pranav Anand and Valentine Hacquard

1. Introduction

This paper is concerned with English sentences where a present tense embedded under a past tense need not refer to the utterance time (t*). Such sentences are illustrated in (1):

(1) a. *The medieval monarch King Richard said that he would let his daughter marry any knight who come**s** back from the Third Crusade*.
b. *Caesar declared that he would execute any senator who stir**s** up rebellious sentiment in the Roman Empire*.
c. *After the battle of Bunker Hill, Washington said that he would promote a soldier who ha**s** fewer than five wounds in order to bolster morale*.

In (1a), the relative clause present tense (on *comes back*) is interpretable as simultaneous with the embedding sentence past tense (i.e., the *letting* time) and not with t* (i.e., today: May 2, 2005). Similarly, the present tense in (1b) and (1c) need not include t*.

These facts are puzzling on any current theory of tense, as they all predict that (in English) a present in the scope of past has to overlap t*, given the interpretation of sentences as in (2):

(2) a. *Two weeks ago, Jon met a student who lives in Tokyo*.
b. *Jon said (#two years ago) that Sue is pregnant*.

(2a) is felicitous only if there is a student who lives in Tokyo during an interval overlapping t*. (2b) is a classic double-access sentence where Sue's pregnancy overlaps both t* and Jon's speech time (*modulo* intensional concerns).

We show that current analyses of tense cannot handle the facts of (1), and in particular, that theories of tense where the English present has an indexical component (because of sentences like (2)) are not rescuable.

Sentences of type (1), which we call *Present-in-the-Past* sentences are licensed under very specific conditions: the present must be (i) embedded under a future-oriented modal (such as *woll*)[2], (ii) in a non-specific relative clause (i.e., in contrast with CP complements of attitude verbs). We show that this distribution can be straight-forwardly accounted for, once we make the theoretical move that there are polarity relations between tenses.

Specifically, we propose a new analysis of tense where (i) the present tense (henceforth PRES) is an anti-PAST Polarity Item, in that it cannot be in the scope of a PAST tense, following Stowell's (1993) insight; (ii) the future *woll* is a polarity intervener (cf. Kroch 1979, Szabolcsi 2002); and (iii) a semantic type restriction on the tense of the complement of an attitude verb (cf. Kratzer 1998) forces a PRES under a PAST to scope out of an embedded CP, and thusly escape the protective domain of the polarity intervener.

This paper is organized as follows: in Section 2 we describe the classic and novel data involving English present under past sentences. We discuss shortcomings of previous theories of tense in Section 3. Section 4 proposes a new analysis of tense.

2. The Data

2.1. English PRES under PAST (the classic picture)

English PRES, when embedded under a PAST, seems to have the peculiar property of forcing the event time to always include t* (and possibly more), yielding double-access sentences such as (2b), repeated below:

(2) b. *Jon said (#two years ago) that Sue is pregnant*.

The (alleged) state of pregnancy has to overlap both the time of Jon's speech act and t*. Note that in a non sequence-of-tense language (like Japanese), PRES would only require the pregnancy to overlap Jon's speech time.

When PRES is in a relative clause embedded under a matrix PAST, it also must overlap t* (note however that, in this case, it doesn't have to overlap Jon's speech time):

(3) *Jon said that he met a woman who is pregnant*.

As pointed out by Ogihara (1989) and Abusch (1988), *et seq*., this sentence requires a *de re* reading of the DP containing the relative clause,

which suggests a correlation between scope-taking mechanisms of DPs and the licensing properties of tense in relative clauses.

In sum, an English PRES embedded under a PAST in both relative clauses and CP complements shows a requirement to overlap t*. However, CP complements with PRES force a double-access reading, while relative clauses obligatorily refer to t* alone and are read *de re*. This suggests that the mechanisms for interpreting PRES under PAST in complement CPs must be different from the scope-taking explanation for relative clauses.

2.2. Pres under PAST (novel data)

While our puzzle sentences in (1) have a *de re* reading (ignoring felicity concerns) just like (3), they also have a second reading which (3) lacks, namely, the *de dicto* reading of (4):

(1) c. *After the battle of Bunker Hill, Washington said that he would promote a soldier who has fewer than five wounds*.

(4) *After Bunker Hill, Washington said that he would promote a soldier who* ***had*** *fewer than five wounds*.

(1c) and (4) share a reading where the state of having fewer than five wounds holds during promotion time after Bunker Hill, but *not* in the present day. For (4), this is analyzed as a case of sequence of tense, where the past tense on *have* is semantically vacuous (through a deletion (Ogihara 1996) or morphological agreement (Schlenker 1999) rule, triggered by a higher PAST). However, this sequence-of-tense (SOT) rule is not an option for (1c), given that there is no c-commanding PRES that could trigger such a rule. Hence, something else must be responsible for the availability of (1)'s *de dicto* reading.

2.3. Conditions on *Present-in-the-Past*

There are specific conditions which license *Present-in-the-Past* sentences. First, it appears that a future-oriented verb needs to intervene between PRES and a matrix PAST. Hence the *de dicto* reading in (1c) is also available when other future-oriented attitude verbs replace *woll*:

(5) *After Bunker Hill, Washington {wanted, expected} to promote a soldier who has fewer than five wounds in order to bolster morale.*

However, the extra reading of (1) is unavailable with non future-oriented embedding verbs (such as *try*):

(6) #*After Bunker Hill, Washington* ***tried*** *to promote a soldier who has fewer than five wounds in order to bolster morale.*

The availability of this reading is also sensitive to the specificity[3] of the relative clause's head. If a specific reading is forced by using a determiner like '*the',* the sentence becomes infelicitous (PRES has to overlap t*):

(7) #*After Bunker Hill, Washington said that he would promote* ***the soldiers*** *who have fewer than five wounds.*

Finally, the availability of this reading of PRES is unavailable in complement CPs of attitude verbs (i.e., in contrast with relative clauses). The sentence in (8) is infelicitous because it has to be interpreted double-access:

(8) #*After Bunker Hill, Washington promised that he would say* [$_{CP}$ that his generals are no longer required to serve in the army].

The generalization that emerges from these facts is described below:

> GENERALIZATION: An embedded English PRES requires the event time to overlap with t* when in the scope of a matrix PAST, unless it is in a relative clause which is:
> (i) non-specific; and (ii) embedded under a future-oriented verb.

3. Problems with Current Analyses of Tense

The punchline of this section is simple: all previous analyses of tense reduce Present-in-the-Past sentences to the cases of PRES under PAST discussed above, and as such are inadequate.

All theories of English tense argue that a (non-vacuous) PRES in the scope of a PAST is ill-formed. Ogihara (1996), Abusch (1997), and Schlenker (2003) assume some form of Abusch's (1993) Upper Limit Constraint:

(9) *Upper Limit Constraint* (ULC): The tense of the embedding clause is an upper bound on the tenses in subordinate clauses. (Abusch 1993)

Abusch (1993) motivates the ULC based on the observation that sentences such as (10a) cannot be understood as in (10b).

(10) a. *Sue believed that it was raining*.
b. *Sue believed that it would rain*.

Informally, the believing event of Sue in (10) cannot strictly precede the raining event without the presence of a future element (e.g., *would*).

Note that in considering (3), we already saw one way of rescuing a potential ULC violation: movement. However, as that correlated with *de re* interpretation of the DP containing the offending PRES, while the *Present-in-the-Past* sentences do *not*, we cannot appeal to DP movement to explain these. In other words, it seems that the PRES has to stay where it is, and our best bet is to play with the interpretation of PRES itself.

3.1. Indexical Accounts of PRES

Ogihara (1996), Schlenker (2003), and von Stechow (2003) all assume PRES has an indexical component, like (11):

(11) $[\![\text{PRES}_j]\!]^{c,i,g} = g(j)$ iff $g(j) \cap t^*$, else undefined. (Schlenker 2003)

The key fact motivating an indexical reading is that in English a PRES under PAST cannot get a simultaneous reading, which follows if PRES is always utterance-indexical. The obligatoriness of double-access readings follows from the ULC (the standard derivation of double-access readings is a *de re* interpretation of the lower PRES; see section 4.2.4). Suspending the ULC in *Present-in-the-Past* environments will *not* get the correct reading, as the PRES will be utterance indexical (hence in (1a) the knight would be returning *now* from the Crusades). What is needed is to remove the presupposition of utterance-time overlap that PRES contributes.

Such a mechanism is needed independently by indexical theories to handle a present tense under *will*.

(12) *Sue will think that her husband is a doctor*.

In a context where Sue is an unmarried child, (12) is still felicitous, even though (11) would require her to have the belief that her future husband is a doctor *now*. Such non-indexical PRESs are explained in indexical accounts by Tense "Deletion", which removes the indexical presupposition:

(13) $[\![\varnothing\text{-PRES}_j]\!]^{c,i,g} = g(j)$ iff $g(j) \cap \text{TIME}(i)$, else undefined.

The distribution of (11) and (13) is governed by Tense Deletion licensing constraints, which descriptively allow a $\varnothing$-PRES only in the immediate scope of another PRES.[4] This does not arise in the Present-in-the-Past examples. We may, of course, add the environment of 2.3 as a subcase for Tense Deletion, but this would only amount to restating the problem.

3.2. Abusch (1998): a digression

Abusch (1998) attempts to handle the future-shifting effects of (12) given unified semantics for PRES. She assumes the following (using the formalism presented above), where PRES is the $\varnothing$-PRES above:

(14) a. $[\![\text{PRES}]\!]^{c,i,g} = \lambda Q_{it}.\ Q(\tau)$
b. $[\![\text{PAST}_j]\!]^{c,i,g} = \lambda Q_{it}.\ Q(-\infty, g(j))$ iff $g(j) \subseteq \tau$; else undefined.
c. $[\![\text{woll XP}]\!]^{c,i,g} = \lambda t.\ [\![\text{XP}]\!]^{c,i',g}$, where $i' = \langle w, (t, \infty)\rangle$

Woll serves to shift the local evaluation time to a final segment beginning at some time *t* (specified by the higher tense), and so Abusch's (1998) system correctly derives our *Present-in-the-Past* reading (the final future shifted interval would be $(g(j), \infty)$). There are, however, two problems. First, the system predicts that *Present-in-the-Past* should hold for complements as well as adjuncts; this is not so. More importantly, it is unclear how the system of Abusch (1998) drives the semantics of double-access configurations. In her 1998 framework, it is argued that double-access sentences have the LF in (15):

(15) PAST_j [Sue say $\lambda\tau$.[[PRES [it be raining]]]$^{c,\langle w,\tau\rangle,g}$]

Thus, attitude verbs bind the evaluation time of the complement clause. This seems sensible, and indeed, we adopt it later on in our own analysis as the proper formulation of the ULC (cf. Kratzer 1998). However, as PRES

simply asserts that the event time is the evaluation time, (14) gives us a *simultaneous* reading for double-access sentences (modulo whatever mediating relation between the matrix clause now and the belief worlds' nows). This unfortunate derivation proceeds in the manner it does precisely because there is nothing in the grammar forbidding a PRES in the scope of a PAST.[5] In sum, Abusch (1998) is both too weak (no complement-relative clause difference for *Present-in-the-Past*) and too strong (does not derive double-access readings).

4. Proposal

We propose a new analysis of tense, which uses two ingredients from previous analyses: polarity (cf. Stowell 1993) and a semantic restriction on tenses of embedded complements (cf. von Stechow 1995, Kratzer 1998). In a nutshell, we claim that there are polarity relations between tenses. Specifically, PRES is an anti-PAST polarity item: it cannot be in the scope of a PAST. Future modals act as interveners in this polarity relation, by protecting an illicit PRES: PRES under *woll* doesn't need to escape the scope of matrix PAST. The second ingredient is a restriction which states that the tense of a complement of an attitude verb must be bound: it either needs to be deleted (SOT), or it needs to move out by *res* movement. This *res* movement scopes above the intervening domain of *woll*, such that a future can no longer intervene between matrix PAST and a *res* moved PRES.

4.1. Overview of von Stechow's (1995) Theory of Tense

Our analysis is couched within the framework of von Stechow (1995), a referential theory of tense. This system postulates a distinguished time variable $t_0 = g(0)$ (cf. Heim 1994): when it is free, it denotes t*; in an intensional domain, it gets bound by lambda abstraction and serves as a local evaluation time.

The tense morphemes can either be free or bound. Free and bound morphemes share the same morphology.

– "free" tense morphemes are generalized quantifiers which use t_0 as a reference time:

(16) $[\![\text{PRES}_j]\!]^{c,g} = \lambda P_{it}.\ g(j) \cap g(0) \wedge P(g(j))$
$[\![\text{PAST}_j]\!]^{c,g} = \lambda P_{it}.\ g(j) < g(0) \wedge P(g(j))$

– "bound" tense morphemes are anaphors that refer to the distinguished time t_0:

(17) $[\![\varnothing\text{-PRES}]\!]^{c,g} = g(0) = [\![\varnothing\text{-PAST}]\!]^{c,g} = [\![\varnothing\text{-FUT}]\!]^{c,g}$.

The bound tense morphemes are the result of an LF Tense Deletion rule (cf. Ogihara 1989, 1996, Schlenker 1999):

(18) *LF Deletion Rule*: A tense can be deleted under c-command by a tense of the same type.

We will further make use of a version of Abusch's ULC, which forces tenses in intensional domains to get bound. The reformulation we use is that of Kratzer (1998), which differs from that of von Stechow (1995) in that, only the highest tense is bound (and not any tense within the complement). As we will see, Kratzer's formulation allows tenses of relative clauses to either be free or bound. This is crucial if we want to account for the differences between tenses in relative clauses and CP-complements of attitude verbs. Note that this requirement on tenses of complements of attitude verbs follows without stipulation, given the lexical properties of attitude verbs: the information that they need complements that denote properties of time is part of their semantics (attitude verbs are of type <<i,st>,<e<i,st>>> that is, they quantify over world-time pairs, not just worlds). Abusch's constraint is thus formulated as follows:

(19) *Abusch's Constraint*: The highest tense of an attitude context must be bound. (Kratzer 1998)

Finally, we will use the following lexical entry for future *woll* (from von Stechow 1995):

(20) $[\![woll]\!]^{c,g} = \lambda t \lambda P_{it}.\ \exists t' > t\ [P(t')]$

We treat *woll* as a tense (not a modal) which selects for a tenseless clause, headed by ∅-FUT (the tense shifted forward of the reference tense by *woll*). In contrast with PRES and PAST, *woll* (like perfect HAVE) takes an additional time argument, as a time of reference for the time shifted forward.

4.2. Accounting for *Present-in-the-Past* Sentences

4.2.1. Relative Clauses 101

We start by accounting for the relative clauses cases. Let's first look at a sentence with a PRES in the scope of a matrix PAST where no future auxiliary intervenes:

(21) a. *Jon said that he met a woman who is pregnant*.

Recall Abusch's Constraint, which forces the *highest* tense of the complement of an attitude verb to be bound. Because of this specific formulation, a free tense in a DP does not have to scope out, even though it is in an attitude complement. This gives rise to the following (simplified) LF for a PRES in a relative clause under a PAST:

(22) b. [PAST_1 λt_2 Jon say λt_0 λw [$\varnothing$PAST he meet [a woman who PRES_4 λt_3 be pregnant at t_3] at t_0] at t_2]
↓
t_0

c. [Jon say λt_0 λw [he meet [a woman who is pregnant at $t_4 \wedge t_4 \cap t_0$] at t_0] at $t_1 \wedge t_4 < t^*$]

The $\varnothing$PAST is the result of the LF deletion rule in (18). The movements of PAST_1 and PRES_4 are driven by type reasons (as for any generalized quantifier); von Stechow assumes that when these quantifiers move they bind the distinguished variable t_0, which in the matrix context is identified with t*, and in general is used as the reference time for free tenses.

Importantly, because of Kratzer's reformulation of Abusch's Constraint, (22c) is a well-formed LF, and the time denoted by relative clause PRES doesn't need to overlap with t* (it actually overlaps with counterparts of the saying time picked out by the attitude verb's accessibility relation). This is clearly not what (22a) means.

To explain the ill-formedness of (22c), we adopt Stowell's (1993) proposal that polarity is involved,[6] specifically, by assuming that the free PRES is an anti-PAST polarity item, which cannot be in the scope of a PAST.

4.2.2. Present is an anti-Past Polarity Item

We propose the following anti-PAST polarity relation:

(23) *Tense polarity*: PRES cannot be c-commanded by PAST.

The polarity relation in (23) is illustrated in the example below. The PRES in the relative clause is in the scope of the matrix PAST:

(24) *Jon said that he met a man who lives in Tokyo*.

(25) [PAST [$_{relative}$ PRES]]

*

The way this violation is resolved is by QRing the DP containing the relative clause:

(26) [$_{DP}$ [$_{relative}$ PRES]]$_i$ [PAST .... t_i ....]

This analysis naturally captures the fact that the DP in (24) can only be interpreted *de re*, as discussed in section 2.1. If it were interpreted *de dicto* and stayed *in situ*, it would create a temporal polarity violation.

4.2.3. Intervention Effects

The NPI literature offers several examples of intervention effects in polarity relation. Kroch (1979) first observed, for instance, that positive polarity items may appear in the scope of negation, provided a quantifier intervenes between the two (cf. Szabolcsi 2002):

(27) a. *{Not every student, No one} said something*.
[✓not>every>some]

b. *I don't think that Jon didn't call someone*.
[✓not>not>some]

We propose that in the temporal domain, there can also be intervention effects in polarity relation. Specifically, we propose that for *Present-in-the-Past* sentences, the intervener is not a quantifier but the future *woll*.

(28) *anti-PPI blocking (to be revised)*: *woll* acts as an intervener between a PAST tense and a PRES in its scope.

This intervention effect is what rescues our *Present-in-the-Past* sentences: the PRES which was in the scope of a matrix PAST is now protected by the intervener *woll*. This is informally represented in (29):

(1) c. *(...) Washington said that he would promote a soldier who has fewer than five wounds (...).*

(29) [PAST ... *woll* ... [$_{\text{relative}}$ PRES]]

Now in formal terms, (30a) is the LF of (1c):

(30) a. [PAST$_1$ G.W. say λt_0 λw [$_\alpha \varnothing$-PAST he woll λt_0 [$\varnothing$-FUT promote [a soldier who PRES$_4$ has >5 wounds]]]]

b. [PAST$_1$ λt_2 G.W. say λt_0 λw [$_\alpha$ he woll λt_0 [promote [a soldier who PRES$_4$ λt_3 has >5 wounds at t_3] at t_0] at t_0]at t_2]

c. [G.W. say λt_0 λw [$_\alpha$ he woll λt_0 [promote [a soldier who has >5 wounds at $t_4 \wedge t_4 \cap t_0$] at t_0] at t_0] at $t_1 \wedge t_1 < t^*$]

d. [G.W. say λt λw [$_\alpha$ he woll $\lambda t'$ [promote [a soldier who has >5 wounds at $t_4 \wedge t_4 \cap t'$] at t'] at t] at $t_1 \wedge t_1 < t^*$]

(30d) gives the truth conditions we want for *Present-in-the-Past* sentences: a relative clause PRES is interpreted as overlapping the promotion time, which is future-shifted with respect to the saying time. However, without (28), (30d) violates the polarity condition in (23), since the relative clause PRES$_4$ is c-commanded by the matrix PAST$_1$. We propose that (30d) is well-formed because of the intervention of future *woll*, which neutralizes the illicit scopal relation between PRES and PAST.

Finally, note that in a sentence such as (1c), a DP still has the option of QRing, yielding a *de re* reading (giving rise to the infelicitous reading of (1c)). This is in fact what obligatorily occurs with specific DPs (in (7), repeated below):

(7) *Washington said that he would promote <u>the soldiers</u> who have fewer than five wounds.*

(31) [PAST ... *woll* ... [$_{\text{SPEC DP}}$ [$_{\text{relative}}$ PRES]]

In (7) the DP has to move outside of the VP domain for specificity reasons. Indeed, according to Diesing (1992), weak determiners have to be VP-internal, as they contain a variable that must be bound by existential closure (provided at the VP-level). In contrast, a definite/strong quantifier must move outside of the VP, forcing QR. Our analysis of tense seems to provide evidence for such a split: we have seen that when the DP contains an indefinite, it may stay in situ in order to prevent PRES from violating past polarity conditions. When we allow QR of the indefinite, the sentence receives an interpretation where PRES overlaps t*. Crucially, the DP then presupposes the non-emptiness of its restrictor. Correspondingly, we can make sense of the sharp intuition that, when the DP is introduced by a definite (as in (7)), it must mean that there exists a particular plurality of soldiers and that they must have fewer than five wounds. This fact is not surprising in the light of Diesing's proposal: a definite/strong determiner must undergo QR.

Diesing's proposal only requires that the strong determiner moves out of VP. The tense facts discussed above force movement in fact above T, otherwise PRES would still be shielded from matrix PAST by the intervening *will*. If QR is above T, the polarity conditions are violated: the DP must raise further up and the reference time of the relative clause is t*, in accordance with the judgments. This has the interpretative consequences that the DP is interpreted specifically and the present overlaps t*.

In sum, a PRES in a relative clause embedded under a matrix PAST can be licensed *in situ* if a future intervenes between the present and the past, unless the DP containing the relative clause has to move for independent reasons (e.g., specificity). We have explained this fact in terms of polarity relations in the temporal domain: PRES is an anti-PAST Polarity Item and future *woll* acts as an intervener in this polarity relation.

4.2.4. Explaining Complements

We now turn to complements of attitude verbs. Ordinary PRES under PAST seems to violate the same polarity restriction as relative clauses, schematized in (33):

(32) *Jon said that Sue is pregnant*.

(33) [PAST ... [$_{CP}$ PRES]]

*

However, contrary to the earlier relative clauses examples, a complement CP cannot QR to matrix level.[7] Indeed, this would give rise to the independent tense readings of relative clauses, which are unavailable to complements. Instead, a PRES in a complement clause to a matrix PAST is *always* read double-access: the state of pregnancy in (32) has to overlap both Jon's speech time AND t*.

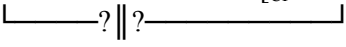
(34) $[_{CP}$ PRES $]_i$ [PAST .... t_i ....]

*

So the first puzzle that emerges when we look at complements is why they give rise to double-access readings. We also have another problem: as it stands, *woll* should be able to intervene between a CP complement and a matrix PAST, as it does for relative clauses. However, such a configuration gives rise to an infelicitous reading. (8) can only be interpreted double-access (the requirement to serve in the army has to hold at an interval which includes t*):

(8) *#Washington promised that he would say that his generals are no longer required to serve in the army*.

(35) [PAST ... *woll* $[_{CP}$ PRES]]



What is different about complements that doesn't allow *woll* to intervene for a CP PRES, but allows it for a relative clause PRES? The answer to the second puzzle will relate to the first one. Specifically, we will argue that (32) violates a condition independent of polarity. Resolving that condition will force a CP PRES to move beyond *woll*'s intervention domain.

Let's first consider the double-access requirement. Since (35) doesn't violate our polarity constraint, there must be some other reason for PRES to move. This is where Abusch's Constraint (repeated below) plays an active role.

(19) *Abusch's Constraint*: The highest tense of an attitude context must be bound. (Kratzer 1998)

The formulation in (19) ensures that this restriction only applies to the tense of the attitude verb complement.[8] Going back to our double-access

sentences, the problem with (35) is that the CP tense is not bound. How do we fix it? Recall that one way for a tense to be bound in von Stechow's system was through Tense Deletion. However, this won't do in PRES under PAST sentences, where no c-commanding PRES can trigger the deletion of the embedded PRES. The solution that von Stechow (and others) adopts is *res*-movement of the PRES, which leaves a variable to be bound by the attitude verb. PRES_i is then interpreted *de re*.

(36) [PAST say PRES_i λt_i [$_{CP}$ t_i]]

Following Lewis (1979), *de re* interpretation of a tense or an individual α is mediated by a contextual acquaintance relation R, which picks out α in the actual world and picks out the attitude holder's counterparts for α in his belief/saying/etc. worlds. Thus, *Ralph believes that Ortcutt is a spy* can be interpreted with Ortcutt read *de re* in contexts where, for example, the relation R is *the suspicious looking man walking on the beach*. In the actual world, this happens to be the individual Ortcutt, but in Ralph's belief worlds, this may not be the case. Given a suitable R, *de re* ascription asserts that the embedded proposition holds of the attitude holder's counterparts for α (i.e., who Ralph might believe the suspicious looking man actually is), but not of α itself. The semantics of attitude verbs that allow *de re* construal is as follows (the picking out α condition is cast as a presupposition).

(37) $[[\text{say}]]^{c,g} = \lambda t\, \lambda P_{ist}\, \lambda x.\ \forall <w',t'>$ compatible with $<w_0, t_0>$
$[P(R(w',t'))(<w', t'>)=1]$ iff $R(w_0, t_0)=t$, else undefined.

Consider the particular PRES under PAST example in (38):

(38) a. *Sue said that it is raining [because her bones ache]*.
b. [$_{CP}$ Sue PAST_i say PRES_j [$_{CP}$ that it t_j be raining]

For PRES_j to be interpreted *de re,* there must be an R – suppose it is 'the interval of Sue's bones aching' – which in the actual world must pick out an interval overlapping t* (by the denotation of PRES_j). Further, for each accessible world-time coordinate <w',t'>, it must be raining in w' during R(w',t'). The PRES_j itself will contribute that g(i) overlaps t_0; as the presupposition of *say* in (37) ensures that $R(w_0,t_0) = g(i)$, we have that $R(w_0,t_0)$ overlaps t_0. In a matrix context (without *woll*), this will ensure that, for instance, Sue's aching time in (38) overlaps t*.

Note that there is no inherent ordering of R(w',t') with respect to t' itself; in particular, as it stands there is no constraint forcing the rain time to overlap the internal now of the attitude verb. This seems like a job for the ULC, and that is precisely what Abusch (1993) proposes: the ULC applies to the trace t_j, forcing it to precede or overlap Sue's speech time. Heim (1994) argues that this is because the ULC is a definedness condition on T nodes, not the lexical items themselves:

(39) ULC (Heim 1994): For any T dominating term α,
$[[\ [_T\ \alpha]\ ]]^{c,g} = [[\alpha]]^{c,g}$ iff. $[[\alpha]]^{c,g} \leq t_0$, else undefined.

As written, the ULC in (39) will apply to the trace of res-movement t_i in (36). It thus will project to the attitude verb quantifier the presupposition that R(w',t') ≤ t' (as t'= t_0 within the scope of the attitude verb), ensuring the lack of any future-shifted readings even when the tense itself moves.

This avenue is not open to us, since our ULC ("Abusch's Constraint") is a type-theoretic restriction, and not a temporal-ordering constraint. Following an option that Abusch (1997) considers, we will assume that the ULC effects result from a lack of suitable *de re* acquaintance relations about the future.[9] This means there is no need to postulate the strange functional category label triggered presupposition Heim is forced to adopt.

Let us return to the main quarry, complement clauses under *woll*. Let us assume *res*-movement occurs to satisfy Abusch's Constraint:

(40) [PAST ... *woll* say PRES_i λt_i [$_{CP}$ t_i]]
└──────?‖?──────┘

As it stands, this is not enough: indeed, PRES is still in the scope of *woll*, and hence need not move further. Thus, we must have a *res*-moved tense raise further, outside of the domain of *woll.* Why would it move higher? The key is that PRES is a generalized quantifier. As shown in (41), the *res* slot is only for times, not temporal quantifiers. Hence, we assume that the PRES must continue onward by QR for interpretability (von Stechow 1995). Thus, PRES will move further up, outside of the domain of *woll* for type-theoretic reasons. This yields a configuration which then violates our polarity restriction, as schematized below:

(41) [PAST ... PRES_i ... *woll* say ... t_i ... [$_{CP}$ t_i]]
└──────┘
*

Because (41) violates our polarity restriction, PRES is forced to move to the matrix level, yielding a double-access reading:

(42) [PRES_i ... PAST... t_i ... *woll* say ... t_i ... [$_{CP}$ t_i]]

In sum, a complement PRES under a matrix PAST is bad for two reasons: (i) it violates our polarity restriction and (ii) it leaves an embedded CP tense free. The PRES first moves by *res-movement* in order to satisfy Abusch's Constraint. It will further move for type-mismatch resolution, outside of the protective domain of an eventual *woll*, and further again until the polarity restriction is satisfied (i.e., all the way to matrix level). Abusch's Constraint will not apply to relative clauses, thus the first step (res-movement) will not be required: a PRES in a relative clause will never need to scope out of *woll*'s protective domain.

So far, we have schematized the role of the different constraints and how they were resolved. Formally, the story is complicated by the semantics of the future, which selects for a tenseless clause headed by ∅-FUT (the tense shifted forward of the reference tense by *woll*):

(43) $[\![\textit{woll}]\!]^{c,g} = \lambda t \lambda P_{it}.\ \exists t' > t\ [P(t')]$

Consider the LF of (44) below:

(44) a. *Sue thought that Jon would say that Bill is unhappy*.

b. [PAST_1 Sue think λt_0 λw [∅-PAST Jon woll λt_0 [∅-FUT say λt_0 λw" [$_\alpha$ PRES_4 Bill be unhappy]]]]

c. [PAST_1 λt_2 Sue think λt_0 λw [Jon woll λt_0 [say λt_0 λw" [$_\alpha$ PRES_4 λt_3 Bill be unhappy at t_3] at t_0] at t_0] at t_2]

d. [Sue think λt_0 λw [Jon woll λt_0 [say λt_0 λw" [$_\alpha$ Bill be unhappy at $t_4 \wedge t_4 \cap t_0$] at t_0] at t_0] at $t_1 \wedge t_1 < t^*$]

e. [Sue think λt λw [Jon woll $\lambda t'$ [say $\lambda t''$ λw" [$_\alpha$ Bill be unhappy at $t_4 \wedge t_4 \cap t''$] at t"] at t'] at $t_1 \wedge t_1 < t^*$]

As can be seen in (44e), the tense of the complement CP α is not bound, and hence violates Abusch's Constraint. In order to solve this, PRES must scope out, by *res*-movement. This yields the LF in (45).

(45) [PAST_1 Sue think λt_0 λw [∅-PAST Jon woll λt_0 [∅-FUT say PRES_4 [λt_3 λt_0 λw" [$_\alpha$ t_3 Bill be unhappy]]]]

However, because the *res* argument of the embedding verb is an individual (time) type, the quantifier must move again to adjoin to a node of type <s,t>; the closest such node is above the ∅-FUT:

(46) [PAST$_1$ Sue think λt_0 λw [∅-PAST Jon woll λt_0 [PRES$_4$ λt_2 ∅-FUT say t_2 [λt_3 λt_0 λw" [$_\alpha$ t_3 Bill be unhappy]]]]

Note that this is distinct from the LF of (41) we offered in our schematized version, where type mismatch resolution drove PRES above *woll*:

(41') PRES ..... PAST ... t *woll* say t .... [$_{CP}$ ... t ...]

③ ② ① *Abusch's Constraint*

resolve polarity violation *type-mismatch resolution*

The complication is that type-mismatch resolution actually moves PRES below *woll* and above the tense it selects for, as illustrated below:

(47) PRES ..... PAST ... t *woll* t ∅-FUT say t .... [$_{CP}$ ... t ...]

③ ② ① *Abusch's Constraint*

resolve polarity violation?? *type-mismatch resolution*

This LF *is* actually well-formed if we take *woll* to be the intervener in the polarity relation, which would mean that there shouldn't be an adjunct-argument asymmetry for *Present-in-the-Past* readings. Recall that we postulated that it was *woll* itself that intervened between the PRES and a matrix PAST. We propose instead that (28) be reformulated as follows:

(48) *anti-PPI blocking* (final version): ∅-FUT acts as an intervener between a PAST tense and a PRES in its scope.

(48) renders (46) ill-formed and drives PRES to scope above matrix PAST for polarity reasons. This correctly yields the double-access reading for complements under future-oriented items.

What is this ∅-FUT, which is interpreted as a bound tense but suffices to intervene between PAST and PRES? First, we assume that it is found with all

future-oriented modals, explaining why they also create *Present-in-the-Past* environments. We further suggest that this particular null tense morpheme is actually the marker of a kind of irrealis, indicating that complement is unrealized at the time of the matrix tense (and saying nothing about its truth at t*). It is this irrealis component that gives rise to the "hypothetical" or "conditional" flavor of the *Present-in-the-Past* examples.[10]

5. Conclusion

We have discussed examples in English in which a present embedded under a past, a configuration which should be illicit under any theory of tense, seems to be rescuable when a future-oriented predicate intervenes between the two. We have called such sentences *Present-in-the-Past*, and have shown that such examples seem to counterexemplify indexical accounts of the English Present. We have suggested instead that we should incorporate notions of temporal polarity, which would allow us to explain: (i) why PRES under PAST is ill-formed for both complements and DPs; (ii) why embedding under future-oriented items repairs the ill-formedness for DPs but not complements.

Notes

1. The data we present in this paper has been compiled from an online survey. For helpful discussions, thanks to D. Fox, I. Heim, S. Iatridou, D. Pesetsky, P. Schlenker, T. Stowell, and the CHRONOS 6 audience.
2. Following Abusch's (1988), the tenseless future modal.
3. We assume that DPs that allow *Present-in-the-Past* readings differ from those that do not in 'specificity' (assuming that specific DPs must QR). Whether the correct generalization involves definiteness, strength or genericity we leave to further research.
4. The technical implementations of these deletions vary. We will continue to employ the term Tense Deletion for the principles governing the regulation of the distribution of (13).
5. If we allowed the embedded PRES to *res*-move, we would obtain a double-access reading, but only if we stipulated that res movement (but not say, temporal adverbials) can extend the top node's evaluation time.

6. Note that for Stowell, the *present* and *past* morphemes are semantically vacuous Polarity Items. What is responsible for temporal relations in his system are the tense heads themselves which are (i) morphologically null; (ii) not polarity items themselves. Our proposal is substantially different in that we don't have a separation of the *present* and *past* morphemes vs. the corresponding tense heads. Thus, we adopt von Stechow's semantics of PRES and PAST but retain Stowell's notion of polarity.
7. Stowell (1993) actually claims that CP complements can and in fact must QR in cases of double-access. See von Stechow (1995) for a semantic argument against this position.
8. It also naturally accounts for temporal attitudes *de se*; see Kratzer (1998).
9. A potential problem which ultimately makes Abusch reject this possibility is the alleged lack of suitable acquaintance relation in sentences such as:
   (i) Jon PAST_i believe that he PAST_j be in Paris at some time.
   However, we are not sure this is a real problem: we can think of relations for the evaluation time such as "my life up to this point" and aspect would ensure that the event time be contained within that interval.
10. (ii) may appear as a counterexample to our generalization (P. Schlenker, p.c.):
    (ii) #In 40 B.C. Caesar met someone who would later kill any senator that stir**s** up rebellious sentiment in the Roman Empire.
    PRES in (ii) needs to be interpreted as overlapping t*, despite the presence of *would*. However, sentence (ii) feels like a fate in hindsight (cf. Kamp 1971).
    (iii) A child was born that would be king (*in 2010).
    Crucially, fate in hindsight sentences require that the complement of *would* be realized by t*. The exact relation between fate in hindsight *would* and "regular" *would* remains puzzling: distributionally, the former appears in extensional contexts, the latter in intensional ones, but there is nothing in the semantics of *woll* combined with lack of intensionality that would prevent its complement to be interpreted after t*. We suggest that fate in hindsight is always realis *de facto* and thus won't select the irrealis ∅-FUT, which is responsible for the intervention effect in the temporal polarity in (i).

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Reference time without tense

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The notion of Reference Time was first presented in Hans Reichenbach's (1947) analysis of tense.[1] For Reichenbach, the meaning of a tense includes the time talked about in a sentence, known as Reference Time. Reference Time is related both to the moment of speech and to the time at which an event or state occurs. This idea has been critiqued, extended, and developed in later work.[2] Naturally, then, one thinks of Reference Time as associated with tense. But when one looks closely at languages without tense, it turns out that Reference Time is also needed to understand at least two other systems of temporal location as well.

I propose here an account of temporal location without tense which depends on default inference from aspectual information, using the notion of Reference Time as key. I discuss Mandarin Chinese, which is tenseless, and Navajo, which allows sentences without temporal information. In these languages aspectual viewpoints code Reference Time, while the relation of Reference Time to Speech Time is due to pragmatic inference.

I conclude that Reference Time is basic to temporal location in language: it may be conveyed by tense or aspectual morphemes. This study adds a new dimension to the well-known connection between temporal location and aspect.

§1 presents background information; §2 and §3 discuss Reference Time in Mandarin Chinese and Navajo, respectively. §4 offers a sketch of semantic and pragmatic rules for temporal interpretation in Mandarin, using the framework of Discourse Representation Theory; §5 concludes.

1. Background

This section provides background information for the discussion of Reference Time in Mandarin and Navajo.

1.1. Principles of interpretation

I assume three general, well-known, pragmatic principles that allow and constrain temporal location. Temporal location based on tense, adverbs

and/or temporal particles is direct; otherwise it is indirect. Since indirect temporal location involves interpretation based on inference, I'll use the term 'temporal interpretation' when warranted. The principles are these:

(1) *The Deictic Principle*
Situations – events and states – are temporally located with respect to the present moment, Speech Time.

(2) *The Bounded Event Constraint*
Bounded situations are not located at Speech Time

(3) *The Simplicity Principle of Interpretation*
If information is incomplete, choose the interpretation that requires the least information added or inferred

The Bounded Event Constraint, or something like it, is discussed in Lyons (1977), Kamp and Reyle (1993), Giorgi and Pianesi (1997). The Simplicity Principle states a computational principle that is used in managing information and inference of many kinds (Kanisza 1976 presents a study of the key role of the simplicity principle in vision).

1.2. Time and tense

Time is a single unbounded dimension, so that some kind of orientation is needed to locate a situation temporally. At a minimum, we recognize the moment of speech – Speech Time (SpT) as the central orientation time; and the moment or interval of the situation expressed in a clause, Situation Time (SitT).[3] What Reichenbach showed is that a third time, Reference Time, (RT), is also needed to account for tense meanings. For certain tenses - e.g. the perfect - the meaning directly involves this third time; in a systematic account all tenses involve RT, which gives temporal perspective or standpoint. Thus the notion of tense involves three coordinates for locating situations in time: Speech Time, Reference Time, and Situation Time.

This approach underlies a general 'two-tiered' analysis of tense: a systematic account inspired by Reichenbach's work in which all tenses convey information about three times, and two relations between them (Kamp and Reyle 1993, Smith 1991/7). The three times are Speech Time (SpT), Reference Time (RT), and Situation Time (SitT). One relation is between RT and SpT, the other between RT and SitT.

(4) *The two-tiered analysis of tense*
Present tense RT=SpT=SitT:
Past tense RT<SpT, RT=SitT; Future tense RT>SpT, RT=SitT
Perfect tense & embedded future, SitT ≠ RT.

In a tensed language RT is available in all main clauses, because RT is associated with each tense. In the body of this paper I will argue that RT is also available in Mandarin and Navajo, through aspectual viewpoint.

To provide a basis for comparison between tensed and tenseless language, I sketch briefly a semantic account of the information conveyed by tense in English. I assume a Discourse Representation Theory approach (Kamp and Reyle 1993, Smith 1991/7). The theory constructs a semantic representation on a clause-by-clause basis from the sentences of a text.

Tenses and adverbials have features that give their relational, deictic, and aspectual values (if any[4]). These features license the introduction of temporal information into semantic representation, the Discourse Representation Structure (DRS). Temporal information appears in the DRS in the form of temporal entities and conditions. A temporal entity which represents the present moment, t1, is introduced automatically into the DRS for every clause. The tense morpheme – tense appears in every main clause in English – introduces two more times, t2 and t3. The three times correspond to Speech Time (t1), Reference Time (t2), Situation Time (t3). Each tense codes the relations of the three times to each other, roughly as indicated in (4); this information is associated in the lexicon with a given tense.

For instance, in the sentence Mary laughed, the tense is past: it has the relational value of 'before' and is deictic, oriented to Speech Time. The English past tense conveys that RT< SpT, RT=SitT. The sentence is analyzed by construction rules, which license (a) the introduction of the temporal entities t2 and t3 in the representation and (b) conditions that state the relations between t1, t2 and t3. Temporal location adverbials specify RT time in a simple sentence; in more complex sentences they may specify SitT. Thus when we add an adverbial to the previous sentence, e.g., Mary laughed 5 minutes ago, RT is specified more narrowly. This adverbial has the relational value of 'before' and is deictic, calculated from SpT: RT is 5 minutes prior to SpT. For further discussion, including tense in complex sentences and non-finite clauses, see Smith (1991/7).

1.3. Reference Time

I now introduce Reference Time, presenting the four main arguments that I know of for the notion. The first is Reichenbach's demonstration of the meaning of the perfect in English. There seems to be no truthconditional difference between the present perfect and the past in English: both locate the event of John's leaving before the Present, or Speech Time.

(5) a. *John has left*.
b. *John left*.

But Reichenbach argued convincingly that there is a difference in perspective, and thus in meaning: (5a) takes the perspective of the Present while (5b) is set squarely in the Past. In his terms, (5a) has a Reference Time of the Present, with an earlier Situation Time. (5b) has a Reference Time of Past, and the Situation Time is the same. Schematically:

(5') a. *John has left*. SpT=RT, SitT < RT
b. *John left*. RT < SpT, SitT=RT.

In these examples the construct of Reference Time explains a rather subtle difference in meaning. When we look at other cases of the perfect, we see that three times are required to express the temporal information they convey. The past and future perfects require three times. Thus (6a), a past perfect, requires the Present – the anchoring time; a time in the Past, from which the leaving is calculated; and an earlier time, the time of leaving. Symmetrically, (6b) also involves three times: the Present, a time in the Future, and a time before that at which the leaving takes place.

(6) a. *Mary had left*. RT < SpT; SitT < RT
b. *Mary will have left*. RT > SpT; SitT < RT

In actual texts, of course, such sentences usually have adverbs and other information that make the interpretation clear. The temporal relations between situations in a text can be understood and modeled with the notion of RT. This point was made by Reichenbach; it is worked out in detail by Hinrichs (1986). The context of a clause gives information that locates the situation expressed relative to another situation. Modeling the relations with RT, we can say that overlapping situations share RT while those in sequence do not. This accounts nicely for the difference between the examples in (7).

(7) a. *Leigh was smiling when Jo left*.
b. *Leigh smiled when Jo left*.

Thus the notion of RT provides a locus for relating situation in a principled manner.

Adverbs also provide evidence for RT: there are adverbs in many languages that locate situations before a time talked about in a sentence, for instance *already* and its cousins:

(8) *already*, *déjà*, *bereits*, *yijing*, *t'áá'íí ɖą́ą́,* etc.

The examples in (8) illustrate this; they are from English, French, German, Mandarin Chinese, Navajo.

Finally, shifted deixis constitutes evidence for RT. Reference Time is often said to provide the temporal perspective for a sentence. Extending this notion of perspective gives us an understanding of shifted deixis. The adverbs *now*, *in 3 days*, etc., are deictic, with the moment of speech as anchor. But they can also anchor to another time, a time in the past (or future):

(9) a. *The army was now on the verge of rage*.
b. *Mary was now ready to stop working*.

The RT for these sentences is a Past time; the shifted now takes the perspective of the past. When a particular consciousness is involved, there is an additional element: a point of view ascribed to that consciousness. So in (9b) for instance we interpret the sentence as presenting Mary's point of view.

These arguments show that Reference Time is indispensable to an understanding of the temporal information conveyed in tensed sentences. Aspectual information plays a role in the relation of a situation to its temporal location. The key factor is boundedness. Situations may be unbounded or unbounded, according to the internal structure of the situation and the aspectual viewpoint of the clause. There is a well-known interaction between the boundedness of a situation and its relation to Situation Time, SitT. Bounded events are included in the situation interval; unbounded events and states overlap the situation interval:

(10) *Boundedness and Situation Time*
a. Bounded events (E): E $\subseteq$ SitT
Leigh built a sandcastle. John left.

b. Unbounded situations (E,S): SitT 0 E/S
John was working. Leigh was at school.

In a somewhat different approach, Klein (1994) suggests that aspectual viewpoint codes the relation between the run-time of a situation and Topic Time, a designated reference time.[5]

As before, I assume the approach of Discourse Representation Theory (DRT). Aspectual and temporal information is interpreted by construction rules from surface structure and entered into the ongoing Discourse Representation Structure (DRS) of a text or discourse. The information consists of temporal and situation entities with defining properties and relations (Kamp and Reyle 1993, Smith 1991/7), as indicated above in the brief discussion of tense.

2. Mandarin Chinese

Mandarin is a tenseless language.[6] It has a full range of temporal adverbs, which are syntactically optional: thus a sentence need not convey direct temporal information. There are many such sentences in actual texts. In such cases aspectual information allows inference of temporal location. The principles for default temporal location are explored in Smith and Erbaugh (2001, 2005); Lin (2003). As noted above, the key factor is boundedness, which may be due to aspectual viewpoint or situation type. The principles are summarized here:

(11) *Default temporal location, inferred*
Unbounded situations, Present - by the deictic principle (1)
Bounded events, Past - by the pragmatic principles (2) and (3).

Explicit or contextual temporal information is needed to locate situations in the Future; and to override the default by locating bounded events in the Future, and unbounded situations in the Past. There are also many cases in which information in the context allows temporal interpretation.

I will now show that the notion of Reference Time (RT) is needed to explain a variety of facts in Mandarin Chinese. The four kinds of evidence for RT adduced above have counterparts in this language. Consider the perfect first.

In Mandarin there is an aspectual viewpoint, a perfective, that semantically conveys temporal information like that of the perfect. By 'semantically

convey' I mean that the information is coded in the forms: it is not arrived at by inference, and cannot be cancelled. This viewpoint morpheme contrasts with another perfective aspectual viewpoint, *-le*. Compare, for instance, the pair of sentences in (12), from Chao (1948):

(12) a. *Wǒ shuāiduān le tuǐ*
I break-LE leg
'I broke my leg (it's still in a cast)'
b. *Wǒ shuāiduān guo tui*
I break-GUO leg
'I broke my leg (it has healed since)'

The -guo viewpoint in (12b) conveys that the time of the situation talked above precedes the time talked about; like the perfect of English and other languages. The notion of RT explains the contrast in (12a-b): the two viewpoints convey different relations between SitT and RT: *-le* conveys that SitT=RT; *-guo* conveys that SitT<RT. Thus *-guo* is essentially a perfect (Smith 1991/7, Mangione and Li 1993, Klein *et al*. 2000). There are other differences between *-le* and *-guo*, not relevant here.[7]

Like all languages, Mandarin has morphemes that convey the temporal relation between situations. The notion of RT provides a way of understanding these relations. For instance, the temporal adverb of (13) indicates a relation between two situations.

(13) *Tā chīle fàn cài zǒu de*.
She eat LE rice only then go DE.
'Only after eating did she go.'

In this example the structurally determined RT for 'going' is the time of 'eating', as Mangione and Li put it (1993). RT is also needed to model the temporal relations between situations in independent sentences - as in other languages.

Mandarin has adverbs that code the anteriority relation between a situation and a Reference Time, e.g. *yijing* 'already', *cai* 'have just'.

(14) *Zuótiān wǎnshang tā yǐjing zǒu le*
yesterday evening s/he already leave LE.
'Yesterday evening s/he had already left.'

Here there is an explicit temporal adverb that specifies RT; *yijing*, the adverb we are interested in, conveys that the leaving situation is prior to that time.

Finally, one finds shifted deictic forms in Mandarin texts. The following example is a fragment of a 1997 novel. The speaker compares a past time of good fortune with her earlier, rough life in Shanghai.

(15) *xiǎng dào gěi nàge shā qiān dāo kèrén dà bāchang de shì, he xiānzài´*
think to give that kill 1,000 knife guest big slap DE incident with now
shēnghuo yī bǐjiào zhēn shì bù shēn huìshou. Wǒ xiànzài sǔoxìng
life one compare really be boundless comparison. I now simply
nénggòu jià gēi Bǐ Xiānshēng....
able marry with Bi Mr.
'...thinking back to the time when I slapped that violent killer guest, comparing it to my current life, it was really a boundless difference. Simply, now I was able to marry Mr Bi.. '

A longer excerpt from this novel appears in Smith and Erbaugh (2005).[8] I conclude that the notion of RT is needed for Mandarin. As I analyze the language, aspectual viewpoint morphemes code the relation between Reference Time and Situation Time: it is part of their semantic meaning. The perfective morphemes *-le* and *-guo* differ as noted above: *-guo* conveys that SitT < RT. The imperfectives *zai* and *-zhe* convey that SitT=RT.[9] Clauses that have no overt aspectual viewpoint morpheme are zero-marked and have the neutral viewpoint, in which RT=SitT. For details see Smith and Erbaugh (2005).

Thus we have a straightforward parallel between tensed and tenseless languages – or more cautiously, between English and Mandarin. In English, all clauses have tense; tenses introduce times for RT and SitT and relate them to each other and to t1. In Mandarin, all clauses have an aspectual viewpoint, including the neutral viewpoint. Viewpoints introduce RT and SitT times and their relation into the DRS.

Temporal location: I assume that the temporal location of the situation expressed is part of the basic, truth-conditional interpretation of a sentence. One must know 'when' as well as 'which individuals', and 'where'. To locate a situation temporally, one needs to know the relation of the situation to Speech Time. In Mandarin, this relation is not coded in the language: grammatical forms do not relate RT to SpT (ignoring temporal adverbs which are always optional). Recall that aspectual viewpoints express the RT-SitT relation only. Temporal location – the relation RT-SpT – is inferred. This is the main difference in how temporal location is determined

for tensed and tenseless languages: in languages with tense, the relation of RT to SpT is coded. This account holds in the absence of optional adverbs and/or contextual information.

The key factor for inferring temporal location is the boundedness of the situation expressed. The default interpretation is that sentences with imperfective viewpoints are taken as Present, those with perfectives taken as Past (cf (11) above). For instance, (16a) has *zai* (impf), (16b) has *-le* (perf):[10]

(16) a. *shìshíshàng, zhèzhǒng móshǐshì zaì chaōxí kēxué*.
fact-on, this-kind model be ZAI copy natural science
'In fact, this model is already copying the natural sciences.'
b. *zhèxiē yánjiū doū beì pīzhǔn le*.
this-several research all BEI approve LE
'These research projects were all approved.'

The English translations reflect the default interpretation with tense. Not all Mandarin sentences have an overt viewpoint morpheme. Many are zero-marked, with the neutral viewpoint. They do not present a problem for speakers. They too allow the inference of temporal location, with an extra step: boundedness and temporal location are both determined indirectly, through inference.

The feature of boundedness is inferred from the temporal schema of the situation expressed in a clause: telic and single-stage events are intrinsically bounded, others are unbounded (by the Simplicity Principle given above). The inference of boundedness allows an inference of temporal location. Unbounded situations are taken as Present (17a), bounded events are taken as Past (17b).

(17) a. *xiānggǎng méiyǒu bìguān zìshoǔ de tiáojiàn*.
Hong Kong not-have close self-self DE situation.
'Hong Kong does not have the option of closing its doors.'
b. *Wáng Jizhì fāmíng zhōngwén dǎ zìjī*.
Wang Jizhi invent Chinese word processor
'Wang Jizhi invented the Chinese word processor.'

Locating a situation in the Future requires overt information of some kind – a modal, a future-oriented verb, or Future adverb.

In sum, decoupling the two Reference Time relations is the key to understanding how temporal information is conveyed in Mandarin. The relation of Reference Time to Situation Time is coded linguistically. The relation of

Reference Time to Speech Time is inferred on the basis of pragmatic information and inference.

3. Navajo

Navajo, an Athabaskan language, has a complex verb word that can function alone as a sentence. The language has several types of optional morphemes that convey temporal information. Thus, sentences with and without such information are found and a full account must thus provide for direct and indirect temporal interpretation.

The notion of Reference Time is needed to account for temporal interpretation in Navajo. As in Mandarin, Reference Time is conveyed by aspectual morphemes and allows the inference of temporal location. I sketch the system and illustrate the cases that rely on Reference Time; for a more complete analysis, see Smith, Perkins, and Fernald (2003, in press). Direct temporal information in Navajo is conveyed in several ways. There is a conjugational morpheme that conveys Future; it is available for event verb words.

Event verb words have one of seven 'conjugational modes' which contrast in a designated position in the verb word. One mode conveys Future. I thank Ellavina Perkins for providing some of the examples; the others cited are from Young and Morgan (1987).

(18) *Future mode*

a. *Deeschah*.
1p-Fut-cry
'I will cry' – cf *Yishcha* ('I am crying')

b. *Shimá ch'iyáán ɬa' bá nahideeshnih*.
1p-mother groceries some 3-for pref-1p-Fut-buy
'I'll buy some groceries for my mother.'

The semantic value of the future mode is privative (future *vs*. no information) rather than future *vs*. non-future. Thus it is not necessary to have the future mode in a sentence about the Future.

The remaining modes code aspectual information and the optative, an irrealis mode. The future mode is like a tense morphologically, since it is conveyed by a conjugational morpheme; but it is unlike a tense in distributional pattern. Since this is the only temporal mode, not all Navajo verb words have a conjugational morpheme that conveys temporal information.

Semantically the future mode is like a tense. It conveys temporal information, and has special atemporal interpretations in conditional contexts, as tenses have in many languages (Fleischmann 1989, Iatridou 2000).

There are also independent particles that convey Future (FPrt) and Past (PPrt); they appear with both event and state verb words.

(19) Past and Future particles

a. *'Ashą́ą́ dooleeł.*
1p-Impf-eat FPrt
'I will be eating' cf. *'ashą́* ('I'm eating')

b. *'Ashą́ą́ ńt'ę́ę́*
1p-Impf-eat PPrt
'I was eating' -cf *'ashą́* ('I'm eating')

These particles are semantically like tenses: they convey temporal information and they have special atemporal interpretations in conditional contexts.

The language also has a full range of temporal adverbs; they are optional, not tense-like (Smith, Perkins and Fernald 2003, in press).

I can now turn to the main topic, evidence for Reference Time in Navajo. All four kinds of evidence for it appear. I give them here in summary form.

Adverbials: the adverb *t'áá ĺídą́ą́ 'already'*; conveys that Situation Time precedes Reference Time. (20) illustrates: both clauses have the perfective aspectual viewpoint; the main clause has the Future particle and *t'áá ĺídą́ą́*.

(20) *Yiskąągo nihaa yíníyágo t'áá 'íídą́á kintahgoo niséyá dooleeł.*
tomorrow 1pl-to 2p-see-1pl-Perf+GO already town-to 1p Perf maketrip FPrt
'Tomorrow when you come to see us, I will already have made a trip to town.'

Temporally related clauses: Navajo has a subordinating conjunction, the morpheme *-go*, that can convey temporal relatedness. As noted above, I take it that the expression of temporal relations between situations requires the notion of Reference Time (RT): overlapping situations share RT and those in sequence have successive RTs.

(21) a. *dibé nanishkaadgo hataał.*
sheep 3pl-Impf-1p-herd-GO 3p-Impf-sing
'He is singing as I herd the sheep.'

b. *'ani'įįhii shiiɬtsą́ą́go sits'ą́ą́' dah diilwod.*
thief 1p-Perf-3p-see-GO, up/out 3p-Perf-run
'When the thief saw me he took off on the run.'

Similar examples can be constructed with forms corresponding to 'before', 'after' etc.

Shifted deixis: there are deictic adverbs in Navajo that can shift, anchoring to a time other than Speech Time. (22) illustrates with k'ad 'now'.

(22) *Jane tsosts'idigo bighandi nádzá. K'ad t'oo hanńshyįįh nízin.*
Jane seven-at 3p-home 3p-Perf-return.Now just 1p-Impf-rest 3-Neut-want.
'Jane got home at seven. Now she wanted to rest.'

The adverbial *k'ad* 'now' is anchored to a Past RT, the time specified in the preceding sentence by the adverbial *tsosts'idigo* 'at seven'. The shifted deictic takes the temporal perspective of the Past RT; and suggests the consciousness of the subject, as in similar examples given for other languages.

The Perfect: In certain cases, Navajo sentences can express a meaning that is essentially perfect: that a situation obtains prior to RT. (23), for instance, has two clauses: the first has the past particle *ńte'ęę́*; the second has the adverb *k'ad* 'now'; both have the perfective viewpoint in the verb word. The second clause conveys that the event of repairing occurred prior to now:

(23) *Shichidí yíchxǫ́' ńte'ęę́ k'ad 'anáshdlaa.*
1p-car 3p-Perf-ruin past now thus-back-3p-1p-Perf-make
'My car was ruined but now I have repaired it.'

The prior meaning is inferred: it is due to the Bounded Event Constraint, which blocks bounded events at Speech Time. (24) is another example of a perfect interpretation. Here it is triggered by the Future adverb and the perfective viewpoint; the sentence does not have a tense particle.

(24) *Kíi yiskąągo shichidí nayiisnii'.*
Kii tomorrow my-car na-3p-3p-Perf-buy
'(By) tomorrow Kii will have bought my car.'

This is perhaps the weakest evidence for RT, since Navajo does not have a form that directly codes the perfect.

Conclusion: The notion of Reference Time plays a role in Navajo, in sentences with and without direct temporal information. For further discussion see Smith, Perkins and Fernald (in press).

Finally, I present a Discourse Representation Theory account of temporal location in Mandarin, illustrating the use of Reference Time in temporal interpretation.

4. The semantics and pragmatics of temporal location in Mandarin

I sketch an account of RT and default temporal interpretation in Mandarin, within the framework of Discourse Representation Theory (DRT). I use semantic information and pragmatic inference, as discussed above in §2. After setting out the semantic information associated with the relevant forms, I present derivations for a sentence with the perfective *-le* and for an otherwise identical zero-marked sentence. The derivations infer temporal location from aspectual information. The account here roughly follows the DRT approach given for English in Kamp and Reyle (1993), but it differs in some respects, partly because English is a tensed language and Mandarin is not.

I assume a syntactic surface structure with an Aspect Phrase projection as the highest functional category (Cole and Wang 1996 propose a similar structure for Mandarin).

Temporal location is expressed as the Speech Time-Reference Time relation. It is stated as a condition in the Discourse Representation Structure that relates the two times to each other. Speech Time (t0) appears automatically in the DRS for a clause (Kamp and Reyle 1993). Reference Time (t1), Situation Time (t2) and their relation are introduced by aspectual viewpoints. Inference rules derive the key temporal location relation of t0 and t1 (Speech Time and Reference Time).

Recall that the aspectual feature of boundedness determines temporal location. Boundedness is expressed directly by the perfective viewpoint, as in (25a); it is inferred in a sentence that is zero-marked for viewpoint, such as (25b).

(25) a. *Lisi mai-le yi-ge pingguo*.
Lisi buy-LE one-CL apple
'Lisi bought an apple.'

b. *Lisi mai yi-ge pingguo*.
Lisi buy one-CL apple
'Lisi bought an apple.'

The two sentences have the same temporal interpretation, as the translations indicate, but by slightly different routes. The perfective morpheme -le semantically expresses bounded events. According to the inference pattern developed above, (25a) is taken as Past by pragmatic inference – using the Deictic Principle (1) and the Bounded Event Constraint (2). (25b) is zero-marked, with the neutral viewpoint. Since it expresses a telic situation, we infer that the event is bounded and that it is Past, by a second inference depending on the first. A more detailed account is set out directly below.

Bounded events are included in the t2 (SitT) interval; unbounded events and states overlap the interval. The relation between a situation and the SitT interval appears as a condition in the DRS for a sentence after its aspectual information has been introduced. What we need is an inference rule that derives the default inference of temporal location from this information.

We will provide for the inference of temporal location from the relation of an event or state to t2, the SitT interval. The rule thus makes an inferential leap from a relation involving t2 to the relation between t1 and t0. The rules provides for the interpretation of Present and Past temporal location, in the following way: (a) If t2 overlaps an event or state (E/S), then t1 = t0; the interpretation of Present; (b) if an event E is included in t2 then t1 precedes t0; the interpretation of Past. The rule assumes that the three times are already stated in the DRS. Recall that t0 appears automatically in every clause; t1 and t2 are introduced by aspectual viewpoints, including the neutral viewpoint.

Rule (26) essentially states the effect on interpretation of the first two principles given in §1 above: the Deictic Principle, together with the Bounded Event Constraint.

(26) Default temporal location inference rule
  a. If t2 O E/S -> t1 = t0;
  b. If E $\subseteq$ t2 -> t1 < t0

Note that we can't infer boundedness directly from an event that has intrinsic bounds because the aspectual viewpoint of the sentence might be imperfective.

I now develop the aspectual information needed to interpret temporal location, using the sentences in (25) as examples. We need a rule stating the intrinsic bound property of situation types; rules that provide the temporal information associated with each aspectual viewpoint; and a rule for inferring the boundedness of zero-marked cases from the boundedness property of a situation type.

Situation type is determined compositionally. I assume 5 situation types: State, and the four event classes of Activity, Accomplishment, Achievement, Semelfactive.[11] From a surface structure input, compositional rules interpret a sentence as expressing a situation type and introduce the appropriate situation entity – event or state – into the DRS with its characterizing features. Here I consider only the feature(s) relevant to boundedness. Two classes of event are intrinsically bounded: telic events and events that are [-durative], single-stage events. Telic events have intrinsic bounds as the characterizing property of their final endpoint; single-stage events are intrinsically bounded, due to their lack of duration they consist of a single stage. Strikingly, the two classes can be represented very simply in one statement. The statement is cast in part structure terms. For a telic/single-stage event that falls under a predicate P, no proper part can fall under the same predicate: (27) states this as property B of an event entity E:

(27) Property B:
For event E, predicate
Pt: $\forall$e, e' [Pt (e) & Pt (e') -> $\neg$ $\exists$e' < e]

Telic and single-stage events have property B as a characterizing feature. (this feature is similar to the [+telic feature] proposed by Krifka 1996 in his discussion of telic events).[12]

Aspectual viewpoint is conveyed morphologically, according to features of the verb, its arguments, and other information (Smith 1991/7). The viewpoints of Mandarin code temporal and aspectual information. They introduce the two time entities t1 and t2, and their relation; and they relate the relevant situation entity to t2 (SitT). (23) states the information associated with the perfectives *-le* and *-guo*, and the neutral viewpoint ø of zeromarked sentences. The zero morpheme – the neutral viewpoint – requires only that the initial endpoint of E (I(E)) be visible at SitT. This allows for the full range of neutral viewpoint interpretations. For a sentence S:

(28) Viewpoint rule
a. s[X AspP[-le] Y] -> t1, t2; t1 = t2; E at t2; t2 E.
b. S[X AspP[-guo] Y] -> t1, t2; t2 < t1; E at t2; E t2.
c. S[X AspP[ø] Y] -> t1, t2; t1 = t2; E at t2; t2 $\subseteq$ I(E).

Information associated with the other viewpoints of Mandarin is given in Smith and Erbaugh (2005).

This weak requirement in (28c) is supplemented by a default inference rule for zero-marked sentences, the Temporal Schema Rule. As noted above, the default interpretation depends on boundedness, here stated as property B. If an event entity E has property B, it is taken as bounded and the rule infers that E is included in the SitT interval (t2). If an event or state entity E/S does not have property B, it is taken as unbounded and the rule infers that E surrounds the SitT interval.

(29) Temporal schema rule: Default interpretation of zero-marked clauses
If an entity E has property B, then E $\subseteq$ t2; otherwise, t2 O E.

The rule follows directly from the Simplicity Principle of Interpretation. The default is triggered in the absence of other information. I can now give the derivations that infer the temporal interpretations of (25a) and (25b).

I begin with sentence (25a), repeated below. The sentence expresses Lisi *mai yige pingguo* 'Lisi buy an apple' – an Accomplishment; it has the perfective viewpoint morpheme *-le*. The DRS is developed gradually. The initial DRS is the interpretation of the situation type of the sentence, as in (30). The entities are given at the top: the event (e), its participants (x y), the time t0 automatically introduced with each clause. The lower sector of the DRS has conditions characterizing the participants and the event; line 4 has a condition that characterizes the event as an Accomplishment, with property B:

(30) *Lisi mai-le yige pingguo*

e x y t_0
1. x=Lisi 2. y=yige pingguo 3. e: mai (x, y) 4. e = Acc[Prop B]

The next step of the derivation is the interpretation of the aspectual viewpoint morpheme. The perfective *-le* triggers the application of the Viewpoint rule (28a): it introduces t1, t2 and their relation, and relates the event to t2:

(31) *Lisi mai-LE yige pingguo*

X y e t_2 t_1 t_0
1. x=Lisi 2. y=yige pingguo 3. e: mai (x, y) 4. e = Acc[Prop B] 5. t1 = t2 6. e t2

The final step relates t1 to t0: this gives the temporal interpretation of the sentence. In the absence of specific temporal information, the default rule is triggered for Temporal Location (Rule 24). This is a pragmatic inference rule. Since the condition on line 6 states that the entity e is included in t2, clause b of the rule applies. By this clause, the rule infers that t1 precedes t0, the past interpretation, given in (32).

(32) *Lisi mai-le yige pingguo*

X y e t_2 t_1 t_0
1. x=Lisi 2. y=yige pingguo 3. e: mai (x, y) 4. e = Acc [Prop B] 5. t1 = t2 6. e t2 7. t1 < t0

Now consider the DRS derivation of sentence (25b), which is zero-marked for viewpoint.

(25) b. *Lisi mai yige pingguo*
Lisi buy one-CL apple

The final DRS for this sentence is identical to (32) – but there is an additional inferential step in arriving at it. This additional step infers the infor-

mation of boundedness by the Temporal Schema rule. The rule provides that, since the event entity has Property B, the event is included in t2.

These are the steps for deriving sentence (25b):

a) The initial DRS is as given above in (30): the sentences has the same situation type, as (25a); the time t0 is introduced automatically.
b) The Viewpoint Rule for zero-marking (28c) and the Temporal Schema Rule (29) apply. The latter supplies the information of boundedness, that e t2.
c) The resulting DRS is identical to (31) above. In this case however the condition on line 6 is licensed by an inference rule, not by semantic information associated with the overt aspectual viewpoint.
d) Finally the Temporal Location inference rule applies, giving the relation between t0 and t1; resulting in a DRS identical to (32).

This account ignores the non-default cases. Such cases arise when there is temporal information in the context. It would have to be supplemented by rules that are sensitive to such information in a sentence.

5. Conclusion

Reference Time is an indispensable part of how temporal location is conveyed in Mandarin Chinese and Navajo. After presenting evidence for this claim, I gave an account of temporal interpretation in Mandarin for sentences without direct temporal information. A similar account would be appropriate for those sentences of Navajo that do not have direct temporal information, the tenseless cases discussed here.

In these languages without tense, linguistic forms involving Reference Time code its relation to Situation Time. The relation of Reference Time to Speech Time is pragmatically determined. This is a striking difference from tensed languages, in which both relations are coded grammatically. Speculating, Reference Time is found generally in language, but is systematically related to Speech Time only in tensed languages.

By deriving the inference of temporal location from aspectual information, I have shown that the two areas – traditionally seen as closely related – are even closer than may have been realized.

Notes

1. This paper was given at the 'Chronos' meeting in Geneva, Switzerland, 2004. I would like to thank the audience at the meeting for their questions and comments.
2. For instance, Comrie (1986), Hornstein (1990), Kamp and Reyle (1993).
3. Reichenbach's term was 'Event Time'; I use the more general 'Situation Time' to explicitly include events and states.
4. In the romance languges, e.g. French, past tenses code aspectual viewpoint information (imparfait, passé composé, passé simple).
5. Klein's Topic Time is in many cases almost indistinguishable from Reference Time. However, Bohnemeyer (2003) argues convincingly that there are significant differences between them, and that the notion of Reference Time is preferable because it accounts for a wider range of cases.
6. This point has been much discussed in recent years: see Hu *et al*. (2001), Lin (2003).
7. The meaning of *-guo* is considered in Yeh (1996); Lin (2003) discusses several approaches to this and other aspectual viewpoints of Mandarin.
8. The example is from Zhou Tianlai (1997). *Tingzi Jian Saosao* (Sister Next Door). Hefei: Anhui wenyi chuban she.
9. This account may hold only for default cases. A reviewer points out that it is possible to have a wide range of readings with both *-le* and *-guo* and that they may not all be covered by the relations between RT and SitT given here. Additional information in a clause or sentence may override the default.
10. These examples are from recent magazine articles (16a) is from Li Oufan, (2000). *Xianggang weihe zai chu bu liao da xuewen zhe?* (Why can't Hong Kong produce great scholars again?). Ming Bao Yuekan (Ming Pao Monthly). August. 21 - 22. (16b) is from Chen Lirong, (2000). *Feng bao chuixi Zhongguan Cun* (Stormy personnel conflicts rock Beijing's Silicon Valley). Qianshao Yuekan (Frontline Monthly). February. 48 - 49.
11. Each situation type has a characterizing cluster of the temporal features [±state], [± telic], [± duration]. States are [+ state]; Events are [- state]; Activities are [-telic] [+ duration]; Accomplishments are [+telic] [+ duration]; Achievements are [+telic] [- duration]; Semelfactives are [-telic] [- duration].
12. Krifka focuses on durative telic events – Accomplishments – and does not include single-stage events.

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